[SQUEAKING]

[RUSTLING]

[CLICKING]

SPEAKER: And our last speaker for this session is Jonathan Buonocore.

JONATHAN BUONOCORE: All right.

SPEAKER: Oh, you've got it?

JONATHAN BUONOCORE: I'm looking for a slide changer. Here's one. Is this the slide flipper?

SPEAKER: Yes.

JONATHAN BUONOCORE: OK.

SPEAKER: You got it.

JONATHAN BUONOCORE: All right. Yeah, so my name is Jonathan Buonocore. I'm an assistant professor at Boston University School of Public Health. And my goal in the next 10 minutes is to not only convince you that a person from public health belongs in the room, but also to convince you that you all are secretly going to be public health professionals.

So where I wanted to start was to look at this process. This is how EPA, other environmental agencies, help public health and environmental health professionals look at just hazards in the world. We do a lot of very fancy stuff, but very often it breaks down into these four basic steps. Start on the left just ask, is there some kind of pollutant, a stressor, something like that, that people are being exposed to that might cause a problem? Could be air pollutant, water pollutant, heat, a safety issue. Anything that could harm people should go in that box.

Next up is this dose response assessment. This is really just a process of asking, if there's a certain amount of this thing in the environment, what are the health problems at different levels of exposures? Like high levels of air pollution are worse than lower levels of air pollution. Same goes for water pollution, and that kind of thing. The third step that goes in parallel with that is this exposure assessment step that asks, OK. So we know that there's a thing that is bad. How many people are exposed to it? How long are they exposed to it? Are there certain susceptible windows or susceptible populations, like infants or marginalized communities, that are exposed to this? And then in the end, we have this fourth step called risk characterization, which basically just asks, how big of a deal is this anyway?

So what I've done and do occasionally is I flip these four steps to look like one of these hazmat placards that you'll see on the trucks going down the highway or whatever. And then, again, here's a simple version. Is there something that might be harmful? How harmful is it if you're exposed? How many people are exposed to it? And how big of a deal is this really? So four basic questions.

Now, you can overlay this, look at the full life cycle. This is the supply chain of natural gas starting from your wells and everything on the left, over to the right all the gas consumers, like your commercial buildings, your residences, the use of gas in power plants and all the pipelines, storage facilities, compressor stations, processing stations, LNG terminals, whatever else it that is in between a well and your stove or your furnace.

And we take our little hazmat placard and say, OK. How bad is all this anyway? And I'll argue to you that there are hazards present across the entire supply chain. We know very little about most of these, which is this could potentially be my whole research career as a public health professional. But I'm going to talk in detail about a couple of these different endpoints just to explain that what you all are doing, you know all about the climate hazards. You're also doing a lot for public health.

So I'm going to start on the production side of things. This is a map of every single oil and gas wall in the United States. You may have noticed that there's a lot of them. And a natural question that you should be asking yourself is, OK. So how big of a deal is this really? Going through a hazard assessment, there's a lot of things that you could potentially be exposed to, being I mostly focus on regional air pollution.

So I did a study that was focusing on the regional air pollution aspects of this and basically found that there are a lot of violations of the National Ambient Air Quality Standards in the US that are due to the air pollution from oil and gas extraction. There's a big plume of ozone in the middle of the country over the oil and gas production there. There's NO2, which we're concerned about from a respiratory health standpoint. This tends to be more concentrated in production areas. And then PM 2.5, which is our standard aerosol somewhere in between. So that's great.

And then running it through all the science that we have about who lives where and what the health impacts of these different pollutants are. We have about 7,500 deaths per year in the United States due to air pollution from oil and gas production, about 410,000 asthma attacks and 220-- these are children that are newly diagnosed with asthma per year due to oil and gas-- just the production side pollution in the US.

So totaling up all the health damages on top of this, there's emergency department visits, hospitalizations, heart attacks, strokes, a whole growing menu of health outcomes that are related to air pollution. And we can put a price tag on of about $77 billion, with a b, dollars yearly due a production of oil and gas. And as you've heard, geothermal will be able to put a dent in that.

So that's just the production side. And I'm going to move over to the other end of this, which is the stove. They do emit air pollution. There's benzene, which is a carcinogen, so it causes cancer. There's a whole lot of volatile organic compounds that come along with that. There's NO2 when you burn it again. And methane, which is the greenhouse gas that we're all worried about from a climate standpoint.

So Zeyneb, myself, and maybe a few other people in the room, Nathan, were involved in a study that basically sampled gas around Boston. So we put it in a canister, sent it to a lab, and they told us what was in it. And it looked like an organic chemistry textbook. There was a lot of methane, as expected, a lot of ethane, as expected, but a whole lot of things that were not methane, and they were not ethane. We got hexane, benzene, toluene, and heptane, carcinogenic, MP xylene, carcinogenic, carcinogenic xylene, and then all these other things that are also carcinogenic.

So they went on to keep doing this kind of research. Turns out that Boston is not the only place that has a problem. There's also issues related to these odorants, which is the chemical that is intentionally added to the gas stream so you can smell it when it leaks. Turns out that humans don't like how it smells because it is a respiratory irritant. It's harmful. And potentially, there's other health issues related to it. But it is present in all the gas everywhere.

And again, looking at just benzene, again, basically every single canister they sent to a lab had some amount of benzene in it. Boston is actually on the lowest end of the spectrum as far as benzene concentrations. The highest in the US is Los Angeles. And the highest of places in North America that they sampled was Vancouver and Los Angeles.

So I could go on for hours about every single one of these spots, but I just wanted to give folks a small snapshot of the types of health hazards that you all are helping to prevent by switching over to geothermal because if you change what's going on the right side of this supply chain, you're having ripple effects all the way across the supply chain and reducing air pollution, reducing safety hazards due to gas storage, which I could talk for hours about, reducing use of pipelines, reducing compressor station pollution, and really being a public health resource. So that's it.

[APPLAUSE]

SPEAKER: Thank you so much. I am feeling really grateful for those three amazing talks to start our day.