



iLLUminate Blog Transcript: Chad Meyerhoefer on Oral Health and Heart Disease

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- ANNOUNCER: 00:06 This podcast is brought to you by iLLUminate, the Lehigh Business blog. To learn more, please visit us at business.lehigh.edu/news.
- STEPHENIE VETO: 00:18 Welcome to iLLUminate, the podcast for Lehigh University's College of Business. I'm your host, Stephanie Veto. Chad Meyerhoefer is with us to talk about his research on the causal effects of poor oral health on heart disease. Meyerhoefer holds the Arthur F. Searing Professorship and is the chair of the Department of Economics. His research focuses on the economics of health and nutrition and involves using microeconomic methods to evaluate and inform public policy. Hi, Chad. Thanks for being here.
- CHAD MEYERHOEFER: 00:49 Thanks for having me.
- VETO: 00:50 Can you start by explaining what health economics is and why it's such an important field?
- MEYERHOEFER: 00:57 Sure. So health economics is the multifaceted study of how health and healthcare affect both the economy and individual behavior. So health as an industry is about 20% of GDP, which is quite a large fraction. So we all know about the healthcare industry in terms of its organization with hospitals, outpatient clinics, physicians. And so health economics studies how people interact with those providers of healthcare. But it also studies how health considerations affect people's individual behavior. So things like how smoking, the consequences of smoking, may alter your view of how risky it is to smoke, or whether you want your kids to smoke, or things like that. So it's pretty broad in its scope, but it looks at both the healthcare industry as well as aspects of health that matter in people's decisions.
- VETO: 01:57 How did you first become interested in health economics?
- MEYERHOEFER: 02:00 Right. So I was originally, when I-- going back to my graduate school days, I was interested in economic development in less developed countries. So I did a lot of work related to health and nutrition in those countries and transition countries which were moving away from communist regimes, socialist and communist regimes to market-based economies. And the first real substantive study I did on healthcare was in Vietnam. And what was interesting to me there was the way the healthcare system works. So in Vietnam, there was a lot of subsidies from the Soviet Union to support their healthcare system. And then they went away after the Soviet Union collapsed. And so the healthcare infrastructure there was very underfunded. And so people would go to pharmacists a lot. The rules about prescriptions are much looser than here. And so people are getting a lot of care directly from pharmacists and bypassing doctors completely because of cost issues. And I was interested in how that affected their health and what the consequences were downstream. And I got into issues of substitution between healthcare and other products when people were making trade-offs between whether to buy food, whether to buy durable goods, and whether to go to the doctor. Because in particular, inpatient care is very expensive and difficult to access in Vietnam. So that was my original interest. And then a few years later, I



ended up working for the US Department of Health and Human Services and transitioned to studying the US healthcare system.

VETO: 03:54

I have to ask, and I know it's not about the quantity, but you've published more than 50 peer-reviewed journal articles. Looking back at the start of your career, did you think you'd be so engaged in academic research?

MEYERHOEFER: 04:08

Absolutely not. So when I was in graduate school, I really had no intentions of seeking an academic job. I wanted to work for an NGO or an international organization like the World Bank or the IMF. And it's just one of those things where-- I started out my career in nonprofit and government research. So I didn't originally have an academic job. But the more time I spent there, my desire to really do in-depth analysis of certain topics was higher. And it's hard to do that sometimes in a setting where there's certain products that you're producing. And once you find and you answer the question to a certain level, you move on to something else. And so I also started teaching at Georgetown University when I was working in DC and supervising master's theses. And I kind of got re-engaged in the academic setting. And then, of course, there's a whole set of life choices and circumstances that I won't go into, but it eventually led me back to an academic job, and I enjoy that. And so I never would have expected to be doing so much academic research. But for me, the one thing that's important is I want the research I do to have a tangible impact on policy in people's lives. I'm really not doing highly abstract research. I'm doing more policy-oriented work.

VETO: 05:39

You're working on a research initiative about causal effects of poor oral health on heart disease. What drew you to this topic?

MEYERHOEFER: 05:48

Well, this is something that I've been working on for a long time, actually. So about 20 years ago, I worked at the US Agency for Healthcare Research and Quality. And I met a dentist there. His name is Richard Manski, and he's the chair of Dental Public Health at University of Maryland. And we started talking about the dental care markets and how incentives provided by dental insurance are different than medical insurance and what that means for people's demand for medical care. So along with some other co-authors, we started working on how prices for dental services and insurance really affected whether people got preventive dental care, whether they got more expensive restorative care. And then transition that work into really focusing on the elderly and the situations that underlie access to dental care among the elderly. So that population is really the only population in the US that has a very difficult ability to access dental insurance. And that's because dental insurance is not part of the Medicare program. It is incorporated indirectly in some people's Medicare plans if they have Medicare Part C, also known as Medicare Advantage. But it's not part of traditional Medicare like prescription drugs is now, or inpatient or outpatient services. So we wanted to really determine what would change, like how much people's health would improve if there was a Medicare dental benefit and how it would also change demand patterns. And so then that got us interested, the relationship between oral health and physical or non-oral health. Because if it turns out that better access to oral hygiene and oral health actually has an indirect effect, important but indirect effect on chronic disease, then adding a dental benefit to Medicare may actually be less expensive than people think because it could offset the costs that are spent on



the treatment of other chronic diseases like diabetes, heart disease, stroke, even cancer.

VETO: 08:11

So give us an overview of the study and what you set out. You already told us what you set out to examine, but give us kind of that high-level overview.

MEYERHOEFER: 08:20

Right. So this study is funded by the National Institutes of Health, and it focuses on identifying the strength and importance of the link between oral health and cardiovascular disease. So cardiovascular disease is not the only chronic condition that's affected by poor oral health, but it's the most expensive condition that Medicare pays to treat. So it's very important in that sense. It's very important in a person's likelihood of mortality. And it's obviously very common. So we thought it would be best to start out looking at the link between oral health and cardiovascular disease.

MEYERHOEFER: 09:07

And there are biological models that tell us how those things are related. And to briefly summarize, the link comes through periodontitis. People with poor oral hygiene can develop gum infections. That's periodontal disease. And those infections lead to bacteria around your tooth and your gum tissue. And because of the fact that there's a blood flow through that part of your mouth and your gums, that bacteria can get into your bloodstream and then cause an inflammatory reaction in other parts of your body, which can lead to heart disease and heart attacks. So people don't realize that when they practice good oral hygiene, brush their teeth, treat infections, things like that, that they're actually reducing the likelihood of having a heart attack, but they are. So we know that that link exists conceptually, but we don't really know how strong it is or how important it is. So what this study does is it tries to actually measure how much more likely a person is to have a heart attack or to have congestive heart failure, angina, or any other cardiovascular condition, stroke, when they have a very strong form of poor oral health, which is edentulism. So your periodontitis is so severe that it actually causes you to lose all your permanent teeth.

VETO: 10:42

I'm just thinking about how much you had to really dive deep into dental knowledge and oral health on a whole different level beyond health economics itself. It's just you're speaking about things like you were a dentist. [laughter]

MEYERHOEFER: 10:59

Yeah, so that's actually one of the interesting things about my job that I like is that I have to learn about information from other fields to work in health. That's one of the unique aspects of health economics. And I, of course, learned a lot from my co-authors, who are trained and have formal training in this area. But in some sense, this study, the economic part of it, is at the very end of the study that we haven't even gotten to yet, which is concerning how much cost offset there is in reduction in treatment of chronic disease from covering oral health. And it's really the statistical--economists spend a lot of time, especially applied economists like myself, studying statistical and econometric methods. And so this study, it's really about the application of those methods that have been developed in economics and in epidemiology to this problem. So people haven't really investigated this problem using the techniques we use. So that's kind of the part of my training that's more relevant, is the econometric modeling that we do.

VETO: 12:14

And this research uses genetic data and large data sets to do your study. What is it like working with so much data?



MEYERHOEFER: 12:24

Right. So this is kind of why I'm working on it, I suppose, is that I spend a lot of time working with large data sets. And I find it very interesting. There is a level of complexity. This is a project that's funded across three institutions. It's not something that any one of us can do alone. So Lehigh University, we're doing the modeling of the study. We have some help constructing the data and some dental expertise from University of Maryland. And then the genetic component, we are collaborating with the University of Michigan, which has detailed genetic data on all the participants in our survey. So what we're trying to do is identify a causal effect of poor oral health and heart disease. So the problem is that there's a lot of-- much of the relationship between the two conditions is due to associations. So, for example, if somebody has-- grew up in poverty, have poor access to education, more limited knowledge about oral health hygiene and other health-related factors, they may be more likely to have poor oral health and more likely to have heart disease because of lower levels of education and poor access to dental and healthcare services. So if you don't account for that, it may look like oral health is more strongly associated with heart disease than it actually is. In a laboratory experiment, what you would want to do is you would take a set of people and you'd randomly give some people periodontitis and not give that condition to others. And then you would look at, among the people who you randomly gave periodontitis, how much more likely they were to have something like a heart attack.

MEYERHOEFER: 14:29

Now, of course, you can't do that type of experiment. It's infeasible and unethical. So instead, what we do is we look at variation in the disease, the condition, periodontitis, that's due to something random, and that random thing is your genetic endowment. And genes are not fully random in the sense that they come from our parents, but we get half of our genes from each parent, and which genes we get is random within our parents. So that allows us to-- if we just isolate the variation in poor oral health that's due to genetics, then we know it's not due to-- it's not associated with lower levels of education or poor access to healthcare, and we can identify the effect from that variation. Now, there's a whole host of difficulties in implementing that methodology that we have to deal with that have been discussed pretty comprehensively by epidemiologists. And so, we developed a new method of doing that, and that's kind of the innovation of the study.

VETO: 15:38

And is that what you think this study adds to what we already know, which is poor oral health is associated with heart disease, like we've been saying. What else do you think this study is adding to that?

MEYERHOEFER: 15:51

Right. So we know, conceptually, that poor oral health could certainly-- there's biological pathways through which it could cause heart disease. But we just don't know how strong that relationship is, so this approach is called-- in the epidemiology literature, it's called Mendelian randomization. And essentially what it does is it uses genes to identify this effect. The problem though, the fundamental problem is that there's something called horizontal pleiotropy where the genes that you inherit can cause multiple traits. So the genes that cause poor oral health or predispose you to poor oral health may also predispose you to other things related to heart disease. They could, for example, predispose you to having diabetes, and diabetes is also associated with heart disease. So if you don't account for that, then that genetic variation could be picking up both the effect of, say, diabetes and poor oral health. So



what we do is we use a structural equation model that was developed a few years ago for another purpose, and we adapt that to this problem. And what it does is it allows us to isolate the genes that cause poor oral health separately from the genes that directly affect heart disease. And how we do that is using this statistical model, but that's an innovation in the literature. And if we don't do that, so what we find if you just do simple associational modeling and you look at you regress different measures of heart disease on poor oral health, everything is significant, essentially, because of these unobserved factors. And then if we do-- we apply the model that's conventional in epidemiology where you just use genes that you know affect oral health and you run the model, then you get these very large effects on these factors. They're not all significant.

MEYERHOEFER: 17:52

So for example, when we apply this what we call instrumental variables method, we find that the main effect is really on heart attacks, the propensity to have a heart attack, not as much on angina or congestive heart failure or stroke. Those things are not really significantly affected by these bacteria that enter your bloodstream through periodontitis. It's really the inflammatory trigger and that really affects your propensity to have a heart attack, so we know that. But then when we apply this new method that really isolates the genetic variation in oral health, net of heart disease, we find that the size of the magnitude of those effects is lower by about 20 to 40 percent. So what we're doing is we're kind of narrowing-- we're kind of homing in on the actual importance of poor oral health to the likelihood of having a heart attack. And we're finding that it's not exactly what is affected by poor oral health and then how strongly. And so that's what we're adding is we're really coming up with precise estimates. And that's important if eventually you want to figure out what's the cost offset of covering oral health and Medicare. And by doing that, not having to pay as much for chronic disease because we're going to eventually estimate a simulation model where one of the things we have to know is when oral health improves, how much does heart disease improve? And if the estimates are like 40% off, the cost will be 40% off, so that's why this is important.

VETO: 19:38

And then for you, what do you think the most important takeaways are from this research? I feel like you laid it out right there for us, but I have to ask what do you think?

MEYERHOEFER: 19:47

Well, I think one important takeaway is that we know better now which condition are most affected by poor oral health, so we know that it's really increasing the likelihood of heart attacks. So that's something that's clinically important in and of itself. So if you have a patient that has poor oral hygiene, has problems with their teeth, and then is also, by other measures, at risk for a heart attack, then that's important to know because it means that one of the things you can do for that patient is you can really emphasize the importance of better oral hygiene or going to a dentist or trying to find that patient a pathway to access dental care. Because for a patient that's already at risk of a heart attack, that's going to be more important. Actually, we find it's a pretty large effect, so it's larger than probably a lot of clinicians believe. And then for a patient who has angina or something, it's not that it's not important - good oral health is always important - but it's not going to be an acute risk factor like it will be for somebody at risk of a heart attack. So I feel like that's a contribution.



MEYERHOEFER: 21:09

And then I feel like there is going to be a contribution to downstream work that's really focused on the costs and benefits of incorporating a dental care benefit into Medicare, which is something that is pretty relevant in healthcare policy right now. So there's definitely a group of policymakers that is really pushing to do this, but there's concern over the costs, and changing a large program, a large entitlement program like Medicare, is difficult and complicated. So it's not something that will come easily, but it's something that, to kind of have a path forward, we do have to know more about these linkages between chronic conditions and oral health.

VETO: 22:01

I think that's one main thing that drives me nuts with healthcare is why isn't dental part of traditional healthcare, and why hasn't it been a part of it? Why isn't it integrated into our primary care the same way?

MEYERHOEFER: 22:17

Yeah. It's interesting. So a lot of aspects of the US healthcare system have historical roots, and the whole idea of why is insurance linked to employment in the United States and not in Europe? Well, it has to do with the fact that during World War II, there are wage controls, so companies couldn't really increase wages to compete for scarce workers, so instead, they started offering benefits like pensions and healthcare, and that's how the system became established. The reason why dental care is not part of Medicare is because when Medicare was developed in 1965, there were a couple of factors. One is that dental care was really seen as separate from medical care, that the two were not so connected. There was concern over the cost to Medicare of adding a dental benefit. And then there was resistance by the American Dental Association and dental advocacy groups because dentists were very skeptical of the benefits of joining the Medicare program. So they were worried, and rightly so, that if they got involved in Medicare, that Medicare would start to dictate the reimbursement rates, and those reimbursements would become lower, which is true. So in medical care, reimbursement from Medicare is below private insurance. That being said, Medicare and Medicaid, they contribute a lot of dollars to healthcare and the aggregates, so they're very important. But at that time, in 1965, a lot of people were paying-- dental insurance was very uncommon much less common than medical insurance was. And so a lot of dental procedures were just paid fee for service. But the technology that was used in dentistry back then was much less. So that fee-for-service model was workable in some regards because the costs were lower. But the problem is, over time, the amount of technology that's gone into dental treatment has increased dramatically, and that technology drives up costs. And so now, people are much more likely to have dental insurance. So most people with white-collar jobs, they have dental insurance in some capacity because dental procedures are very expensive. So if we were creating Medicare now, there'd be a much stronger argument for having dental care-- or dental insurance as part of the Medicare program. It's just that historically, it didn't develop that way, and now it's hard to integrate it. But we're finding more and more that there is a connection, an obvious connection, right, between oral health-- your mouth, it's in your body, so they are connected, right? And there's an obvious connection between the health of your mouth and oral health and physical or non-oral health.

MEYERHOEFER: 25:16

And so the system we have is definitely not the best in that respect. And we have had some movement to integrate it, especially for children. So if you look at the essential benefits of health insurance under the marketplace plans developed under the ACA,



they have to cover dental care for children. But we don't have any such mandate for adults. And so dental care access among adults is very low. And actually, one of the most common preventable conditions is cavities, so dental caries. It's extremely common among the US population. And it's something that could be improved through better access to dental care, but we just need to do more to give people that access.

VETO: 26:11

Have you been going to the dentist more?

MEYERHOEFER: 26:16

I go to the dentist. [laughter] It's funny you said, because the standard for-- I have dental insurance, of course. And the standard is two preventive care visits per year. And then hopefully, if you do that, you go to the dentist less because you don't develop issues that need restorative care. So I do my two visits a year, and then knock on wood, I haven't needed to go yet for other things. But as you age, of course, the need for dental care improves no matter what you do. And going back conceptually to why isn't it part of Medicare, it wasn't just dentistry that was excluded. It was actually vision and hearing. And conceptually, one of the arguments there was that those things are predictable. So if you have poor-- if you need glasses, then once you start needing glasses, you always need glasses. So you don't really need insurance for that because that's a predictable expense that you can budget for, and it's more efficient to self-budget than it is to insure. And same thing as your hearing declines, it usually declines slowly. And so people were like, "Oh, you're going to need more dental care as you age." And so it's predictable, but it's really not. Dental care is not like hearing and vision. So you develop infections in your mouth and other things, and it's not as predictable as those other types of non-medical care. So even though we know that we need more dental care as we age, we need a lot more of all types of healthcare as we age.

VETO: 27:54

Well, Chad, thanks so much for being on the podcast today. I really appreciate it.

MEYERHOEFER: 27:58

Yeah, sure. Thanks for having me.

VETO: 28:00

That was Chad Meyerhoefer speaking with us about the impact of poor oral health on heart disease. This podcast is brought to you by iLLUminate, the Lehigh Business blog. To hear more podcasts featuring Lehigh Business Thought Leaders or to follow us on social media, please visit business.lehigh.edu/news. This is Stephanie Veto, host of the iLLUminate podcast. Thanks for listening.