Transcript of CleanLaw Episode 4: Joe Goffman with Francesca Dominici on Air Quality, Public Health, and Science, July 12, 2018

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Robin Just: Welcome to this podcast from the Environmental & Energy Law Program at Harvard Law School. Today Joe Goffman, our executive director, will be talking with Francesca Dominici, professor of biostatistics at the Harvard Chan School of Public Health and co-director of the Harvard Data Science Initiative. Professor Dominici will be discussing her recent research on the health effects of the Trump administration's environmental deregulation. We hope you enjoy the podcast.

Joe Goffman: Thank you very much for coming to the Environmental & Energy Law Program here at Harvard Law School. We're here today to talk to Dr. Francesca Dominici of the T.H. Chan School of Public Health here at Harvard University. And I hate to admit it, it's really exciting to have you here. Because the work that you've done is so critically important generally, and it goes right to the heart of the public policy discussion, or I should really say controversies, that we're having around changes in rules, practices, and methodologies that Scott Pruitt is attempting to impose on the Environmental Protection Agency.

Joe: Recently you've done just magnificent work in the area of public health. And there are three things that would be great to talk to you about today. First, you took a look at the body of rules that Scott Pruitt is trying to slow down, weaken, or reverse, rules that had been put in place by the Obama administration, all aimed at reducing air and water pollution or curbing waste. And we as lawyers have been tracking the changes that are being made from the perspective of administrative law. What you try to do, and I think what you did very, very successfully, was take a look at what the actual public health stakes were. So could you give us a little bit of a thumbnail summary of what you found in terms of the public health stakes of those rule rollbacks?

Francesca Dominici: Yeah. Well, first of all, thank you for having me here. Indeed, I think that in the last few months or year, there's been pretty much an attack on science from the Environmental Protection Agency, and what is happening in terms of rolling back or threatening to rolling back a lot of these environmental rules is extremely concerning for the public health.

Francesca: This was an opportunity that came to me through my colleague David Cutler, to write together a short piece for the Journal of the American Medical Association, and it's called Forum. It's more like an opinion piece. We didn't attempt with this

opinion piece to do a full investigation of the public health consequences of rolling back all of these rules. But we wanted to, I would say, provide a higher level view of the public health impact.

Francesca: And so what we did, we had a very short time to do this, and we had a very limited amount of space to do this. And what we wanted to do is basically we wanted to ... We tried to find all of the environmental rules that have either been already rolled back or they're going to be rolled back. And we tried to cluster them in the most important one, the one that will target contaminant in the air, so levels of air pollution, levels from emission from power plants, emission from car and trucks, pesticide in water. And then what we did is we literally went to the EPA cost-benefit analysis and reviewed the EPA-cost benefit analysis associated with the implementation of this rule and the consequences or the damage you would see by going back to not implementing that rule.

Francesca: And so we created this table with some, with literally some of the public health damages. And when you're starting to take all of these action of going backwards and you start looking at it cumulatively, the public health impact becomes very substantial. And my feeling was that the public was losing the importance, because there was all over the news every single day, they're talking one rule at a time in a very isolated fashion. So the line is, we found that that if they are going to do what they're saying to do in rolling back some of the rules, we were going to see 80,000 extra deaths in the next decade and many more hospitalization, hospitalization among kids, hospitalization among adults, respiratory problems.

Francesca: The other thing that I wanted to emphasize is, again, we didn't come up with this number doing any type of very complicated calculation. We just came up with the number by adding the public health damages that are already documented by the EPA. And the other piece that I would like to add, that we do feel pretty strongly that that is an underestimate of the public health impact. Because most of these public health damages do not count the potential, what we call cobenefits. So the classical example is, if you're trying to target a source of pollution, for example, a power plant, you are not only going to have a public health gain as a result of lowering the level of a particular contaminant. But if you're shutting down a coal fire power plant, you're going to reduce emission of many, many, many, many pollutants, and therefore the public health impact are going to be even larger.

Francesca: So it was really trying to speak to the public and say, it's important that the people understand the cumulative in a certain way, the concern, and you want to raise concern about movement that the EPA is taking on really going back to many, many of the progress that we are making to assure that people can breathe clean air and drink clean water.

Joe: Well, I think in some ways your work was a kind of wish fulfillment. Because what we've been tracking and what the media pays attention to is the step-by-step of changing the rules themselves. So if you're just looking inside the box from a legal point of view, you can forget exactly what it is that you brought to light, which is, the actual stakes are not how the administrative process or the process of judicial review is going, or just those questions. The question is, how is the public health being affected? And I think what's so important about your effort here is that as many people know, but not everybody knows, when the EPA puts out a rule, it does something called a regulatory impact analysis. And you refer to it as the cost-benefit analysis, which is analysis, which is basically what it is.

Joe: But on the benefits side, each of the rules that Pruitt is targeting, when each one was proposed or finalized, the EPA had already done an analysis that attempted to estimate the number of illnesses that the rule would avoid, or the number of premature deaths that the rule would avoid. So Pruitt's own agency had generated this information, had put together the basis of estimating what the cumulative impact on public health would be, and yet nevertheless went ahead and tried to draw these benefits back from the public by changing these rules. And I think your work, really using the EPA's own information, makes it clear what the stakes are for the public that these rules are intended to serve and protect.

Joe: I should say that we will post the link on our website to the column you wrote with Dr. Cutler in May, in the Journal of the American Medical Association so people can read it, they can see the group of rules that you clustered and focused on. It gives a wonderful and very necessary perspective to what the EPA is doing. Let me ask you to talk to us about another topic that in some ways is at least as important, if not more so, because it gives us a chance to look forward. One of the things that I think people who work in this policy area realize is that it's urgent to continue to make progress. Whether it's in scientific understanding of public health issues, or it's in responding to that understanding and making change in policy, or whether it's looking at very closely related issues like climate change. It's the urgency of progress that really is the most important urgency.

Joe: One of the things that we've seen the EPA start to do, at least since last October, is call into question whether or not particular increments of pollution reduction have any benefit for the public, and whether or not those increments should be treated as having a positive value. One of the ways they've been going after it is by positing the proposition that emissions reductions below the current ambient air quality standards are of no value, either in public health terms or in monetary terms. And you were one of the lead experimenters and authors of a study that focused in on that very phenomenon, reductions in so-called clean air areas and how they affected public health. So please let our listeners know what you found in that study and what conclusions you, at least, came to.

Francesca: Yeah. Yeah. First of all, I think that in terms of thinking in a positive view in the long term, above and beyond what the current administration is doing, I always felt from my own work that the most important way to impact policy for the benefit of the public is to rely on solid science and solid data and solid evidence. Because different administration and different people with different political opinions can always have, again, opinions. My work has always been, instead of talking about ideas or opinion, I always bring data to the table. And we are in an area, and that's also, I'm a co-director of the Harvard Data Science Initiative because right now we are uniquely positioned to measure pretty much everything. And so I mentioned the importance of data and science because the study that we did, which I think has had an enormous impact in policy, will have it in the long term, is because it relies on data, a massive amount of data.

Francesca: And so what we did was, this was a large team that I had the pleasure of leading at the School of Public Health here at Harvard Chan School of Public Health, was basically to first gather data from satellite and use any additional information, including sophisticated approach to computer science and machine learning, that will allow to estimate the level of pollution for every one kilometer to one kilometer grade for the entire continental United States. By doing so we were able to assess with a higher level appreciation geographical areas around the US where pollution levels were well below the national ambient air quality standard. So now we have the data, we'll continue to produce the data. It is publicly available, everyone can see which air in the United States in the last 15 years, and we'll continue to work further, have people leaving in areas where they always breathe pollution level below the national air quality standard.

Francesca: And then we need to have very good information on health and diseases. And the United States, we have what we call the Medicare system. And most, I think 97% of people in the United States older than 65, are enrolled in Medicare claims. And so we gathered Medicare claims for every single person in the United States in Medicare, 100%, which says that more than 96% of the population older than 65, we know where they live, we know their place of residence, and we knew we could track every time they go to the hospital, for which reason they go to the hospital, and the date of that. And so we used so many more data. This was an enormous, data intensive undertaking. But basically we were able to identify over 13 million Americans that were constantly living in areas that we call clean. They were always living in levels of pollution that were below the national air quality standards.

Francesca: So we were, again, by relying on data, relying on data science tool, we could create enormous amount of people in creating a cohort to where we could track their health, even if they were always breathing clean air. And we found actually that small increment of ambient level of fine particulate matter, again, even in an area they were always below the national ambient air quality standards cited by

the EPA, have had a 13% increase in mortality risk. So I feel that the power of the study, not only, the study was published a year ago, I think, had an enormous amount of press coverage. But regardless of how this can be received and how it's going to impact the new standard that will be reviewed pretty soon, by the way, I think we go back to the idea that relying on solid data and solid science, I think, are the major, I would say, building block that could inform regulatory policy for the best of the public interest without being subject to different views and opinions.

Joe: I think what you've just laid out is a feast for people who are interested in policy. It seems as if we could do a whole podcast just on the monumentality of the methodology you used and the way you collected and assembled data and the almost limitless richness of that approach. However, before we get to that, let me try to translate, from the perspective of people who watch the regulatory process as it currently exists, what some potential takeaways would be. First, even though the current standard for pollution in this case, fine particles, was arrived at by the EPA as part of an assessment as to what is a so-called safe level of particulate concentration to inhale, what you saw and what your colleagues saw is that further reductions in pollution below that ostensibly safe level really would bring benefits. Because the pollution that is in the air in areas that meet the standard is nevertheless causing health effects to, if you will, real people having real experiences both in terms of suffering ill health and imposing costs on the medical system.

Joe: So that to make the argument that the EPA is currently making, that changes or reductions in pollution even at that level have no material effect and therefore no value, that's a proposition that seems to be thoroughly refuted by what you observed and concluded in your study.

Francesca: Yeah. By data.

Joe: Yeah.

Francesca: And I think that's the argument. The argument is, we can measure ambient level of pollution now in a very, very rigorous manner. And so data clearly pointed out that even if you are living in an area where the level of pollution is below this 12 microgram per cubic meter, which is an international ambient air quality standard for PM 2.5, people experience adverse health effect. And not only a moderate health effect, there is a statistically significant increase in the risk of that. So data informs policy, and this is a massive amount of data that cannot be subject to, "Well, you have studied this population but you haven't studied this population." We studied everybody.

Joe: So we have to have faith that data will defeat ideology and regulatory convenience.

Francesca: Yes.

Joe: Which goes to the heart of something you said at the beginning, which is, not only are we seeing an attack on specific rules and regulations and standards, but we're seeing an attack on science. And now that you've explained the work you've been doing, I at least think I can see the deeper meaning in what you said, which is that by going after these rules, which themselves were based on analysis and data, that Pruitt is implicitly rejecting the underlying intellectual infrastructure and the data and analysis that went into those rules. And what you've done is not only call him out in the JAMA column, but you've basically countered that with this really monumental study. As you know, predecessors' studies which relied on data involving confidential information now seem to be targeted by a proposal that Pruitt has made to exclude those studies because the patient data is confidential.

Joe: You used Medicare, where the patient data isn't protected by confidentiality. So it would seem that your study would not be affected by this censoring proposal that Pruitt has offered. I don't think that means they're going to restrain themselves from attacking your study, given its conclusion that in order to increase public health protection, we need more rather than less regulation. What's your sense of how they might attack the study? And even more important, what's your understanding of why the study is so likely to be durable and resilient in the face of those attacks?

Francesca: Well, I don't know. I don't know if it would be resilient. And for sure they're attacking me very ferociously, as they have attacked my colleagues. But let me step back for a moment, and I think it's important to clarify a few important facts. Clearly I think you're exactly right, that this is a general tactic. The general tactic is that all of the public health benefit of EPA regulatory policy had been very well documented based on rigorous science. Rigorous science, it relied on data. And in the last 25 years, starting with the Harvard six city studies from my own school, from colleagues, there were six city studies, what I would call probably one of the most landmark studies. They used data on six cities to show the air pollution, increased risk of that. And then there was American Cancer Society study led by Arden Pope. And there have been thousands of epidemiological studies that all point around, and all are consistent and tell you exactly the same thing, that ambient exposure to pollution affects health.

Francesca: And they were the backbone on which there was the public health benefit and why we have these rules. So the general tactic has, regardless of any of the work I've done, but the general tactic is pretty clear. "If we refuse and attack and discredit the science, we will now be able to make any changes that we want

without being able to rely on data." And the way they have been attacking the science, because they couldn't attack the scientific credibility of hundreds of thousands of scientists around the world, was attacking by the fact that you're doing epidemiological study that used health information from individuals. And clearly we have to, if we do any cohort study, we follow the health experience of people over time. We ask them to sign a consent form, and we make the promise to the individual that we're not going to release this information publicly. So their attack is, all of these studies, they have all been saying the same thing, from which we have relied on the science or rely on data that they considered secret.

Francesca: And so the general public cannot access it, so we should not believe it. We should discredit it. And clearly to me that makes absolutely no sense. Basically you can have the same argument for any type of science. And so that means that anything regarding policy should not rely on science. And it seems to me that's a silly argument. So these studies are extremely valuable, should continue, and they must continue. Because what is important about these studies and the reason why they rely on also personal data is that they can be carefully designed to measure things about your health. They are really important to measure, for example, the thickness of your artery, how your genes respond to environmental exposures. So these studies must continue for the good of science.

Francesca: Now, what I have done, I tried to approach the problem from a different viewpoint. And instead of a carefully designed study where I enroll a group of people and I measure personal health about them, I basically went to central Medicaid, Medicare services and I thought, "Well, the government collect claims data for everyone is in the Medicare." These data are less, I would say, rich than I can have a single person coming to the doctor office and measure everything about them, because these are claims or bills.

Francesca: But still, they have all of these variables, and the good news, they are on everybody. And so the studies that we're publishing in the past few years, especially the study that we published in New England Journal of Medicine and JAMA last year, relied on what I called publicly available data. Not in the sense that everyone can go on a website and download the data, but in the sense that everyone, every scientist or not scientists, can buy these claims data and can do the analysis in the same way that we have. But the most important, there are two take-home messages. One is, ultimately the interesting thing is that the study that we have conducted that rely entirely, 100%, data that's been produced by the government, which I thought was actually a very cost-effective way, because the government's already spent the money to collect the data. So I'm just going to leverage that.

Francesca: But guess what? We found the results that were perfectly consistent with all of the rest of the literature that Pruitt is considering secret science. So I did not

report any different estimate that was inconsistent to what was found before. And so you want to have something ...

Joe: So basically what you just told us is, all of the studies that Pruitt and his coalition tendentiously referred to as so-called secret science are consistent with your work, which meets the definition of so-called open science.

Francesca: Correct.

Joe: So the entire exercise in making this distinction, which is a contrived one designed to produce a certain result, that is, a deregulatory result, this distinction was basically dissolved by your work. In tracking you down and preparing for this discussion, I tapped my own network of folks that I had worked with over the years, particularly in the Environmental Protection Agency, starting of course with Gina McCarthy, the former administrator, who is now part of your larger team at the Public Health School. But I talked to a number of other people as well who are specialists in the area, and I came away with an appreciation that among your peers you are something of a celebrity and certainly have a very, very large fan club. So what I'd like you to do is just make sure everybody knows what your background is, what your training has been, and how you found yourself on this, from my perspective, very enlightening path.

Francesca: Well, you made me blush a little bit.

Joe: Sorry. If you want to, I will edit out the celebrity business. But I think your resume says, among other things, that you are a biostatistician. And you've certainly made the discipline sound awfully compelling this morning. So hearing a little bit about your background would be great.

Francesca: So I have a PhD in statistics, and then I started my career at Johns Hopkins University in environmental biostatistics. I was hired by Jonathan Samet, who is now the dean of the School of Public Health in Colorado. And Scott Zieger, who at that time was a biostatistian at Johns Hopkins University. And I think that my background has always been in the most rigorous training of the theory and the analysis of data to address important questions in society. And what has been happening to me and my colleagues, we call it now statistician or computer scientist or biostatistician, and now we like to call ourselves data scientists, is that I do think that we are now having this enormous opportunity to solve big, important problems in the world by relying on rigorous analysis of data.

Francesca: And so my training has been really to... Math and statistics. And when I started my postdoctoral fellow at Hopkins, I realized in the context of estimating out the effects of pollution, because the data, first of all, the health effects or pollution, even though they affect everybody, the signal is small, fortunately. And so

analyzing these data would require a higher level of sophistication in trying to parse out where they call the signal from the noise in the data. And so I became very passionate about using my skill in statistical theory and analysis and computation and general data science, and then apply this skill to solve such an important problem in environmental policy.

Francesca: Of course, when I started this, I had no idea what I was getting into. For me there was just one dataset, but that's why I think now also Harvard is positioning themselves with the Data Science Initiative, is the idea that students and faculty and scientists, they have enormous amount of skill in extracting knowledge from data, are now in a much more powerful position they used to be, because we have sensors, we have cell phones, we have satellite, and now we have all of this massive amount of technology that can solve important question with data.

Joe: It sounds like you're pursuing an integrated mission. The mission of using data in a way that really does justice to the tool or tools and to the purpose which it should serve. And the other mission, of course, is that purpose, improving people's lives through improving public health. Thank you very, very much for joining us. I think that people listening to this podcast will be grateful, not only for the work that you do, but for spending a little time helping as many people as possible understand it. Thank you very much.

Francesca: Thank you, thank you very much.

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