Alrighty.

So, welcome to the launch of the 2019 Report of The Lancet Countdown on Climate Change and Health.

I’m Robert Dubrow, a professor of epidemiology in the department of environmental health sciences and I’m also the Faculty Director of the Yale Climate Change and Health Initiative.

And so, let me introduce the two other participants. First I’ll introduce Jodi Sherman, an associate professor of anesthesiology and she has a joint appointment with our department of environmental health sciences. She’s an affiliated faculty member of the Climate Change and Health Initiative. And she’s actually one of our most active affiliated faculty.

Yale is really fortunate to have Jodi, because she’s the world leader in the field of environmental sustainability in the health care sector which as you’ll hear a little bit later is very important.

And then, we’re also fortunate, very fortunate to have Dr. Nick Watts, who I’m gonna, make this screen larger now, so’s Jodi.

And then, we’re also fortunate, very fortunate to have Dr. Nick Watts, who I’m gonna, make this screen larger now, so he’s the Executive Director,
oh, I should mention of course, Jodi is a co-author on the report. And Nick is the Executive Director and lead author of The Lancet Countdown. And, one of the pleasures of being part of the Lancet Countdown network for me has been working with like minded people from all over the world who are dedicated to this issue of climate change and public health. So, Nick really epitomizes that and it’s been such a pleasure to get to know Nick and work with Nick over the last year and a half or so.

He’s really the heart and soul of the Lancet Countdown. And it’s amazing to me, how he’s able to work with sixty-eight other co-authors on this project who also have strong opinions and he’s able to pull together a coherent document that’s really written in a single voice. And if you’ve ever tried to do something like that, it’s extremely difficult. And he does it with calmness and with grace.

And so, I’d like to thank Nick for working tirelessly for the Countdown and for the cause of climate change and health.

And so, Nick is gonna give a few words.

Okay, so, we’re actually, there are plenty of seats if people want to come in, you know, seats over there, over here, you don’t want to stand.
Okay, so, yeah, we’re really honored to be one of three U.S. regional launch sites for the Lancet Countdown. And so, let me first give you a little more background about The Countdown. The Lancet has had a long history of involvement with climate change. Dating back to its first report, it was commissioned in 2009, that was a published report which identified climate change as the leading threat to public health in the 21st century. Then they formed a second commission that produced a report in 2015 that kind of shifted gears and identified climate change as being the greatest public health opportunity in the 21st century. There are enormous health benefits that can occur by addressing climate change over and above the health benefits of stopping climate change which we’ll get into a little bit later. And so, since that report in 2015, Nick was actually the lead author on that report, and as he remains being the executive director, there’s been an annual report and it was named in 2016. The reason it was called the Lancet Countdown is that
the intent is to do a countdown every year until 2030. And maybe by that time, things will be great or we may need the countdown to go past 2030.

So, just briefly, about the organization, I'll gloss over some of this, cause Nick covered some of it, but there are thirty-five academic institutions and UN agencies that are part of the collaboration. It's a fluid collaboration.

Central office is based in University College, London. That's where Nick was speaking from.

The Lancet, of course, was convened funded by the Welcome Trust and that was actually a big... This was being operated out of a basement until last year when major funding was obtained from the Weldon Trust. So that was really big.

The Countdown is organized into five working groups which I'll name in a minute.

And the report is organized according to indicators. And in the 2019 report there were forty-one indicators in a few minutes, I'll give you a flavor about the indicators. And it's important to know that the indicators are based on observational data, not on projections.

And both of those things are important. With climate change we do a lot of projections.
But everything that I’m gonna show you today isn’t guess work or what’s gonna happen in the future, it’s what has happened so far with regards to climate change. And each year, the indicators are updated and approved and some new indicators are added and some that weren’t so good are taken away.

Okay, next I’ll show this, these are the partners. There are a good number of partners in the UK as you can see but, there’s at least one partner from every continent except Antarctica. That’s reasonable. So, let’s just go through these slides in detail but I just wanted to show you what the five working groups are. So, the first is Climate Change Impacts, Exposures and Vulnerability.

Second is Adaptation Planning and Resilience for Health. Third is Mitigation Actions and Health Co-Benefits. Fourth is Economics and Finance. And the final one is Public and Political Engagement. So it tries to cover the whole gamut.

So, Yale’s role. We tried in the summer of 2018, we were not involved in the 2018 report but we are involved in the 2019 report.
And we participated in two of the working groups. And as Nick alluded to, we’ve been responsible for two of the forty-one indicators. So one is Air Conditioning - Benefits and Harms and that’s me, also Dr. Dung Phung who is at Griffith University in Australia but he was a visiting scientist here last year. And then the Mitigation in the Healthcare Sector is Jodi, along with Matt Eckelman who’s at Northeastern University in Boston. So, these are the key messages of the 2019 report. And I’ll be coming back to these. These are the key messages. The life of every child born today will be profoundly affected by climate change. Without accelerated intervention, this new era will come to define the health of people at every stage of their lives. That’s the first message. Second one, and that’s with the path that we’re on now, which we could call a business as usual path this is what we expect to happen. However, there’s an alternative. A second path- which limits the global average temperature rise to ‘well below 2 degrees Celsius’- which is the Paris agreement goal, is possible, still possible, and would transform the health of a child born today for the better,
right the way through their life.
And then finally, it’s possible, but it’s not easy
an unprecedented challenge
demands an unprecedented response.
It will take the work of the 7.5 billion people
currently alive to ensure that the health of a child
born today
is not defined by a changing climate.
So those are the three essential messages
that the report is trying to convey.
So, now the central office produced this
three-minute video, that hopefully is gonna work.
That I thought was worth showing.
That summarizes things in a non-technical way
in a much better way than I could possibly do.
So let’s see.

Our response to climate change today
will determine the world we live in tomorrow.
And will shape the health of children across the globe
at every stage of their lives.
The Lancet Countdown: Tracking Progress on
Health and Climate Change
monitors our choices, demonstrating what action
or the failure to act, means for human health.
There are many paths we can take
from a world of extremes and uncertainty
where a child has to fight simply to survive.
To an environment that creates the conditions
that allows them to thrive.
If we continue down our current path
A child born today will live through a world that is over four degrees warmer, with a changing environment threatening the food they eat, the air they breathe, and the communities they grow up in. Air pollution, already dangerously high in more than 90% of cities, will worsen and further damage their hearts and lungs. As they grow, food insecurity will rise with children among the worst affected by the malnutrition and stunting that comes from crop failure in a more volatile climate. Throughout their adult lives, they will experience more heat waves, stronger storms, the spread of infectious disease, and see climate change intensify mass migration, extreme poverty, and mental illness. But the future doesn’t have to look this way. A global response that limits temperature rise to well below two degrees will transform the life of a child born today for the better. Children in the UK will see an end to coal by their sixth birthday and the growth of solar and wind energy resulting in cleaner air across the country. In France, the last petrol car will be sold by the time they turn twenty-one. With cycleways and green spaces supporting safer and more livable cities, they will celebrate their thirty-first birthday.
as the world finally reaches net-zero emissions

securing a healthier future for coming generations.

Which of these two pathways the world travels down will depend on the decisions of individuals, businesses, and governments.

And only an ambitious response can ensure that the health of a child born today isn’t defined by a changing climate.

Visit The Lancet Countdown online to find the latest assessment of health and climate change in your country.

Okay, so, what I’d like to do next is focusing on the key messages.

So select some indicators that support a key message.

So first, the first mentions that this a pessimistic message.

The life of every child born today will be profoundly affected by climate change without accelerated intervention, this new era will come to define the health of people at every stage of their lives.

So one of the trends in the indicators, why are we saying this.

What are the trends of the indicators?

And so I'll give a few illustrations.

And so the first one, of course, the first thing a lot of people think about in regard to climate change is heat.
That makes a lot of sense, the world is warming, we’re seeing more heat waves. Heat waves kill people, and make people sick. And so, this indicator, Exposure of Vulnerable Populations to Heatwaves, first it defines a heatwave as four or more days with minimum daily temperature greater than the ninety-ninth percentile for summer months of 1986-2005. That’s what it, different ways to define a heatwave. This is one of them. And then it defines a heatwave exposure event, which is one heatwave experienced by one person greater than age sixty-five years. So, why greater than age sixty-five years? Turns out that older people are more vulnerable to the adverse health effects of heat. And that’s for a number of reasons, both physiological and social. And so, what this indicator takes into account is both the exposure, because if there were no heatwaves there’s no exposure, and so the number of heatwave exposure events would be zero. as well as vulnerability. So the more people over age sixty-five, the more heatwave exposure events there are. So it takes both exposure and vulnerability into account. And you can see the trend
In comparison with the 1986 and 2005 average, the bottom line is that in 2018, 220 million additional vulnerable people were exposed to heatwaves over that baseline, which is eleven million more than the precious record set in 2005.

You can see that, as you know from experience with the weather, there’s a lot of noise in all of these. But you can also see the upward trends, and again, this is observational data, it’s not like making projections into the future.

Okay, second thing, wildfires. I need to have a good graphic for this, but we all know that wildfire is increasing in the western part of our country. I mean, you just know that from watching the news year after year.

But, this was a more formal analysis that looked at the number of people exposed to wildfires expressing it in person-days. So one person exposed to a wildfire for one day is one person-day.

And so, they found that 152 out of 196 countries saw increases in populations exposed to wildfires between a baseline year, or period, compared to 2015-2018.
And so the mean increase per year of this exposure was almost a half a million person-days per year of exposure to wildfires.

So, why are wildfires a health issue? So, for a number of reasons.

One is it produces a tremendous amount of air pollution that doesn’t just stay where the fire is, but it kind of, like, in Australia right now, there are record wildfires that were in Sydney, Australia, which is a city of five million people.

I just heard this on the news yesterday, that the pollution levels for particulate matters, PM2.5, for those of you who know about this, is ten times the limit right now, in Sydney, Australia.

Secondly, remember what happened in Paradise, last year where all the homes that were destroyed happened to be, mainly of homes of people that were retired.

And what does homelessness do to people? In terms of health.

It’s really bad for people’s health. Remember, in that situation people had to flee their houses, like, within minutes. These are older people, a lot of them are taking multiple medications, didn’t have time to grab their medications when they left.

And then couldn’t necessarily get to a pharmacy
0:17:41.72 –> 0:17:44.737 within the next week or two to refill their medications
0:17:44.737 –> 0:17:47.27 if they even remembered what their medications were.
0:17:47.27 –> 0:17:49.378 A lot of people don’t remember those things.
0:17:49.378 –> 0:17:51.6 So those are health issues.
0:17:51.6 –> 0:17:56.6 And finally, mental health is being
0:17:56.731 –> 0:17:59.07 increasingly appreciated
0:17:59.07 –> 0:18:02.4 as a climate change and health issue.
0:18:02.4 –> 0:18:05.839 So, if you think about the stress that would be involved
0:18:05.839 –> 0:18:07.568 if you’re sixty-eight years old,
0:18:07.568 –> 0:18:09.32 your home has just burned down
0:18:09.32 –> 0:18:11.55 you don’t know where you’re gonna go.
0:18:11.55 –> 0:18:16.55 So that creates long-term mental health concerns.
0:18:17.57 –> 0:18:19.083 So that’s wildfires.
0:18:22.69 –> 0:18:25.24 Infectious diseases are also a concern
0:18:26.467 –> 0:18:29.48 and so, we don’t have time to really go through the
details
0:18:29.48 –> 0:18:30.74 of some of these graphs
0:18:30.74 –> 0:18:34.011 but what this Vibrio is a type of bacteria
0:18:34.011 –> 0:18:38.807 that causes gastro-intestinal illness, wound infections
0:18:38.807 –> 0:18:41.428 and sometimes lung infections.
0:18:41.428 –> 0:18:44 And actually, you’ve probably heard of cholera, of course
0:18:44 –> 0:18:47.596 Vibrio cholera is one species of Vibrio that’s probably
0:18:47.596 –> 0:18:49.22 the most important one.
0:18:49.22 –> 0:18:51.714 But there are other pathogenic species as well
0:18:51.714 –> 0:18:53.21 of Vibrio.
0:18:53.21 –> 0:18:57.21 And, what this shows is for both the Baltic area
0:18:57.21 –> 0:18:59.813 and the United States North East.
0:19:00.67 –> 0:19:04.09 We’re looking at tracking climate suitability
0:19:04.09 –> 0:19:06.91 for Vibrio infections.
0:19:06.91 –> 0:19:08.51 Or for growth of Vibrio.
0:19:08.51 –> 0:19:13.155 And the simple thing is that Vibrio grow better in
warmer, they live in the water, they live in the ocean. And they especially like coastal waters, brackish water. And they grow better when the water is warmer. And they especially like coastal waters, brackish water. And they grow better when the water is warmer. And the oceans have been warming, and so you can see that where we’re tracking here, are both the percentage of coastal area suitable for Vibrio infections, you can see it has increased about 30% in both areas. And the number of suitable days per year in the Baltic for Vibrio infections and that approximately doubled between the early 1980’s and 2018. And in fact, the number of Vibrio infections diagnosed in both the North East United States and in the Baltic region has been increasing over the years. Now, there’s some question, always, whenever you see those kinds of increasing trends in a disease, whether it’s due to increased reporting of the disease or due to a real increase in the disease. But nevertheless, it has been increasing. It has been increasing. Okay, I’m gonna skip some things just because, I wanna make sure we cover everything. So, food insecurity, as was mentioned in the video is a really important concern about climate change.
leading to under-nutrition, malnutrition, etc. And so, this shows trends in global yield potential which is measured by crop growth season duration. And that for four major crops: maize, winter wheat, soybeans, and rice. There's been approximately 2-4% decrease from the 1960's to the present day. Now, this doesn’t", these graphs per se don’t prove that’s due to climate change but there’s other kind of, independent analysis that do link decreases in yield to climate change. So this is an important indicator. So, coal is bad for two reasons. Of the fossil fuels, when you burn coal, it emits more CO2 than the other fossil fuels, that being oil and natural gas. So, coal's really bad for the climate. And when you burn coal, you produce particulate matter, sulfur dioxide, pollutants, more so than when you burn oil and natural gas and those pollutants kill people. That’s the air pollution. And so, we’re trying to track what we hope will be a coal phase out but if you just look at the bars just to keep it simple
0:22:09.91 –> 0:22:14.138 This is global total primary energy supply
0:22:16.52 –> 0:22:20.92 And you can see that there was an increase from
0:22:28.068 –> 0:22:30.95 But then there was some encouraging signs of a de-
crease
0:22:30.95 –> 0:22:32.57 but now it’s kind of leveled off
0:22:32.57 –> 0:22:34.01 and it’s increasing again.
0:22:34.01 –> 0:22:35.513 So that’s another bad sign.
0:22:35.54 –> 0:22:41.32 So this is related to the coal.
0:22:41.32 –> 0:22:44.78 Premature mortality from ambient air pollution by
sector,
0:22:44.78 –> 0:22:46.19 let’s not worry about the sector,
0:22:46.19 –> 0:22:49.117 so the main point here is that in 2016
0:22:49.117 –> 0:22:52.026 there were about 3 million premature deaths
0:22:52.026 –> 0:22:54.81 due to ambient particulate matter.
0:22:56.874 –> 0:23:00.44 And the comparison here isn’t a long-term compari-
son.
0:23:00.44 –> 0:23:03.56 It’s between 2015 and 2016,
0:23:03.56 –> 0:23:05.933 but they’re all only very slight improvements.
0:23:16.91 –> 0:23:19.43 Those are some of the pessimistic trends
0:23:19.43 –> 0:23:22.7 and there are others that, just due to time, I had to
skip.
0:23:22.7 –> 0:23:25.1 And there were others that I wasn’t even planning on
0:23:25.1 –> 0:23:27.79 covering to begin with that are pessimistic.
0:23:27.79 –> 0:23:31.365 So, just a minute on some of the more optimistic.
0:23:31.365 –> 0:23:34.86 So, now we’re on to the second key message.
0:23:34.86 –> 0:23:36.28 A second path, which limits
0:23:36.28 –> 0:23:38.35 the global average temperature rise
0:23:38.35 –> 0:23:41.067 to well below two degrees centigrade is possible
0:23:41.067 –> 0:23:44.434 and would transform the health of a child born today
for the better, right the way through their life.
So these give a glimmer of hope.
So first of all, what do we need to do?
This is what we need to do.
And this is from last year’s Intergovernmental Panel on Climate Change Special Report.
To limit warming to 1.5 degrees centigrade which is the aspirational goal of the Paris agreement.
We need a 45% decline of greenhouse gas emissions from 2010 levels by 2030 so about half so net zero by 2050.
And obviously, this is not my words, it’s the conclusion of the report, that will require rapid and far reaching transitions in energy, land use, transportation, buildings, and industrial systems.
So this is zero-carbon emission electricity. So that would be renewables, and would also include nuclear and hydro.
So, in 2018 renewable energy counted towards 45% of growth in electricity generation. That’s still a very small share of electricity generation but at least it’s counting for a big share of the growth.
Okay, this is really, we are really grasping at straws here but, as you know, fossil fuels dominate transportation.
So this graph is showing from 1971 to the present the fuels that are used for transportation.
and you can see that the gray is fossil fuels and the green is bio fuels. And I don’t know if you can see the top one, but there’s a little bit of black and that’s electricity. But then the bottom graph separates out the bio fuels and electricity and you can kind of see how the electricity is growing. And so, between 2015 and 16 the latest years where data were available there was about a 21% rise in fuel from electricity. So obviously, we need to greatly accelerate this, we really need to transform the transportation system to electricity. And it’s kind of just a glimmer of this starting to happen. This is another really important indicator that coal is critical. And so this is looking at investment in new coal capacity. So you can see, just focus on the blue line. You can see that there’s been a decline in investment in new coal-fired power plants since about 2011. That’s an optimistic sign. Okay, this is maybe more controversial one, but it’s one of the indicators. So the Lancet Countdown thinks that divestment’s important for two reasons. One is that it removes the social license.
of the fossil fuel industry.
So, saying, you know, we don’t think that the fossil fuel industry is just like every other industry.
There are special problems with the fossil fuel industry. And the second reason,
that’s kind of a more practical reason...
So at some point, hopefully sooner rather than later fossil fuel reserves that are in the ground are gonna be worthless.
Because we’re not gonna use fossil fuels anymore.
And so therefore, they’re worth a lot of money.
But there’s the concern about investments of fossil fuels, at a certain point, really tanking.
And so that’s kind of a practical reason for divestment.
And so, there were 2.1 trillion dollars in new funds around the world that were committed to fossil fuel divestment in 2018.
So, another optimistic one is the revenues from carbon pricing.
So these are revenues from what are called cap and trade schemes which are basically a way of making fossil fuels more expensive.
And also direct carbon taxes. And so revenues increases by 10 billion between 2017 and 2018, reaching 43 billion dollars. And more than half of that was allocated to climate change
0:28:11.72 –> 0:28:13.17 mitigation activities.
0:28:13.17 –> 0:28:14.913 So that’s a positive sign.
0:28:17.15 –> 0:28:19.14 Okay, so now
0:28:19.14 –> 0:28:21.787 I’m gonna turn it over to Jodi
0:28:21.787 –> 0:28:23.89 to talk about the third indicator
0:28:24.8 –> 0:28:28.02 and then I’ll be coming back to kind of finish up
0:28:28.02 –> 0:28:29.503 with some final words.
0:28:52.593 –> 0:28:54.22 - Well, good afternoon
0:28:54.22 –> 0:28:58.04 so, as Dr. Dubrow said, I’m an anesthesiologist
0:28:58.04 –> 0:28:60.37 practicing down at Yale across the street.
0:29:00.37 –> 0:29:03.995 And the things that motivate me to work on this issue
0:29:03.995 –> 0:29:07.305 are every time I take care of a patient,
0:29:07.305 –> 0:29:10.25 I suffer immoral injury
0:29:10.25 –> 0:29:12.88 because I know I’m causing indirect harm
0:29:12.88 –> 0:29:14.44 at the same time
0:29:14.44 –> 0:29:15.59 through the pollution I’m generating
0:29:16.452 –> 0:29:17.285 through the care that I’m giving.
0:29:18.17 –> 0:29:19.34 And so, I feel motivated to try and help
0:29:19.34 –> 0:29:21.2 clean up the health care industry itself
0:29:21.2 –> 0:29:22.85 and also to engage health professionals
0:29:22.85 –> 0:29:27.85 because not only is this issue not taught at medical schools
0:29:28.028 –> 0:29:30.191 not taught in nursing schools,
0:29:30.191 –> 0:29:34.89 but health professionals are dedicated to their patients
0:29:34.89 –> 0:29:35.9 and busy with their patients
0:29:35.9 –> 0:29:38.36 and so most of them may not feel motivated
0:29:38.36 –> 0:29:40.51 to be engaged with trying to affect policy
0:29:40.51 –> 0:29:43.37 or even administrative changes in their own facilities.
0:29:43.37 –> 0:29:44.9 But if you can enlighten them
0:29:44.9 –> 0:29:46.68 about the pollution that they’re generating
0:29:46.68 –> 0:29:48.37 through the care that they’re giving
I think that this is how we can help engage health professionals which are trusted members of society like everyone in this room here to help make the transition in short order.

And so, the questions I ask have to be what does climate change have to do with health care? Well, you just heard some about what it has to do with health.

What it has to do with health care includes increasing demands for services increasing costs, and then a positive feedback loop also increasing pollution.

And also, what does health care have to do with climate change itself? And how much pollution are we generating?

And these were all unknowns when I was just starting and so it motivated me to collaborate with environmental engineers such as Matt Huckleman to try and put some numbers behind to help us understand what we can do and that’s really what started this whole path.

So here in Connecticut, Yale New Haven health system is all along the coast along the coastline between here and Providence. We are very vulnerable to weather related events. And if you talk to our disaster management and emergency preparedness division which is very robust and they’re in agreement, it is not a matter of if
but when we are going to be suffering these events.

And so, Hurricane Sandy which mostly impacted New Jersey and New York kind of quickly disrupted health hospitals and health systems that never thought they would have to deal with such a thing.

On the right, you see hundreds of patients were evacuated down the stairs by flashlight including nineteen patients out of the neonatal intensive care unit requiring hand ventilation down several flights of stairs. That made international news.

On the left, you already heard from Dr. Dubrow about the campfire in Paradise, evacuation occurring out of Feather Meadow Hospital. That was completed just before the hospital burned to the ground.

And so, this is also already impacting, disrupting our health care services.

Now, with health care Maria, I have to be honest I didn’t know until then that the majority of several of our drugs and bags of fluid saline were actually manufactured on the island of Puerto Rico.

So when Hurricane Maria hit it very much disrupted the supply chain affecting care even here in New Haven, Connecticut.
where we feel probably immune to it. So, the vast majority of hospitals across the country reported that they were suffering major supply shortages changing the care that they deliver which actually increasing the risk in the care that we deliver.

Things like medication substitution, different concentration, different drugs can have different impacts and result in errors. Inappropriate substitutions of drugs, improper handling of drugs, so splitting vials between patients in non-sterile conditions and then shortages when there’s no substitution available.

And then this odd phenomena where actually, we saw some increased drug waste.

here is a two ml vial of a local anesthetic named Mepivacaine that we use for spinal anesthetics when that was absent, we actually had to substitute a 30 ml vial and because of concerns for cross-contamination of microbial risk, that had to be thrown away. And until we create an infrastructure for pharmacy to split these drugs.

So this odd phenomenon of increasing waste. So health care is an enormous industry, here in the U.S. 3.65 trillion dollars
near 20% of our gross domestic product goes toward health care.

It’s a very energy intensive industry, not only the manufacturing of all the things, but with the energy we use to run the hospitals which are two and half times as energy intensive as the average commercial building. They operate 24/7, they have complex medical devices and equipment. We have unique requirements to prevent the risk of cross-contamination, so infection prevention. And so we use more chemicals and we use disposables. And there’s this really disturbing trend in some of these disposable devices because a lot of it’s not evidence-based there just seems, if we can get to zero-risk we should go there but we’re actually ignoring the secondary harm to public health. And so, we’re at a balance there. There is a risk stratification of what things need to be sterile, what things don’t need to be sterile and yet we’re going toward more and more disposables. And so conservative estimate by Health Care Without Harm said that there was about six million tons of solid waste generated from hospitals in the United States annually.
This is a very conservative estimate.

So many years ago now, we’re doing more and more disposables.

And then we have so much regulatory complexity and complex business models.

All these things contribute to systematic waste.

We’re a rich society. So we are excessive in the resources and this disposability is normalized.

So there’s a real need for a culture change to help engage around cleaning up health care and engaging health care professionals.

This is an image of a robotic surgery. Some things to notice, there’s a lot of disposables here including all the linens and the complex medical devices.

All of these instruments here that are attached to the robot arms are single-use disposable.

There are options for reusing them but that is not the norm currently.

And so, Rob mentioned Dr. Eckelman so he’s an environmental engineer from Northeastern University and also has an appointment here in environmental health sciences,
specializes in life cycle assessment. We started collaborating several years now trying to understand what the footprint is of drugs and devices and entire health systems. And life cycle assessment is an internationally standardized scientific modeling system. So it’s not just all the stuff that you throw away, it’s not just that we generate six million tones of solid waste annually. But there’s emissions involved in raw material extraction, production, transportation as well as disposal. So unless you put all those pieces together we can’t really understand where the hot spots are and what the alternatives are. So a couple of different approaches to life cycle assessment, including a bottom up approach where you essentially look at all the materials that you’re using, there are international data bases that tell you what the emissions are for those materials. And then you can add them up and understand where in the life cycle you’re having your impacts. And another approach is sort of a top-down where you’re looking at something like an entire health system where you can’t really measure any single material that’s going into that system. So we use national statistics to help expenditure data.
coupled with economic material flow analysis both nationally and multi-regionally. And then, that gets linked to environmental initiatives.

So top-down and bottom-up approach to come to some understanding of what the footprint is. And I think it’s worth highlighting one study that we did looking at different anesthetic drugs.

There’s a lot to absorb here, so if you allow me to tell you these are four different anesthetic drugs. The first three are gases, or actually four because Microsoft site is not moving the bars. These are inhale drugs, this is propofol, an intervenous drug.

So we look at the life cycle footprint of an hour’s worth of this drug to keep a patient asleep. And, first thing to pay attention to is the fact that you can’t see propofol here at all. It’s there, but its greenhouse gas emissions are four orders of magnitude less than inhalent anesthetics.

So these drugs have different properties, why we would chose them under different conditions. But this is just to help guide environmentally preferable choices as a clinician.

So if you have a choice between these, and often we do, chose the one that is least harmful
The other things to note are that if you just look at the pink that this drug desflurane has about twenty times the impact of isoflurane.

And nitrous oxide, if you add it, it makes everything worse. So take homes include:

Avoid desflurane and nitrous oxide when you have the ability to do so. And I should say, inhaled anesthetics are very potent greenhouse gases.

Hundreds to thousands more potent than carbon dioxide and they’re simply vented off of hospital rooftops.

So, the blue here is the non-waste phase. So, the manufacturing, transportation, utilization phases.

Everything else is the waste phase.

We can look at things like waste and anesthetic gas technologies which exists.

That’s another solution.

And another study done by Sandra Thiel from New York University compared different surgical approaches.

Again, there are different reasons why you’d choose an open technique versus a minimally invasive technique.

The first techniques in a hysterectomy on the left are open.
The two on the right are minimally invasive, one being laparoscopic and one robotic. Some take homes here include the purple which are inhaled anesthetics. So depending on the approach one third to two thirds the footprint of everything happening in the OR the energy to run the building, the equipment, all the disposable and reusable devices. Inhaled anesthetics are a pretty big piece of that. Another take home is this light green here which is all the single-use disposable instruments. And the error bar is because a couple of these cases had propofol. So if we took this out the error bars would be much smaller. So I showed you a picture of a robotic surgery for a reason that’s really interesting. Because there’s this increasing trend to push toward robotic surgery. It is not has been shown to improve outcomes over a laparoscopic approach but it is becoming sexy to patients. They want to go to an institution that is doing the most technologically advanced procedures. So now there’s this competitiveness that we have to be more and more technologically advanced. And so that is also contributing part of the problem.
national health sector studies
so the first one we did was on the U.S.
And so this was really not astonishing,
we know we spend more per capita on health care
than any other industrialized nation.
And we found that the U.S. health sector in 2013
was nearly 10% of our nation’s greenhouse gases.
Nearly 9% of our criteria air pollutants.
If the U.S. health sector were a nation itself
it would rank 13th in the world for greenhouse gas emissions
ahead of the entire United Kingdom.
And we also looked at other emissions
notably air pollutants as I mentioned.
If we were to translate that into public health damages
614 disability-adjusted life years lost annually
especially due to air pollution and also climate change.
And this is similar magnitude to deaths
due to medical errors.
This was first reported by the Institute of Medicine
“To Err is Human” in 1999.
Those deaths lost on average ten years of life.
By calculations we’re seeing the same magnitude.
This was important, this IOM report “To Err is Human”

0.41:15.66 is a landmark report that sparked the
whole patient safety movement.
The fact that people are dying
from preventable medical errors.
So there are institutions that pay to see
health care research and quality was formed and funded.

So it totally transformed every aspect of how we deliver care.

Patient safety is formalized in how we deliver our care.

And so what we are trying to say is pollution is just as big and just as important to how we deliver care.

And that this is the new patient safety movement.

I’m gonna go ahead and skip ahead to we then worked with The Lancet team and there’s a new indicator we wanted to essentially make this an international metric.

And, surprisingly globally take homes here include that global health care greenhouse gas emissions are 4.6% of global emissions.

I mean, I just like to let that sink in.

The other takeaway here is that the United States is a top player.

And not in a good way.

So on the left we see, this is per capita gross domestic product by per capita health care emissions.

And the bubble with those is the expenditure on health care.

So again, we know we spend twice as much on health care in the U.S. as any other nation.

And on the right is over time, so trending upward.
So roughly a quarter of these emissions are coming from the U.S. alone. We are not number one in health outcomes in terms of outcomes such as maternal deaths, life expectancy, the money we're spending on health care is not being spent wisely. And so that's part of why there are a lot of opportunities here to save money as well as reduce pollution. We really need to look at globally how health care sectors are performing, and obviously particularly in the U.S. And we wanna get some positive news, right? So Kaiser Permanente is a large non-profit health system in the United States. 12.3 million people. They have a very robust sustainability division looking at improving their entire organizations' footprint between 2008 and 2017, they reduced their greenhouse gas emissions by 20% while increasing their membership by 36%. In 2018, they started hosting on-site solar panels and have a commitment by 2020 to have 100% renewable energy. And 3% of their health sector emissions are coming from inhaled anesthetics.
That is consistent with national work out of the U.K. and other health organization work. So inhaled anesthetics was a big part of its footprint. And I should say the U.S. numbers I gave you also the global numbers I gave you do not include inhaled anesthetics. And so K.P. reduced this by 25% by progressive elimination of that one drug desflurane. And we’re actually working on a campaign to reduce their nitrous oxide use. So we’re working together on that. And the other one worth mentioning is the U.N. National Health Service. They’re leading the world with the division of sustainable development which is dedicated to reducing the footprint measurably so by 18.5% between 2007-2017 while increasing their clinical activity. And they have a very robust action plan that is a global exemplar. And so, you talk about delivering health care which is delivering the maximum health gain at the least cost, while adding value for the most people. And we’re talking about that we need to add environmental and social benefits as well.
Okay, so just to finish up. So the third key message, an unprecedented challenge demands an unprecedented response. I thought it would be worth talking about that a little bit. So first, I think we really need optimism. Pessimism, and this is me talking, not the Lancet Countdown, but I think they'd agree with most of it. Pessimism is self-fulfilling prophecy. So it's really morally imperative that we be optimistic about achieving this. And there are some reasons for optimism. We see that solar and wind are actually happening. They're becoming economically competitive. They're technologically feasible. We can do solar and wind. Transition to renewable energy is possible. We have the Pope's encyclical, that was a powerful document. That's still resonating. With all of its flaws, we have the Paris Climate Agreement that right now, every nation on earth is part of the Paris Climate Agreement. There's one nation that's in the process of withdrawing. Unfortunately.
But even so, we have states, cities, collages and universities, businesses, etc., that have said, “We are still in”. So these are in the United States. They’ve pledged to do their part for the climate and essentially stay in the Paris agreement. There’s ongoing divestment. New York City divested its entire pension fund last year. One of the things we have to do is stop building new fossil fueled infrastructure. That’s essential in order to achieve this transition. There have been a lot of defeats, but there have been some victories. Like this one victory here in New York state. The Juliana vs U.S. climate lawsuit is still alive. This is where young people are suing the United States to do more about climate change. And young people around the world are rising up around this issue. In the U.K. Outside Speaker Pelosi’s office. So to me, that’s the most hopeful thing of all it’s like, well the young people they understand that their future’s at stake. Or, a lot of you are young people you understand that your future’s at stake. (laughter) You understand that your future’s at stake. And people are rising to the occasion.
So I’d like to end with this quote from Martin Luther King.

Which was not about climate change obviously but is applicable to climate change in my view.

We are now faced with the fact that tomorrow is today.

We are confronted with the fierce urgency of now.

In this unfolding conundrum of life and history, there is such a thing as being too late.

So time is not on our side, time is our enemy in this case.

We have to do things faster.

The transition’s going to happen.

Really, the question is what is the pace of the transition?

There is no time for apathy or complacency.

This is a time for vigorous and positive action.

Okay so thank you.

And if people are particularly interested and you do have some hard copies of the report here so if you’re interested come up and get a hard copy.

(clapping from the audience)

(chatter throughout the room)