

THE BROOKINGS INSTITUTION

WHAT DOES CLIMATE CHANGE HAVE TO DO WITH ZIKA?

A FUTURE OF CHILDREN EVENT

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P R O C E E D I N G S

MR. HASKINS: Welcome to Brookings. My name is Ron Haskins. I'm the co-director along with Richard Reeves of our Center on Children and Family. We study kids, obviously, and we're especially interested in poverty issues, and issues of economic mobility. And along with my CCF colleague, Belle Sawhill, I'm also an editor of "The Future of Children," which we publish twice a year with our colleagues from Princeton. Sara McLanahan is the editor-in-chief, and the managing editor, Jonathan Wallace is here. Jonathan, thank you for coming. He's here primarily to keep an eye on us, I think.

Whenever we release a volume, which we do twice a year, we write a 3,000 word policy brief about some issue that's covered in the volume, and we try to pick an issue that's related to public policy. And then we have a public event at Brookings and announce the release of the volume. We give an overview of the volume, and so forth.

So that's our purpose here today. Thank you all very much for coming. Here's the plan that we're going to follow for the event today. First, after I get through, Janet Currie, who is one of the senior editors of the journal, and also one of the two editors of this volume, and she's also the Henry Putnam professor of economics and public affairs, and the director of Center for Health and Well Being. I'm not sure she sleeps, but she does all that stuff at Princeton in the Woodrow Wilson School of Public and International Affairs.

Then when she gets through, I'm going to give a brief description of the policy brief, and tell you what the argument of the policy brief is. And our event is organized around the policy brief rather than the entire journal. The only time we'll talk about the entire Journal is right in the beginning. It'll come up from time to time in the discussion, I believe.

Then after that, we're very fortunate to have Debra Lubar here from the administration from the Centers for Disease Control and Prevention, and she is going to talk about the administration's proposal on the Zika virus, which we'll get into in a few minutes.

And then we're all going to sit down and we'll be joined on a panel. So we have a panel of four people discuss several issues that have come up. And then we'll give each of you a chance to ask questions of the panel. And Alan Barreca is here from Tulane, who will also participate in the panel discussion.

So that's our plan. I hope you like it. Let's have a good time. Janet.

MS. CURRIE: Okay. Thank you very much, Ron. So this volume starting point is the idea that the debate about climate change is often framed around effects on our children, but we're not generally very specific about what those effects might be. So the aim of this volume is really to get more specific about what the effects of climate change are likely to be on children.

So there's four broad themes that come out of the various chapters. One important theme is that this is no longer something which we're speculating about. This is something that's already happening, and will continue to happen, and it is going to, and is already, affecting children's health and well being.

Children are likely for various reasons to bare a disproportionate share of the brunt of climate change. Poor children, children in developing countries, and especially children in countries that don't have very strong institutions, are particularly at risk.

And although we know that this is already happening and will continue to happen, we still have a lot of uncertainty about exactly how bad it's going to be. That depends in part on what we do. And the fact that there this uncertainty, and also that the costs and the benefits are in the future, and also that they're going to be very unevenly distributed I think make the politics surrounding climate change particularly difficult.

So I'm going to start off just with this article, which many of you may have seen. It appeared in the New York Times yesterday, and I thought it was perfect for this presentation because it hits all the themes that I just talked about. Climate change is already happening. As you can see here in the United States, we have our first climate refugees, who are being moved off of Isle de Jean Charles, which has lost 90 percent of its landmass, and most of its trees because of salt coming up through the water table. So 48 million has been allocated to move people off of the island to a different location.

You can see that literally the poster child of the article is three-year-old girl, whose family is going to have to move. This is a poor community. It's a Native American Community illustrating again that it's the poor who are most likely to suffer. And then on the political front, even this sort of relatively small and well-defined thing, let's take these people who are on this sinking island and move them

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somewhere else, is still kind of a heavy lift, and fraught with various difficulties that are discussed further in the newspaper article.

So in terms of what this volume covers, we start by talking about the science of climate change? What is known? What is not known? Having set the stage, we then focus on temperature extremes which are one of the most obvious implications of climate change. Children are particularly vulnerable to health effects of high temperature which is one of the many ways in which climate change affects children.

We talk about climate change in conflict. There's a growing body of evidence that high temperatures are related to conflict in part because they can have severe economic effects so in parts of the world that are prone to conflict anyway, if you do things that threaten farmers' livelihoods, that makes it more likely that there will be armed conflict.

We discuss natural disasters and effects on children. Again, that's one of the things that's expected to become more common due to climate change.

We talk about pollution and climate change which I'll go into a little bit more detail about in a minute. Climate change in developing countries which is a particular problem.

And then we talk -- it's a little bit more technical chapter, but just about how do we measure the costs and benefits of climate change. A lot of the standard ways that economists think about things are quite difficult to apply when you have something that is going to take place a long time in the future, and also where there's substantial uncertainty, and that, I think, bedevils efforts to talk about this in a really rationale way.

And then finally, we come back to the political problem that it's so difficult to mobilize effort to combat claimant change.

So looking at temperature, this figure, which is from the chapter on temperature, shows the number of days over 90 degrees that are expected in four U.S. cities. The white bar is for 2001-2010 so that's already happened. Then the next gray bar is 2046 to 2055, and the black bar is the end of the century, 2090 to 2099.

So what you can see is that it's going to get even hotter in Houston, although it's pretty hot in Houston already in the summer, so maybe, arguably, people in Houston are used to dealing with that.

If you look at Kansas City and New York, the two middle sets of bars, you have a really big increase in expected hot days. So in New York it goes from ten days in the summer to 70 days in the summer by the end of the century, so that's a big change. And then Seattle comes off relatively easily with an increase to only 20 day of really hot weather.

So this is just illustrating how the costs of climate change even within the U.S. are going to be unequally distributed across regions.

Now some of the things that we could do about climate change in the short-term which will also have some benefits in the short-term are reducing pollution by, for example, switching more to renewables from fossil fuels.

So this table here, which is based on the projection made by the Intergovernmental Panel on Climate Change -- it's the Projection A1B for those of you who follow these things -- is based on the idea that we use more renewables. And if you just look at the far right column of the table, there's an estimate of how much the switch to renewables would reduce infant mortality by reducing particulate matter. So this would be a benefit of something that would affect climate change in the longer run, but would have a short-term benefit on pollution.

And you can see that these benefits are also unevenly distributed. So in the southeast, you would get almost a 20 percent increase, or decrease in infant mortality. In the northeast, you would also have a fairly large decrease. In the west not so much.

So again, this figure is just summarizing what's in that column showing the decreases in infant mortality that are projected by region compared to doing nothing, which is the light gray bars.

Similarly, if you -- infant mortality is obviously very important, but one reason why it's important is because it's a more general marker for child health. So the same things that reduce infant mortality are expected to improve people's health in the longer term. Healthier people will have higher earnings, and so this projection is suggesting that earnings would also increase in the same places that had the biggest decreases in infant mortality.

Now moving a little bit from the U.S. to the rest of the world, this figure is just showing particulates for one U.S. city, Pittsburgh, where we have data over a long period of time, and we all know that the air used to be really bad in Pittsburgh, but it has really improved over time, and showing by way of comparison numbers for the same particulate matter, pollution, for Mexico and for China.

So what you can see is that things have also been improving in China, actually, but they started at a much higher level so people were being exposed to really bad air. And so, again, anything that affects pollution and also affects climate change would be a win-win in that it would have both short-run and long-run effects on people's health.

Staying with the developing countries area, I mentioned a little bit about the research on conflict. This map is showing the Horn of Africa, which is a place that has a lot of conflict. And on the left, what you see is a map showing how much change in temperature there's been since 1991 to 2005-2009. So you can see that even within that relatively small area there's some places that are having much more temperature change than other places. And then using that kind of variation, the authors of this study, which is summarized in that chapter on conflict, shows that you would expect to have both a short-run and a longer-term increase in conflict as a result of the temperature change.

So turning again -- this is a kind of rapid walk through the volume -- but turning to the chapter on cost and benefits, this table illustrates one of the problems, and so what it's actually showing is the solid line being a projection of economic growth not paying any attention to climate change. So standard economic models that forecast economic growth don't usually take climate change into effect. And so we think that growth continues and so in the future we should all be richer.

Now the dashed line is showing what happens if you have catastrophic climate change. And I think the interesting thing about the dashed line is that nothing happens immediately. It's happening at the end of the century, and then you have a decline in real consumption compared to business as usual. So this is one of the things that makes climate change a heavy lift in the sense that if we do nothing today, nothing will happen tomorrow. It'll happen in the future.

And then another issue with respect to thinking about costs and benefits is the issue of what discount rate we should use for the future. That is, how much should we value things that are going to happen in the future relative to today? And, again, if you look at the numbers on the far right that's

showing a 5 percent discount rate which is fairly standard, and what that says is, well, we don't value at all, \$1,000 in 2200, okay, because that's too far in the future for us to care about.

So in order to have a discussion of climate change, we have to also change the way that we evaluate future costs versus benefits in order to take account of the needs of future generations.

So I just wanted to make one comment about the heavy lift. To talk about one particular example, the Waxman-Markey bill of 2009 which was not passed, so 2009, that's only seven years ago, already seems like a long time ago, if it had been passed, it would have reduced carbon emissions by 83 percent by 2050. So that would have made a really significant impact on what's going to happen in the future.

Now, of course, it wasn't passed. After going through the House, it didn't make it through the Senate, and so this is just one illustration of sort of a history of failure to address the issue.

So that's all I have time for. If you'd like to take a look at the issue, I think you can get copies at the back, or it's all online at this website.

(Applause)

MR. HASKINS: Thank you, Janet. Appreciate it. As I said before, whenever we publish a volume, twice a year, we write a full -- a 3,000-word policy brief trying to seize upon some issue that is implied in the volume, but to play it out a little bit, especially in a policy sense, and we try to pick things that are actively under consideration in Washington.

And we were quite fortunate at this time that Zika appeared. It's unfortunate for people's health. We don't know the extent yet, but it certainly does lend gravity to this event and to the issue, and it makes our point, which is there are a lot of implications here for public policy, especially for children's health, and so we'll learn a lot more about Zika in a few moments.

Here is the logic of the brief. Temperatures are rising. Janet already covered things. I'm going to mention a few more things that I think are quite interesting. Rising temperatures have impacts on children's health. There's a whole chapter in the volume, and it goes into that in some detail, both direct and indirect effects.

And one of the indirect paths is through infectious illnesses which a lot of people might not think of as being related to the environment, but I'll show you how that's the case. And Zika is a great

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example of that, and I'll talk about why. And we will -- in doing so, we will focus a lot of attention on the aedes aegypti mosquito which is a strange little creature that has all kinds of habits that make it unlike other mosquitoes, and some of those habits bear on its vector, as the Public Health officials call the method of transmission, or the means of transmission.

And then we're fortunate to have Debra here to talk about the administration proposal. And then as (inaudible) about the proposal.

So I just want to show two things about temperature. This is a temperature graph from the National Oceanic and Atmospheric Administration, and it shows the temperature -- if you look at it carefully, I think statistically the trend line actually begins in 1950, but it looks like it really starts picking up around 1980, which is consistent with other evidence. And it has gone way up. And the last two years have been huge temperatures. I think 2015 was the hottest year we ever had, and we're on course in 2016 maybe to repeat that.

So temperatures are going up. And especially -- this is an important point -- this is kind of a difficult graph. We undoubtedly have great experts out here who understand this stuff very well, but for a normal person -- what has happened the red is temperatures and the white is the normal distribution. And what is happening is that the temperatures are shifting up. The entire distribution of temperatures have shifted up.

And an especially important feature of that is that the tails of the distribution, especially the positive tail, is increasing even more. So we're getting even more increases in extremely hot days usually defined as 90 degrees or more, often defined as 90 degrees or more, and those are the ones that Janet pointed out, and as pointed out in the volume, that can really big impacts on health, especially on infants. The chapter on infants shows that infant death even rises at temperatures above approximately 90 degrees. So if the projections are correct, these are really important considerations.

So temperature is going up. And it has an impact on children. It has direct impacts, as I've implied, on mortality, on illness, on infant deaths, and it has indirect effects especially in vector-borne diseases, and these are laid out in greater detail in the chapter.

But I want to focus on the vector-borne diseases, and the vector here is aedes aegypti. So Martin Edwards, a famous entomologist, said of this little mosquito, "He loves us. It loves our cities. It

loves our blood." Kind of a colorful statement about what this little guy is like. I mean, all mosquitoes to some extent love our blood, but this guy is especially thirsty.

This particular mosquito carries a lot of infectious diseases, including yellow fever, dengue fever. I've read several arguments about how you pronounce this word, but I'm going to say it with an English-American way of saying it, chikungunya. There's a more fancier way to say it, but I couldn't master it. So it carries all of those in addition to the Zika. So this guy is a very important means of transmission of disease to children. And why is that the case? And why are we concerned, especially about both Zika and the role of the aedes aegypti?

Well, first of all, there's some evidence that it has the widest range now that it's ever had. Places that have increasing temperatures, many mosquitoes are more likely. It's easier for them to breed. They multiply faster, and so they're occupying new areas.

There were predictions -- I think these are mentioned in the Journal, but not -- there's several journal articles and other journals more focused on climate and children -- that say that even in the United States we're going to start getting Zika quite of expansion of territory. It's present now in the southeast, but it will expand.

It breeds in and around standing water, which is extremely important because especially when it's hot people like to have more water, and especially in more traditional societies they keep it in buckets and pails and all sort of things all around, and any of that can be a breeding ground for Zika, as well as other mosquitoes.

So that's an important idea that might have an impact and has in the past on trying to control mosquitoes, and especially Zika, that you need to do something about standing water.

Also, rising temperature allows the Zika virus to multiply more quickly (inaudible). And there's a particular feature of this mosquito that I found fascinating. I didn't know anything about until I started reading into this.

Most mosquitoes bite you and suck up your blood, and they go away and they don't bite another person. They were satisfied for a while, and some mosquitoes, I think, they only do it a couple of times.

But this mosquito takes only a little bit of blood, goes to the next victim and takes a little bit of blood, goes to the next victim and takes a little bit of blood. So they can infect several people if they happen to be carrying whatever they happen to be carrying.

So this aedes aegypti is really a formidable weapon in nature's attempt to get us. And it's after our blood, and it will -- it has a capacity to infect many people at one time.

And that is why Margaret Chan, who is the head of the World Health Organization in discussing the Zika virus, she said that it's the main cause of the, what she called, "explosive spread in the Americas." I'm sure she was referring primarily to South America.

So this, of course, raises the question, now what? What are we going to do? It's not an emergency at this moment in the United States, but it's potentially a very serious problem. So should we do something?

And here to answer that question is Debra Lubar from the Centers for Disease Control and Prevention. Debra, thank you so much for coming.

MS. LUBAR: Thank you, Ron. I'm glad to be here, and glad you set up our nemesis so well in this fight by describing the aedes aegypti in some detail.

I'm going to tell you a little bit about CDC and what we are doing, and what we need to do, and give a little bit of background about the Zika outbreak.

So just a little bit about this great agency that I represent. CDC was founded in 1946, and we were actually founded to deal with malaria, so mosquitoes are sort of part of our origin story, and continue to be part of the work that we do.

We're in Atlanta, so I got to fly in to see you all today. We're the only, I think, federal agency headquartered outside of Washington, which gives us a different perspective on life than many of you probably have.

So our mission is to save lives and protect Americans from health safety and security threats. And one of the really interesting things about this outbreak has been seeing all of the expertise at CDC that we're able to draw on. So a lot of times when we're responding to emergencies, it's an infectious disease outbreak and it's our infectious disease doctors and experts who are leading the outbreak.

In this case, we've really seen across the agency drawing on expertise in vector-borne disease, in environmental health, in birth defects, in reproductive health. And I think that we're a very unusual collection of people who are able to bring all of that together to support this response. So we based our actions in science, but we are very much a practical agency who's out in the field, and you'll hear more about that.

We work in partnership with state and local public health agencies, so there's a public health system in this country and CDC is not in charge of it. So that's sort of an interesting thing about our work. A lot of authorities for public health interventions and things like that are local and state controlled. And so I'm going to talk a bit about CDC's budget because a lot of what we do is fund and support the public health system in this country and around the world.

So we are all over the United States even though we're headquartered in Atlanta, so this gives you a little bit of a sense of where we are. We have some very specialized labs around the country, and one of them that you'll hear a lot about today is in San Juan, Puerto Rico where we do our work on dengue, and increasingly on Zika.

We have over 1,600 people located in 60 countries, and this will give you just, I'm just going to go through this really quickly. We're working on disease detection in general, on polio eradication, and measles immunizations, flu, still working on malaria all these years later, global HIV and AIDS is a huge part of our global footprint. We're training the public health workforce in partnership with other nations, and we're working on a cross-governmental initiative called the Global Health Security Initiative, which I'll mention a little bit more later.

CDC's budget is really complicated, and my job, which I should have mentioned, is running the Office of Appropriations. So I work with Congress and the White House on CDC's budget which is why I'm here today to talk to you about the Zika request. But CDC is funded from many different sources, and this gives you a pretty big picture of what our money does and where it comes from, and I can answer questions about that if people want to dive in deeper.

The amount of -- our core budget is about \$7 billion that Congress decides on each year. This is a budget history of that core budget, and you can see its 2013 was low. You guys remember 2013

in D.C. We had some sequestration and things like that. But relatively steady over the last few years. We are funded in these kind of broad categories that you can see on the screen.

But something that people don't really know or understand about CDC's budget is how detailed it is. So you're not supposed to be able to read this. This is one page out of probably a five-page table where 160-ish different budget line items are presented as Congress directs us to spend it.

So we interact a lot with Congress about where our funding goes, and we are bound by that, which is one of the reasons that when we have emergencies and a need to surge, it can be challenging for the agency financially, and we're not always able to be as nimble as we would like.

So just as one example that's relevant here, this is a budget history on vector-borne diseases. We do have a budget line item for that. The name has changed a little bit over the years, and you can see there was some growth there. You all may remember the West Nile virus outbreaks of the early 2000s, and there was some attention to vector-borne diseases in the United States. It's been kind of relatively steady since then, since that drop in 2007.

But that's a place where Congress says this is how much money. You will spend this much and only this much on vector-borne diseases, and we get that direction every year.

So Zika comes along, and this is an overview of the transmission patterns, and until the last few months, we actually didn't know about two of these transmission patterns, or transmission pathways. And so this is really a space where we're learning more every day. We're more and more alarmed by some of what we're learning, and we expect to continue to find new, hopefully, new solutions, and also new challenges with this virus. So the sexual transmission pathway and the pathway to the fetus are the new findings.

So just an overview. This is a flavivirus, which is related to other viruses as Ron explained. Dengue, yellow fever, and West Nile. It's primarily spread through the bite of infected aedes species mosquitoes, and primarily we think through aedes aegypti, but maybe not exclusively.

This virus is not new. It was discovered in 1947, and for 57 years there were a whopping 13 cases reported. So very surprising. There was an outbreak in Yap in 2007, but very surprising last -- at the end of last year when we started to see a huge spike in cases in Brazil. And the authorities in

Brazil suspect that there were nearly a million cases. So that is tremendous growth and not what we expected.

The other thing that we didn't expect was the significant risk to pregnant women. So the efforts that you'll hear about, Zika is not a very serious disease for most people. Some people never know they have it. Other people have sort of general symptoms that might look like any other viral infection that we would all sort of live with and get over. But the really tragic outcomes have been for pregnant women. And this is the first time in more than 50 years that we've discovered an infectious disease cause of birth defects, and it's really the first time that a mosquito bite could cause these kind of lifetime consequence for families. There's all been noted an association with (inaudible).

So Zika virus infection during pregnancy, we have now determined is a cause of microcephaly and other severe fetal brain defects. And what we don't know is the full range of health problems that might result from this infection to the fetus.

And that's going to be -- that's something we really do need to study. It's going to take time to see how children who may have been exposed develop, and that's part of the work that we're starting now, and that we hope to continue with some emergency funding.

So this is what we've been doing. What we've been able to do to date. We have determined the link with microcephaly. We're examining the link with guinbarae. We're looking at a range of other adverse pregnancy outcomes. We have seen miscarriage and other things associated with Zika.

We've learned that sexual transmission is more common than expected. It was sort of theoretically know, but it seems to be happening more than we would have predicted, and there's a lot more to be learned.

So here are some of the things that we're doing. I hope you all have heard about our travel guidance, particularly for pregnant women. We're working with clinicians so that they know what to do with someone in the United States who may have traveled.

I do want to say I think Ron said this is not an emergency yet in the United States. This is an emergency in Puerto Rico right now, and the territories. And so a lot of our early response has been to support those areas. And I'll talk a little bit more about that.

We've been doing a lot in the laboratory diagnostic area. Something that had 13 reported cases in 57 years most labs were not testing for. So we have several different tests that we have been getting out to the public health labs around the country. Again, that system where it's not all CDC doing the testing, although we do a lot of validation, and we have been developing new diagnostics that are easier to use, better at detecting.

So this is a picture of our foe that you've described well. And I want to talk a little bit about the factors that contribute to spread. So we've heard a lot this morning about climate change. And, certainly, vector-borne disease and being able to track where vectors are and where vector-borne diseases are happening are an important part of understanding changes in the climate.

What we've seen though is with this, it's not easy to determine what role climate might be playing. There are a number of other factors that are affecting the spread of this disease, including global travel, and the movement of infected humans. We have over 400 Zika infections in the continental U.S., excluding Puerto Rico, and those are primarily travelers, some sexual transmission, but that's happening all over the globe.

Living conditions I'll talk a little bit more about are a very big factor as Ron described in terms of standing water and urbanization. The disease reaching populations who haven't been exposed before can cause these large outbreaks as well. And there may be changes in the virus, so we're still studying that.

So this was -- this could be our public health intervention if we could just get the mosquitoes to avoid us, and go to happy hour. That would be a most excellent outcome. But that's not available, so we are looking at what are these other factors, and how can we work with them.

So this is, I think, a really interesting case. This is a study of dengue and chikungunya spread by the same mosquito done at the border of the U.S. and Mexico. And what you see is obviously these places do not have differences in climate, vegetation. They are very much in the same place, but the living conditions are dramatically different.

So you see a 4 percent infection rate in Brownsville, Texas, and a 32 percent infection rate just across the border in Mexico. And here some of these factors are that 85 percent of the homes in Brownsville are air conditioned, and only 29 percent across the border. There are bigger lots in Texas, so

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you're not as crowded together. And that's part of what we're seeing in Puerto Rico. That we're seeing infection rates that are close to what you would expect in that kind of an environment.

So this is a map of air travel. And this is where I come back to our global health security agenda. The CDC is part of a government wide effort to improve global health security across the world because of the connection that we have with the rest of the world. That we're all connected by the air we breathe, by the environments that we live in, and by our human connections through all of the traveling and trade that goes on across the world.

So the effort that sort of underlies these outbreaks that we see is to bring other countries' capacity to detect, respond, and prevent diseases around the world, to strengthen that globally. And that will help us -- that would help -- Ebola was a really stunning example of how an outbreak in one part of the world can affect the global, global health and the global economy.

So this has been a major effort, and is part of the ongoing public health capacity building that we're doing following the Ebola outbreak.

So just to show you some maps of spread, this is dengue spread by the same mosquito as Zika. This is the spread. From 1950 to 2013, this was the spread of chikungunya. And then that came to the Western Hemisphere in 2013 to 2015.

So this is Zika moving is part of this trend as well. And you can see that these are fairly similar patterns

So I just want to quickly talk about Puerto Rico where we have seen these outbreaks as kind of a bellwether for the U.S. So this is chikungunya in 2014, and this is the -- that was a week-by-week map. It shows you the spread. And this was the final map for chikungunya.

This is what we're seeing now in Puerto Rico from November through April. That top line is Zika. The other lines are dengue and chikungunya, and you can see the dramatic increase there in the third or fourth week of the year. And this is what Puerto Rico looks like today with over 600 locally-acquired infections.

Their labs have done over 6,000 tests. They know they have at least 65 pregnant women with Zika, and that has been the real focus of our work with Puerto Rico.

So the lab, obviously, needed a lot of support. We have a lab in Puerto Rico that work on dengue, and so we've been able to partner with them very effectively. We are also doing surveillance of pregnant women and newborns to understand what the risks are longer-term.

And I'm going talk about -- so here the map of aedes aegypti, and aedes (inaudible) which we also have some concern about transmissions, but it seems to be a less competent vector.

What I want to say about this map is this is the best data we have. A lot of it is based on models and other things that scientists have done. We don't have really strong vector surveillance. Public health is weird. We like to go out and count mosquitoes. So we are hoping that one of the things that we can do through this response is really improve our vector surveillance in this country, which helps us target the control efforts.

As Ron explained, this is a really challenging mosquito. I've heard people call it the cockroach of mosquitoes, and so there's -- we have to do many, many things to try and control it. There's not one specific intervention that does the job.

And so, for example, in Puerto Rico, those efforts are focused on the homes of pregnant women. Very, very targeted because it's not something that is effective if you try and do it community wide.

Ron was surprised to hear we have over 400 travel-related and sexually transmitted cases in the continental U.S. right now. And we are working with state health departments to monitor those and to provide clinical guidance for -- particularly for pregnant women.

So I'm going to get to the funding request in my last few minutes. The administration has asked Congress for \$1.9 billion in emergency funding. 1.5 of that is for the Department of Health and Human Services, and I'll speak specifically to what CDC has requested.

So you've kind of heard me talk about throughout this some of the work that we're doing. We really need to dramatically expand, and we need to do it before mosquito season hits the continental United States. So we are already working with some funding that we've repurposed to work with all of the states, particularly those that appeared on the map and have the mosquito.

We know we've seen limited outbreaks of dengue and chikungunya in the United States, and we don't think we will have explosive outbreaks like Puerto Rico or Brazil, but we need to be vigilant about that, and we need to continue to support Puerto Rico.

We also really need to learn more, and so some of the things that we would like to get started on as soon as possible are some of those longer-term settings to see if we follow babies born to women who are exposed to Zika, what are some of the effects? What are some of the factors that were protective or risky for those women? What are some innovative methods for controlling mosquitoes, and what are some better diagnostic that we could introduce. And you can see some of the other activities here.

So that's an overview. And I suppose we'll have questions with the panel. Thank you.

(Applause)

MR. HASKINS: Before we begin our panel discussion, we'd like to hear from Alan Barreca from Tulane. Alan.

MR. BARRECA: Hi. I'm Alan Barreca, and I work on thinking about ways for us to mitigate the health costs of climate change. So today, I'm going to share some lessons I've gleaned from my research on malaria, which is a disease also transmitted by mosquitoes where I learned three things. I want to see how we could apply those lessons to fighting Zika today.

So I want to start in a nonfictional setting, and I'll tell you more about this location later, where you have a 1 in 10,000 chance from dying from malaria, which is caused by the anaphalis mosquito, which is different than the cause of the malaria parasite.

You have a 1 in 10,000 chance of dying in this place. You also have a 1 in 50 chance of contracting malaria, and, you know, brings on serious fevers and chills which is very challenging for you to make it to get to work or go to school for that matter.

And as I find in my research, if you just happen to be a child who's born in a particularly bad epidemic year where there's high malaria rates, you go on, your lifetime possibly through developmental delays in early childhood. You go on to have a 10 percent less likely chance of finishing eighth grade or high school, or a 10 percent higher chance of ending up in poverty.

So this is not the case for the United States today. Throughout the world there are some 200 million cases of malaria every year, 500,000 deaths. These are our best guesses. But virtually no chance of contracting malaria in the United States.

So what can we learn from our experience with malaria? And I should say that this fictional setting that I'm taking you to, I can kind of jumped a little bit ahead, is that we're going to look at malaria actually (inaudible) of the United States.

So in the U.S., actually, in the 1920s and 1930s, malaria was a serious problem. So what are we going to be able to learn from our experience? So I've got a map for you of the malaria death rate. Malaria cases were really hard to record in the early 20th century. But what this map is showing is that the places like Louisiana, the Florida panhandle, Mississippi delta, were the places where the malaria was the most prevalent. So these were ten times higher, say, than in Virginia.

So the south, malaria was a southern problem. And note that also, following up on Janet's point, that the south is also poorer, so if we're thinking about Zika, this is also going to be the case where we're going to see the poor parts of the U.S. are going to be most affected.

But there's also another important lesson for our talk today given our focus on climate change. And that is the south is, shocking revelation, warmer than the rest of the U.S. So I'm from New Orleans, and I can definitely preach to that.

So laboratory experiments suggest that the malaria parasites, the mosquito populations thrive when the temperatures are in the 70s and 80s. So it's got to be nice and warm. These are from laboratory experiments.

What does this mean then for us in the future? Well, as Ron noted, that we're going to see this distributional shift in temperatures in the U.S. So we're going to end up with more temperatures in the extreme. So more warm temperatures.

To put this into a nice, simple statistic, the climate change models predict something like 60 more days above 80 degrees Fahrenheit, so this is right in that range that at least the anaphalis mosquito really like. And the studies I've seen on the aedes aegypti, they also suggest that those temperatures are ideal.

So that's suggesting that we're going to see increased risk of mosquito-borne illnesses in the U.S. So more risk in the south potentially throughout larger parts of the year, but also those risks are moving north.

Okay. So what can be done? Little bit of hope here. Malaria is not a problem anymore for the United States, so what happened over time? So in the 1930s, the malaria death rate was about 10 per 100,000. That's about the same level we have for deaths from motor vehicle accidents. So this is relatively high. So 10 in 100,000 that would be like on student at Tulane University where I teach dying every year from malaria. So that's a real, real number. But they think that the infection rate was something like 200 times higher than that.

So in the 1930s, malaria transmission in the United States was relatively stable. But then there was this big drop between 1935 and 1940. So what happened? What gives? Well, there are a few things. The first two we have pretty good evidence on. The first being that the New Deal allocated considerable amount of money to drain ponds, constructing better drainage on ditches, something like tens of thousands of ponds were drained, and thousands of miles of ditches were also better drained. So this is the first thing that we think led to this drastic decline between 1935 and 1940.

The second thing we think is that populations were moving out of rural areas in the United States where the contact between humans and mosquito was relatively frequent. So when you take people, and you take mosquitoes, and you separate them, you break the cycle of the disease.

So as part of the New Deal, they paid farmers to fallow their land, and this led from a transition away from sharecropping where we had large numbers of farmers with relatively small plots of land who ended up having to leave because there was no need for their labor anymore. So they moved to urban places, or they ended up moving north. So that helped break some of the cycle.

The third thing I want to mention is that what we don't have as much evidence for is that education was increasing over this time period. Now, I can't necessarily account for this stark decline between 1935 and 1940, but it wasn't really until 1900 where people actually knew the malarial parasite was caused by the mosquito. They used to think it was just caused by bad air. Malaria.

So at the early 20th Century, people would, didn't quite have the grasp of where this was coming from, and I think there might be some lesson here about how we can use education to hopefully reduce the prevalence of Zika.

And I also want to point out that the CDC came into being around 1946. So we began spraying for these mosquitoes starting around that time after World War II because we needed to conserve our spray, that DDT chemical, a very powerful chemical, until then. So it wasn't the spraying that necessarily caused this massive decline. So old school technologies ended up having a pretty sizeable effect on a mosquito-borne disease in the United States.

So to recap, keep three things I would like just to leave you with is that, one, southern states are more at risk. These are the poorer places, and we expect that children especially in these places to be more vulnerable. Climate change is likely to increase these risks. So we have seen about 60 additional days in this, these really hot temperatures, these days above 80 degrees Fahrenheit. And we've got some old school policy tools.

Now I don't want to say that these are the magic bullet to solve the Zika problem. I only wish to say like in addition to thinking about insecticide treated (inaudible) in addition to thinking about spraying with powerful insecticides that there were some effective tools from the past that we can draw on. And in my pun moment of the evening when I was preparing this, we could think about another DDT. We could think about drainage. We could think about economic development possibly drawing people in from subsistence farming into the urban environments, and then we could also think about teaching, educating people about the ultimate cause of Zika.

And the final thing I want to leave you with is a quote by the Dalai Lama. "If you think you are too small to make a difference, try sleeping with a mosquito." So thank you.

(Applause)

MR. HASKINS: Okay. So thank you for those great presentations. I really enjoyed them. A lot of information to try to absorb. I want to talk first, and we're going to give the audience a chance to ask questions, but I'm going to ask a few first.

So the first thing I want to talk about is timing. In the Journal, and a lot of articles about this in the popular press about what we could really expect from measures to change emissions, especially carbon emissions.

So the question is if we could do that, which is by no means certain that we're going to be successful doing that, how long would it take before you begin seeing impacts on the mosquito, on the spread of illness, on all of the various effects that were shown in this volume to have an impact that are impacted by temperature? How long will it take?

MS. CURRIE: I can talk about that. I guess one of the problems with talking about climate change is that there are so many different time scales to be aware of. So I think the scientists say now that even if we cut carbon emissions to zero tomorrow, temperatures are going to still keep rising for a while. So we're already on that path, and we're going to have to deal with it.

So it'll take a long time before we see -- well, we probably won't see reduction in temperature, but to see that it doesn't keep increasing even more. That will take a while.

What I was trying to talk about in my presentation is there's some things like reducing pollution which will have an impact on climate change, but we would also see a more immediate benefit because that has an immediate health benefit if you reduce -- it also has a more local benefit. If you reduce particulate matter in Washington D.C, people in Washington D.C. will benefit from that pretty much, say, in the next decade.

And then the time scale where we're talking about responding to the Zika virus, that's something where we need to respond right now. We wish we had responded yesterday. So I think -- yeah. That just makes it difficult because you have to juggle all these times scales.

MR. HASKINS: Okay, here's another time-related question. I mostly don't study public health issues, so I'm fairly new to this, and, of course, questions are coming up a mile a minute about the difference between this area and other areas.

One thing about this area that is really interesting, and public health in general, is that a lot of things haven't happened yet that you're worried about. And those are particularly hard to convince people that they ought to watch out because this could happen.

And it's also difficult to convince Congress that we ought to spend money on things that didn't happen yet because we have a lot of things that happened that we have to spend money on, and we are spending money on.

So we'll come back to this later, but this is a problem with this whole area of trying to get people prepared for what could happen a year or five, or ten years from now. The example of pregnant women is a great example, and we really don't have even very good information from Brazil yet about exactly what percentage of women get it and all that sort of thing.

So the data laying out the problem is pretty -- so how do you deal with that? What are the conclusion we should draw from this? You have ideas about how we can convince people, the public, and especially policymakers that this is a big threat, and you better take care now, or you're going to be sorry later?

MR. BARRECA: I can say one thing on that which is I think that how we market climate change, we always talk about it in terms of these 1, 2 degrees Celsius increases, which if it's December it's kind of hard to like this early feel that that's a bad thing. What I like to do, and how I plan --

MR. HASKINS: We should plan our hearings in Washington on days when it's going to be 100.

MR. BARRECA: That's the point I think -- I like how you brought up the distributional changes, and that's what I think is important to emphasize. So coming up with these matrices that are really easy, easy to feel so the amount of hot days we're going to experience. So not a 2 degrees increase in Celsius to temperatures like, like how many days are we going to experience that are above 80, 90 degrees Fahrenheit because even in December I can feel, I feel what that is like.

MS. LUBAR: I think this is a huge challenge for public health in general, and not just because we have to get people to pay attention to things that haven't happened yet, but that when we're really successful that things don't happen.

And so it's hard to point to the successes as well. And so sometime in public health people say, you know, we feel sort of invisible because the only time that people notice is if it goes really badly.

I think Zika has been an interesting example because it has been creeping our way. And so it's not something where there's huge person-to-person transmission like Ebola where people were very afraid that if we had, and did have, even one case in the United States that we were going to see something very dramatic happen.

But I do feel in our communications with Congress and in the statements that I've been seeing that they are recognizing the seriousness of this issue, and I think seeing what's happening in Puerto Rico has really moved people.

So I'm hopeful that we have been effective in communicating what the risk is, and at the same time it is, the risk to the continental United States we think is rather limited in terms of person-to-person, or in terms of mosquito transmission on the continent.

So we don't want to alarm people, and make it sound scarier than it is, but we do want to have better data, be able to target interventions and prevent as many cases in pregnant women as possible.

MR. HASKINS: On other thing that I think we ought we to just discuss briefly, for just a brief period, this mosquito seems -- it differs according to entomologists from other mosquitoes in many ways that are related to this illness, and one of them seems to be that it's hard to kill. And a lot of things we've done in the past, especially spray them, and spray in areas like we'd spray in forests and so forth, will not have an impact, or have modest impact.

So if you can't use sprays, what -- I mean, does that kind of limit our -- not that you can't use them, but they'll be less effective, and the most effective means actually go into people's houses and spray their house which a lot of people are going to resist.

So if that's not off the table, but not going to be a major method of control, what are we going to do? How are we going to control the spread and kill the mosquito in the areas that we're worried about?

MR. BARRECA: I think this goes to drainage. To attacking them at the source. So I think that the aedes aegypti breeds in small pools of water, and so this is maybe information campaigns about you must be mindful around your house, and I think that if we could stop that, that part, and this probably suggests maybe going into developing countries and doing -- where there actually is this

problem. That's where the returns are going to be not necessarily like in the south of the United States. The returns are probably going to be higher there for these sorts of educational campaigns.

You know, the United States had yellow fever up until about 1905, and it was a real problem in New Orleans, and they actually conquered it just by these informational campaigns. And they had a lot of economic incentive to do so because it was an important trade town in the U.S.

MR. HASKINS: Well, in health incentives too, right?

MR. BARRECA: Yeah. Yeah. Right.

MR. HASKINS: I mean, people will respond if they feel like they're directly -- their health or the health of their children that is quite a motivator.

MS. LUBAR: What's happening in Puerto Rico is that the vector control initiatives, and the behavior change, and the personal (inaudible), and wearing long clothes, and staying indoors, are focused, literally, on the pregnant women. So we've been working with the Puerto Rico Department of Health with AC, which sees about 90 percent of the pregnant women in Puerto Rico to identify women who are at risk, and literally working with the Health Department to bring the spray into their homes, screen the windows, provide individualized protection packs that include bet nets, that include larvicide that they can use in their homes.

So it's very targeted. I mean, I think on pregnant women and outdoor spraying, you're right, by itself is not going to solve the problem.

MR. HASKINS: Okay. I want to talk about the administration proposal. People who hang out in Washington always interested in policy, this is a really interesting case, I think. I had the opportunity to talk to several people in Congress, especially Republicans, and here is what I think the situation is. I'd like to hear your comment on this.

I have not heard Republicans oppose the administration proposal. They're not saying we don't need this proposal. They're not saying this is not a big problem. They're not doing that at all. They are claiming it's not an emergency, and that the administration wants \$1.9 billion for its proposal, and so they're saying you should have a pay-for. The administration should increase access, or cut another benefit. And then they suggested using money from the Ebola fund.

So how do you respond to that? It's a case where Republicans are not opposed to the policy; they're opposed to the financing. At least that's what they say. So how do you think the administration is going to respond to that not just for Debra, but for the rest of you?

MS. LUBAR: I can start. The administration requested that this be designated as emergency spending. Our position is that it meets the requirements that Congress sets for that. It's necessary to protect the health of the United States, and others around the world. This was sudden. I mean, you're not anticipating this kind of spread of this disease in Brazil, and then into other countries, and into the territories. It's urgent that we act. Mosquito season -- I live in Georgia. I've already seen them. And this is a temporary search that we need. There are some longer-term things that we need to build up to be ready for continued transmission and other things, but in general, it's a temporary search. So for us it meets those criteria.

I was sitting at the dinner table with my -- after dinner, and my daughter was doing her homework, and I was reading emails, and I was like I have all these questions from Congress about Zika. And she said why? And I said, well, because they want to know what we need the money for. And she said, well, of course you need money for Zika. She's ten. But why don't you just use your Ebola money?

(Laughter)

MR. HASKINS: No, she did.

MS. LUBAR: And I could not even figure out how she --

MR. HASKINS: Your ten-year old said that?

MS. LUBAR: And I just -- she's like why are you laughing at me? I said that you sound just like Congress.

MR. HASKINS: She's going to grow up to be a Republican.

(Laughter)

MS. LUBAR: So I think that the issue there and I showed you our budget structure a little bit, is we can't stop working on Ebola. We've had recurrences and flare-ups there that have created the need to do contact tracing with hundreds of people. The fact that we're finding the single cases is because of the continuing work in those countries.

And so the way that our budget is structured, for us to turn towards something that needs a surge means turning away from something, and that's not what we'd like to do.

We did have to temporarily repurpose some funding in order to respond in a timely way, and we're hoping that we are able to replenish that. That's part of the proposal.

MS. CURRIE: And I want to speak to this. I'm sure Debra is not allowed to say this so I'm going to say it. I think the public health spending is woefully underfunded in this country in general, so the response of saying, well, we have this eco emergency so let's just take money away from something else.

Well, that's like what should you take it away from? Should you take it away from other maternal and child health programs, other infectious disease programs? And also as Debra said, I mean, the CDC relies on state and local public health agencies, and those are woefully underfunded. I live in New Jersey. I work with the New Jersey Department of Public Health, and I have seen the number of staff cut by like half over the 15 years that I've been working with them. Almost everybody who was there when I started is now working somewhere else, and since they're all very capable people, if the government doesn't want to pay them what they're worth, they can get a lot more somewhere else.

So I -- personally, I think it's kind of outrageous to say that we should rob Peter to pay Paul as the saying goes.

MR. HASKINS: The other choice is to get it from the Chinese and the Saudis which is our normal course of action, and this is what Congress is trying to deal with. So if you decide you're not going to increase taxes, and revenues are only going to increase if the economy grows like mad, you're only going to have a little bit of money, then you're limited in what you can do, and that's the situation we're in.

We have this situation not just in public health funding, but in funding of all kinds of agencies, and all sorts of issues that people, even some people in Congress would like to address. So I think it's -- stay tuned. This is going to continue. This will happen over and over and over again.

The first thing I thought of when I looked into this was it seems on its face to meet the congressional definition for an emergency. But the Congress has at least so far staying firm. Let's see what happens.

Okay. Questions from the audience. I'll recognize you and you'll get a microphone. Stand up. Introduce yourself. And right up here. And ask your question. Try to make it a question and not a comment so we can get in as many questions as possible. Okay. There you go.

MS. ERVIN: My name is Sue Ervin. I had one comment which is if you're looking for a success story -- this reflects my age, but I had friends who looked at the chart of lead in children's blood before and after we banned leaded gasoline, and after the first summer of the ban, I remember him saying he wished he had that for his dissertation in statistics. It was the clearest link he had ever seen. So I just offer something like that if you do it.

But I had a question about the risk issue that -- the focus is on pregnant women, and the military has now offered to pull pregnant soldiers out. What about childbearing age if you're not pregnant? I mean, are we just pulling out and treating women who are already pregnant, or is also a risk if you're of childbearing age and might become pregnant, and how do we know about the male soldiers?

And then can I ask one other question which is some reporter as a big click to get people to read said that there are mosquitoes carrying yellow fever someplace on Capitol Hill, so if that's true, I'd be interested.

MR. HASKINS: They were planted. Go ahead.

MS. LUBAR: In terms of women of childbearing age, I think that's definitely part of the communication strategy is for woman who could become pregnant to know the risks to manage their -- make their travel decisions in an informed way. And we do know that there are many, many unintended pregnancies as well. So encouraging people to avoid exposure to Zika if they could become pregnant is part of the public health intervention for sure.

MR. HASKINS: We do a lot of work here on teen pregnancy prevention and on unplanned pregnancy so for women of any -- couples of any age. And it turns out very difficult to affect people's sexual behavior. We have had some success with teens more than any other group. Teen pregnancy has declined every year since 1991 except two years and way over 50 percent. So that's a huge triumph.

But it's still very difficult, especially for people in their twenties. They're beginning to cut down a little bit, but the rates are in historical terms. Huge.

ERVIN: (Off mic)

Hand her a mic, please.

ERVIN: ... women who are in their twenties, and expect someday to become mothers, should they stay away from Brazil and Puerto Rico forever? Should they stay away until they're past menopause? I mean, what's -- I guess that's my question is when the military is pulling out pregnant soldiers, we'll get away from the unintended, but just --

MS. LUBAR: So there isn't evidence that an infection prior to pregnancy has any ill effects on future pregnancies.

MR. HASKINS: Okay. Next question. Right up here.

SPEAKER: Hi. I'm from Singapore, a newspaper in Singapore. I just wanted to ask Debra about CDC's working of clinicians. Have you spoken -- I mean, what do the clinicians tell the women who are traveling or have traveled? And also in terms of people looking for fertility treatment, is there a message to tell them to put that off for some time until further notice?

And the second question is on educational outreach. What is the CDC doing in terms of educational outreach? Are there conferences, pamphlet, and maybe Alan can also comment if there's anything in New Orleans to that effect?

MS. LUBAR: So in terms of clinical advice in the United States, the travel advisors are out there, and clinicians, we've been working with clinicians to make them aware. For pregnant women who may have traveled, the advice is for clinicians to talk to them about the potential for being tested. Sometimes this is asymptomatic. We don't know enough about whether having an asymptomatic infection has the same effects on a pregnancy, so that's one of the things we need to study. So we don't have as many entries as we would like to have for clinicians.

But that's one of the reasons we think having testing available in public health labs across the country is really important because women who traveled, or they have otherwise been exposed are really concerned, and we want them to be able to get testing. The tests are not perfect, and then there's advice about monitoring a pregnancy that is likely to have been unknown to be Zika exposed. So working with obstetricians, gynecologists on that kind of monitoring.

We have many, many channels for communicating to clinicians, and you can see a lot of those messages and materials on our website if you want to dive deeper. That's also true on more general educational outreach. There's a lot of educational outreach going on in Puerto Rico, and there is all of the things you would imagine for an educational campaign. Broadcasts, and posters, and all of those things.

We're doing less of that in the continental United States right now. I think you would see that increasing with supplemental funding, and the ability to really stand that up.

MR. HASKINS: Right here.

SPEAKER: Hi. My name is Ariana Sobol. I'm a reporter with Green Wire. I'm wondering what the environmental factors or economic factors are that are making Zika more prominent in Puerto Rico. For example, you mentioned air conditioning. So, yeah.

MS. LUBAR: We had an article come out just last week in the very exiting we named Morbidity Mortality Reports. The epidemiology in Puerto Rico that I think answer a number of those questions. I think what you see is a lot of breeding areas, lot of standing water. I'm told this mosquito can breed in a bottle cap. So when you think about standing water, it's not just that bucket, but it's just little micro environments where they can breed.

There's a lack of window screens and air conditioning. There are junkyards and abandoned home that have a lot of standing water. And it's in proximity with which are people living as well.

SPEAKER: (Off mic.)

MS. LUBAR: I would think that some of that is associated with poverty. I don't think it's necessarily contained to areas of poverty because of the environments that persist on an island.

MS. CURRIE: Yes, heat and humidity are obviously important.

MR. BARRECA: Yeah, it's less clear like what the causal relationship us between poverty and these mosquito borne diseases because historically we've just had a lot of people living in hot and humid places, and so you can't say if that's just from the history of poverty to being just of spuriously correlated.

SPEAKER: (Off mic.)

MR. BARRECA: I would think it's more of the heat. I don't know if we've even got enough like a full understanding of that, but --

MS. LUBAR: What I think we've seen with dengue where we've had very limited outbreaks in Texas and Florida. Is that -- the living conditions till, even though the heat and humidity is there are different enough that we don't get the kind of spread that you see in Puerto Rico or the Virgin Islands.

MR. BARRECA: Yeah, there like a checklist that has to be met, and like all the things have to be checked out. So heat, and maybe what Debra is saying like the poverty with poor living conditions. Like all those thing have to be met. When you start to break any of those links like in the south in the United States when people moved away from these places where the mosquitoes were, and if you just break that link, then the disease transmission goes to zero.

MR. HASKINS: And way behind, do you have a question?

MS. TAVALO: Jennifer Tavallo with Eco America. I had a question for you, Dr. Currie, about you just briefly touched upon the Waxman Markey and the failure to pass that, and what could have been perhaps in terms of temperatures and other things.

As we're looking to rally more public support and engagement around climate change solutions, and particularly leveraging the health frame, the importance to our personal health, and in this case with children, our most cherished population, very vulnerable, what opportunity do you see to highlight this new threat, and at the same time not overblow or overstate the connection to climate change? It seems like a really important opportunity to get the public more engaged about how this is personally affecting us, especially during a presidential election cycle, you know, the summer.

So I'm just curious about any of your responses to that, but yours in particular.

MR. HASKINS: By the way, you just gave a great summary of why we the topic of Zika and the spread of Zika and climate change.

MS. TAVALO: I'm in the right place.

MR. HASKINS: Yeah.

MS. CURRIE: You know, one reason why I talked about Waxman Markey is I'm trained as an economist, and I would say every economist thinks that cap and trade is the most rational way to

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try and approach greenhouse gas emissions. And so here was a bill which was going to cap and trade, and it just didn't get any traction. Right?

So I think that's kind of a lesson in what Alan was talking about earlier that you have to kind of present things in a way that what is appealing to people that helps them to understand why this is a good way to do things.

So cap and trade people didn't like the -- people just like the sort of command and control like, well, that is if I'm an environmentalist, I just want to tell people not to pollute, and that's actually not very practical in many cases, and so trying to, I guess, do the work to explain to people why this is a reasonable way to proceed is important.

On the threat from Zika, I guess people have been saying a number of time this isn't probably going to be an explosive threat in the U.S., but I guess the way I think about it is it might up being more like West Nile, for example, where we saw something. It was introduced. We saw it moving up. It follows very much the geography of places where there are lots of mosquitoes. So we have it in New Jersey. And there's like not huge numbers of cases of West Nile, but there are cases every year. So if Zika takes hold, you know, we saw the map of where the mosquitoes are, yeah, we're not going to get thousands of cases, but there probably are going to be cases every year, and there probably are going to be kids that are born with these horrible birth defects. And so it's important for people to know that so that it doesn't get established, and we don't end up having that new equilibrium.

MR. HASKINS: I think one thing that Debra said here that we ought to keep in mind, and it's another opportunity exactly in response to your question is it you could make the argument, and you did suggest that one of the problems with making the public health argument is if we're real successful, the problem doesn't get big, so people say, see, we went all that money. The problem wasn't that big.

So you could turn that around though and you can say, and you have to be on the offensive to do this, but people in Washington are used to that, is to say the reason that this thing didn't get out of control is because we took precautionary measures. It only us, I can imagine a benefit (inaudible) how many cases of babies with stunned brains you're going to have to have before people think, well, it's worth spending a billion dollars on something like that.

Back here.

MS. RAUCH: Hi. I'm Molly Rauch. I'm with Mom's Clean Air Force, and one of the things that we do is try to educate parents about the links between climate change and health. And so I have a question about the Zika epidemic. I was just wondering if you think we have any evidence that this epidemic is fueled by climate change, or, rather, do you see this as an example of how climate change may threaten us in the future? And this is important just in terms of how we frame our education to our members.

MS. CURRIE: We're not really able to determine the role that climate has played in this outbreak. It didn't happen slowly over time like climate change does, and we can't really disentangle that from other factors like global travel, living conditions, just the virus getting to an immunologically naive population. There's not a way for us to know that.

What would help us understand some of the changes that could be happening is if we did have better surveillance data on the mosquitoes, on the disease, and that's one of the things we would like to do.

Also, understanding what some of the longer-term effects might be for babies who were exposed in utero is part of what we need to understand to influence some of the arguments you were suggesting as well, and what did we avoid by having an effective public health intervention requires knowing what the full range of outcomes is.

MR. HASKINS: If you want to have some states for the control group, give me a call and I'll tell you states that we could put in the control group.

MS. CURRIE: So I think Debra's response is appropriately cautious, but it's also clear that Zika is basically a tropical disease. The U.S. is becoming more tropical because of climate change. There's larger area that's affected. We know that these kinds of vectors are spreading north, and so you can't sort of, you can't make a solid line connecting all the dots, but I think it's pretty clear that the dots are connected.

MR. BARRECA: Yeah, I would echo that as well. You can't say definitively that climate change caused this outbreak, but it's certainly going to make it worse in the future because mosquitoes like hot weather. So the more hot weather we have, the more costly this is going to be to contain.

MR. HASKINS: And with that, you can go on to make a general point which is stand by. There are going to more like this because the temperature is going to increase, and it will have impacts like this on the vector, and, therefore, on the disease.

Go ahead. Right on the aisle there.

SPEAKER: Hi. I'm Lynn Bentz, and I'm just here for interest, but I have two just questions.

The first is that Hawaii has had a big outbreak of dengue fever, but you haven't really talked about Zika being a problem in Hawaii which is everyone out on the west coast where I live goes there.

And the second is what happens if, let's say, Hurricane Katrina happens again in two years and New Orleans was standing water everywhere, how does FEMA work that into their plans?

MS. CURRIE: We've been engaged with Hawaii on their dengue outbreak, and they are definitely one of the places where we have concern about transmission, local transmission of Zika. So you're absolutely right about that.

I think, you know, one of the things that CDC's role is really to help the state and local health departments prepare for health threats that are likely to occur. So we work with all of the hurricane-prone areas supporting their emergency response efforts, and certainly one of the areas that they need to be prepared for is vector control.

MR. HASKINS: Other questions? One more here. We'll make this the last question.

SPEAKER: Good morning. My name is (inaudible). I'm with the Congressional Research Service. I was wondering if you could talk about any emerging technologies that may be helpful in combating the spread of Zika.

MS. CURRIE: I'm not expert at some of the emerging technologies, but I do know that we're very interested in innovative and new vector control technologies. You heard us all say how challenging it is to control this vector, and all of the different methods that we have to combine to be able to at least reduce the risk.

So, you know, there are lots of media reports, and there's lots of interest in new technologies. We have to use right now what we know works, and we do work with industry as do some

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of our HHS partners on developing new and innovative ways. We're doing that a lot in the diagnostics area. HHS has a big effort on vaccine development here, and then vector control is another place where innovation would make the difference.

MS. LUBAR: I want to add a comment here. In that everybody always like to think about new technologies, but this is, you know, making sure that you don't have little bits of standing water on your property, that's a really old technology. You just take the bottle cap and turn it over. So I think there's a lot of room for that type of thing. I know that it's possible to reduce the number of mosquitoes on your own property just by doing things like that, and if people did that on a larger scale, it would probably have an impact.

MR. HASKINS: In closing, I want to thank you for coming. You've been a very attentive audience. Asked great questions. Thank you. And join me in thanking the panel. Good day.

(Applause)

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