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Title: Unearthing the effects of climate change on human health
Subject: Dr. Jay Lemery, Associate Professor of Emergency Medicine, Chief Section of Wilderness and Environmental Medicine
Host: Ken McConnellogue, Vice President Communication, University of Colorado System
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KEN: Two very big fields, climate change and global human health, and you're at the convergence of those. Tell us how you got interested in that.

LEMERY: I started off doing a lot of wilderness medicine education out of residency, and that's kind of the art and science of how you take care of people in remote and austere places. It was a real derivative of emergency medicine, which of course, is my day job. Then, I began to think about wilderness medicine as really a dual mandated take care of people in remote places, but also the fact that a remote and austere place is -- a healthy environment is integral to human health. I began to think about the larger conversations about climate change, and the impact on health, and the conspicuous absence of the clinical community in that. The more I dug, the more I realized it was a niche that needed to be fulfilled, and no one was really doing it. So, that's kind of what drew me into it.

KEN: And how long have you been at that?

LEMERY: I've been doing that since about 2007-2008. I was really inspired by my mentor and my coauthor, Paul Auerbach, who is the former Chair of Emergency Medicine at Stanford. He wrote an essay in the journal, The American Medical Association JAMA, called *Physicians in the Environment*, and I read it in 2008. We were friends, and I immediately called him. I was like, "This is amazing. We've gotta push this through in the medical schools in the curriculum, and we've gotta start teaching this." Then, from that initial conversation came the book idea.

KEN: And is the field growing?



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LEMERY: I think the field is slowly growing. I think medicine is very slow to move. Truthfully, the most traction we've gotten is with medical students and residents. They get it. They want more. They want to know more. They're excited about it. I think when we talk about the ossified, board-certified physicians, of which, I guess I'm one of them now, it's just harder. It's harder to, sort of, change the way people think, and I think a lot of it isn't necessarily any other reason than doctors are confident in knowing what they know, and things that they don't know they don't necessarily feel like they can venture out and speak authoritatively about it. I think our messaging is you know health, this is sickness. If you're an orthopedic surgeon, or an obstetrician, you still what sickness is, and I think, in fact, yes, you can -- we sort of invoke the white coat to say you can speak authoritatively on this, and not just -- you may be professional, but even personally, within your own constituency, your friends and family just to say this is a big deal, and we need to pay attention to it.

KEN: I think, despite the terrible hurricane season we saw this year and wildfires, many people still view climate change as kind of an abstract thing that's out there in the future. Does linking it with health make it more real?

LEMERY: Absolutely. Climate change has historically been messaged through altruism, so you know, love mother earth, save the whales, or abstractions. Parts-per million of carbon dioxide hit 400, and what does that mean for most people? So, I think science communication has generally failed in this regard, and now I think when you bring it to an issue where you can talk about the health of your family, and you know, their kid's risk of asthma, that has a whole other meaning for people. Again, the goal is to change risk assessment, and say we need to understand that this is gonna impact our health, and we have to change the way we view it in terms of our risks.

KEN: Do people make the connection between climate change and some of the health issues that we're talking about?

LEMERY: I've been surprised that people, even physicians, when you sort of link climate change with extreme weather and the impact on human health, or extreme heat events, or even mental health, the aha moments that I get still suggest to me that a lot of people aren't getting it, or haven't thought much about it.

KEN: People have their head in the sand.



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- LEMERY: Yeah, I mean, there's a lot of noise of there, right? I think it's just a matter of understanding -- is getting a message to people, yeah? A lot of competing messages, I think.
- KEN: Unfortunately, climate change has gotten politicized, and it's out there in the political discourse, and probably not in the best way. As you've noted, the evidence is quite clear that this is real; this is happening; and this is gonna get worse, but does having physicians involved in this discussion, perhaps, move it out of the political realm a little bit?
- LEMERY: I hope so. I meant, that's the whole goal is that physicians have always been a trusted part of people's lives, and when you can articulate, you know, that obesity is bad, smoking is bad, you know, sugary snacks are bad, you know, this is the same messaging. I don't think it has to be politicized when physicians do what we've always done. We bring forth the best science, and we distill it into recommendations, you know, all day long; we're science communicators. You know, I sit down and say, hey, you need this surgery; you really should take this pill, and you know, and a second opinion is not withstanding, people generally say okay, doc. You know, we still have the benefit of the public trust, and I think that's something that's very, very important.
- KEN: You've noted that many aspects of climate change can affect human health, and we wanted to talk about a few of those. If you could tell us about, like, extreme heat events seem like a bit of an obvious issue, but also a bit of a sleeper issue for people in terms of when you think about global warming.
- LEMERY: Yeah, there's a few things about that. All right, so like extreme heat events are -- you know, there are some direct impacts. The hottest day of the year, people are more susceptible to heat stroke and heat illness, but really, it's more insidious than that. The hottest day of the year, of which, there's used to be one, now there might be 10 days or two weeks well beyond the historical record for a given area. The people that we're most worried about in these extreme heat events are the most vulnerable, so those with diabetes, heart disease, congestive heart failure, kidney disease. These are people we call physiologically vulnerable. They don't need much to push them over the edge. Then, when they body is overheated, it's very sweaty. They may not have access to cooling or air conditioning. These are people that can have exacerbations of their chronic disease. So, they'll come into the hospital, and you know, they'll be sick, or maybe even die from congestive heart failure, from diabetes, from heart disease, but what you have to understand is that may have been what's on their medical record, but



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you have to correlate that with the weather outside, and say this was the hottest day of the year, and these vulnerable people were pushed over from these extreme weather events. That's where the hidden numbers lie, where the impact is the greatest.

KEN: Can you describe what vector-borne diseases are, and why they're increasing?

LEMERY: Vector-borne diseases are -- vectors are just bugs, so you know, mosquitos and ticks. We know a lot of infectious diseases are carried by these vectors. When you create more hospitable space for these vectors to live, to thrive, to procreate -- and what I mean by that is just warmer temperatures over a longer part of the year. What we're seeing is their spreading higher in latitude. In the U.S., they're going to more northerly states, and places that haven't existed before, and higher in altitude. So, places like east Africa, we're seeing -- the mosquitos that carry malaria are moving to higher mountainous areas, where those people have never had that exposure before, and we know that there's a risk of increased disease in these areas, particularly the people who have been naïve to these diseases before, so they haven't had experience with them. They don't know how to protect themselves, and in some cases, may have a more severe form of the disease, because they don't have an immunity built up.

KEN: As we're speaking, wildfires are raging in California. What does that do to the air and the people who are breathing it?

LEMERY: Yeah, so wildfires are -- we're seeing longer seasons and more intense wildfires, and you know, it's been -- in the United States, we've seen a lot in the mountain west over the summer, and the west coast, you know, this whole fall. Wildfires have the ability to degrade air masses over huge swaths of land, and over, you know, big cities, so huge population centers. The particulate matter that is in the air -- you know, so the particulates from the burning vegetation, irritate the lungs. Again, we think of vulnerable populations, those with existing pulmonary disease, or asthma, or maybe the very young or very old are more susceptible, and they can get into real trouble, because the air that they're breathing is now degraded, and they can go into a respiratory crisis from that.

KEN: Extremes in precipitation and drought are really affecting all over the world; how do they influence food supplies?

LEMERY: Drought, of course, you know, degrades food supply in any -- you think of any impact from farm to the table, any perturbation in that supply chain can really impact food



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security. We don't think about it too much here in the United States, but in parts of the food where food supply is very tenuous, and the food chains are long, and take a while to get, you know, from the fields to the table, that's a big impact, and a drought can devastate crops, you know, in entire nations. I think that has the ability to have one of the biggest impacts, is that food security is gonna be really at risk from these extreme weather events.

KEN: What aspects of climate change are we seeing here in Colorado, particularly, as it relates to health?

LEMERY: Well, we're seeing wildfires. We're seeing worsening extreme precipitation events. When you think about the floods in Boulder a few years ago, I mean, they impact to property and human life was palpable. We're seeing increased drought. We're always at the risk of decrease snowpack, and that has real downstream implications for agricultural areas, and again, food supply. So, we're certainly not immune, and this is sort of a pattern that's playing out all over the American west.

KEN: You pay attention to the science of climatology I would imagine. Do climatologists pay attention to global health aspects?

LEMERY: The way we approach this is that we're healthcare providers, and that's really where our recommendations come, is that we know sickness, this sickness, but to understand it, you have to pay attention to what the data's telling us. Researching the book that we just wrote, we had to pay real close attention to what was happening with environmental science, because that's how you distill the impact to understand what's happening with health. I think we're pretty clear that we're not primary researchers in environmental science, but the data is there, and extrapolating that to human health is actually pretty straightforward.

KEN: What's been the reaction to your book?

LEMERY: It's been pretty positive, actually. I think the one thing that we wanted to do is take the reader to the bedside, and it was written just for that, for laypeople. So, we wanted to get away from abstractions, or even a public health voice, where we speak in terms of large populations. We actually wanted to speak in terms of individuals, and one of the features is we did these clinical vignettes of composite patients that my coauthor and I have had a career seeing. So, when we talk about heat stress, we can tell you exactly what that looks like. When we talk about infectious diarrhea from an extreme weather



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event and degrading water quality, we can tell you what that feels like that. It's the same thing with forced migration from climate change. I think that's one of the things we wanted to do is give readers a palpable sense of really what's at stake in a way that maybe they hadn't heard before.

KEN: Can you talk to us about forced migration?

LEMERY: Forced migration is just when people have to move for a certain reason or a number of reasons. Certainly, drought, and increase in civil conflict, in which climate change has been associated with exacerbating in places with poor governates. These are all considered forced migrations. One of the other big causes that we are seeing, and we'll definitely see in the next century, is sea level rise, particularly within nations of the Indian Ocean and the south Pacific. These nations will just cease to exist. So, now we're seeing more resettlement happening in nations like Australia and New Zealand, where these populations are truly having an existential crisis. One of the other examples that we've seen in the United States with forced migration is, you know, this summer with Houston, or even 12 years ago with Katrina. Katrina was an extreme weather event. It was an urban flood. Climate change was not the soul reason it happened, but we know that we'll be seeing more of these types of events based on the prediction models. When you look at the forced migrations of these vulnerable communities in New Orleans, and if you look a map, very powerful maps that are out there of the diaspora, or the citizens of New Orleans, who are now living in other parts of the U.S., you see that -- almost every county in America has citizens from New Orleans from 2005, and those are essentially climate refugees.

KEN: Will yoking global health issues to climate change discussions raise the profile of this discussion, make it more real for people?

LEMERY: Yeah, we hope so. There's very few things that people are more concerned about or pay more attention to than the health of their loved ones, their friends and their families. That's what we're really trying to bring forth is that this is a health issues, it's getting worse, we have the ability to change it; therefore, we should think about how we're going to do that. We're trying to make that link. It's been a very difficult process, and I think, you know, our nations discourse to get us there, and again, we wanted to do it from a physician's point of view, because we hadn't seen much of that, and we thought we could be in a position to make a change.



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KEN: Do you think people have an overly optimistic view of the risks associated with climate change?

LEMERY: I'm not sure I would call it overly optimistic. I think people don't know, and I think if anything, there's a sense of helplessness; there's a sense of confusion; there's a sense that these are quote on quote natural fluctuations that humans have not really been a factor in. I think, as the sciences are merging, we all know that this isn't true. This is human caused, but the good news is if it's human caused, it can be human fixed, and I think that's what we're trying to push, particularly, understanding that the impacts are big. Again, that's something that people haven't necessarily realized. They think of climate change affecting polar bears or far away places. You know, I think we've seen a lot this past year in the United States that these extreme weather events have real impacts, and hopefully people understand that they're not so far removed from it; they're in a position to actually affect change.

KEN: And it seems like, certainly, the discussion, but the pace of climate change seems to be accelerating. Do you see the discussion about global health impacts accelerating, as well?

LEMERY: I would say it's becoming more conspicuous, and more people are talking about. Certainly, in the global health world, climate change is playing a larger role in terms of impacts and efforts to mitigate against it. It does seem, in the United States, that more and more people are accepting it slowly. So, I think there's cause for optimism. I think the question is gonna be the pace. Is the pace of our change enough to keep up with the pace of climate change? The data on that, it accelerates at different levels, but I think there's no question that the prediction models that even we knew 10 years ago, have born to be true, and the science is getting better ever year to suggest that it will keep happening for the next several decades and into the next centuries.

KEN: Shifting gears, but related, you've done work on global health responders, you produced a massive open online course that you delivered and you're refining. What was the response to that course?

LEMERY: Yeah, it was amazing. You know, the massive open online courses, we call them MOOCs, is a who new way of teaching. Historically, if a professor was able to get four or five hundred students in a room, that was incredibly popular. Our courses had over 10,000 people take it, and that's actually very low numbers for MOOCs. We also had people from over 130 nations take it, which was phenomenal when you're talking about



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a global health course. It was very exciting, and very dynamic. We created it, so people of all backgrounds could take it. It was an introductory course, you know, sort of a background around global health and how to get involved. The feedback we got was fantastic. We had a lot of help, and we featured a lot of prominent CU faculty, but we brought in some heavy hitters in the field, as well, to sort of bolster our ranks. We did it three or four years ago, and it's still very relevant today.

KEN: When disasters happen, many people are altruistic, and they hop on planes, or they go to disaster areas, but rushing in might not always be the best approach.

LEMERY: Well, that's right. That's one of the big things we talked about is that you do have to be prepared, particularly, with humanitarian disasters, to help. You just can't expect -- even if you have a real expertise at home. So, you may actually be a prominent surgeon, or a nurse, or an administrator, and very good at your job in the United States, but popping into a humanitarian crisis, all those skills, which you had in a resource rich environment, you really need different types of skills. So, that was one of the big messages we talked about, and very much we learned that from our work in Haiti, where it was an easy place to get to, but it was a desperate situation, and a lot of the first responders that landed there actually ended up becoming victims themselves in compounding a disaster in an already tenuous place. So, that was one of the big lessons we hope to impart from our course.

KEN: What's the difference between disaster response, and what you call responsible engagement?

LEMERY: So, disaster response is in the aftermath of an earthquake, or hurricane, or, you know, a civil war even, and I think those are things that have emergent and really desperate situations. I think responsible engagement, particularly in the context of global health, is having a sustainable relationship that where both parties have a lot to bring to the table. We often think about we come from a resource rich place, so we have resources, but it's not always a good thing just to show up with resources and think you're doing anything meaningful, so we really try to build a lot of the global health programs along on the lines of education and reciprocity. So, our colleagues in other nations are able to educate us, and show us and our students a different type of pathology, a different type of patient, and in turn we're able to bring our educational background to them, and hopefully build some capacity within their ranks, so they can deliver healthcare to people long after we're gone.



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KEN: Are there some particularly good examples of where that system works?

LEMERY: There's lots of people doing great work. Here at CU, we've got our faculty working in South Africa and Ghana helping to build healthcare systems to increase the capacity of our colleagues there. There are programs that exist where nurses and young physicians can go abroad, and again, in a Peace Corps model, help build capacity in the local environment, and through a funding mechanism here in the U.S., they're able to pay off their student loans. So, yeah, I think there's lots of great examples that exist. I think the one thing is that just because a place is easy to get to, doesn't mean it's a good idea to go there, particularly, if you're a healthcare provider, I think you have to be thoughtful about what's the impact on the local community, and what's the lasting legacy. All too often, we've seen cases where American providers go abroad, they do your discrete intervention, but actually in the end they sort of undercut the local healthcare system, and actually do more harm than good.

KEN: Tell us a little bit about your students and their interest in the confluence of global health and climate change?

LEMERY: The students totally get it. They're eager to learn. They're out to save the world, and they actually see this as one of the big challenges to their society moving forward, and it's one of the big challenges they see in their healthcare careers, how we're gonna be able to manage these big forces that'll affect everyone's health worldwide.

KEN: And what's ahead in this field of study, and with your students, as well?

LEMERY: I think we have yet to see this coming to the mainstream. I think climate change and health is still on the fringes. We're starting to see traction with different medical society that are now starting to talk to one other. So, emergency physicians, and pediatricians, and internists are now saying okay, what are the common themes that we can focus on, and how can we mobilize around this? I think medical education, it's still -- I would call this on the fringe or somewhat of an elective topic. It's not a real core topic, but you know, I think about where global health was 20 years ago, same thing, and now there's proper global health tracks embedded within more med schools. So, I think -- I think it's a process, but I think there's still -- you know, we still have to push, and we still have yet to have it become what I would consider a mainstream medical core topic within a core curriculum.

KEN: Are some of these extreme weather events shoving it more into the mainstream?



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LEMERY: Yeah, without a doubt. I mean, every year, sadly. You know, it takes a crisis, or a tragedy, or an extreme event to get people to pay attention to it, right? So, I think what happened in Houston this year, and Puerto Rico, and the Virgin Islands, and then the wildfires, I think more and more people are realizing that these are not isolated events, but it's part of a greater pattern. So, with that, comes a chance to reassess, and hopefully we're understanding that this is a problem that we're gonna have to face head on, and I think viewing it through a healthcare lens helps us really see the impact in a way that everyone can relate to.

KEN: Are you optimistic or pessimistic about the near future?

LEMERY: I'm an optimist, and I think in many ways it hasn't nothing to do with healthcare. We know that renewables are making huge strides forward, so battery power wind and solar generation. Those are the things that are really gonna be the drivers of the new economy, and with that, you know, will come a slow and steady demise of carbon based energy sources. I truthfully think that, more than anything else, will be the biggest change agent regarding climate change. But with that said, I think we do have to understand that there's an impact here, because we just can't wait for these economies to change, and we can't sort of be lazy about it, I think we have to have our eyes open. If we can link this to health risk, I think that can almost act as an accelerator to these larger trends that we're already seeing.

KEN: You've had private individuals come forward and provide financial support.

LEMERY: Can I make a shout out to them? Denver based nonprofit, the Living Closer Foundation.

KEN: And then, are there other -- is the government involved? Are private corporations involved? Who all is involved in this space?

LEMERY: We're seeing a lot more people in the private sector be interested in helping what we're doing. There is a Denver based nonprofit called the Living Closer Foundation, and they have supported a physician fellowship in climate and health policy here at CU, where we're taking one of young physicians for a year, and sending -- in this case it's a her. We're sending her to the CDC in Atlanta, to the NIH in Washington, and to have this young physician really be in the room where the climate and health policy discussions



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are happening, and basically become an insider, and be a real agent for change when the fellowship is over.

KEN: How does it feel to be what, to me, seems to be a pioneer on this frontier?

LEMERY: It feels like we got a lot of work to do. I mean, it feels -- you know, this came out of a need. You look around, and like probably most people, you wanna leave the world a better place for your kids. I'm a physician; I work in healthcare. I also run an educational program in wilderness and environmental medicine, and to me, it slowly became an elephant in the room. Like, why aren't we talking more about this? This is so clear to me in the world that I'm in. Then, the more you explore, the more you realize there's so much to learn, and so much to share, and it just became a calling. So, I just feel like I can't think of anything more important we should be doing right now. We just finished a book, and there's a lot of work left to be done.

KEN: Well, we're glad you're out there doing it.

LEMERY: Thank you for having me.