Everyone I think we can get started.

Today it’s a very special day because today the Intergovernmental Panel on Climate in the House just released a Working Group II report, which is focused on climate change. So today we are very, very pleased to have Dr. Kim Knowlton joining us. Dr. Knowlton is a Senior Scientist at the National Resource Defense Council. She’s also Assistant Professor at the Columbia University’s Mailman School of Public Health, the department of Environmental Health Science. And she has been a senior member for one of the first climate health program in the country. So Dr. Knowlton specialize in the Human Health impact of climate change. She served as the co-convening lead author for the Human Health chapter of the US Third National Climate Assessment, as a member of the second and fourth New York City Panels on Climate Change. And participated in the IPCC’s fourth analytics reports. Her work with the New York’s Climate and Health project, which you will hear about later, describe some of the very first down skilled global to regional climate
and health access modeling in the US.
which to me is also one my
the kind which inspires me
to do my PhD thesis on this topic.
So I’m very pleased to welcome Dr. Kim Knowlton.

You are so kind and thanks to you and Mauro
for helping with the technology
and just for the invitation
and really everyone in the room
on such an auspicious news day.
As Kai said, it’s just huge.
I am really honored that you are taking some
time
to be here with me and us talking about
climate change and how it affects people’s
health,
certainly a topic near and dear to my heart.
This is gonna be, I think a pretty personal
conversation with you.
I’m not representing, you know,
NRDC or Columbia University officially.
I’m gonna tell you some things about my personal experiences
in this field as Kai said.
From some pretty early days in the climate and
health world and to where I am now as a
scientist advocate,
still at the Natural Resources Defense Council,
most of my time and still at Columbia,
but I hope that I’ll talk a little bit,
give you a sense of my slow conversion from someone who probably somewhat idealistically and blindly thought data. It’s all about data. Once I can do, or someone can do a great study and just bring forward those connections between climate change and health that’ll be it. Then we’ll just march into, you know, climate policy and health protections and all will be well. Well, I’m a firm believer but it takes a lot more than that as we all see from our experience and I’m gonna try and save time at the end for a lot of discussion time between us too. So thank you, Mauro and Kai for keeping me honest on that. So I’ll give you a tidbits about what I’ve experienced along the way as we go. Most of my time now is spent at the Natural Resources Defense Council, an environmental not for profit that was established more than 50 years ago by a group of young attorneys who had the idea that they would use the environment as their client. Environmental law didn’t even exist as a field then. And we have since that time,
pretty much kept the same mission statement. And it’s a big one. It’s a little bit ambitious to protect the earth, the wild places, the people, the health of all those systems, and to ensure people’s right to clean and healthy air, water, land and the wild. So, climate change and climate policy is really... If one had to pick one, it would be overarching, you know, theme that we work on. So, it has sure been a challenge, but I’m so happy, satisfied, learn something, many things every day at this advocacy organization working as I do in the health frame. So let’s get started. Next slide please. So this is a representation of me connecting the dots between climate change and health. I started actually as a geologist, I like those big systems. I loved earth systems and learning about how human activities affect the earth and the environment and vice versa. How environmental change affects our health. I was very influenced by some work I did on radioactive waste management. I worked at a group that was kind of the counterpart of the nuclear industry.
We would try and find potential areas of concern and license applications that proposed radioactive waste sites. And there were a group of activists at a site we were working with in West Texas who impressed me mightily with their ability to link this environmental change to local health. We can’t have this rad waste facility here because the groundwater will bring it into our town, you know, the radionuclides. Contamination and no, we can’t have it. And they were successful and powerful, small but mighty and I thought that’s quite interesting. I would like to study that. So I ended up going back to school to City University in New York City and then to Columbia University where I got so many lucky breaks. I was lucky enough to be part of the New York Climate and Health Project. Next slide, please.

This was funded by the Environmental Protection Agency’s STAR grants Science To Achieve Results. It was really one of the first big US-based integrated assessment modeling projects and kind of funding proposals.
So, we had global climate modelers who fed their information to regional climate modelers who worked with land use modelers. Then there was an atmosphere chemistry model that sort of used all those inputs and kind of at the end of this interconnected chain was the health risk assessment.

Dr. Patrick Kinney who was my research mentor, he’s now at Boston University. He has been continues to be a leading light in the climate and health field. And he gave me lots of opportunities, including when he shattered across the classroom.

"Hey Kim, are you still looking for a dissertation topic?"

I said, "Yes, I am." The one that I had in mind about radioactive waste was not taking shape.

So I jumped on board, the climate and health train, which in 2000 was kind of new and I jumped on forward and off we went.

Next slide, please.

That job of connecting the dots between climate change and our health was... I mean, in the research community,
it was starting to grow,
but kind of in the community at large,
it was an absolutely new idea.
And I have to say,
20 years later, it still is a constant conversation,
not only does climate change affect the environment
and the Arctic and polar bears and like non-human faces.
It also affects people
and some people far, far more than others.
So, this is an old chestnut
something from a article from the "New York Times" in 2003,
the introduced this project that looked at the New York City Tri-state area,
31 counties in New York, New Jersey, Connecticut,
and the novel thing then
about the New York Climate and Health project
was health was the driver.
At the end of that cascade,
who was going to estimate the impacts
to the health of people in New York city?
Who was gonna be specific to New York?
Who was gonna look into the future?
At the time, these were new ideas.
In this image you see Dr. Cynthia Rosenzweig
who worked at NASA GISS,
with Jim Hansen, who was one of the, you know,
like the pioneers of this whole impacts in climate change field.
At the table you see yours truly on the left and Pat Kinney
Cynthia again Joyce Rosenthal, who is a urban planner,
worked in public health.
So, this was like the beginning, the blossoming of a really interdisciplinary team
or transdisciplinary.
Next slide, please.
And it was, and it still remained somewhat challenging
to find the space, to find the funding,
to find the journals, to find the academic appointments.
That kind of foster and feed interdisciplinary work.
But there's been, you know,
lots of progress in the years in between.
It's been a challenge, but a good one.
We would meet every week for three years that was the term of the NYCHP as we call it
every week to learn each other's jargon and language.
And how do you do your modeling?
We really had to come up with
over that time a shared language, a shared vocabulary,
so that we could put together link these models.
And these are some of the images from the more than a dozen peer review journal papers, eventually that came out of the project. So it was a very rich project and you can see here kind of the, some of the images that represent those different sectors whose climate impacts are being modeled. In the upper left is I believe that’s looks like from the model resolution global climate change that was dynamically down-scaled to regional climate model temperature. On the upper right you see the results of the atmospheric chemistry modeling component that Christian Hogrefe at the University of Albany did beautiful work with his colleagues there. Sort of below that the lower right is a figure from a paper that I was lucky enough to leave the team... This is all teamwork. You know, none of it is singular. But it was really one of the first times that people who live in a region in the US could look at their county. Those are counties that are kind of outlined and say, "Hey, in some future year there’s gonna be an increase in premature mortality here.” It’s gonna be how much hotter.
I think that this was kind of the beginning of that geographic specificity that has become quite a powerful way to use data. And in the lower left here is some land use change modeling. We look forward to the 2020s, 2050s and 2080s. Next slide, please. This is just a little bit of a zoom in. And I know Kai that paper and wanted me to talk about it. So here we are. These show, the estimates of percent increases in summer. ozone related premature mortality look into the 2050s relative to the 1990s baseline. So here again, you just get the sense of the, kind of the original in my backyard. Hey, that’s my county. Hey, that’s where my aunt Sharon lives that came out of New York Climate and Health Project, which I think was part of why it created a foundation for other papers. What we found that was that overall there was a median 4.5% increased region-wide by the 2050s in that ozone related premature mortality. Next slide, please. Kai created this.
Thank you very much for that. But it gives a sense of how the work of the New York Climate Health Project was useful in other papers that since have gone on to go much further looking at how climate change affects air quality and then mortality. We know that ground level ozone it’s a temperature and sunlight sensitive formation chemistry reaction. So that’s part of why climate change in particular will serve to, you know, other things held constant, make it more challenging to meet ozone regulations and will tend to increase ozone concentrations. Actually, the work of Michelle Bell who’s one of the faculty members at Yale was also really instrumental in understanding this kind of regional and super regional effect. She was lead author on a paper and climatic change that found estimated that there will be a 68% increase in ozone exceeded days by the 2050s. That is days that don’t meet the eight hour standard. So this was some of the first times that we, people really got a chance to like vibe that, "Hey, in my backyard where I live "climate change could affect my health.” Because as we know, there’s 25 million people,
adults and children in the US that have asthma
ozone can be a trigger for asthma attack.
There’s all kinds of reasons why this is important.
There was also a companion paper on heat.
And heat related premature mortality that came out
of the New York Climate and Health Project
that gave a view to, you know,
increases by the 2050s,
like a 70% increase in premature heat related mortality.
By the 2080s, a tripling in the New York Metro region.
So in a lot of ways,
it put ozone and air quality and heat on the
New York Metro, I think, you know, sites for future work.
Next slide, please.
I’m gonna transition a little bit to
the storytelling aspect,
which has been a big feature of my work at NRDC.
As Cynthia Rosenzweig from climate and health projects said wisely,
she called it the four Ps at the time,
which meant for her that proposals, you know,
research proposals, lead to projects
which lead to papers,
but then they very much influence policy.
And I would add people
that you can’t have those influences on policy.
kind of flowing from the data without people to make it happen.
And then for better or worse, the another P kind of the six P is politics.
These are all issues of some science and health science that have become as we know, so politicized in the years since and to this very day. So, local stories help fuel advocacy. And next slide, please. It's my hope, my belief that with health climate change becomes very personal and that it can help motivate that kind of health protective advocacy. I'm showing this because this was a study conducted with the California Department of Public Health and some NRDC scientists, myself included that was published in 2009 in Environmental Health Perspectives. It was really one of the first US-based studies that looked at a big heat wave and its impact, not a premature mortality, but a morbidity on different illnesses, emergency room visits, hospitalizations in a big state. This is California. You can see the counties on there, but these are kind of climatic zones in California. There was a two week heat wave in 2006.
That was really intense, had a really large geographic extent. And what this work found was to our surprise somewhat. There was a huge... I mean, you expect that there would be an increase in excess emergency room visits, but it was enormous. It was over 16,000 additional excess ER visits beyond what would typically be expected at that season of the year. There were almost 1200 excess hospitalizations, and you can see from this figure that the Central Coast region was just on the Western and Central Coast includes the San Francisco Bay Area. Well the temperatures there were not in an absolute sense, the hottest temperatures on the state, the relative risk was very high. And that is because the population there, the infrastructure, the residents are not a climatized are not prepared for intense heat. There’s a lot of resident that don’t have air conditioning. So, this was an interesting study. Another one that’s been helpful to other people doing heat morbidity work.
But it was also interesting because our partnership with the State Department of Health was really fruitful. We, as an NGO, as a nonprofit, as an advocacy organization could be kinda more forward and more direct with some of the messaging coming out of this and they had the, you know, the de-identified data, the statistical analysts, it was a great kind of marriage of skills and I think that that is part of, I mean, my message to us. We all have a role in what we’re trying to achieve in the way of both learning and taking our learnings to a wider audience both public and policy making to get the heck on board with more health protective climate policy. Government agencies have a critical role and geoscientists have a critical role, you academic scientists have a critical role as do lots of other people, artists, writers, musicians, the people, children, elders, you know, community groups, we’re all in this thing together. So a little bit of my pitch for it takes a village but next slide please.
To continue on that theme of like making global climate change, which can be sometimes rather abstract or rather, let’s say abstract now after the last 10 years, that for sure. But it can seem rather large scale and I have found in my time at NRDC and working with partners there in particular, that making that global story local is hugely important. It brings it closer to home. It reflects people’s lived experience from media point of view because working with the media successfully is important to get our science and our data out into the public sphere. Is great because if I do, as I have with, you know, my partners and colleagues, you see here in the map below, which I’ll talk about a little bit more, we typically at NRDC use existing data sets, but try to put them together in novel ways that tell a health relevant story. And when we do that on a national scale, like the map you see here, it means that news outlets and people can look at the map and say, "Hey, what’s this story?" And we work with them to try and
bring that local story to the fore.

These are two URLs for some of the websites that NRDC still has that combine not only mapping tools like this, but also some of the information on the impacts writ large for people. And there's a lot of people who haven't been introduced to the connection between climate change and health.

We also try to show preparedness and adaptation and action steps that are happening locally at the state, even at the local level, to give people a sense of what can do and see themselves in a kind of action frame in this story.

Next slide please.

We've gotten a lot of very positive feedback through the years. It was like 2011. It's been a decade little bit more.

Yeah, a little bit more than decades since those maps first came out. And this is the URL for the original site.
We made a large effort to bring together that statewide and then county level information. In that original site, we had more maps actually. We had showed air quality, how climate change affects environmental change and then related to health outcomes for air quality, extreme weather events, drought, flooding, extreme heat, one infectious disease, dengue fever. So we tried to put the information there. Next slide please.

Our website has been streamlined by much better designers. Well, you know, better designers let’s say certainly better than me. We also blog a lot.

Our scientists, our policy experts blog. So they were all collected on the pages. Next slide please.

And we felt it was important to give people that sense of what they can do, like preparedness actions. It’s just frustrating and, you know, frankly can lead to a sense of, you know, a lack of agency to give people somewhat alarming
health concerning news
and not, you know, show a way to move their concern
into action and movement.
So we did try to do that.
So this is just kind of sharing with you
our thought process.
It began the map series as a poster session,
internal to NRDC.
We got a lot of feedback from our colleagues
and we took some time and we turned it into
these online maps.
Have since kind of maintained and sustained themselves
as one of the most popular of NRDC's web pages.
And we've gotten great feedback that they're great screening
tools for local planners.
Students have used them to inform their local work.
So we're glad that they met with success.
Next slide please.
And this just gives a little view
spin through these real fast.
It shows in this case,
this is kind of collocates ozone exceedance days.
Days the year that this was mapped,
it was 2007 when this first came out,
but where there's ozone exceedance days and where ragweed,
which is a plant that produces an arrow allo-
genic pollen and tends to produce it in late summer, early fall.

Exactly the same time in much the US when ozone exceedance days in the hot and often still days of late summer can exacerbate ozone concentrations and the two conditions present a double whammy to health.

The more sepia-toned areas in the map show where ozone exceedance days and ragweed are co-located and found kind of a map of relative risks.

This map kind of survived through the years, had a real evergreen kind of lifespan because every year in the spring it’s tree pollen.

In the summer, it’s grass pollen.

In the fall, its ragweed,

and there’s a lot of pollen sufferers in the country.

So we find that this gives us an opportunity to bring up those interconnections year after year.

Next slide please.

And this is just one other example of those national maps that take data sets and put them together in a novel way.

This is the dengue fever.

It maps where the two mosquito species, Aedes aegypti and Aedes albopictus
were at the time found in the US using ArboNET dataset to map the vector. And it combined that with centers for disease control and prevention reports of dengue fever cases.

Most of those admittedly were imported cases from people traveling outside the US becoming infected back to home and developing infection and symptoms.

But that said, it is feasible that a mosquito vector could come into contact by an infected person, and it could become a local transmission source.

And there, there is local transmission of dengue fever in some areas of Texas, of Florida of Hawaii. So this again was just a mapping example that began a series of discussions that has had a long lifetime.

Interestingly, the year after this came out, this came out in 2009 and in 2010, CDC made dengue fever a reproval illness. We have to take credit for that, but it’s kind of indicative that the national dialogue was amped up for a lot of reasons around that infectious disease.

Next slide please.

So just some more URLs, 'cause I want you to have resources when I’m here and when we’re done.
We at NRDC put together weather detailed climate health fact sheets, or I think seven states. Michigan is shown here. We also have California, Colorado, Illinois, Virginia, Washington, and Pennsylvania. A lot of detail, a lot of citations for people that may be doing climate health work in those areas. And the last link is our current URL that tries to put together in one place, the climate and health work. And we'll be updating this soon.

Next slide please.

I'm in the bend to two other huge opportunities. Huge learning experiences for me, and I'll talk about them a little bit. But first NCA3 National Climate Assessment. The third US National Climate Assessment. I was fortunate enough to work on this effort as one of the co-convening lead authors for the Human Health chapter. This was back in kind of 2011 through 2014. There has since been a fourth iteration of The national Climate Assessment and right now work on the fifth assessment is underway.
But this was a huge learning opportunity for me,
I’d like to network with amazing scientists
and see how the NCA reports come out.
But it was very gratifying and interesting
that this was the vintage of NCA
when the here and now message
really came to the fore.
The climate impacts on health
are happening here and now in the US.
Probably the first time
that’s been so loud and clear.
The whole effort was aimed to make
all the information in all the chapters
totally digestible, not just to, you know,
academics or scientists working in the field,
but to everyone to the, you know, the public.
And I really respect that
and learned a lot from that effort.
And third vulnerability.
It was one of the first times that the differential,
the disparate, the inequitable vulnerability
of some places and people and communities,
the climate change really was emphasized.
Next slide, please.
This is just some reflection on that here and now
in the years, since that effort.
Sadly year after year,
it seems like we, you know,
just get more of the lived experience of climate change.

Years 2013 to the present, all of them in the top 10 warmest years globally ever recorded.

The two gentlemen in the upper left are members of the National Medical Association.

They surveyed their members down 86% of their survey members said climate change is directly relevant to patient care.

I mean, the physicians, the both the public health and medical communities and more and more people are learning about climate change from life, from experience and less so from reports and academic efforts.

Next slide, please.

Something else that NCA3 and other reports certainly have done is this. The view on the left is under a relatively lower greenhouse gas emissions scenario. The one on the right under a relatively higher emission scenario and kind of painting the difference.

In this case here.

If you could just go back advance, that happens.

Thank you, thank you.

Giving a sense of the difference between the low emission scenario
like three degrees Fahrenheit difference between now and the hottest days of the 2090s.

versus on the right higher emissions more like a 10 degrees Fahrenheit difference on the highest temperature on the hottest days.

Giving a sense of what we can accomplish and what we can avoid by moving with all haste toward cleaner energy.

Now, next slide please.

And I bet you in this course and in your work, you talk a lot and we’re all cognizant of, you know, the elderly, the very young, economically disadvantaged, many communities of color,

people with preexisting conditions, certain locations, not equally vulnerable to climate health effects.

The IPCC report that Kai mentioned that came out today, estimates that basically half of the world’s population like 3.6 billion live in what they’re calling hotspots.

You have to wonder if half of the world’s lives in a hotspot.

kind of changes the meaning of hotspot.

In other words, billions of us are highly vulnerable and highly exposed.

Next slide, please.
I wanna mention kind of in this transition of data is great. It’s very rich, but what can we do with it? Partnerships. Taking your findings, your work, your projects, your papers, your knowledge, and using it to learn about the lived experience about local knowledge, local expertise in partnership with people, communities and groups who live in some of those highly exposed and vulnerable areas it’s what makes the work real. It can really turn the data that we have into action. And I wanna share with you a story, you know, my again, great fortune. Next slide, please, in working with NRDC and partners in Ahmedabad India, a city in Western India in Gujarat state. I actually see one of my dear colleagues and partners from that work is here today. I’m very glad Dr. Pavian. In 2010, this city experienced what was for Ahmedabad’s historic heat wave. This is a news report that there were over 50 people who had died but... Next slide please. It turns out that upon further investigation among this partner team with the local experts
and health scientists and researchers and NRDC researchers, it was more like over 1300 excess deaths in the month that the heat wave occurred. This graphic became known as the graph because it told a story graphically that had great meaning and motivated the Ahmedabad municipal corporation leadership, fantastic leadership from the city, just who said no more. This peak that one can see in the red, upper line of a peak with maximum temperature, that’s maximum temperature peak, right below a daily death counts. Then Mayor said no more. I do not want this to happen again to, you know, the people of Ahmedabad. So next slide, please. The city, the leadership at our great partners, Indian Institute of Public Health in Gandhinagar, NRDC other experts help the city put together a heat action plan. Then first, all of South Asia with an early warning system with outreach to the most heat vulnerable communities with extra like dialogue with health professionals, with outreach to the media, and it really changed the whole kind of equation,
dynamic appreciation of heat. 

Extreme heat as an approachable public health issue 

that and we can do something about it. 

Next slide, please. 

The people of Ahmedabad as well as city leadership 

took this issue and made it their own. 

This shows women and people having a parade 

to the streets of the city to raise awareness. 

On the right you see city leaders putting rooftops white 

to be more reflective and reduce indoor temperatures. 

Next slide please. 

And actually we were able to conduct an evaluation 

of the work in Ahmedabad and found that there were 

in the years after the launch of the heat action plan in 2013. 

And the years after the city avoided 1100 premature deaths. 

Not strictly heat related, 

but the deaths in there in the summer heat season 

were reduced dramatically. 

Could be a host of different reasons, 

but surely the heat action plan factored into that 

and that was published in journal environmental 

and public health. Dr. Jeremy Hess 

was the lead author on that.
Next slide please.

I'm rounding the bend.

And I want to say thank you to Ahmedabad as always.

our partners there for that amazing work which continues both in terms of extreme heat.

and now we're working on air pollution as well.

But to bring our climate and health work and data back home, this is an appreciation of the health related costs.

We're already paying for climate change with our health.

In 2011, NRDC lucky to work on this work, took the first look from already published reports papers.

kind of the array across the US.

and health outcomes related to them.

You can see kind of the array across the US.

And in that first study, we found, we were surprised to find $14 billion in health-related costs, just from six.
Surely those are not the only six such events that occurred in that time, but we lack integrated databases that give an ability to discern the whole fabric of climate sensitive events.

Next slide please.

But this interest in valuation continued strongly with this report and the Fourth National Climate Assessment. Next slide please.

And my NRDC colleague, Dr. Vijay Limaye just advance it a couple times, if you don’t mind please.

And we will see that Dr. Limaye looked at just one year, 2012. Again, looked through the literature to document events.

This was 10 different events and came up with $10 billion in health related costs typically unassigned.

Health costs are not included when you hear about Noah’s billion dollar disaster tally.

These kind of realities need to be factored in for us to keep in mind.

There will be over 37,000 encounters related to those climate sensitive events.

And 2/3 of the illness costs being paid for Medicare and Medicaid encounters.

These kind of realities need to be factored in...
when at least for me when I hear people say it’s gonna be so expensive to make that leap to greener and cleaner energy. We have to put health into the picture.

Next slide, please.

I don’t know if you’ve had Dr. Ed Maibach from George Mason University come and speak with you, but he is a real leader and has been for a while in this climate and health messaging.

Along with that your colleagues at Yale University, for sure. But Ed Maibach has a way of putting it like this.

It’s, you know, five messages, experts agree, climate change it’s real, it’s us anthropogenic, it bad yes. The more we learn, the more sobered we are by the impacts and their effects on people’s health. But these are solvable issues.

Next slide please.

But they’re solvable when we take our knowledge and our outrage perhaps the knowledge we learn, and we determine that we’re gonna protect the people, the places that we care about and the people and places that we can’t even see perhaps.
because it is, we are a global community. There is no doubt.
And when we protect the most vulnerable, those who are on the front lines of, you know, suffering the worst impacts, when we go first to them,
we learn a great deal.
We help them, you know, most imminently we help ourselves to build that healthier and more secure future.
That data is really about because if data doesn’t help us connect with each other
and connect to the, like the last doc,
which is, I don’t want my children, my grandchildren to live in a science fiction. I wanna give them like a future, you know, in my small part that’s worth living and a current day that is, you know, worth fighting for.
And we’re gonna do that.
So with that...
Next slide or two.
Thank you.
We’ll keep our eyes open our hearts open and our data streams open to learn about the differential impacts of climate change on our health around the globe with all humility and respect and that’s me. And that’s where you can find me at that at the NRDC email. I’m at Columbia, but I pick up emails
mostly from NRDC. And we blog. And now lucky me, I get a chance hopefully, to listen to you and your experiences, concerns, questions. So the last slide is just, you know, the question but if you wanna leave the contact info up there Kai, that would be fine. Thank you everyone. Thanks for giving me a chance to talk with you and tell you my story. Thank you Kim. Thanks for the wonderful story from your research to the community engagement and to the policy. So I think we can first give a round of applaud for... (indistinct) Well all those joining online if you do have questions, please feel free to post your question in the chat box. But Yiqun has already gathered a lot of question from our students. Our students read some of the readings materials you sent, and I think I summarize some into big categories. The very first question many students are having is that you showed your 2011 paper on the cost of the health impact climate change,
and also Dr. One at the 2019 GeoHealth paper. <v>Yeah. </v>

And the students are wondering, like,

we know this message is important, but have you been surprised at all with how your data has been used or by who has been citing it?

And do you see any impact from using your paper in politics or in implementation?

I will give a few examples.

Yes it’s starting.

First, I’ll answer the question then maybe I’ll go back to the genesis of the health cost work.

Yes, from almost the start when (indistinct) Dr. Limaye in particular, because frankly the 2019, the GeoHealth paper that you have both the paper and the back sheet from Dr. Vijay did a really interesting analysis that got to a lot more of the particulars.

And we found that in among the 10 sites that were the case studies, there was interest from some like governor’s offices and some of the states.
We heard the paper referenced in congressional hearings on climate and health topics. The earlier 2011 work, the NRDC worked on with health economists at University of California. That was cited recently in an amicus brief. That is, you know, when friends of the court get together and put together evidence that supports their side. That was cited in support of, you know, kind of the previous court findings kind of asserting and I'm sorry, EPAs ability to regulate greenhouse gases. It was cited there. It got both of the valuation studies got quite a lot of press at the time. So between media and those mentions in state and federal level hearings, I wouldn’t say that, you know, legislation has not been based on them. It’s not always like a law or a regulation per se, but just to see the work used in a policy building framework is very satisfying. And you know, I think that for any of us, when we see our science kind of move out of the ivory tower or off the bookshelf and into, you know, movement toward action, that’s great.
That’s why only speaking personally, that’s why I do this. And I don’t even expect that it’s gonna happen, but when it does, it feels good.

Here comes a relatively more technical question regarding how you actually calculated the, you know, economic burden of this cost. So the students are not very familiar with, for example, the statistical life lost. And they’re wondering, like, for example, how do you calculate for example, let’s see the ozone pollution. The ozone air pollution in Nevada. So how do you, you know, calculate the cost associated with this mobility and the mortality? I’ll try to do a decent job.

Just noting that Dr. Limaye could do an awesome job because he knows the insight and the method, but to your two, I mean the two main components of the valuation assignment are the mortality and the morbidity. The mortality, the value of a statistical life
is the basis for that cost assignment.

We’ve had a lot of discussion, a lot of questions about what that means.

It’s then wide use the environmental protection agency,

for example, has used it for many years.

It kind of evolves.

It is not a statement about the value,

the inherent value of life.

It’s comprised of kind of looking at again statistically,

a large group of people and the,

what people would pay to avoid risk of death across you know, a large and you know, millions of people,

and then assigning that.

So it’s way of assigning willingness to pay to avoid death.

That may not have helped much, but just to be clear,

it’s not a statement of life value.

For the morbidity,

the emergency room visits, hospitalizations,

the outpatient, visits, home healthcare medications.

There are two fantastic databases,

Healthcare Utilization Project HCUP,

and the Medical Expenditure Panel Survey MEPS

that were used to take

the already tabulated health outcomes.

We used already existing reports,
either published literature or state or federal reports.

Excuse me.

And then to assign a value to

the cost related to treatment care

in those different categories.

So we’re using kind of national data sets

to assign appropriate costs,

to what was already documented,

and then adding those costs together

and trying to always use and apply a consistent methodology.

If you look in the GeoHealth paper at table four,

it gives you a sense of the different types of costs

that go into the totals for the different locations

and different health outcomes.

So I recommend if that wasn’t entirely satisfying,

check out table four in the GeoHealth paper.

But those are great questions.

I mean, we could have a whole session

with Dr. Limaye
to dig in ’cause it’s fascinating.

And of course, methodological work is evolving all the time.

It showed us very clearly the great value

of having inter...

Or let’s say our goal

to advocate for more integrated climate health
and cost data sets because we had to spend quite a bit of time and effort to assemble the different data sets used to eventually assign those costs. I hope that helped a bit. That helps a lot. Thank you, Kim.

We do have a question from online audience from Leo. The question as we saw in the US and worldwide directly related to the shutdowns and closures we made at the start of the pandemic, the pollution level was dropped. So how do we get back on track with those gains that we have now lost?

And this is a question just to be clear, the fact that emissions are rising again after the diminishment owing to relating to the economic shutdown and like diminished transportation travel economic activity. How do we get back on track?

Well, we’ve seen the kind of reductions that are possible not to in any way minimize the journey that, and you know, the suffering, the loss that people have been through, continue to be through with the pandemic,
but I think we, with everything that’s happening right now,
the realization of that climate impacts associated air pollution,
associated flooding heat related mortality and morbidity
are just accelerating.
There simply must be a commitment,
a demand to move toward cleaner energy systems
whereby no matter what is happening,
we can support robust economic activity and not be polluting
and creating the health harms today
and the climate related harms in future.
I think if anything, you know,
it sobers us as to how vulnerable
it sober us as to how vulnerable
we are as a global society to a pandemic.
How differential the vulnerabilities are.
How we have to pay attention to the inequities,
but we simply have to invest and demand cleaner energy now.
there is no time to wait.
What a powerful message.
Thank you Kim.
As you know, like our students at the MPH students
and the master students in other schools.
So they’re wonder like for public health students,
if they’re interested in this field,
I want to, you know, make it do intent
or at future career plans.

So what kind of skills do you think that the students are currently to liking or maybe is best for them to help in order to be successful in this field?

Well, first good, great. Keep your interest alive. We need you. We need you at the field. The world needs you so badly. Please continue.

You know, with every week, with every month, every year, the need is greater. So good for you, I applaud you.

MPH students continue your basic, you know, skill building. It's foundational.

Building communication skills, writing more. Is there an outlet where you can, you know, blog or write essays or you know, write, write, write, and listen, listen, listen. Talk with other people. Talk with, you know, use every opportunity to hone your own speaking and listening skills.
because the amount of information and learning and studies that are coming out it’s like a gusher right now. But keep at it and make common cause. Find a group, local group, community group, citizens group, student group join in with other student, do not let your yourself get to the point where you have a sense of being alone. Like the news is so sober rank, the latest science, the data is so sober rank. Don’t get to the point where you feel like you’re working alone in a bell jar. You are not. There are, you know, hundreds of millions likely people around the world. Maybe more in be interesting to have someone try and assign that sometime, but you’re part of a huge community and we all have to have each other’s backs, but we all have to keep kind of bolstering one another. And you know, having a good outlet for our outrage and turning it into action, making it move so that we’re, you know, not burdened. Not laid down in our work. And keep doing your work.
Be the best scientist and the most involved person that you can be. And you’ll have skills of plenty and people will come and find you. But it helps when you go and look yourself and make common cause. 

I think we do have a not question, but a commenter from the Chan saying that the importance of now looking by professional reservations is also suggested like the students should be members of the APHA. Yes, the American Public Health Association has been great on climate change and health a few years back, not too many. I think it was 2017. Climate change was the annual meeting theme. And they have student groups. This is all, you know, it’s really important to stay connected locally. Find a local community group. Ask what can you do? How can you learn from them? How can you serve them? You’ve got skills. I mean, face it. Even if you’re, you know, in your student hood,
you're gaining skills, use them. Yeah.

Y eah.

Thanks Kim.

A kind of related question to that is you have been doing a lot of work on the science communications to the general public.

So the students are wondering, you know, we do a lot of academic work, we know the science.

But how can we better communicate this connection between climate change of health and economy costs to their general public?

Oh, well I mean, I could put in a plug for, you know, please stay tuned at NRDC via the URLs I showed you before. www.nrdc.org, but specific to the valuation work, it is our intention to keep that going. And with you know, new partners and new applications, because we're really interested in having a hand doing what we can to help build that sense of the larger fabric. Like the whole fabric of what are the climate sensitive events and climate sensitive health outcomes that climate change is fueling. Right now we've got like six one year and 10 another year.
Like little great spots on a map that are lit up because there's data and information there.

But if we're going to have you know, an appreciation of who do we serve with preparedness and adaptation and funding and support first, we need a more complete picture so there's that.

There's also, it occurs to me the Mailman School of Public Health, they have put together have organized a global consortium made up of over 250 health profession schools. Yale school of public health is a member. It's called the Global Consortium on Climate and Health Education. Dr. Cecilia Sorensen at Mailman is the director now. And they're doing a fantastic job of putting information content trainings, networking through their website. And because you’re a member at Yale School of Public Health, I’m sure that there is opportunity to enrich that and participate in groups like The Consortium, as well as these other membership groups there. And all of those groups would be only too happy to have you help them learn and then do
about climate and health communication. I guess the last pitch on that is, it definitely needs to be a part of the climate and health training. This communication piece. I don’t think that we scientists should have to do a turn at a place like NRDC, where I very fortunate to work with a very, you know, enriched and experienced communications group. But we all need to have that training and learn from one another. So put it in the curriculum. Maybe that’s a conversation you can have with your faculty and administration. It wouldn’t hurt. Thanks Kim. And we can have, like... I feel like we can have another hour discussion on all these topics, but unfortunately we have another class right after this. So we have to end the discussion today. But just to remind everyone that the recordings of this lecture will be online. So, yeah. I’m sorry, Kai. I didn’t mean to interrupt, but thank you for the opportunity. And I did have one last question,
tell you what it’s about a resource.
I don’t know if people know about
the Climate Change and Human Health Literature Portal,
which NIEHS put together and it’s a compendium
of lots of climate and health literature.
I’ll be sure to give you the link
so that you can distribute it among
the folks who are here today.
’Cause it’s a resource that’s online
and although it’s a couple years kind of
behind the current,
it’s very it’s very good.
So.
Yeah, thank you Kim.
Thank you for everything you’ve given me.
with your questions.
It’s very nourishing to me.
So I thank you for that everyone
and good luck with your work.
Thank you Kim.