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# *Transcript of*
# *American College of Preventive Medicine (ACPM)*
## *Addressing Public Health Impacts of Global Climate Change through Prevention Practice and Policy Solutions*
## September 24, 2008

## Participants

Joshua Lipsman, M.D., M.P.H., F.A.C.P.M., Chairman of ACPM Environmental Health Committee
Kent Bransford, M.D., Co-Chair of the Physicians for Social Responsibility, Environment, and Health Committee
Cindy Parker, M.D., M.P.H., Fellow of American College of Preventive Medicine, Co-Director for the Program on Global Sustainability and Health at Johns Hopkins Bloomberg School of Public Health, and Vice Chairman of the ACPM Environmental Health Committee

## Presentation

**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
Good afternoon, I'm Josh Lipsman and I will be your moderator for the webcast this afternoon. I'm the Commissioner of Health for the Westchester County New York Department of Health and the Chair of the ACPM Environmental Health Committee. It's my pleasure to welcome you to this live CME web conference titled, "Addressing Public Health Impacts of Global Climate Change through Prevention Practice and Policy Solutions." This event is being offered by the American College of Preventive Medicine and funded through a grant supported by the CDC's National Center for Environmental Health as part of an educational campaign to inform today's healthcare providers and public health professionals on the importance of prevention in practice.

ACPM aims to educate and increase awareness of the health effects of global climate change through a combination of web based and in person information, education, and training activities. ACPM is the national professional society for physicians committed to disease prevention and health promotion and its members are engaged in practice, teaching, and research. I invite you to learn more about ACPM online at www.acpm.org. Also to learn more about other environmental health educational activities and resources please visit ACPM's environmental health resource center at the address on your screen.

This interactive webcast is associated with one hour of American Medical Association's Physician's Recognition Award category 1 Continuing Medical Education credit. This activity has been planned and implemented in accordance with the essential areas in policies of the Accreditation Counsel for Continuing Medical Education. ACPM is accredited by the ACCME to provide continuing medical education for physicians. I'll tell you a little more later in the broadcast about how to earn that credit.

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During today's webcast, participants will learn about the health effects and medical consequences of the increasing frequency and severity of heat waves associated with climate change and the impact of increasing temperatures on air quality and pollution, respiratory, and cardiovascular conditions and morbidity. In addition, speakers will address the major contributing factors to increasing greenhouse gas concentrations, the science supporting the purposed national emissions goals and what healthcare professionals can do to get involved. To address these important areas of global climate change, ACPM has brought together two leading experts. We will first hear from Kent Bransford, M.D., Co-Chair of the Physicians for Social Responsibility's Environment and Health Committee and then from Cindy Parker, M.D., MPH, Fellow of American College of Preventive Medicine, Co-Director for the Program on Global Sustainability and Health at Johns Hopkins Bloomberg School of Public Health, and Vice Chair of the ACPM Environmental Health Committee. The webcast faculty has disclosed no relevant financial relationships.

Now for some housekeeping before our presenters begin. We invite you to submit questions to these presenters throughout this activity by utilizing the question and answer function seen on the top of your screen. You may submit a question at any time during the event, however, I will hold the questions until both speakers are finished presenting. As you know, in any live event, we cannot answer all the questions but please feel free to submit a question at any time addressing it to the appropriate presenter and we'll do our best to get it on the air for you. During the course of the presentations, websites and other resources may open in other internet windows, these are sources you may bookmark and return to at any time.

At the conclusion of this webcast, you will be prompted to answer a few questions about your learning experience today. Please take a moment to complete this evaluation so ACPM might continue to improve and develop meaningful learning opportunities. To earn CME or MOC credits, please visit the web address on your screen to access the necessary request forms. Also, be aware that this presentation will be available as both a multimedia archive and a full text transcript on ACPM's website.

It is now my pleasure to introduce Dr. Kent Bransford who will discuss the science and health impacts of global climate change.

**Kent Bransford, M.D. – Physicians for Social Responsibility – Co-Chair of Environment and Health Committee**
Hello. I'm Kent Bransford and I appreciate very much the opportunity of being with you here today. As you can see, we'll be spending about 20 minutes discussing a little bit of the science background of global climate change and focusing then on the health impacts of climate change and then turning over to Dr. Cindy Parker who is going to focus on the solutions including mitigation and adaptation to global climate change.

This slide is a view from space that really shows the fragility and thinness of the earth's atmosphere and just to remind you, all of the energy that we rely on comes

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from the sun in the form of solar radiation. Light waves arriving and passing through the atmosphere then radiating to the earth's surface warming that surface and then as infrared waves, bounce back toward space. What we see with the atmosphere here in this cartoon is that some of that heat is then retained and maintains the earth at a fairly comfortable temperature. What we now know is that man-made processes, particularly the burning of fossil fuel, has increased the thickness of the atmosphere represented by the blue line and therefore we are retaining more of the heat that would otherwise have escaped to space leading to a general warming of the planet.

This is a land-based glacier that shows the various layering of ice and snow over what can go back to hundreds of thousands of years and if you use devices like this hollow drill, we can core this ice and in this ice are trapped air bubbles that can allow us to reconstruct what has happened on the earth going back in time and this cartoon basically shows a thousand years of ice data and temperatures extrapolated from the carbon isotopes that show very clearly that toward the far right end we're seeing a definite warming trend in the northern hemisphere temperatures.

Well, this is just another look at these thousand years of CO2 warming and as you can see, temperatures have been rising rapidly, almost exponentially here toward the end of this timeframe leading up to year 2000. And CO2 concentrations really going in locked step with those temperature increases. But beyond the thousand years, we now have ice core data going back approximately 650,000 years and this is probably one of the most important slides in the presentation. As you can see here, CO2 concentrations have varied up and down over the last 600,000 plus years but never exceeding 300 parts per million. If you look at temperatures during the same period, the same seesaw pattern essentially matching CO2 concentration is apparent.

Today, CO2 concentrations, as you see, are approximately 380 parts per million, are again far exceeding anything seen in the last 650,000 years. And with business as usual, if we continue to use energy and burn fossil fuels at the current rate, it's projected that by mid century 2050, we may be up to approximately 600 parts per million.

The Intergovernmental Panel on Climate Change, or the IPCC as abbreviated here, is the largest peer-reviewed scientific effort ever and has been updating its findings over the last decade plus and in the 2007 update, we see that they reiterated their conclusions that greenhouse gas concentrations have markedly increased since the dawning of the industrial revolution. Temperatures are increasing, sea levels are rising, ice is melting, and the climate system warming is unequivocal and furthermore, the human activities very likely are the cause of the warming over this past 50 years. And lastly and importantly is that with business as usual, temperatures will continue to increase, sea levels will continue to rise, and ice will continue to melt.

The 10 hottest years on record have all occurred in the last 14 years. The hottest year on record is 2005. And this picture of an Indian elephant getting cooled off in the Munich Zoo in 2003 is an example of a heat wave and the public health impacts. As you can see here, the temperatures across Continental Europe are unusually warm particularly affecting France with high double and triple digits essentially across the

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continent but what this led to was a death toll in excess of 35,000. Most of these deaths were heat related, stress related. They affect the very young, the elderly, and particularly those with preexisting medical conditions, cardiac or pulmonary conditions particularly.

Well, it's not just Europe. Here we see extreme temperatures in India reaching 122 degrees Fahrenheit leading to over 1400 deaths. High temperatures across the United States again in the high double to triple digits in this year 2006.

Just to spend a moment to remind us that air temperatures have not been as hot as they otherwise would if it weren't for the oceans. Our oceans have been heating up gradually over the last 50 years or so that we've been keeping careful records. They act as a heat sink and moderate temperatures by they also act as a source of storms and hurricanes and in this slide what we see is that water temperature as it increases, hurricane and other storm intensity increases. Wind velocity due to increasing energy capability increases and then storm moisture content increases because more water vapor can be held by warmer air masses. So this view of a hurricane from space is an example of the storm systems that are developing and can have significant physical destructive impact. This was the largest oil drill drilling rig in the world prior to Hurricane Dennis destruction in 2005. Just before Hurricane Katrina hit New Orleans, this MIT study was published with the conclusion that major storms spinning in both from the Atlantic and the Pacific since the 1970s have increased in duration and intensity by about 50%.

We just passed the third anniversary of Hurricane Katrina and this short movie shows this monstrous storm moving across Florida back into the Gulf, gaining intensity because of warmer ocean temperature reaching category 5 before the eye hits New Orleans. But weather and flood catastrophes have not only affected human health, they've wrapped up billions of dollars in losses as you can see here exponentially increasing over the last 40 to 50 years, physical destruction across Continental Europe, major floods have been increasing significantly across… throughout the world. Here we see Europe, similar pattern in Asia. Mumbai, India, 37 inches of rain falling in 24 hours leading to a thousand deaths in the aftermath the following day.

This woman here is rinsing rice outside of her hut in Madagascar where because of extensive flooding, contamination of fresh water or drinking water, fecal contamination, spreads of cholera, and because of standing water, increasing outbreaks of malaria.

China has the longest history of flood records of any civilization and here we see flooding in Shantung Province, similar scene in Sichuan Province with two police officers rescuing an infant in a basin and yet, paradoxically, in a province right next door, in this same example being China, we see here desertification throughout and the question is, "Well, how can this exist? And are there other examples?" and because of a lack of this lake now, displacement of environmental refugees compounding the political issues that we can see here nearby in Sudan in Darfur.

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Well, this cartoon is trying to give us an idea of how this disparity between draught and flooding can exist at the same time. Now as you can see here over oceans and water bodies, we can see evaporation, the potential to form storms as we discussed but over land-based masses, we can actually see it with an extreme dry and depending on how those storms are distributed over land, some land masses will exhibit flooding and (inaudible) can co-exist.

Well, look at what would happen in Intercontinental United States with the business as usual CO2 rise that we looked at earlier. Here in a doubling of CO2, we see somewhere around 30%, possibly up to 40% decrease of the soil moisture which has impacts on the ability to grow crops and food supplies and looking at this worldwide, obviously, malnutrition and hunger. Quadrupling of the CO2 would lead to more than 50% to 60% decrease in precipitation.

Well, let's just turn briefly to air pollution and its link to climate change. We all know if we've grown up in near cities in the summer that summer high temperatures increase and worsen air pollution. We've noticed an epidemic essentially of asthma in the United States, about 16 million of us have asthma; about 9 million of these are children with the largest increase since 1980 being in the pre-school ages.

I just want to mention two studies here where the effect of air pollution on children's… the incidence of asthma in children was noted. The first here was done in Southern California, looking at children living in 12 different communities that range from good air to bad air, low to high ozone levels, and these children have no previous history of asthma and were followed over about five years and what they noticed is that the kids that were following a lifestyle we'd like our own children to follow, out of doors active, defined by playing at least three sports per year, they had a three-fold increased risk of developing asthma if they were active out of doors in high ozone areas and this trend was not noticed in kids who were sedentary, inside watching TV or playing with their Game Boys or in kids that were active playing sports in cleaner air areas. The second study though, the bottom bullet here, is that the study done looking at college freshmen entering the University of California and what they did is divide these freshmen depending upon where they grew up, in more healthful air in Northern California versus not so healthful air in Southern California and what they noticed is a definite decrease in the pulmonary function of those college freshmen that grew up in less healthy air.

Well, this landmark study in the New England Journal of Medicine looked at the effect of air pollution on lung development between the ages of 10 and 18 and by the age of 18, particularly girls, have fully developed lungs and from there we slowly deteriorate as we age. They looked at over 1700 children in 12 Southern California communities. They were followed again from age 10 to 18 and the conclusion was that levels of air pollution that currently exist adversely affected lung development so that there was significant deficit, up to 20% decreases in FEV1 in children. This was important and linked to nitrous oxide levels and importantly PM 2.5, as you see here, which is particulate matter that is very small, 2.5 micron particles. And a way to look at this is the proportion of 18-year-olds who had significant lowering of their FEV1 was about

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five times as great if they were to exposed to the high versus the low level of particulate matter.

While the average temperature of the earth is about 59 degrees Fahrenheit, the earth acts as a heat engine moving that heat and energy around but an increase of about 5 degrees Fahrenheit or 3 degrees centigrade, the mid projection of the IPCC with business as usual is that we'll see about a global average increase meaning only about a 1-degree increase at the equator but about a 12-degree Fahrenheit increase at the poles, a much more marked effect obviously. And how this will be circulated and affect individual land mass is a little less easy to predict from computerized modeling.

What this slide shows is some of the vectors of emerging infectious diseases which we're all familiar with and in the interest of time, we'll just briefly look at the Anopheles mosquito, the vector as you know that spreads malaria, the most important infectious disease worldwide and as this cartoon tries to show us that as warmer temperatures are already moving into more northern latitudes, higher up on mountain elevations. The area where this mosquito can live, because it does not like to live in places that get colder than about 60 degrees Fahrenheit at night, has expanded and will continue to expand and the World Health Organization estimates that as many as 50 to 80 million additional cases of malaria each year may result because of projected climate change.

Here, we see just a brief list of other weather and precipitation sensitive diseases, tick-borne diseases, dengue, encephalitides. As I mentioned, the most marked increase in the temperatures would be at the pole so that habitat would be decreasing but also land-based ice will be melting.

This view of Antarctica and particularly the little square in the upper left looking at the Larsen Ice Shelf and this is of particular importance because this ice shelf, about the size of Rhode Island, broke up over approximately a one-month period in 2002, an ice shelf that's felt to be thick enough and stable enough to last at least another hundred years. And so events like these has led to sea level rise and indentation as you can see here in Polynesia and increasing stress and signs of melting here in Canada and on the Iceland ice sheets.

The two land-based masses of ice seen here, the West Antarctic ice sheet and Greenland, are felt to be at particular risk and if either one of these were to melt at a more catastrophic form of climate change and warming, we could see up to 20 level… a 20-foot rise in the sea level. So in these brief cartoon recreations here, we see Florida and what it would like with a 20-foot sea level rise, a view of the San Francisco Bay and the indentation and rise in the sea level, and again in Beijing, home to over 20 million people, and the effect and the displacement of population and the destruction that would be seen.

Even without that significant sea level rise, this view after Hurricane Ivan of a sea level rise compounded by storm surge and the physical destruction that result is of particular concern. Again, about a third of the world's population living in coastal

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zones, the displacement leading to environmental refugees, salt water intrusion of fresh water aquifers compromising fresh water supplies.

And then this final slide really is an attempted summary of the potential impacts of our energy choices on human health affecting the air quality that we breathe, the climate change affects the temperature precipitation extremes and sea level rise and the cascade of events and most of these as you can see as far as human health effects are adverse.

So with that, I'd like to thank you for your attention and I'll turn over the microphone to a more positive side of this aspect of what we can do in solutions for the future. Thank you very much.

**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
Thank you, Dr. Bransford.

I now have the pleasure of introducing Dr. Cindy Parker who will discuss practical solutions for reducing greenhouse gas emissions and will introduce ways you could get involved in the policymaking process to help stabilize the climate.

**Cindy L. Parker, M.D., M.P.H. – American College of Preventive Medicine – Vice Chairman of Environmental Health Committee**
Good afternoon. You've just heard from Dr. Bransford about how climate change can affect health. Now, I'm going to be talking to you about how you can get involved in being part of the solution to climate change and actually getting our climate stabilized. So today we're going to talk about some of the science behind the proposed national emissions goals as well as some of the things that you can do in your personal and professional lifestyle to actually reduce the amount of greenhouse gas emissions that you individually or professionally contribute to the problem and perhaps most importantly, we are going to talk about ways that you can get involved as a health professional in the policymaking process to help stabilize the climate.

So, is this an urgent problem? Well, hopefully, you've gotten the impression from Dr. Bransford that it is. The climatologists actually also say that it is an urgent problem, not just something we need to worry about in a hundred years, but something we need to worry about and start making drastic changes in how we do business right now. One of the pieces of information they use to determine that this actually is an urgent problem is how quickly the summer Arctic sea ice is disappearing. So what you see on your screen on the left hand side is a composite satellite photo of Arctic sea ice. That's the white part, floating Arctic sea ice. The gray part at the bottom of the white is Greenland and then you can see the other continents and islands around. That pink line is the 20-year median edge of how previous to 2005 when this photo was taken how much the ice had melted up to that point. So this photo is taken at the end of the summer melt season, so at the lowest point of the ice before it starts to refreeze and you can see that the amount of white is way inside that pink border. This was very concerning to scientists when they first saw that. And part of the reason they were so concerned is because this is part of a positive

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feedback loop as, also I think Kent described, ice is very good at reflecting sunlight, dark water on the other hand is very good at absorbing the sun's radiation and then causing more warming which then causes more ice to melt and so forth.

What you see now on the right hand side of the screen is the amount of melting that had occurred in 2007. So the climatologists were very concerned when they saw how much it had melted in 2005, they were totally aghast when they saw how much the ice had melted at the end of 2007 melting season. You can see that there's actually more than a million square kilometer less ice remaining at the end of the summer of 2007 than there was at the end of 2005. So far for 2008, we're definitely worse than the 2005 level but not quite as low as 2007. So that's good news. We actually have not gotten worse than the 2007 level yet although there's still some time left in the summer melt season.

So some of the minimum national emission's goals that you're going to hear, for example, next January or early next year, with the new administration, both presidential candidates have said that they care about climate change and they are going to do something about stabilizing the climate. That means that from looking at the science that we need to stabilize carbon dioxide equivalents concentrations at 450 parts per million or less to keep global average surface temperature from increasing more than 2 degrees centigrade compared to pre-industrial levels to avoid dangerous climate change. Now, why I say 450 parts per million as a minimum is because some very well-respected climatologists are actually suggesting that this number even is too high and we're going to talk about why that is in a few minutes. But to avoid dangerous climate change, dangerous climate change has been defined as more than one meter of sea level rise, more than half of all species on earth going extinct, and local and regional changes in precipitation and weather conditions that would be sufficient to compromise food and water supplies. And I think most of us would agree that that would indeed be dangerous climate change. So to avoid that 2 degree centigrade increase and avoid dangerous climate change, we would need to decrease global carbon dioxide equivalent emissions 20% by 2020, 50% by 2050, as an absolute minimum. Again, these are global emissions, not just U.S. emissions.

There're some caveats. It's not always clear to know what people are talking about and the different terms have different meanings. So, for example, you'll hear carbon emissions and you'll also hear carbon dioxide emission. If you hear different numbers perhaps it's because people are changing what they're using, either carbon emission which one ton of carbon is equal to 3.62 tons of carbon dioxide because of the difference in molecular weight. The current carbon dioxide levels in the atmosphere are about 387 parts per million. That goes up by 2 or 3 parts per million per year. However, there are also something called the carbon dioxide equivalent as opposed to just carbon dioxide itself and what that means is that it includes the carbon dioxide plus some additional greenhouse gases. So if they're talking about carbon dioxide equivalents per Kyoto that means the greenhouse gases that are regulated under the Kyoto protocol, and that's methane, nitrous oxide, and something called CFCs which are man-made chemicals which are very strong greenhouse gases. Then there's also something called the carbon dioxide equivalent total which as you can see is a lower number. That's because it includes some things that actually cool the planet like

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sulfate aerosols. It also includes ozone which is fairly strong at warming the planet plus the Kyoto greenhouse gases plus things like black carbon or soot but the overall effect, if you take into effect all of those things, that's the total carbon dioxide equivalent and that's equivalent to about 375 parts per million right now.

So one of the reasons why scientists are concerned about the difference between carbon dioxide, methane, and nitrous oxide is because they have different abilities to warm the atmosphere and the surface of the earth. If we use carbon dioxide as a measure of one, methane is 23 times more powerful, nitrous oxide is almost 300 times more powerful and then the other chemicals that you see on the bottom of that table are all some of that category that's frequently called CFCs even though they don't as you see all have Cs and Fs in their chemical formulas but these are all man-made gases used in a variety of things. Some of these were created to take the place of chemicals that we're banded under the Montreal protocol because they destroy the ozone layer. So these chemicals don't destroy ozone but instead some of them are very powerful greenhouse gases. One in particular to note that's been in the news recently is NF3 because it's used in the manufacture of LCD TVs which has gotten very popular and so there's more of this chemical being used. As you see, these chemicals are extremely powerful at global warming and so they really need to be phased out as quickly as possible.

What you see now is the table taken from the Stern Review, the Economics of Climate Change. This was published in 2006, available online. It was produced by Sir Nicholas Stern and his group. Sir Nicholas Stern is sort of like the Alan Greenspan of the United Kingdom in terms of his economic credibility and expertise. He is very physically conservative. He is not an environmentalist. He is concerned about what the economic impacts of climate change could be and he created this report. So across the top of this chart you'll see increasing temperatures in centigrade, that's compared to pre-industrial levels and then you'll see kind of some of the categories of what we would expect to see using climate modeling projections at those different temperature levels. So at 2 degrees, you can see the amount of impact increases tremendously. At the top of that other table that you just looked at, there's the parts per million CO2 equivalent concentrations in the atmosphere that we, again using climate modeling, project would cause that amount of temperature increase. So for 2 degrees centigrade you can see we need to hold the carbon dioxide equivalent concentration at 450 parts per million.

Part of the reason why some climatologist are suggesting that 450 part per million is too high is because look at the arrow bar there, that 5% to 95% confidence level arrow bar is quite big and so what the climatologists are telling us is that if we maintain carbon dioxide equivalent levels at 450 parts per million in the atmosphere, that gives us about a 50/50 chance of holding temperature increases to 2 degrees centigrade. Those aren't especially good odds in my opinion and that's why some climatologists, particularly well-respected ones like Jim Hansen, Director of the NASA Goddard Institute for Space Studies, is suggesting that that number really needs to be more like 350.

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What you see now is somewhat a probably confusing table. You don't need to worry about all those numbers and letters but what I do want you to focus on is the red line. These different colored lines are different scenarios that the Intergovernmental Panel on Climate Change created back in 2000 to give us some ideas as to what to expect would be our carbon dioxide emissions if we continue with no intervention to change. And so they looked at different combinations of population growth, different kinds of economic growth, etc and they created these different scenarios. The red line represents their worst case scenario. The black lines are actually emissions that are observed and measured by two different agencies and you can see how those compare with the different scenarios. Now what you see are the actual emissions for 2005, 2006, those are the red dots and you can see they're a whole lot worse than even the worst case scenario that was envisioned by the Intergovernmental Panel on Climate Change back in 2000.

So do we need to act immediately? Well, we talked about the possibility of positive feedback loop with the melting sea ice, for example. One other reason why we need to act immediately is because infrastructure that's built sticks around for a long time. So for example, if we decide to build another coal-fired power plant now, that will be in existence and producing coal-fired power for approximately 45 years, if not more. So it's easy to understand why a utility for example that has spent millions of dollars building this new station would be upset, to put it mildly, at legislation that would require it to take that power plant offline before that 45 year lifespan is done. They've invested a lot of money. So the decisions that we make now about the infrastructure we build will have profound effects on our near and distant future. So deciding perhaps not to build those coal-fired power plants now makes a lot of sense.

Okay, if we're going to stabilize the climate that means that carbon emissions must equal carbon sinks. A sink is what absorbs carbon out of the atmosphere. So plants, forests, for example, absorb carbon dioxide, use that in their photosynthesis that takes carbon out of the atmosphere. Oceans also absorb carbon dioxide out of the atmosphere. Our current carbon emissions are about 34 gigatons or 34 billion tons of carbon dioxide equivalent per year but that's expected to increase as much as 60% to 70% if we continue on a business as usual trajectory by 2030. Our current carbon sinks are about half what our emissions are but unfortunately, the sinks are decreasing because the natural sinks are degrading and it's another one of those positive feedback loops. So, for example, forest absorbs carbon dioxide but as global warming continues, those forests get stressed, they dry out, they die because of infestation, they burn, and then no longer are they able to continue to pull carbon dioxide out of the atmosphere but all that carbon that's been stored in the plants themselves as they decay or burn then gets released into the atmosphere and you could see that just that process could get out of hand very quickly and cause our carbon dioxide emissions to increase and our carbon dioxide level to skyrocket. It's projected that these things could degrade to almost 0% absorption by 2100. So we really can't count on these things to continue to absorb half of all of our emissions for very long. U.S. emissions must decrease by 80% below 2000 levels by 2050 in order to stabilize the climate at that 450 part per million level that we have been talking about. If it's going to be lower than those emissions need to decrease even faster and more significantly.

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What you see on your screen now is a chart that compares climate change proposals back through the recent history. Now none of these bills are currently being debated. They've all actually kind of have been put to bed. So I'm not advocating for any particular piece of legislation. I am using this slide to show you that one thing that the organization that put out this slide, the World Resources Institute, is a non-partisan, non-governmental organization predominantly looking at the economics of various legislations. But they are trustworthy source and so new legislation gets introduced next year, that might be a place for you to go because they will probably create something similar and you can look and see how it actually pans out in terms of does it get to where we need to go? That gray bar on this particular table shows what we need to get to in order to stabilize at 450-550 parts per million if we're going to shoot for the bottom end of that we're looking at the lower edge of that gray bar. So also notice that some of the lines are ramp shape, some of them are stair steps. That's important because the ones that are stair steps actually even though they may end up at the same place or similar place by 2050, they've allowed a lot more carbon dioxide to be admitted into the atmosphere and because carbon dioxide stays in the atmospheres for somewhere 100 and 200 years as an average, that means that there has been a lot more global warming even though they may still end up reducing emissions by the same amount by 2050, they actually are less desirable bills if they're using that stair step method as opposed to a solid ramp.

So how to be a part of the solution. Well, as a healthcare professional or a health professional, one thing you can do is to counsel your own patients about the health risks from climate change. No, I'm not suggesting that you spend 20 minutes telling them all about this, but you could for example hand them a science-based pamphlet about the health effects of climate change and say something like, "I'm concerned about this. I believe it's important for the health of individuals and our community to get the climate stabilized. Please take a lot at this when you get a chance." You could also educate your own colleagues about the health risks from climate change. You can do that efficiently using grand rounds or talk to professional groups, so you can just do it on a one-on-one basis as well. You can make your own practice more sustainable, whether that is a clinical practice or a public health department, or some other sort of an agency or organization, you can use less energy to do what you currently do and you can produce less waste; that is a huge contribution to stabilizing our climate. As a health professional, you can also get involved in the policymaking process and that's perhaps the most important thing you can do because individual change alone is not going to get us to where we need to go. We need national and international policy changes to dramatically reduce the amount of carbon we omit.

So how to get involved in a policymaking process. Well, locally, you can talk to professional groups, you can talk to civic and community group, they often have tremendous influence in terms of them educating their own members and that's a movement that spreads. You can also get involve in urban planning exercises, for example, decisions to whether to improve public transportation or not or you can perhaps provide some health input that would move main traffic quarters away from residential areas that could decrease greenhouse gasses. It could also improve the health of people who live along those traffic quarters by improving air quality. You can

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prevent further building in high risk areas. We know with global climate change that flood plains, for example, both coastally and inland are going to increase. So it doesn't make any sense to put more development in those areas and so by being a voice of reason with the impact of a health professional, you can actually hopefully prevent further building in those high risk areas and prevent further injuries from the damage from the storms and the flooding that's going to come. You can also perhaps get involve with something like an educational board that would get these health effects of climate change included in curricula K through 12, college educational curricula, perhaps even also medical school or public health training as well. At a state level, you can educate you policymakers and believe it or not, your policymakers probably even care about what will impact the health of their constituents. You can do that simply by picking up the phone and talking to a legislative aide or you can schedule a visit to talk with a legislative aide or the policymaker, him or herself, and you can educate them about the health impacts of climate change. If there is legislation that's brought up at the state level, this has been happening a lot around the country because the national legislation has been slow in coming and so the state have taken it upon themselves to do their own legislative work and you can give the health perspective and you can testify in support of legislation that you support. You can work with professional organizations to endorse legislation that would have positive health impact that can also be very powerful. You can get involved in the policymaking process at the national level, probably best by joining with others who have similar views. There is a list of organizations there. They are not listed in any particular order. Check them out, see whether their views actually are similar to yours, whether their values are similar to yours. One thing you can do is sign up for e-mail alerts because these organizations all have professional staff that follow what's happening legislatively and can let you know when something is going on and that can be very helpful. And you can work with national professional organizations like ACPM for example to make public statements about how climate change could impact health.

One of the best ways to lead is by example, so you can also make some personal lifestyle changes to make your lifestyle more sustainable. You can drive the most efficient vehicle you can afford and drive it less by using public transportation whenever possible, by combining and condensing car trips for shopping, errands, site seeing, by walking more, biking more. You can also reduce the amount of energy you use in your home. One way to do that is to buy the most efficiently appliances you can afford, particularly if you are thinking already about replacing your own appliances. The refrigerator for example is a big energy hog in most homes. If your refrigerator is more than about 7 years old then buying a new one will save energy. Other energy hogs in the home tend to be washing machines, air conditioners, and furnaces. So you can think about replacing those with energy efficient models. You can adjust your own thermostat in your homes so it will make a little cooler in the winter, a little warm right in the summer that saves energy. You can spend very little money to weatherproof your home. That can be as simple as weather stripping and cocking around doors and windows to reduce the amount of cold air that comes into your home during the winter, therefore, using less energy to heat.

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And one thing is that all of our electronic devices that many of us surround ourselves with use energy even if we're not using them, even if they're turned off, they still have indicator lights for example that are using energy, so if you unplug them when they're not being used, that saves energy. One way to simplify doing that is to plug everything that you're going to use together into one power strip, that way, with just a flick of the switch, you turn on everything at once, when you're done using it another flick of the switch and you turned it off all at once.

Another thing you can do is change your diet. Livestock contribute 18% of carbon dioxide equivalent emissions per year. That's a huge chunk, it's even greater than that transportation sector, and so to reduce that amount of greenhouse gasses, eat less meat. Tony McMichael, a very well-known and well-respected heath and climate researcher from Australia actually have laid all these out in a paper in The Lancet; the reference is given their on the slide. He suggests that we all eat 3 ounces of meat per day or less and less than half of that should be beef. 3 ounces is about the size of a regular hamburger patty, just a kind to give you a goal of what you might try to strive for, but any amount less that you could eat of meat per day would be a help. Also, you can eat more locally produced food and drink. That helps to reduce the amount of energy that it took to get it to you.

Although high gas prices can cause a lot of harm to people who are struggling to make ends meet, they can also be a powerful motivator to help people change their behavior. Political decisions that get made in the hurry, however, to try to ease the pain drivers are feeling when they have to fill up their cars can end up doing way more harm than good. So one thing to watch out for is if a policymaker suggests that we switch from regular gasoline to some other sort of non-traditional fossil fuel like tar sands or oil shale; getting oil from those sources actually ends up emitting far more carbon than using so-called regular liquid crude petroleum. Synfuel is turning coal into liquid fuel that also emits far more carbon than liquid crude oil. So, avoid using these non-traditional fossil fuels if at all possible. Really look at the full trade off of what it means to reduce the price of gas even if that would happen, it really could be devastating for our climate.

So in summary, there is considerable science behind the number. We need to stabilize atmospheric carbon dioxide at 450 parts per million as an absolute maximum. That means we need to decrease the United States emissions 20% by 2020 and 80% by 2050. Physicians actually do still hold respective positions in society and can make significant contributions to stabilize in the climate to improve the health of their patients and their communities. There is a range of personal and professional actions that are possible but health professionals can use their influence to help stabilize the climate and I would strongly encourage you to do so. Thank you very much.

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**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
Thank you Dr. Parker.

We will now open it up to questions. Please feel free to submit questions for our panelists at this time through the question and answer link at the top of your screen.

We are going to go ahead with the questions. Some have already come in and these questions could be either for Dr. Parker or Dr. Bransford. So I will ask you to pick which ever ones you like or both of you answer them. We'll start with the first one which is, "Can you comment on carbon capture and storage, does it work?"

**Cindy L. Parker, M.D., M.P.H. – American College of Preventive Medicine – Vice Chairman of Environmental Health Committee**
Okay. This is Cindy Parker, I can address that. In theory, it should work and it should work fairly well. The problem is that the technology is not quite there yet in order to make it work in any substantial quantity and the technologist tells us that that technology is probably 10 to 20 years out, that's fairly optimistic. One of the problem is that you need to find places in the earth's crust that are suitable for storing that carbon and storing it for potentially forever and make sure that they don't leak, and so those places are limited and we're talking about a huge amount of carbon that would have to be stored, something like 12 cubic miles worth of carbon every day. So you can see that this is not going to be the panacea and solve all of our problems. It hopefully will end up being part of the mix of the solutions that we rely on; probably about 10% of carbon emissions. Once this is scaled up and has proven to be safe and effective and not leaky then maybe 10% of our carbon emissions could be stored in this way.

**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
There is in fact a second part to this question, Dr. Parker. Can we utilize this technology to allow us to continue to use fossil fuels as an energy source?

**Cindy L. Parker, M.D., M.P.H. – American College of Preventive Medicine – Vice Chairman of Environmental Health Committee**
Well, actually, no. Because if it's only going to take care of kind of at the most 10% of carbon emissions that still leaves 90% of carbon emissions which go un-stored and are going into the atmosphere and will have significant effects on changing our climate. So in addition to carbon capture and storage, we also need to figure out how to produce less carbon in the first place.

**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
Another question for either of the presenters, "Are there examples of global efforts to abate the negative health effects of climate change, for example, China, India, or Northern Europe?"

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**Kent Bransford, M.D. – Physicians for Social Responsibility – Co-Chair of Environment and Health Committee**
This is Kent Bransford. I think there are efforts. I think the take home message though here today, which I think Dr. Parker summarized, is prevention has to be the key in stabilizing and dramatically reducing greenhouse gas emissions to limit the damage and the expected degree of climate change has to be #1 high in the priority list as way of mitigating the effects. And so that needs to be a worldwide effort. Dr. Parker pointed out here in the United States, we really need to lead the way with around 80% reduction by 2050, but that alone is not going to be sufficient. We need worldwide effort and cooperation, all of the industrialized nations and developing nations have to be part of this solution as well and this includes those nations that have the most rapidly growing population and specifically, India and China. On the adaptation side, we know that the carbon that's being admitted today is going to be hanging around for decades and so we've already caught… the climate change engine has already started, it's moving and even if we were to completely stop emitting carbon today, we will see effects of the carbon that's already been admitted going out for the rest of the century, and so we do have to spend some time and focus efforts on adapting to climate change but again not to ignore mitigating and limiting the degree of climate change. But some of those common sense interventions will be, for instance, in Europe, the example I gave was the heat wave just a few years ago, with tens of thousands of deaths. Basically, temperatures that… I'm from California and southwest to the United States are dealt with routinely in the course of warm summers, so adequate ventilation, air conditioning, which obviously is the double edge sword as far as producing carbon emissions, re-thinking the infrastructure and response to heat wave warnings, adequate hydration, etc. to prevent heat stroke and other heat-related injury as an obvious intervention both in the U.S. and in abroad.

**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
Thank you. Here is another question for Dr. Parker. Referring to the soil moisture issue, what are interventions that can abate these negative results as alternate irrigation systems or crop growth systems?

**Cindy L. Parker, M.D., M.P.H. – American College of Preventive Medicine – Vice Chairman of Environmental Health Committee**
There are a variety of things and let me just… at the risk of sounding like a broken record, at least for those of you who are old enough to know what a broken record sounds like, prevent all the adaptation in the world is not going to save us if we don't get the climate stabilize. So, yes it's definitely worth talking about these adaptation methods, but we also really need to not lose site of the fact that we have to get the climate stabilize to prevent much of these damage.

So, back to the soil moisture issue, yes, there are fairly new low tech ways of irrigating with less water, preventing some of the soil moisture loss. Sandra Postel for example has been at the forefront of leading that research and trying then to translate that research into real practice around the world. We now know a lot more than we did about when plants need the most water, so we can actually use better timing in terms of how much, not just how much water is use, but when the water is actually given to

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the plants. Things like cover crops and reforestation will help to prevent a lot of that moisture loss because the plant's roots actually hold more of that moisture in the soil and hold more of the moisture in their plant bodies and keep it from being lost. So there are a variety of things that can be done.

**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
Thank you. Dr. Bransford, are there ways to reverse or limit the cases of chronic disease related to air pollution injuries among children in urban areas?

**Kent Bransford, M.D. – Physicians for Social Responsibility – Co-Chair of Environment and Health Committee**
As far as reversing the injury, not to my knowledge. I think probably the most important thing is to prevent that injury in the first place. So the kinds that affects that we pointed out in the presentation, as you say, are generally confined to urban areas where air pollution is most notable. How to prevent this? Well, decreasing pollution in the first place, which also will have a dual purpose of decreasing the four things that are driving climate change, is got to be the #1 priority as Dr. Parker just mentioned. And we can do this. Using Southern California, Los Angeles Airbase as an example, air quality is actually better than it was 40 years ago. So, policies can work. There is a long way to go and the injuries that I pointed out during my part of the presentation are occurring at these better but still not healthful levels of air pollution. Just common sense though, we don't see this kind of injury for instance in kids. The example I gave were children exercising vigorously, participating in multiple sports each year. The kids that had the higher incidence of asthma were the ones exerting themselves in these bad air areas and the kids that weren't, that were indoors weren't experiencing these effects. So not that we don't want our children to exercise, but we all know that there are bad air days, high ozone levels and we have mechanisms for ozone alert and these can be used by parents and patients and ourselves to decide when it is most appropriate to exercise and when we would be better off not exercising out of door. The other thing I think we can think about is making sure our public health policies and our planning policies are rational to avoid hot spots and air pollution in urban areas and unfortunately, they tend to occur in poorer areas. It brings up the whole social justice issue and how we do our urban planning. But where we're sighting fossil fuel plants, the kinds of protection, and when we address global warming, we also need to address the other pollutants that affect respiratory health at the same time.

**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
Thank you, Dr. Bransford. Here's a question for either speaker. The questioner says neither of your presentations mentioned population growth. Won't worldwide increases in population coupled with industrialization of the developing world have the effect of essentially undoing any cuts in greenhouse gases we might achieve here in the United States?

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**Kent Bransford, M.D. – Physicians for Social Responsibility – Co-Chair of Environment and Health Committee**

I'll tackle that to start with. We have about 6.5 billion people worldwide today. By 2050, that 80% reduction in greenhouse gases in the U.S. that Dr. Parker mentioned. By 2050, we'll grow from about 6.5 to little over 9 billion at the rate we're growing currently and by century end, we will grow even further somewhere north of 11 billion. So most of that population growth is going to occur in the developing world and the developing world is really striving to have a lifestyle and stuff like we have here in the West. So their energy consumption and, therefore, greenhouse gas production as the side effect, if they don't develop more intelligently than we did, it very well could dwarf any efforts we make here in the U.S. So the answer is yes and in order to address that the United Nations in their UN Millennium development goals actually proposed ways of stemming by the end of century population growth instead of 11+ billion to only 8.6 billion, which is again 2 billion more than current. And how would they propose to do that? And the UN Millennium development goals would really encourage investments in education worldwide in women's healthcare internationally, gender equality which is equated with decrease birth rates and instability and decrease infant mortality, and also the eradication of hunger. And if all of that panned out and we we're able to hold global population to about 8.5 billion, the equivalent of about 23% reduction of CO2 compared to business as usual in the mid range scenarios that were described by Dr. Parker from the IPCC. So, it's a very important component.

**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**

Thank you. That sounds like a fairly modest agenda. Just a little joke there. We're going go a few minutes over because of the number of questions that are coming in and we're going end around 3:05, so we do have time for a few more questions. I have another one here that again could be for either presenter. Where can you get materials to educate patients and colleagues? ACPM, PSR, AMA, where do you go for that information?

**Kent Bransford, M.D. – Physicians for Social Responsibility – Co-Chair of Environment and Health Committee**

I will just turn this over to Dr. Parker in a second but being a representative of Physicians for Social Responsibility, I can at least speak for our organization which will provide you free various brochures that can be displayed in patient reception areas. It can be distributed through whatever your local network hospital that will point out what you can do to prevent or minimize global climate change, changes in lifestyle, changes in practice, which also brings up Healthcare Without Harm connection which has similar overlapping materials. So there's a lot out there and I'd encouraged you on the slide that Dr. Parker displayed with an example of the organizations to look on the websites and either contact them electronically or give them a call and that material can be sent directly to you or downloaded and printed and distributed.

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**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
Here's a question from a colleague in a local public health department, which asks, "Please talk more about what local public health departments are doing?" And by the way, I should say to the audience I see that a window has just opened asking you take a survey. I guess that came because it was 3 o'clock but please bear with us for a couple more minutes while we answer some more questions and conclude before answering the survey. Anyway, this question from I assume from a colleague at a local public health department. Please talk more about what local public health departments are doing and can do related to mitigating impact of climate change particularly in areas where climate change may be seen as not the purview of public health or of local government at all, and actually I'm going to take the moderator's prerogative to answer that question myself. I'm active as a local health official in NACCHO, the National Association of County and City Health Officials. We do have global climate change working group. We have come up with some best practices. We've done a survey. We have some information from health departments that are far along in addressing this issue or at least furthest along and information for others who are just getting started. So I would encourage the questioner to contact NACCHO, go the NACCHO website, or feel free to contact me through ACPM or directly after the webinar and I can direct you to it.

The next question, "Is carbon trading a realistic approach to a solution or is it just a delaying game to avoid finding a solution?"

**Cindy L. Parker, M.D., M.P.H. – American College of Preventive Medicine – Vice Chairman of Environmental Health Committee**
Well, I can address that. Carbon trading can certainly be an important part of a solution. It's not just a delaying game but the critical piece with carbon trading is that it has to be in conjunction with a steadily decreasing cap on the amount of total carbon that can be emitted. So for example, if the United States says we're only going to allow 100 units of carbon dioxide to be emitted from all of the industries in these three sectors and so we're auctioning off 100 permits for one unit each, the idea is then that the companies that are doing a good job at reducing their carbon emissions would have some extra permits that they could then sell or trade to other companies that aren't doing such a good job but that overall cap of 100 units is still met and then the following year that cap needs to decrease to 90 units, etc. So the trading by itself doesn't reduce emissions but trading in addition to the cap actually can reduce emissions and can be a fairly effective way of doing that.

**Joshua Lipsman, M.D., M.P.H., F.A.C.P.M. – American College of Preventive Medicine – Chairman of Environmental Health Committee**
Thank you. We are unfortunately out of time despite the fact that I have quite a few more very good questions and I apologize to those who asked those questions. We will be happy to find some way to answer them other than through this webcast activity.

As a reminder, CME and MOC credit are available for this webcast activity and to earn that credit, please complete the request form that is located at the ACPM CME MOC

Center. Also, a multimedia archive of this program including a full text of transcript to the presentation will be available on ACPM's website in the next week.

Before closing, a couple of additional resources just to mention. ACPM is launching an Environmental Health blog on the ACPM Environmental Health Resource Center. This blog will feature discussions on the latest environmental health news, research, and events on global climate change and other important environmental health topics. Join the conversation at acpm.org/education/environmentalhealth.htm.

Through a partnership with Medscape WebMD, ACPM is preparing two environmental health preventive medicine columns for publication on Medscape. ACPM members will author an indoor air quality and environmental justice column and a global climate change column under the heading Perspectives in Prevention from the American College of Preventive Medicine. In the coming months, the articles will be featured on ACPM's website and Medscape's Public Health and Prevention homepage, the MedPulse newsletter, and throughout many other primary care and subspecialty sites on Medscape. CME credit will be available for both of the columns. Please watch for them.

Let me close now by thanking our two presenters, Dr. Bransford and Dr. Parker, for terrific presentations on this very important topic and thank you all for joining us this afternoon. We hope to see you at our next live webcast. Bye.

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