

## 20.10.17 Covid is in the Air Hour.wav

SM: Sarah McConnell

AS: Audio Sample

LM: Linsey Marr

SZ: Steven Zeichner

JZ: Julian Zhu

HDS: Hannah Dudley-Shotwell

AB: Aysha Bodenhamer

[00:00:00]

SM In the age of COVID we're faced with small but agonizing decisions every day. Should I go to the grocery store or should I order online? Is takeout food okay? How about jogging outside or hugging your parents? Fortunately, one expert has run the numbers on hugging.

AS And a quick hug I think is fairly low risk if you do the following. Both people are masked, you have your faces pointing away from each other, you don't talk during the hug and you get in and out of the hug quickly. You don't linger at a close distance, taking each other in before and after the hug. You kind of maintain your distance. You zoom in for the hug and then you get out quickly.

SM You heard it here. No lingering hugs. It's going to be a long winter. From Virginia Humanities, this is With Good Reason. I'm Sarah McConnell. Today on the show, the science of COVID-19. Linsey Marr has studied some of the most dangerous airborne diseases, Ebola, influenza, Legionnaires' disease. She's especially interested in how they spread through tiny little particles in the air. Marr, who is a professor of civil and environmental engineering at Virginia Tech, has now turned her attention to COVID-19, Linsey in the first presidential debate with the candidates about 12 feet apart, do you think Joe Biden was at any risk for catching coronavirus? Now that we know the president had it.

LM I think there was definitely a risk. Trump would have been in a period when he was infectious. He was talking a lot, probably quite loudly. When you do that, we know that you release a lot of aerosols, very small, microscopic droplets into the air. These are smaller than we can see and they can float around in the air like cigarette smoke, so they can easily travel beyond six feet. And Biden was standing there for an hour and a half breathing the air. And so there's certainly a chance that he could have inhaled a virus that came out of Trump's mouth.

SM Did you think the auditorium, though, was so big, the ceiling so tall, that the risk was mitigated?

LM The fact that the auditorium was large certainly helps, it means that virus that might have been released into the air would be diluted in that larger space. But still, the people who are closer to Trump would be more at risk. So both Biden and Wallace were closer because the virus in these aerosols travels like cigarette smoke. It's more concentrated close to the person who releases it.

SM Even though we know the virus is in the air, it disperses. And a lot of those drops are aerosolized as opposed to the actual moist droplets that land on someone's skin when they're close, right?

LM Yes, that's correct. When we talk or cough, we release maybe one or two droplets that are large enough to see. Those fly through the air like many cannonballs or like spitballs, and they can land on someone else's body. But for every one of those, there are hundreds of smaller ones. The aerosols which can float around in the air for a long time and travel quite far.

SM When did we first confirm that those tiny bits of virus that are aerosolized like a mist, actually could cause infection in someone else?

LM The confirmation has come in a few different steps. First of all, someone detected viral RNA, its genetic material, in the air in very small aerosols in a hospital. And then in August, using a special instrument that's able to sample the aerosols very gently and preserve the virus, they detected virus at distances up to 16 feet away from patients and confirmed that these viruses were infectious. They were able to grow and replicate in cells. Now, the remaining question is, we don't know exactly how many it takes for you to breathe in to become infected. But certainly there was a high enough concentration in the air in that hospital room that it - it certainly seems possible.

SM Every now and then, there's a big story and I think back to early on, the horrifying report that a church choir had infected tons of its members and many had died. What did you learn, let's say, for that first story in America of many people together contracting the disease in a way we hadn't realized was possible? And then, what you're learning now, as we closely study what happened to the Rose Garden?

LM During that choir outbreak, I believe 53 people were infected out of 61 who were present. And that, to me, was a clear sign that transmission was happening through the air, because it's really very difficult to explain that number of people getting sick in any other way. For a close contact, kind of large droplet spray-transmission to have occurred, all those 52 people would have needed to be close to the infected person for roughly 15 minutes or more. And there just wasn't enough time, there's not enough space to have 50-something people around you within a six-foot radius. With a contaminated object, that also seemed very unlikely because if somebody deposited virus on a - on an object, you know, maybe the first couple of people who touched it could pick up virus. But for 50 other people to have touched that object and picked up enough virus and then poked themselves in the eyes, nose, or mouth seems very unlikely. And what we've learned since is that we've seen other of these types of super spreading events or outbreaks. And the commonality between them all, is that people are not wearing masks, there's a large number of people, there in an enclosed environment indoors where there's insufficient ventilation.

SM Do you think that we should become more vigilant as the cold weather arrives and we're all moving indoors?

LM I think we need to be especially careful as - as the temperatures drop and people are forced indoors more and then they start running their heating systems, which means they're going to seal up the buildings to prevent leakage. And there might be more recirculation of air indoors rather than kind of replenishment with cleaner outdoor air. And these conditions can allow a virus to build up in the air and lead to greater exposure.

SM We talked about masks earlier, but how important do you think they are. If both people are wearing a mask, have you greatly cut the likelihood of transmission?

LM Masks are incredibly important for slowing transmission of the disease among the population. We talk about in N95s for health care workers, you know, being really the only - the gold standard. And it's true that cloth masks are not as effective as an N95. But even if they're only 50 percent effective, that means that reduces the amount of virus that I might breathe in from the air by 50 percent. For someone who is infected, it's going to cut the amount of virus that they spread around into the air by 50 percent. And the combination of those two means that we actually have a reduction in my exposure by, let's say, 75 percent. And so then we're reaching a level of effectiveness where we can actually reduce the number of cases that are caused by any one person and to get that reproduction number down below one.

SM Let me ask you some questions about, knowing all that you know, what kinds of risks you're willing and unwilling to take for yourself? Which is not scientific, because you may take risks that you shouldn't, but - do you mind me asking?

LM Not at all. Certainly, with every decision, I think about the benefits versus the risks. Yes, there's a risk of going to the grocery store. But if I don't go get food, then I'm gonna be in trouble. So I have flown on an airplane. Airplanes have very good ventilation and filtration. The main concern is transmission that would occur from people right next to you or right in front or right behind you; aerosols reaching you before they go through the filtration system. But if everyone is wearing masks, then that is that risk is greatly reduced. I have ridden public transit - busses and trains when they've been pretty empty, maybe there's five other people and everyone is masked. Let's see, I have - I pick up food from restaurants, takeout, but I do not eat indoors at restaurants, nor outdoors either because you're sitting there for a long time, you can't really control how far away you are from the nearest table.

SM Huh. What about Ubers?

LM I have taken Ubers because research has shown that if you open the window a few inches, then the air inside is refreshed every minute or two, which will really cut down on any risk of transmission. But if the windows are closed, then you're in a small, confined space with someone who's potentially infected. And that is a much more risky situation. But really, opening the windows makes a huge difference.

SM Driver isn't masked, which you do that?

LM I would want the driver to be masked. And I think Uber and Lyft are requiring all drivers and passengers to be masked.

SM But you would not, this winter, eat inside a restaurant?

LM I will not eat inside a restaurant until the pandemic is over. Restaurants are one of the riskier situations because you have potentially a lot of people, you have masks off in order to eat and drink, people are there to socialize so there's always someone at all the tables talking, and it's talking that really releases a lot more aerosols into the air than just breathing. You're sitting there for a long time, maybe an hour or more, and we know nothing about the ventilation in these places. So that - that's one situation I would avoid. Again, I am picking up takeout as often as I would go out.

SM But you would go outside if there were one of those outdoor heaters?

LM Let's see if there were outdoor heaters and I was the only table within a good 10 to 15 feet. Might, I - I'd consider it. Yes.

SM What about teaching in person?

LM I'm willing to teach in person with reduced capacity, mandatory masks and sufficient ventilation and of course, it's hard for the average person to judge the ventilation. I have a carbon dioxide sensor. You can get these for a couple hundred dollars. And so I would bring that into the classroom with me and make sure that the concentration does not get above a certain level, which would be kind of 800 ppm. Our background outdoor level is 400 ppm, and I came up with that number because it indicates that there's a certain amount of ventilation per person, because we release carbon dioxide into the air when we breathe. And if it doesn't build up beyond a certain level, it means that there's good ventilation in the room.

SM Will you vote in person or by mail?

LM I am voting in person. I think that if there are proper precautions of having people wait outside rather than inside and spacing the booths far enough apart, having good hygiene and requiring masks, if they do all those things, then I think that voting is a relatively low risk activity where it's an important thing to do.

SM And finally, what about hugging your parents?

LM I would - you know, I looked at hugging, did an analysis of hugging and a quick hug I think is fairly low risk if you do the following: You - both people are masked; you have your faces pointing away from each other; you don't talk during the hug; and you get in and out of the hug quickly, you don't linger at a close distance, taking each other in before and after the hug. You kind of maintain your distance. You zoom in for the hug and then you get out quickly.

SM That's what we want to do, right? We we want to take each other in.

LM Right. You know, people ask me about specific scenarios. They're going to a beach house with other family members or they have people walking by outside their apartment and the window is open. And, you know, to judge each of these different scenarios, I always think about, well, what if everyone is smoking a little cigarette? Would I be exposed to the smoke? And if the answer is yes, then that's a concerning situation.

SM Fascinating. Well, Linsey Marr, thank you for sharing your insights on this on With Good Reason.

LM Thank you. It's been my pleasure.

SM Linsey Marr is the Charles P. Lunsford professor of civil and environmental engineering at Virginia Tech. As hundreds of thousands of people continue to die from COVID-19, the world is waiting for a vaccine.

[00:13:58]

SM Steven Zeichner cautions that despite the desperate need for a vaccine, researchers must take their time before pushing one out to the public. Zeichner is a pediatric infectious disease specialist at the University of Virginia and his own lab is working on developing a low cost vaccine. Steve, we're all waiting for this to be over. What is the earliest you think the vaccine will be out or multiple vaccines are out and enough people vaccinated, that it will really make a difference in this sort of pandemic and how we're living our lives?

SZ So that's very hard to predict. Historically, the fastest vaccine approval took four years. Of course, that was back in the 60s for mumps vaccine. Now we have many new technologies and things are moving much, much faster. I think it's unlikely that we would see an approved vaccine before the first of the year. I think it's also unlikely that we would have enough people, in the United States at least, vaccinated with good responses to make a difference before next summer.

SM What has to happen to get from the doses - great, the doses approved, it's 50 percent effective, the side effects aren't terrible. And now let's give jabs in arms. Once we're at the point where we want to distribute it and give free COVID vaccines at CVS's everywhere - how hard is that part of it?

SZ To get to the point where you have an approved vaccine, that's going to be very hard. But then distribution and manufacturing is going to be very hard as well. Some of the companies that have vaccines in advanced stages of clinical trials have already started more or less manufacturing doses on spec to be able to distribute large numbers of doses as soon as something is approved. It's a long process and manufacturing and distribution is a very challenging enterprise as well.

SM And are these by labs all over the world? So some are Chinese vaccines, some Russian, some U.S.?

SZ Yes, these - this is a worldwide effort. And you have vaccines that are being manufactured around the world by many different companies, governments and so on. There are several vaccines that are approved in some limited way for patients in particular countries. There's an approved vaccine in Russia. There are approved vaccines in China. Those vaccines may or may not meet approval standards in the United States, Europe and other developed countries.

SM How large are these tests in the various countries and how much is that a roadblock to actually getting a vaccine into people's arms?

SZ In the United States and in the developed world, the phase three studies that are in progress now are enrolling 40, 50, 60 thousand patients. That's a lot of patients. These trials are enrolling pretty fast. But what we have to remember is that these are placebo-controlled trials. So half of the patients are getting the vaccine and half of the patients are getting the placebo. We have to wait for a while until we see whether those vaccines are going to be efficacious. And the standard that the FDA has articulated is that to be approvable, a vaccine will have to decrease the risk of infection by 50 percent. So you have to wait until a number of those patients are exposed to the virus to be able to see whether 50 percent fewer patients who get the active vaccine become infected than patients who got the placebo became infected.

SM And are we really thinking that even the final approved vaccines are likely to be only about 50 percent effective? Or is that a threshold?

SZ That's the threshold that the FDA has articulated. I think another - another concern we have to consider is that there are two kinds of safety. One is the safety that you're concerned about in the time period immediately after somebody gets the vaccine; does getting the vaccine create some severe adverse side effect? The other kind of side effect is the side effect that may be produced in the patient who is vaccinated and then who gets exposed to the actual infection. There are many examples from history in which someone who was given an early vaccine, for example, the respiratory - the respiratory sensational virus vaccine that was being developed in the 1960s, patients who got that vaccine then did much worse when they were exposed to the actual infection. And those are the kinds of things that - that kind of haunt the dreams of people who are working on vaccines today.

SM Your own team is working on a low-cost vaccine with colleagues at Virginia Tech. How low cost and why does this matter? How expensive are mainstream vaccines likely to be? And why is it important to create some that are very low cost?

SZ Well, looking at the information that's out there, the vaccines that are in production range in cost from four dollars a dose for the Oxford vaccine, although that seems pretty low to me, up to 10, 20 or even 40 dollars a dose for some of the others. And we have to think that most of those require two doses. So you're looking at between 10 and 80 to 100 dollars per vaccine course. 10 percent of the world's population lives on less than about two dollars a day. Half the world's population lives on less than about five and a half dollars a day. If you have a vaccine that costs really even ten dollars per course, it's unlikely that that vaccine at that price would be available to a half, a quarter of the world's population. To make a vaccine that's likely to be available for most of the world, you want to get it down to a dollar a dose or less.

SM Is that what you're shooting for?

SZ That is what we're shooting for. The technology that we're using uses bacteria that have a small piece of the virus placed onto their surfaces and then have modifications made to the bacteria to make them more recognized by the immune system. And then we just grow up the bacteria inactivate it with some formaldehyde, and that's your vaccine. There are other vaccines that are currently available using similar technology, for example, a cholera vaccine that the WHO has produced and stockpiled around the world. That can be produced for about a dollar a dose. So I think our vaccine should certainly be within that ballpark. And there was a company that made that WHO vaccine that said that they could make six million doses in a year for a dollar a dose using just a single 100 liter fermenter - 100 liters is twenty five gallons more or less. It's the size of the gas tank in your car. You can do the arithmetic, but with just a few of those readily available fermenters, you should be able to make enough vaccine at a dollar does to cover everyone. Even countries as as poor as Bangladesh can do that.

SM Well, Steve Zeichner, thank you for sharing your insights on this on With Good Reason.

SZ Thank you very much.

SM Stephen Zeichner is a pediatric infectious disease specialist at UVA Health, and a professor at the University of Virginia School of Medicine.

[00:22:30]

SM An estimated seven million American adults are immunocompromised. And while they might stand to benefit the most from a vaccine, traveling to a doctor's office to get the vaccine is a risk. So my next guest is working on a mailable stick-on patch that would allow people to vaccinate themselves from home. Julian Zhu is a pharmaceuticals professor at Virginia Commonwealth University. You're developing a mailable vaccine patch for coronavirus. What does it look like?

JZ It looks like a very small penny or it also looks like a Band-Aid bandage. It has over a hundred small needles we use, which we call micro needles. So these are very, very tiny needles, so you can barely see them using your eyes, but they can penetrate our skin in just enough so that they can put those vaccine molecules into our body. And so in this way, they can sort of inject those the vaccines into our body, pain free.

SM What sort of other products are on the market that use these micro needles to deliver medicine?

JZ I'm not quite sure if there are already any medical products on the market, but definitely in clinical trials, there are quite some similar micro needles that deliver drugs into the body in one way or another.

SM Is this five years down the road or maybe months down the road?

JZ If not because of the pandemic, it's probably five years or even more, even longer. But because of the pandemic, everything is facilitated and we are thinking it can be shorter, it can be one or two years but it has to be tested in patient volunteers.

SM Right, thousands and thousands. Right?

JZ Thousands, thousands. Yeah.

SM I mean, I think it's a great idea. If I could have a patch mailed to me that I could put on my body and be vaccinated against COVID, that would be amazing.

JZ Yeah. Yeah. Exactly.

SM When did you first get the idea?

JZ We - well, I'm originally from China and I'm actually from that exact premise, where the first COVID-19 case was reported. So I actually emailed and my colleagues and my department chair saying, oh, this is a very, very big thing going on in China and it potentially can affect us in the United States. And it turned out to do that.

SM How could you tell that it was just ravaging that region? What about your expertise as a doctor helped you understand that this thing was getting out of control?

JZ Well, we actually saw in the reports - we actually have some friends who are working in the hospital and we knew that it can be potentially very infectious. It can be very infectious, so we need to find a way to control them very quickly.

SM You know, we don't yet have a vaccine that everyone has decided will really work, though we've got many, many in the works. In your heart of hearts, when are you

imagining there will be a public vaccine that starts to really ease up the lifestyle we all have while we're shut in?

JZ Well, there - there are currently a great number of candidates. My best hope is that all of them work, all of them can contribute a part because you imagine how many people need this vaccine. Seven billion, over seven billion people. If only one product of this current candidate will work, then we don't have enough or we don't have enough in a short time. I really hope all of them work.

SM Do you think China will probably vaccinate all of its citizens or many of them, long before America gets around to it because of - because of restrictions?

JZ I, I actually don't know the answer because it's complicated. But let me - let me, as someone from China, I can tell you that probably no one in China is anti-vaxxer. Which is great. They really did a very good job in social distancing, in quarantine isolation very systematically. So that's why from - from early January, February, March, people knew very little about this virus. But they eventually managed to control it. It's actually very amazing. But I hope that eventually, if not all, but at least the majority of people, especially those at risk, higher risk can have this vaccine?

SM I do, too. I do, too. Thank you so much for sharing your insights about this on With Good Reason.

JZ Well, thank you. Thank you for having me.

SM Julian Zhu is a professor of pharmaceuticals at Virginia Commonwealth University School of Pharmacy. This is With Good Reason. We'll be right back.

[00:28:02]

SM Welcome back to With Good Reason, I'm Sara McConnell. Before we get to the second half of the show, I have a special request. As part of our Why I Vote Campaign, we want to hear from listeners. Tell us - why do you vote? Call us and let us know it 434 253 0396 and we might share your voice on the air. These days, the term self-help calls to mind home organizing strategies and meditation manuals. But in the 1960s and 70s, a different kind of feminist self-help movement was revolutionizing women's health care. Hannah Dudley-Shotwell teaches history at Longwood University. Her new book tells the stories of activists who helped a generation of women reclaim control over their bodies. Hannah, help me understand - what were they pushing back against. What did they feel they needed to take control of, that they hadn't had control over?

HDS I don't think it's even possible for us to understand what it was like to go to the gynecologist at the time, to go to the doctor, to an OBGYN especially in the 60s, for example, a woman is often not going to meet her OBGYN until she's already reclined on a table, skirt up, drape over her lap, no underwear on. The doctor walks in the room and she is not even treated as a human in many ways -

SM And feels humiliated.

HDS Yes, exactly. Yeah. So, you know, she might ask for birth control. Well he'll want to know why do you want birth control, especially if you're not married. So if she wanted to

control the timing of her pregnancies, she is limited in her options. And then there's also the fact that abortion is illegal at this time in most states.

SM You write about Carol Downer, this woman who in some ways is credited with kicking off the self-help women's health care movement.

HDS Yes.

SM There was an incident you write about that in particular just catapulted her to underground fame. Can you describe that?

HDS Sure. She had been, she calls it interning with a with someone who had been providing abortions, his name was Harvey Carman. And in his clinic, she saw a cervix for the first time. So she realized it's so close and so accessible. And so she went home and tried this for herself. Lo and behold, she could see her own cervix, which she had no idea was so accessible to her. And she and her friends put this ad in the paper and they wanted to just have a group of women kind of get together and talk about an underground abortion clinic. So at this meeting, Carol Downer, it's her turn to speak and she decides what she wants to do is show them how to do a self-exam and how to see their own cervix. So she gets up on a table and the way she described it to me is she hitched up her skirt and it was the 70s, so nobody was wearing underwear. And she showed them how she can insert a speculum into her own vagina and then use a mirror and a flashlight to see. And then everybody wanted to try it for themselves. And this has become sort of the mythological founding of the self-help movement.

SM But it wasn't widely known. Right. This was sort of known within the circuit.

HDS When she first did that, yes. But then it spread really, really rapidly, especially the National Organization for Women or NOW that was a major vehicle for spreading self-help. The same group of women, Carol Downer and then some of her friends from that meeting, went to a big National NOW conference and showed dozens of women how to do self-exam in their hotel rooms. And a lot of them left with brown paper bags with their own plastic speculum in it. So because it's a national conference, they all go back to their own towns all over the U.S. and you started seeing the formation of self-help groups where people would meet to practice self-exam and then to learn about their bodies in every way they could by reading medical textbooks, by keeping charts of what they saw when they did self exam, by monitoring their menstrual cycles. Just everything you can imagine, they're starting to keep really good data on it in their groups.

SM What other sorts of mainstream medicine were women pushing back against through this movement to let's - let's treat ourselves?

HDS I think it's important to understand, especially the kinds of things that women of color and indigenous women were pushing back against at this time. So there's a long history in this country of eugenics and forcing women to undergo sterilization so that they can't have children. And this was happening at very high rates among Native American women. It had been happening for several decades among poor women and women of color in general. So that's definitely something folks are pushing back against. There's also especially for lesbian women at the time and women who were having trouble conceiving for any reason. There's also a desire for women to control their own fertility in order to get pregnant. So for lesbian women, figuring out how to do donor insemination was a really important part of this.

SM Tell us about the lesbian couple you write about who ran a self-help clinic for women who also themselves wanted to find a way to have a baby together?

HDS Yeah, their names were Franci and Yael and they wanted to have a baby. So they had been studying what they called fertility awareness or fertility consciousness. And this is essentially figuring out, OK, which time of the month are you most fertile? Mostly thinking about it as a form of contraception. And they go, we could maybe use this to get pregnant as well. If we know when you're most fertile, maybe we can find someone willing to donate sperm to us and use that to get pregnant. And that's exactly what they do. They go, they ask a friend of a friend. This is at a time before sperm banks exist. And once sperm banks do come about, they're not very interested in providing sperm for lesbian or single women. So they just figured it out themselves. And they tell this hilarious story of - so the first time that they went to their donors house was so awkward and they stood around on the porch and it just, you know, was an incredibly awkward situation. And then that didn't work. So another time they tried it. They were with their whole self-help group trying to conceive. They took pictures and it was like this big celebration. And they talked about it to me recently as - lots of people have pictures of their birth. But who has pictures of their conception?

SM Tell me about the woman, Loretta Ross,

HDS Yes.

SM Who started a reproductive justice movement.

HDS She is one of the most fascinating characters in this story, I think. So, Loretta Ross starts in a DC-based group of exclusively Black women do in gynecological self-help. Something is happening at the same time that she's in this group. And it's - it's ultimately going to be called the National Conference on Black Women's Health. She goes to this conference and is just blown away. What women are talking about there is, there is more to our health than our reproductive systems. And for Black women, that felt particularly important because systemic racism and internalized racism were blocking them from being able to take care of many aspects of their health. What happened after the conference was that a lot of Black women started self-help groups that were based more on psychological self-help. So this is the precursor to the reproductive justice movement, which is - Loretta Ross is seen as one of the founders of it. And essentially, reproductive justice advocates say people should have the right to have children, to not have children and to raise their children in safe and healthy environments. And a lot of the folks who participated in self-help early on go on to be part of this wider reproductive justice network.

SM You mentioned earlier the horrific history of forced sterilization. What do you make of the recent allegations that women detained at an ICE facility in Georgia were forced to undergo unwanted gynecological procedures, hysterectomies, things of that ilk?

HDS I think it's a horrifying example of how eugenics is still alive in this country. And in spite of, you know, the best efforts of thousands of women to find self-help ways to control their own bodies and reproduction, in spite of the best efforts of women to reform institutions so that they can control their own bodies and reproduction. This is the kind of thing that cannot be divorced from that long history.

SM Your book on revolutionizing women's health care comes out right in the middle of a pandemic when everybody has been forced inside and we're all living in fear of our health and threats to our health. What's been your thinking about publishing in this time?

HDS My initial thought was you can't try to promote a book during a pandemic. And then I started thinking about it a little bit more. And I think this is exactly the time that we need to be thinking about self-help - at a time when institutions are failing us, at a time when people are terrified about their own health and about the future of health care in this country. I think it's really important to look at the past and what people did in response to those exact same kinds of fears.

SM Well, Hannah Dudley-Shotwell, thank you for talking with me today on With Good Reason.

HDS Thank you so much. This has been a delight.

SM Hannah Dudley Shotwell teaches history at Longwood University. Her new book is "Revolutionizing Women's Health Care: the Feminist Self-Help Movement in America". Coming up next, the resurgence of a deadly disease in central Appalachia.

[00:38:53]

SM Black lung disease used to be seen as a public health success story. It was nearly eradicated. Now this coal miner's condition is surging once again. Aysha Bodenhamer is a sociology professor at Radford University, she's trying to understand why black lung is back and what it says about coal country. Aysha, you spent much of your career studying coal. How did you get interested in it? Did you grow up around coal country?

AB No, I didn't, actually. I did grow up in a small rural town in Appalachia. But I first got interested in coal when I started school for my undergraduate education at Radford University. And at that time, coal made up about 50 percent of our electricity in the United States. And I had no idea that we even use coal. You know, when I thought of coal, I thought of, you know, steam engines and railroad systems and things like that. I had no idea we still used it. And we actually took a field trip with one of my professors at the time, Her name is Dr. Theresa Burroughs, and she took a van load full of us to West Virginia. We went to Kayford Mountain, and it was there that I was able to see the destruction for the first time. And it was alarming. You know, it was - it was alarming to see how vast the destruction was. But to also feel this personal connection to it, you know, having no idea where our electricity came from and how I had taken that for granted for so long. And just looking out over that - that open mine, the surface, mountaintop removal and just how horrible it looked. You know and thinking about how those mountains that are so biodiverse and so rich and, you know, habitats for so many different things, is just absolutely destroyed.

SM Is there as much coal mined in Central Appalachia now?

AB That's a good question. So, I mean, coal has radically changed in the last 10 years and I've watched it fall. It was about, or it made up about 50 percent of our electricity at that time. And within a 10 year stretch - now, it makes a 20 or less, 20 percent or less. Domestic coal use has really plummeted. The big coal seams are gone. So the question has become new. Is it feasible economically to get to the coal? They are competing pretty

fiercely with natural gas and they're - they're really losing that fight because natural gas is so plentiful and so easy to get right now.

SM Your most recent work is looking at a resurgence of black lung. What exactly is black lung? I've heard of it and I know it's awful.

AB It is. It's a horrible disease and it is entirely preventable, which makes it even more horrible. And essentially, what happens is due to that chronic exposure to coal and silica dust in the mines, it hardens your lungs. So there - there are there are pictures from the CDC and it literally looks like your lungs are just lumps of charcoal, hardened and ineffective and black. I mean, literally looks like charcoal that you would use in your grill at home. And you can imagine the impact of that on your entire body. And eventually, you know, it leads to a lot of heart problems or all kinds of different problems. You can't sleep, you can't breathe. You can't do anything. And the miners describe it as a feeling of suffocation.

SM What's the history of black lung? When did we first notice this happened to coal miners?

AB The first time we really took notice of black lung was among British miners. That was in the 1800s. And we knew it was happening and we knew that it was, you know, seemed to be a legitimate disease. But there was so much resistance to that in the United States because of the power structure and just the ability to deny the existence of the disease. So in the United States, you know, it was very common for employers to completely ignore the reality of black lung. They would say, "oh, it's just a miners cough". You know, "it's totally normal - don't worry about it". There were actually earlier accounts where they said, "oh, coal dust is actually good for you. It helps prevent tuberculosis". Right. So there's all kinds of misinformation that was floating around the mines. And it didn't become recognized in the United States until after the Farmington mine disaster in West Virginia. And with that mine explosion, it really became a platform for miners safety and health. And it's essentially the miners there went on strike in West Virginia. I think it was about 30,000 miners that were striking. And so they effectively shut down the entire coal industry for a while. And they said, look, you know, this is - this is real. We're dying, we are sick, and we deserve a safe workplace and we deserve to be compensated for this illness that we contracted in the workplace. Let's see, I think it was 1969 was the Coal Mine Health and Safety Act. And that was the first time that we really acknowledged that black lung was a legitimate disease and that was the first time that we really put any effort into coal mine health and safety.

SM So was it just compensating miners who got it inevitably or were there ways to diminish the chance to get it?

AB Kind of a two - two prong approach. So it was compensation for those who - who had the disease, but it also laid out the preventative measures. So water sprays, you know, using water on the machines to help dampen the dust, to keep it from being so pervasive in the mines was one mechanism. Another mechanism is as proper ventilation, so making sure that ventilation curtains are hung, you're using your fans to kind of push the good air in and move the bad air and the dusty air out. So, yes, there are protocols in place that have been deemed effective for preventing black lung. Yes.

SM And how much were they able to reduce?

AB Well, it was pretty effective. So from about 1970 to the 1990s, prevalence fell from about 30 percent of miners to about three percent of miners. And so, you know, is really celebrated as a public health success. Right. But then in the early 2000s was when black lung became resurgent, particularly in Central Appalachia.

SM And how much black lung did they start seeing then or now?

AB Between 20 and 25 percent of miners who have been in the mines for 20 plus years have black lung. But there have also been some interesting studies recently where younger and younger miners are getting black lung as well. So in their young 30s, early 40s, they are also getting black lung.

SM Is there any theory as to why it's coming back?

AB There are lots of different accounts. One is that the large coal seams are gone, so they're mining those thin seams. They are drilling through a lot of rock. So they're not only getting the coal dust, but they're getting silica dust, which is far more toxic and harmful than just the coal dust alone. And so it just kind of exacerbates that black lung. That's one thing that's going on. And what I'm finding is that they're just not following the dust protocol hardly at all. And if they're following that, then the miners should be safe.

SM So watering it down, ventilation curtains and getting good air in and bad air out. Those are the protocols. Fairly simple, right?

AB Totally, yes.

SM And why are the miners, or the mining companies, often not following those protocols, do you think?

AB Time is money, right. So if you're spending time hanging curtains or making sure your water sprays are working or you're making sure the ventilation is working - that's money that is perceived to be unproductive. So there's certainly a lot more emphasis on coal production than safety and health. There's a lot of pressure from the managers and even among the coal miners themselves. They - they will use incentives, you know, production incentives. And so the miners are actually policing themselves as well. Right. So they're saying, hurry up, run the coal, run more coal. Go faster. You know -

SM We want to get that bonus.

AB Yeah, we want to achieve that bonus. So that's it's kind of a manipulative way that employers are able to turn you into the bad guy, if that makes sense.

SM You know, struck by how you said that coal is a relatively cheap fuel, but it really isn't, when you think about all the environmental and health costs for the workers.

AB You know, I think - I have a lot of respect for coal miners and what they do and just how hard these folks work. And I do think we just really take for granted where that stuff comes from. You know, we don't really stop to think about the working conditions or the health impacts or the environmental impacts. We've kind of moved away from protecting and preserving our workers and instead we approach them as disposable. And again, this is - this is happening around the world. And part of it is - is really driven by the capitalist model of price is what matters. So I do think there needs to be more attention drawn back

to workers and workers' rights and making sure that they are protected, right? And that these industries have more of a long term focus instead of a quarterly focus.

SM Well, Aysha Bodenhamer, thank you for talking with me on With Good Reason.

AB Absolutely. Thank you so much for having me.

SM Aysha Bodenhamer is a sociology professor at Radford University. With Good Reason, listeners, we want to hear from you. Join our Why I Vote VA Campaign and tell us - why did you vote? Call and let us know at 434 253 0396, and we might share your voice on the air. With Good Reason is produced in Charlottesville by Virginia Humanities, which acknowledges the Monacan nation, the original people of the land and waters of our home in Charlottesville, Virginia. Our production team is Alison Quantz, Matt Darroch, Lauren Francis, Jamal Millner and Aiden Carroll. Some of the music is by Blue Dot Sessions. For the podcast, go to [withgoodreasonradio.org](http://withgoodreasonradio.org). I'm Sarah McConnell, thanks for listening.