NJ CLEAN AIR COUNCIL

PUBLIC HEARING

APRIL 13, 2005

AIR POLLUTION - EFFECTS ON
PUBLIC HEALTH, HEALTH CARE
COSTS, AND HEALTH
INSURANCE COSTS

HELD AT:

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19 JUN FENG ZHANG

20 IRWIN ZONIS

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CHAIRMAN EGENTON: Good morning. I'm Michael Egenton, I'm Chairman of the Clean Air Council. Welcome, everyone. Today is our annual public hearing. Part of Clean Air Council statute in the that we are required to hold a public hearing. Today's public hearing topic is air pollution effects on public health, health care costs, and health insurance costs. I welcome everyone. I welcome my fellow council members. Just as far as protocol I would ask the council members during the course of the public hearing if you have a specific question to ask of one of our speakers, please for the benefit of the reporter identify yourself and your question.

Before we begin I thought I would take the opportunity to go around and introduce my fellow council members. Before I do that I

want to give an encouraging welcome return to a fellow council member Joseph Spatola as well as the reappointment of Mr. John Maxwell. And we have two new council members with us today, both Toby Hanna and Dr. Zhang. So welcome to the new council members as well as the returning ones as well.

I want also to give special kudos to

some of my council members who stepped up to the plate. We always have a subcommittee that puts the work together for the public hearing for today, and I want to give special thanks to those members. Dr. Leonard Bielory; Jim Blando, my vice chairman on the council; Irwin Zonis; Stephen Papenberg; Jorge Berkowitz; and John Maxwell.

I also wanted to let the audience know that after this part of the hearing I will be introducing the Commissioner from DEP. I will be handing over the rest of the hearing to the hearing chairman Dr. Leonard Bielory, UMDNJ.

With that we'll go around the table.

As I said I'm Michael Egenton, Chairman of the New Jersey Clean Air Council. I represent the New Jersey State Chamber of Commerce.

Dr. Bielory?

DR. BIELORY: Dr. Leonard Bielory, New Jersey Medical School, UMDNJ-New Jersey Medical School, and director of the Asthma and Allergy Research Center.

MR. BLANDO: Jim Blando, I'm vice chair of the Clean Air Council and I represent the New Jersey Department of Health and Senior

Services.

MR. ZONIS: I'm Irwin Zonis, I'm a public member of the council.

MR. MAXWELL: John Maxwell, and I too am a public member of council.

MR. LYNCH: Dr. Richard Lynch, also a public member of the council; president, Environmental Safety Management Corporation.

MR. ZHANG: I'm Jim Zhang, Associate Professor of the Environmental Health, School of

Public Health, UMDNJ.

MR. BERKOWITZ: Jorge Berkowitz of Langan Engineering representing the New Jersey Business and Industry Association.

MR. SPATOLA: Joseph Spatola, newly appointed member to the Clean Air Council, or reappointed to the Clean Air Council, and I represent the public.

MR. IGLESIAS: Marcelino Iglesias, and I represent the Department of Community Affairs.

MR. THOMAN: Ken Thoman, New Jersey State AFL/CIO.

MR. HANNA: Toby Hanna, Environmental Resources Management representing

the New Jersey Society of Professional Engineers.

MR. ALI: My name is Ferdows Ali, I represent the New Jersey Department of Agriculture.

MR. PAPENBERG: Stephen Papenberg, New Jersey Health Officers Association.

MR. CONSTANCE: Good morning. My name is Joe Constance from the New Jersey Department of Commerce, the Small Business Ombudsman.

CHAIRMAN EGENTON: Thank you, fellow council members. I would be remiss if I didn't point out the support and assistance that we get from the New Jersey Department of Environmental Protection, first and foremost from Sonia Evans who helps keep us on the straight and narrow and organizes us and puts a lot of work and effort together for the hearing today, so many special thanks to Sonia, as well as the two gentlemen who their advice, insight and reputation is very helpful to the guidance of the Clean Air Council, Assistant Commissioner Sam Wolfe and Bill O'Sullivan. We appreciate your support of the council and the help that you give us month to month; thank you, gentlemen.

In the essence of time I would like to turn things over to Dr. Bielory as we await the arrival of DEP Commissioner Brad Campbell.

DR. BIELORY: Thank you very much. Today is a quite extensive agenda, we hope to maintain the time. As chair I think one of Gong Shows items that I have to try to maintain everybody get their time. But in that regard I want to just go over what we are going to be working together. The problem, or the evolution of New Jersey Department of Environmental Protection really came out of health, and focusing on the family where we have patient and family is the issue. There are issues of the citizens of the State of New Jersey. We are going to try to incorporate today or we tried by the committee put a lot of work into this to include obviously a major focus on health care on the impact, but in addition there are a variety of issues. The issues of industry having an impact on our health care quality. We are also looking for interaction between legislative and public health leaders meaning this is a forum and partly it's a Clean Air Council is an advisory, and therefore we generate a report to the

legislator as well as to advise New Jersey Department of Environmental Protection of what the performance. What we look for, and as we have a new member from the School of Public Health is community involvement in the public health issues, meaning in trying to incorporate a variety of entities into a single concept is not an easy concept. In fact as you see the universe as the sphere is here is quite large. And one should not even forget that our children, and I appreciate in the city of Newark the students are 40,000 plus. It's larger than most cities in the State of New Jersey. So looking at school health, idling buses, you know, looking at all those issues are very important. What we also look at now is the cost. We're trying to integrate today a little bit more as an economic balance. And reflective of cost of when we do something and what is the outcome. Everybody has great ideas, we have limited budget both in the state and NJDEP, and there are always funds sometimes trickling in but how do we put it best to use.

And there is something that I always look for is that the pharmaceutical industry is

there's a capital, it's where New Jersey is probably the capital of the pharmaceutical industry of the world when you look at the number of international headquarters. And they can actually be a partner in this whole spectrum. And finally the Clean Air Council, we have to come up with the idea in the final report to putting this all together to create a vision. And we try to take issues each and every year, we take everybody's input at this point in time. So with that as a perspective this is the universe that we hope to cover today, and we try -- we hope to keep within the agenda with the variety a individuals, we have the Commissioner will hopefully be here shortly, Valorie Caffee will be coming up talking about environmental justice as an issue, environmental protection in that regards, and we have gone through a whole spectrum of legislators to I have invited an individual who'll actually sit -- we'll hear from him, Dr. Peden from out of state actually who actually has a very similar position that I have

down in his universe of academia but actually has a great impact on health and environment as well. So we have put together a variety of individuals

though it seems to be -- there's academics for instance with data, meaning we're trying to get really the information to provide the best judgment, the best assessment that we can come as an advisory group, coming from the public, integrating it with the information scientific and validation to create an economic prospect for our citizens of New Jersey.

Any other comments? Actually at this time while we're waiting for the Chair perhaps --

CHAIRMAN EGENTON: I'll say this, Dr. Bielory, looking at the audience here and I see the looks on their faces and they're wondering is that the same Dr. Leonard Bielory I hear on 101.5? And, yes, we do have a celebrity in the making. I was driving home --

DR. BIELORY: He was indicted.

CHAIRMAN EGENTON: -- driving from Atlantic City from a transportation conference and I put 101.5 on and Leonard's talking about the high pollen count. So, yes, it is the same Dr. Leonard Bielory.

DR. BIELORY: It is. And actually one of the issues for pollens as a particulate

matter is a pet project, though the pollen is in north Jersey, you know, pollen is not restricted, travels several hundred miles, but the effect on all the citizens is quite apparent. And hopefully we'll be establishing more stations even locally for individuals in the future.

Any other questions from members of our panel? Looks sort of like a survey set here.

MR. ZONIS: I assume that's pollen on the upper right or -- that's ragweed pollen.

DR. BIELORY: Pollen the particles range from about five microns in size, which if you put it in perspective that goes up to about 40. Ragweed is the most common item that people are allergic to. Three out of four Americans who

have allergies are allergic to ragweed. That's kind of just the universal -- the same thing down below, the little grains. If you look at them under a microscope to quantify you're looking to create a self-reporting component.

Any other questions from actually the audience at this time, or actually --

MR. BLANDO: Well, you know, one of the things that I was just going to say, let me point it out ultimately was the complexity of the

issues, and I think one of the things that we'll see today and will be very intriguing about this particular public hearing is how much in flux many of these technical issues are. And I think it will be intriguing and enjoyable to see and I think it will also become obvious that there still are many unanswered questions when it comes to air pollution and public health.

DR. BIELORY: People should not walk out of -- or expect out of, expectations don't want to exceed reality, but that we're here to

ask questions and perhaps provoke ideas. Do we have all the solutions. That is a different issue. I think is what Jim Blando, the vice chairman of the Clean Air Council and co-chair, I don't know how I got to be the final chair of this public hearing is. So therefore again, ask questions. There are no stupid questions. If you have one please ask because I always learn in public opinion for every one verbal statement made by the public there are nine or ten other people wanting to make it but didn't have the guts to make it. So it's very important I think that we do try to present a large and balanced perspective from the audience, the public as well

as from the expertise that sits on the Clean Air Council.

One other thing that I -- I guess I failed to, I'm the I guess -- I'm also a public member, appointed member for the council. I'm the only physician; there is one physician slot that apparently that's required by the legislation so I've been in this position for

four years. So it's been an education for myself over those numbers years as well. What that means, any other comments as we wait for the Commissioner?

CHAIRMAN EGENTON: Thank you, Leonard. Thank you very much.

DR. BIELORY: All right. We'll just wait a few more minutes.

While we're waiting for the Commissioner I'll just mention for those of you who are not familiar with the Clean Air Council, essentially there was a legislative mandate back in 1969 I want to say, and the council has been operating and annually is required to have this public hearing, it's an opportunity for us get feedback and interact with members of the community, members of the environmental and

occupational health community, and we issue an annual report that contains recommendations from the council that serves as an advisory document to the New Jersey Department of Environmental

Protection and the Commissioner. And the attempt is to have an outside body that consists of people, multiple stake holders who can sort of come up with good quality recommendations for the DEP. So without further ado...

CHAIRMAN EGENTON: Our first speaker this morning to kick things off for the Clean Air Council public hearing is Commissioner Brad Campbell. The Commissioner has been a staunch supporter of the Clean Air Council and has worked very closely with us. Last year we issued a report on fine particulate matter and the Commissioner is now pursuing with the help of the legislature some important issues there.

And I wanted to give special kudos to the Commissioner for his involvement with us and the role that you play, Commissioner, every day in protecting the quality of clean air here in New Jersey. With that, Commissioner, we'd like to hand things over to you.

MR. CAMPBELL: Thanks very much.

It's a delight to be here this morning. And I

want to welcome the council To the Department and particularly welcome some of our newer members, Dr. Zhang and also Toby Hanna who are here today. Also welcome -- or welcome someone who is rejoining the council and that is Joseph Spatola who has a long record of service to the council. I welcome you and I welcome the council to this topic.

As all of you are aware from the work -- the previous work of the council on diesel particulates, our air pollution challenges in New Jersey are closely linked to matters of public health. In the state where every citizen breathes unhealthy air for at least part of the year and we are not attaining new and more rigorous public health standards for soot and smog, those challenges are significant and the cost to the public both in terms of economic cost, impacts to health and quality of life are significant. As your work reflected in the case of fine particulate pollution we know that if we achieve the new tougher Federal standards just for that one pollutant we would avoid more premature deaths in the state and if we stopped

every homicide or prevented every traffic fatality. We know in the case of mercury emissions that roughly ten percent or more of women have unacceptable -- of child-bearing age have unacceptable levels of mercury in their bloodstream. More than 5,000 children and infants each year born in New Jersey are exposed to unacceptable levels of mercury and additional risk in utero. Those are significant public health impacts for New Jersey, and they don't even begin to capture the next order of public health and community impacts from increased emergency room admissions from asthma attacks, increased absenteeism of schoolchildren who have asthma (inaudible) with poor air quality, and these impacts are significant. But they also I think point to the work still to be done in terms -- and the current focus of the council in terms of trying to assess what the health care impact, the health care costs and economic costs of those very critical public health impacts are.

We know across the State of New Jersey, and we certainly know from the state

budget deficit currently, that one of the most

significant increases in costs for small

businesses, large businesses, public agencies is the increased cost of health care for workers. And immediately behind those costs are we believe potentially significant costs from environmental exposure, particularly exposure to dirty air. And at a point in our regulatory system where we are trying to focus more directly on the costs and benefits of environmental regulation and to demonstrate that as New Jersey leads the nation in setting the strictest public health standards, those standards are more than amply justified by the public benefits, including the economic benefits. I think the focus of the council will contribute significantly to an understanding of what some of those impacts and costs are to better regulation by the Department in terms of where we set our priorities, and possibly to more innovative approaches as you've seen recently in the context of our efforts to control mercury. Again, more than ten percent of women have

unacceptable levels in their bloodstream, some 5,000 infants each year, a variety of sources but most of them today from airborne air deposition of mercury from smokestacks. In the case of our clean air standards we have set the toughest

rules in the country. The rules we say are required under the Federal Clean Air Act will achieve 90 percent or better in the reductions of mercury from power plants and incinerators in 2007.

But we've also coupled that with a recognition that in some cases the most cost effective control is not an end to the smokestack control but also other efforts such as the recent legislation advocated and signed by Governor Codey for mercury switch removal from vehicles. Recognizing in the case of mercury switches historically put in motor vehicles by the auto manufacturers that the most cost effective solution is not to allow those switches to go into the scrap metal stream and up the smokestack

to be controlled, but rather to remove the toxics before they enter the recycling stream and thereby avoid the need for end of smokestack controls. We have a long way to go in terms of mercury emissions, particularly given the position that the Federal government has taken under President Bush, but I think it points to some of those -- some of the challenges we face as a state, and also points to some of the

significant areas where the work of the council in assessing the cost impacts can be significant.

I want to sound perhaps to a few particular points of emphasis or focus. First, in so many cases the epidemiology of illness and health impacts associated with air pollution is complex. There can be many risk factors, and in any particular set of asthma cases or the like there may be many risk factors presented and no particular asthma attack might -- is, you know, may be demonstrably linked to a particular pollution exposure. But I think it's important to understand in the aggregate science is well

established on the extent to which fine particulate pollution, for example, can contribute to a range of pulmonary and other illnesses, and we need to understand that science in that context, that while there may be many risk factors we know that air pollution is one of them and there are reasonable ways to attribute the impacts and the costs of those, as EPA has done subject to OMV review numerous times over. And I think that's one thing that I would caution the council not -- to be wary of suggestions that the epidemiology precludes reasonable -- a

reasonable understanding of the health -- of the costs impacts of air pollution.

Secondly, I would urge the council to look closely at the number of studies over the years that have documented that the benefits of air pollution control have far outweighed the costs, and to look particularly at understanding that the public health impacts of air pollution really warrants additional control beyond those

already in contemplation. There are in the recent context of EPA's rules on interstate transport of air pollution, for example, OMV's analysis made clear that there were billions of dollars, literally billions of dollars of public health benefits left on the table because EPA didn't go far enough in protecting air quality.

And I urge the council to consider in its work helping the Department to identify what those unrealized benefits are, and also how we might better capture them for New Jersey. And conversely in considering the range of potential competitive factors on businesses located in New Jersey, the range of costs that businesses face in New Jersey to put the costs of pollution control in perspective in the sense that in terms

of health care costs, in terms of the impacts of employee absenteeism and family demands that there is a case being made for much more stringent controls and for much more aggressive efforts as we are undertaking in the context of our diesel retrofit program to go further than we

have in terms of protecting air quality and to continue to seek at a minimum timely attainment of Federal standards in the years ahead.

So with that let me end my remarks, but also open myself to questions from the council.

CHAIRMAN EGENTON: Thank you, Commissioner, for your input and recommendations. Any questions from the council?

MR. BERKOWITZ: Mr. Chair?

CHAIRMAN EGENTON: Yes, Jorge.

MR. BERKOWITZ: Good morning, Commissioner. If I could be so presumptuous to speak now for the council, I think that we need to recognize your diligent and persevering effort in making sure that our upwind sources are held accountable for the air quality impact that we have in the State of New Jersey and the subsequent help with that I think you are to be

congratulated for all of your efforts.

My question is going to go to the

issue of indoor air quality. Your department is to be congratulated for recently coming to the realization that vapor intrusion from redeveloped sites in the name of brownfields is an important issue and is moving the ball and advancing the ball. And it is an important issue one we haven't focused on in the past. And that's not a form of criticism, the time is at hand. I just want to ask you how you saw the whole issue of indoor air quality being addressed by government whether it's focused or not and where that stands in your role in the state government.

MR. CAMPBELL: I don't think we are doing enough. I think that it is probably the -- one of the last frontiers of air quality protection as you suggest. The fact of the matter is that people spend a lot of their time indoors. Unfortunately in the era of Gameboy I think children spend ever more amounts of time indoors, and obviously for a vulnerable populations whether they're seniors or infants or other populations at risk that's a significant concern as in the vapor intrusions. The first

and foremost we need a suite of approaches to ensure that as site cleanups are completed that those issues are addressed. In some cases they can't be addressed by engineering controls, in other cases they need to -- they militate in favor of more aggressive removal and treatment at sites, in some cases they indict the judgments made a generation earlier that leaving polluted ground water in place, for example, presents no risk or no harm. I think there are a combination of steps we need to take to address that first and first to make sure that as we have in the vapor intrusion guidance to make sure those issues are addressed when cleanups occur to avoid reliance on institutional or engineering controls where we can't have reasonable satisfaction that those controls will be maintained effectively. And to understand the particular areas such as in school construction where cleanups should be meeting a higher standard at the very least the residential standard.

So those are some of the areas in the cleanup program we need to address. There really isn't a satisfactory regulatory regime currently with respect to indoor air beyond the

work we do in cleanups. I think it's an important area to pursue. We have initiated discussions with our Health Commissioner Dr. Jacobs on that issue because Health also has obviously a very direct involvement there. In some sense of tackling the obvious of the legislature's work on the indoor smoking, on the smoking ban issue I think we need the bellwether of public understanding and support. If you can't tackle the obvious, obviously -- if you can't tackle the obvious the subtler threats to indoor air quality will be even harder to address.

But again, getting the cleanups right is critical not just for protection of the public health which obviously it is, but also so that the progress we have made in persuading developers that brownfield sites are appropriate is not rolled back by a perception that sites aren't being cleaned up adequately or that residents choose those options. I think we're

22 going to continue to closely and aggressively
23 follow the science and err on the side of caution
24 in ensuring that the range of re-use of the
25 formerly contaminated sites that we'd like to see

1 is not undermined by the lack of appropriate
2 safeguards. I also think in that context our
3 pursuit of natural resource damages is related in
4 the sense that we'll need to begin to look both
5 at on the one hand that's a class of potential
6 injuries that we will need to look at, on the
7 other hand I will pursue them, natural resource
8 damages also creates greater incentives to
9 accelerate and reduce the temporal component of
10 ground water contamination and thereby creates
11 greater incentives for more thorough cleanups and
12 so forth.
13 The final issue I would note is our
14 efforts which have been the recent subject of the
15 interested party review on soil remediation
16 standards. Obviously ground water is one source
17 of vapor intrusion, soils can be another. I
18 think by updating science on that which -- and

ensuring those standards are reflected in regulatory requirements rather than guidance will go a long way to ensuring the reliability across New Jersey.

CHAIRMAN EGENTON: Thank you. Other questions?

MR. BLANDO: My question just

concerns your comment and any suggestions you might have for sort of the daunting task of the government agencies to communicate these very complex issues and oftentimes not definitive issues for the general public and legislators as well.

MR. CAMPBELL: It is a daunting task. I think that it is not hyperbole to say that people are dying because of air quality in New Jersey. More people are dying than in car accidents, than from crime or any of the other hazards that families worry about as they're lying in bed at night. And it's a more difficult set of public health risks to convey because you

know in the argot of regulators these are -- or public health specialists for that matter, these are unascertained victims, we can't attach it, we can't -- with a drive-by shooting or a motor vehicle accident we can't attach a name and a face to that victim who dies prematurely because of poor air quality. The senior waiting in the emergency room because their emphysema had been triggered by soot, the child whose asthma attack, keeps them out of school and further behind the other children. We can't interview with their

families because they are not ascertained, we can't specifically identify them. But I think that what I tried to convey at every opportunity and want to urge the council to consider is the fact that those victims may be unascertained does not diminish their entitlement to protection, does not make their status of victim any less real, does not make them any less worthy of protection. I think that has to be a constant message. I also think it's important to recognize that these burdens do not fall equally

and, you know, the -- for example, with respect to the fine particulate pollution and pediatric asthma, pediatric asthma rates are epidemic and increasing in this country. It is the leading chronic pediatric illness in the United States, and the reasons for its increase are not fully explained. But the fact of the matter is for black and Hispanic communities those rates are two and three times as high respectively according to the public health surveys. A recent study in Harlem showed rates as high as 14 times as high as they would be in the mainstream population. And I think it probably highlights a caution or aspect of this problem that the

council's analysis needs to take into account, and that is that those impacts, that the distribution of impacts is such that they often fall on the people least likely to have health insurance, least likely to have effective access to health care, least likely to have, you know, immediate attention to those impacts. I think

that there are several elements of that, some of which the council may be able to reach. For example, when those burdens fall on people without access to or ready access to health care or without a personal physician they'll resort to emergency rooms where cost of health care is much higher, the cost to society is much higher, becomes that much greater. And I think we need to recognize those impacts and also to some extent allow for the fact that some of those impacts may be underreported because of the distribution of (inaudible).

CHAIRMAN EGENTON: Thank you, Commissioner. Any other questions? Dr. Zhang?

MR. ZHANG: I'm Jim Zhang, I'm a new member. Commissioner, I personally would like to thank you for nominating me. I appreciate this opportunity. Among the issues that you raised in

your speech this morning, one of them is the impact of the -- whatever actions, you know, actions taken to improve air quality and public health. I think this is a very, very important

issue and the scientific (inaudible) area or scientific committee this is an understudied area and, you know, when we talk about the accountability issues, how effective the intervention or policy towards improving air quality, you know, sort of just to do it but we really don't know what the impact on the health. And I was very excited that you mentioned this. I was wondering if your department would be willing to consider funding some, you know, science to quantify, for example, this intervention program or whatever, you know, that you try to improve air quality, to see quantitatively how much benefits we get. I think that will be really, really powerful message to the public and also to the policy maker if we do have a quantitative or seem like quantitative answer.

MR. CAMPBELL: I would be very interested in funding a study. I think there's been probably too little work on the table in

that regard. I tend to differ from, you know, some advocates in the environmental community who progressively oppose cost benefit because my argument is always well, if you actually did cost benefit analysis in a rigorous way looked at all the benefits of pollution control, you'd actually be able to justify far more stringent levels of regulation as opposed to the way it's currently done in Washington. But I would be very interested in looking to see if we can identify funding sources for that. I am, you know, I think there are hurdles in the sense that -- in the same sense that I mentioned, while studies in the aggregate might be I think very effective in linking, for example, the impact, the linkage between exposure to fine particulate pollution and the frequency of asthma attacks. Again, identifying those particular cases and identifying intervention strategies becomes difficult.

We are currently working with the Department of Health to develop a health tracking pilot, and particularly working in partnership with Hackensack University Medical Center to see if at least in the case of -- in the case of

disorders most closely linked to exposure we can begin to have an actual on the ground study suggesting that a first order is where the cases are coinciding with exposure, and secondly, what the right intervention strategies are. And, you know, one of the useful aspects of the council's focus is to, you know, there is -- the intervention strategies are often poorly the nexus between the beneficiaries and the people actually bearing the cost isn't always direct. So that there may be I think to the extent a public benefit is demonstrated there -- may help the case for different mechanisms to encourage the intervention strategies that may have had to occur at the retail level, tax credits for different types of pollution control and that sort of thing. But we're, you know, we're at a very -- I would say we're at a very early point.

CHAIRMAN EGENTON: Thank you, commissioner. I know you're a busy individual and thank you for your time and presentation here today. We look forward to meeting you in July with our report based on what we hear today. So

thanks very much.

MR. CAMPBELL: Thanks very much.

CHAIRMAN EGENTON: Next on our agenda is Valorie Caffee, and at this point I'm going to be handing it over to Dr. Bielory who will be running the rest of the hearing.

DR. BIELORY: Thank you very much. Valorie Caffee, if you would like to come up. Valorie Caffee is the director of Organized New Jersey Work Environmental Council. She's the chairman of Environmental Justice Advisory Council to the New Jersey Department of Environmental Protection. So we thought this an important component of this universe to appreciate the impact of environmental justice on the issues that relate to all the things here and one piece of the pie.

MS. CAFFEE: Hi. Good morning, and thank you very much for inviting me to speak today. According to a February report released by the Clean Air task Force, New Jersey residents

face the nation's second greatest risk for cancer from diesel exhaust. And that 880 New Jersey residents prematurely die each year from exposure to diesel emissions. As a Trenton area resident myself, I am particularly troubled by the report's findings that ranks Trenton fifth for

metro areas for per capita health impacts from diesel fine particulates. The report found that, quote, people who live in metropolitan areas with a high concentration of diesel vehicles and traffic feel their impacts more acutely, end of quote. This is a really extremely important report because it's the first time that the health impacts from mobile air pollution has been codified in such a centralized way, and because it also validates the anecdotal concerns of those who are most directly adversely affected by diesel emissions.

With the majority of black and brown people living in our urban centers, I do want to address the relationship between New Jersey's air quality and environmental justice. Let me first

offer a working definition. Environmental justice is the right to a safe, healthy, productive, and sustainable environment for all. Environmental justice demands fair treatment for all populations of people, with no group bearing a disproportionate share of negative environmental consequences. It addresses public health and socioeconomic issues related to the distribution of environmental benefits and

burdens among populations, particularly in degraded and hazardous physical environments occupied by people of color and poor people.

Many people of color and poor residents of every race and ethnicity suffered and do suffer from rare exposure to air pollution than their white more affluent counterparts. There is then a direct relationship between poor air quality in many areas of New Jersey and the struggle for environmental justice.

A couple of years ago, for example, the principal at the Sacred Heart School in

Waterfront South, Camden, said in a newspaper interview that the majority of her students in the small community of just under 2,000 had asthma, and that she herself had asthma. That same year, the Federal EPA stated that this area had some of the worst pollution in the nation, prompting, along with resident complaints, the NJDEP to embark on an air quality survey. The preliminary survey indicates that the Waterfront South residents do indeed breathe some very dirty air.

This community's name sounds like a vacation resort, but it is home to two Superfund

sites, 114 known contaminated sites, a regional incinerator, the county sewage treatment plant, a cogeneration plant, a gypsum plant, a medical laundry, at least 30 scrap metal and other recycling businesses, a cement grinding plant, contaminated drinking water, the majority of homes contain lead, and until very recently approximately 70,000 diesel powered trucks rumbled through its narrow residential streets

annually.

More than 90 percent of the residents are African American, Latino and Asian. The median income in 1990 was $15,000. Nearly half the residents are children. Three in five residents in general have respiratory problems. And another study showed that in Camden in general it had the state's highest infant mortality rate in the year 2002. The DEP also found that it had the highest average recorded levels of fine particles in the air were in Camden.

While Waterfront South is possibly the worst of the worst in New Jersey, there are other communities in the state in which the residents suffer from disproportionate pollution

and its attendant health and other effects. The Trembly Point section of Linden is another example. Bounded by Route 1 and the Turnpike, this working class community of residents of Polish and German descent, blacks and Latinos,

has the largest oil refinery in the northeast, a cogeneration plant, a huge pharmaceutical plant, an automotive assembly plant, a large utility plant, a Superfund site, thousands of diesel powered trucks traveling in its roadways daily, numerous oil tank farms, is near the county incinerator and the pharmaceutical company's incinerator, is part of Newark Airport's flight path, near Linden's own airport, and it's proximate to chemical plants. And in fact one such chemical plant is one of the nation's 123 facilities that could affect more than one million people should an accident occur. Various studies have also ranked pediatric asthma as being a significant problem in Linden.

Linden's high incidence of pediatric asthma isn't unique in our cities. The Trenton Childhood Asthma Project, for example, found that asthma related emergency room visits and hospitalizations for children were 1,900 and

Division of Health found that out of 1,000 first graders who were surveyed 25 percent of the children's parents indicated that their children were diagnosed as being asthmatic. In Mercer County, the county in which this hearing is being held, is third in the state for the highest levels of particulates, and more than 70 percent of Trenton's residents are people of color. By the way, as I'm sure some of you know who are on the council, asthma also still remains an ailment that often goes undiagnosed or misdiagnosed so often the figures are even higher.

Asthma, chronic obstructive pulmonary disease, and heart attacks are the most serious short-term health effects from air pollution. Children and the elderly, especially younger children, are the most vulnerable to adverse respiratory problems associated with bad air. Asthma, as the Commissioner noted, is our nation's most common chronic disease among children, with African American children actually five times more likely to die from it than white children. Children of color and poor children

are more likely to develop asthma and at worsening rates as a result of the interaction of urban pollutants with diesel emissions and the burning of fossil fuels.

The American Heart Association recently stated that, quote, hospitalizations for several cardiovascular and pulmonary diseases acutely increases in response to higher ambient PM concentrations, end of quote, such as those found in our urban centers.

Ambient particulate matter is especially problematic for people of color. While the costs to health are great, so are the socioeconomic impacts. And as the Commissioner just noted, many people who live in poor communities are using our emergency rooms as their personal physicians because they have no health care insurance. Many parents who have to take time off from work to attend to a sick child have no paid sick time, and also again no health care insurance. But asthma alone in general accounted for 10 million lost school days, 1.8 emergency room visits, nearly one-half million hospitalizations, and 15 million outpatient

visits in 2000. The financial cost was 14.5

billion dollars. And with the current trends there will be by the year 2010 2,400,000 lost work days. The chronic diseases also cause severe emotional strains for families, as well, and certainly for those suffering from them.

Poor indoor air quality, I'm glad that was raised earlier, is just as problematic also. In fact just this week the Federal EPA declared indoor air quality to be among the top five environmental risks to public health, saying that air is two to five times more polluted indoors than outdoors. Schools are a major source of indoor air pollution. New Jersey has 1.3 million students and 18,000 staff in 2,400 public schools. The overall average age for our schools is 47 years. But in the so-called Abbott school district the average age is 62 years. The 30 Abbott school districts are those in which the majority of Latino and black students are concentrated. Our schools, particularly in those districts, are also densely populated.

Overcrowding, deferred maintenance, poor ventilation, idling school buses, proximity in our cities to heavily-traveled roadways and polluting facilities, mold, the use of pesticides

and other environmental triggers all contribute to indoor air pollution and associated health problems.

And in fact IAQ is the issue for which the Public Employee Occupational Safety and Health, or PEOSH Program receives the most complaints from public employees. And, in fact, from November of 2004 to January of 2005 there were 38 IAQ complaints out of 58 total, or 66 percent. IAQ is also the issue for which most public employers request on-site consultation from PEOSH.

Communities then which have large populations of Latinos and African Americans and lower income residents suffer both from more exposure to air pollutants and more adverse health effects linked to such exposure than

communities with large white and wealthier residents. Therefore, there is definitely a relationship, a strong relationship between New Jersey's air quality and environmental justice.

Aggressive action needs to be taken to rectify this multi-faceted problem, which includes the following recommendations: Prioritize areas where sources of large volumes

of air pollution is already known to exist for immediate remedial action; more vigorous enforcement of the state's anti-idling law; continued NJDEP environment sweeps in the cities -- enforcement sweeps, I'm sorry, enforcement sweeps in the cities; the Department of Health should engage in more extensive health data monitoring and tracking, and make such data available to the public; counties and local municipalities should also help contribute to such data compilation and make the results available for the public. For public schools, bus retrofitting and/or replacements should be priorities, with a viable funding source found

that doesn't add to the school budget's burden, school bus idling near school entrances should be reduced or eliminated, better ventilation systems should be installed, major school renovation work should not take place during school hours, create asthma prevention, screening and treatment programs for children in urban communities; communities burdened with disproportionate pollution must have a meaningful role in environmental decision-making and be informed about tools they can use to address their

problems, such as New Jersey's Environmental Justice Executive Order; and finally, air pollution permits must be examined for their impacts on proximate communities before they are issued. These are among some of the measures that could be taken to reduce and eliminate the adverse health and socioeconomic impacts of disproportionate exposure to air quality on lower income and communities of color.

DR. BIELORY: Thank you very much.

Are there any questions for Ms. Caffee? I guess one major area I guess is the definition of environmental justice for our report that we need to generate, now how would you classify the definition of environmental justice and how would you interface or play it into the report that we generate?

MS. CAFFEE: Again, actually it's a working definition, I'll say that that way because as we move -- the environmental justice movement is still a young movement, it's only around 20 some years old sort of officially, and we're still refining the definition quite frankly. But essentially it refers to two things. One is that all people regardless of

their race, ethnic background, religion are entitled to the right to safe, healthy, productive and sustainable environment. And environmental justice also is an outcome, searching for an outcome to the problem of disproportionate exposure that some populations suffer to pollution.

DR. BIELORY: Any other questions from the audience? From the council?

MR. BLANDO: Yes, Jim Blando, I actually have two questions. My first question just concerns, you know, outreach education. I know the Waterfront South community is very motivated and very active, and I'm wondering two things. If that's been the typical experience in these communities that you reference, and also other issues such as language, for example, are we producing our education outreach materials in the appropriate languages, are they at the appropriate -- are they written in a manner that people can appreciate and digest? I'm wondering what your experience has been with education outreach efforts.

MS. CAFFEE: Well, the organization that I work for, New Jersey Work Environment

materials transferred, particularly into Hispanic because we all know we have a very large Spanish speaking population in New Jersey. And in other areas, in Linden, Trembly Point area, for example, we have still a large significant Polish speaking population there, our iron back community of Newark. We have a significant Portuguese speaking population to have materials that are produced in the languages that are common to the areas in which one is doing outreach to me is a no-brainer and is extraordinarily important. Because it's certainly unfair when people who mostly need the information are denied access because they don't speak nor read English is just adding insult to injury. So that is very, very important. And to also involve people who are from the affected communities that may not be English speaking communities and to have them take leadership on the issues and support that is also very important as well. Which gets back to the first part of your question.

There have been fight-backs in many communities around the state regarding people advocating for environmental justice when problems arise. But I would say maybe in the past five or so years in New Jersey because more of others of us are becoming much more aware of the struggle, the local struggles, and because more people have become better educated about environmental justice or the injustice issues and are now doing more to help support those local struggles that see more people than engaged in them. And an important example, Environmental Justice Executive Order which I am very pleased to say as the chair of the EJ advisory council to the DEP is being fairly effectively used right now by various communities that have environmental concerns, and in fact, we have six or seven petitions that have come to the advisory council and the multi-state agency EJ task force seeking relief on these issues. And so then that is one measure that we have that tells us that broader bases of communities have gotten the word about the issue and there's something being done about it. Also a couple of years ago statewide we formed a New Jersey Environmental Justice

Alliance which is comprised of about 40 different local and statewide organizations as well as some individuals so that we could pool our resources and work more under an umbrella body on these issues which would not only give us more -- help us be more influential on the state level and make policies and legislation and regulation, but also to support local efforts as well.

DR. BIELORY: Any questions? Mr. Spatola?

MR. SPATOLA: Yes, I have one question for you, Ms. Caffee. Other than bloodlet (phonetic) screening tests that can be done in the urban centers where you have this high risk area for children, are there any other screening profiles that can be done for this higher risk group that can be used to be an indicator of general condition of children's health in urban centers who are disadvantaged because of air pollution?

MS. CAFFEE: I definitely think there could be other screenings that could be

done, particularly looking for asthma. I guess now about five to six years ago in the city of Passaic of -- sorry, Paterson there were

screenings done with elementary school children by one of the local hospitals, and they were pretty astounded at the result that they got. A third of the children that they screened were asthmatic. And which also certainly prompted them into treatment programs for those children as well as education for the parents about how to make their homes less hazardous and to take away a lot of the triggers for asthma attacks and so on. I think that kind of aggressive approach really needs to be done because asthma nationwide and in New Jersey is really epidemic levels and quite frightening. But so, so many children are getting asthma. And locally again I mentioned in Trenton, childhood asthma problems here, one of the things that they're going to be embarking on screening, prevention and treatment programs to try to really get control of the asthma problem here in Trenton and to help decrease it.

MR. SPATOLA: Is asthma a reliable surrogate for the aspects of air pollution impacts? Can it be used as an indicator?

MS. CAFFEE: It definitely -- yeah, definitely, it definitely seems to be one of the bellwethers for there's something wrong with the

air if we see these giant increases in asthma. And with new reports such as the one put out by the Clean Air Task Force in February and other studies that are being done at Harvard Medical School, and some of these are cited in my written documentation that you have, and so on, we really have to take a look at what's wrong with the air quality when we see so many asthma cases, and particularly pediatric, dramatic increase in pediatric asthma, and particularly in communities of color. One of the studies that the Commissioner made reference to when he spoke, there was a significant study done in Harlem looking at asthma, and again the results were really pretty dramatic. Connecticut, I think Mr.

Brown from NESCAUM is going to be also testifying later today. I know there was a study done in Connecticut as well that show the same kind of trend. So that pediatric asthma is problematic for all children, but the children of color that are African American or Latino children are particularly troublesome, and linked to that are the type of communities that those populations are living in.

DR. BIELORY: Thank you. Mr Lynch?

MR. LYNCH: Thank you, Ms. Caffee, for your presentation, and this is Richard Lynch here. I thought that your suggestions regarding things that could be done particularly in areas where there may be disparities in income as well as in health were appropriate, particularly related to the schools. But even sort of commenting on Mr. Spatola's questions to you, my experience both as prior program manager for PE OSHA as well as a consultant who does school evaluations leads me to the opinion that in fact asthma reports and even PEOSH complaints are a

relatively insensitive measure of the significant differences that may exist as related to poor indoor air quality, particularly within the schools. As we all know, there are really four characteristic drivers to air quality concerns, fresh air supply and as a clean chemical contamination either from indoor or outdoor sources, biological contaminations, mold, bacteria, et cetera, and then inadequate temperature and relative humidity control. I would wonder if in thinking about the kind of screenings that might be helpful towards identifying problems that we not just think about

outcome related screening on the students themselves, but really talk to the state about process related screenings. That is to say that by the time most indoor air quality problems get to the point of being raised as a complaint is actually probably two or more of those categories of problems that have manifested themselves. Usually one problem in and of itself doesn't

manifest itself to the point where the one-in-ten child is going to have a problem, will raise it because a mold problem may be offset by great ventilation. However, often these older schools you have two or three problems that converge before it gets raised. Then obviously in the older districts where as you indicated the older schools have certainly in many cases a lower state of general maintenance, the threshold by which a complaint would actually be filed is often higher. People are used to seeing stains on the ceiling, people are used to seeing dirty and stained carpets, they're used to smelling odors. And therefore, because there are other more pressing issues at hand they may not be so likely to complain, and therefore a problem continues.

So that being said, I wonder if it's not worth thinking about systematizing indoor air quality evaluations in a screening way, in a screening process before we have the asthma complaints, particularly for these older

districts. So I thought I'd just sort of raise that with you as something that I think you might want to think of, so ...

MS. CAFFEE: Thank you very much, and we do have technical assistant consultants that we use who do do a lot with the public school systems and indoor air quality complaints. What usually get our consultants there is that, you are so right, usually by the time the complaint is issued the problem is a large one and usually more than one problem because people often do become accustomed to, like you said, the stains in the ceiling or some bad smells that permeate throughout the building, or sometimes problems are masked also. It's the same thing too often with environmental problems in general, people become accustomed to seeing the smokestack and so on and they think, well, you know, I'm still standing, it's not hurting me. But that's really good information and certainly something

that I mean all of the patients would like to see

happen in more systematic ways and it would be prevention more so than having to put the fires out once the fire has started.

MR. BLANDO: This is Jim Blando. One of the experiences that I've recently had, I've been to just about every emergency room in the state recently well over the last year or so. And one of the things that I've noticed is I've only been to one emergency department that actually had -- or maybe two maybe, that has actually had a specific triage room for asthma to sort of help fast track and get them care quicker. The interesting thing I found was, and I won't bring any names up, but the one hospital that did have that set up was in a very affluent well to do area. I haven't seen that inner city area, and one of the things that I also experienced being in some inner city hospitals, the day that I happened to be there 95 percent of the people sitting in the emergency room were there for primary care, not for emergency treatment. Which is of course as we all know very problematic for the health care delivery system. So we all are aware of the epidemic of

pediatric asthma, especially in children under five, we're aware many of the issues that you cited, and one of the things I do have trouble sort of reconciling is, you know, hospitals keep saying they have a need to fast track or take people who are not in the emergency room for emergency services, to fast track into the clinics or physicians in the community, and I'm just wondering what you see as the barriers as to why that doesn't seem to happen in the health care system, why aren't clinics maybe not as effective or under-utilized, why are -- I'm just curious what your experience would be in that regard.

MS. CAFFEE: You want another hour?

MR. BLANDO: Well, if you could summarize it quickly that'd be good. I'll give you 30 seconds.

MS. CAFFEE: That's a huge question and certainly a lot of it has to do with just, you know, how we approach health care in our nation in general. Some lives are more valuable than others, looked at as more valuable than others. I'm sorry, but that's the really the

reality of how things get played out. Hospitals,

right, should be all doing particularly in areas where they know they have a lot of asthma problems, they have to do better, much better triage, much better response time, immediate and so on and thus forth. I think that's just really a complex issue that has many challenges and obstacles, and some of which one of our former members of our EJ Advisory Council, Dr. Berlin, who was from then the hospital in (inaudible). Anyway, (inaudible) he was very, very much concerned about the asthma epidemic and was actually working on a lot of the multi-layered facets of the problems, and including doing some surveys and making (inaudible) and so on. So it is my feeling that even if you have some good information and something that we all need to be much more aware of and take some action on.

DR. BIELORY: Thank you very much.

(Brief recess.)

DR. KIPEN: Thank you very much,

Len. It's a pleasure to be here. I remember the day that Jim gave me a call or an e-mail and said did I want to get up and talk to the Clean Air Council about occupational asthma. And I said well, I could do that but I thought there was

something that was a little bit more breaking news. And so with that I'll take your -- and I looked at schedule as Len says and a lot of what you're hearing about is the first organ that pollutants contact when they go in the lung, but I think there's a lot of evidence that suggests we can take our concerns and our attention in a different direction, and that is the direction of heart attacks, and I'll show you at the end as I was asked to comment on the economic impact of this, but right now I want to talk a little bit about mechanisms and then I'm going to talk about the epidemiology that supports the importance of this direction. I'm going to talk for a few minutes about some research that I'm doing, some of my colleagues, or one of my colleagues, Jim Zhang is there, we're doing to try to understand

the mechanism behind the epidemiologic fact that air pollution contributes to acute MIs or heart attacks. And then we'll close up with a little bit on the economics.

For those of you who aren't familiar, the current dogma of heart disease is that there's really two different phases if you will. The first one is if this is an artery, a

coronary artery but it could be any artery in your body, you get the build up of this cholesterol filled plaque or partial blockage, and this takes place over a number of years. And it's contributed to a lot of things I'll show you on the next slide, and then taking this plaque which represents atherosclerosis or arteriosclerosis or if you look at death certificates atherosclerotic cardiovascular disease. You can have it your coronary arteries, you can have it in your carotid arteries which leads to strokes, you can have it in you femoral arteries which leads to leg pains when you

exercise, you can have it in your kidney arteries, et cetera, et cetera. You can have it anywhere, but the big problem is the coronary arteries and the carotid. What can happen is at some point this plaque will become less stable than it was at the time period before and that instability, probably a rupturing of its surface, that instability will lead the rest of your bloodstream to form a clot there, and if that clot or thrombosis completely occludes the artery or occludes it enough so that blood can't get through, as you see here, we're no longer orange

here, we're white, muscle tissue that would be served by that dies and we have a heart attack or a myocardial infarction, a death of the heart muscle or part of it. So that's what we're trying to model here.

There is a very complex cartoon which was devised for a different purpose than this, but just to take you through it, the steps leading to a heart attack are first we think people have high levels of blood fat due to diet

and genetics, that leads to the formation of those plaques that I just showed you, the atherosclerosis, the plaques can rupture and when they rupture or other things occur we get the formation of a clot on top of them and that leads to a heart attack.

There are all kinds of influences on each of these steps. Here is -- this cartoon is designed to show the genetic influences, I don't have diet on here but I have metabolism of blood fats leading to hyperlipidemia. I have the blood vessels contributing to how people get the plaque on them and to the rupture of the plaque, and all kinds of inflammatory contributing genes that participate in that which may eventually

determine who is susceptible to heart attacks or certain kinds of heart attacks and who's not. We have the formation of the clot which is subject to both the vessels still because we still have that, we have this arrow going here, but it's also subject to all the things that go along with

clotting in our blood, all these proteins that float around and the platelets which are the main clotting cells of the blood to make up the thrombus which will block the artery.

And then finally over here down at the bottom left we have environment. Smoking contributes to hyperlipidemia, it contributes in a big way to atherosclerosis, we know people get more clots, more plaques if they smoke. Lack of exercise contributes to all of this, and what we're going to talk about today though is how particulate air pollution, and I have diesel exhaust listed here, but I know we're going to be talking about particles in general, diesel is a big contributor to that. Cliff Weisel from our institute will be talking later today about diesel as an exposure and what's in there. But anyways, how particles can contribute to the formation of clot, the final step in the pathway

to a heart attack. This all takes years to occur here. This may take days, weeks, we're not really sure for the plaque rupture, and clot

formation takes minutes to hours. And that's the focus of where we're going.

This is just a picture, happens to be Los Angeles on a rather bad day, we don't see -- I was just out there for a few days, it never looked like this. It was gorgeous. But that's a bad day, and a lot of what's in the air there making the haze is particles. There's been a lot of epidemiology done since the Meuse Valley here was actually -- but then occurred in the 1930s, but a lot of epidemiology has been done over many years telling us that not only do we have excess respiratory deaths from air pollution, but we have excess cardiovascular deaths. We have these big episodes, the most famous one is the London of 1952, Donora, Pennsylvania in 1948, before that a lot of that was associated with the burning of coal for industrial purposes here, for industrial and residential here. More recently we've had very sophisticated studies which I'll show you a summary of in a couple of slides of how there are

daily changes in mortality and morbidity and we've talked a lot about the respiratory but they apply to the cardiovascular as well. Spatial differences like the Six-cities study also show that and I'll show you a different study of spatial differences in just a moment. And then finally data that probably a lot of you aren't aware of, the case crossover epidemiology studies modeled on the traditional case control but where the subject himself or herself on a different day or time period is represents the control so you get rid of all that within subject potential and doubting like smoking and diet and things like that.

We're talking a lot about particles. This is a cartoon I borrowed from Science Magazine showing you we are the thoracic particles, the PM10, the course fraction and the fine, and every time we get better and do more sophisticated study it looks like the heart disease risk trashed with the smaller particles. This -- the hypothesis of the study that Jim and I are involved in is that it's these ultrafines that are actually mediating the risk. There are no epidemiology or almost no epidemiology studies

that have been able to confine or look at ultrafine, although the PM 2.5 studies, and I'll show you one in a second, include the ultrafine, even though they all -- well, everyone includes the lower particles. Trying -- fractionated exposures is something that I think we can work on. Here is a kind of a complex graph from a study by Arden Pope in Utah that was published just last year based on the American Cancer Society's cancer prevention study II which basically followed a million Americans from about 1982 for about ten years, and after collecting data on them, followed them for mortality, basically, and they're looking at death certificate mortality. And this is hard for you to read, but right here on the left are all cardiovascular diseases plus diabetes, and then next to that here is ischemic heart disease which is the specific kind of heart disease that we're talking about with heart attacks, pre-ischemic. Looking at cause of death, this is relative risk here and this is the unity line where there's no

increase in risk. And what you can see here looking at many tens of thousands of deaths over about a ten year period in relationship to EPA

air quality monitoring data for PM 2.5 in wherever these people lived, there are about a half a million people for this particular analysis, we can see ten to 15 percent increases for all cardiovascular diseases, and up to 20 percent increases in mortality for specifically ischemic heart disease. There are some problems with this data, the COPD data actually shows (inaudible) although they argue that it's due to the death certificate miscoding into the pneumonia and influenza. We don't have to go into those details but there's a lot of other data besides this particular recent study but it had a nice graph, although I guess it doesn't project too well. Here are the actual numbers, I'm going to skip that for now and go ahead. This is another table which I summarized, it's easier to read if I summarize it, also from Arden

Pope from about five years ago which is looking at the daily change in death rates, looking at 60 different epidemiologic studies that have basically been done over the last ten to 12 years is all. And looking at them, looking at 35 different cities and what we see here is this is the percent of total deaths across all these

different studies that are attributed either to all deaths, respiratory deaths, cardiovascular deaths or other kinds of deaths. And what you'll see is that most people die of cardiovascular deaths. Now, that's -- some people argue that that's changing and that cancer is taking a bigger and bigger role, but we still have a huge proportion of deaths are attributed finally to a cardiovascular cause. And here is the meta-analytically (phonetic) accumulated data of the cost percentage increase for death, costs for respiratory, cardiovascular or other or all causes attributed to a change in the PM 2.5, the fine particulate matter of 50 micrograms per cubic meter. Increase in PM -- of 50 micrograms

per cubic meter. You can if you want to divide that by five, that's the increase for the ten micrograms which is what the last slide was, the last slide was per ten micrograms, here we've switched the scale to 50 but you can divide or multiply by five. So there's a seven percent overall increase in death day to day when the PM 2.5 was changed by 50 microns. 50 microns is a big change, we don't see that very often in the United States, we'll see those kinds of

fluctuations at work, away from work. That's a big change. The last slide using the ten microgram denominator, we can see that in our environment. As you'll see here, the biggest increase was for death attributed to a respiratory cause, it's a 25 percent increase. Cardiovascular was somewhat less than half that, only 11 percent. So we saw bigger changes over all these studies, we didn't see that in the last study I showed you which showed a bigger increase for cardiovascular than respiratory.

Nevertheless 11 percent here. But if we look at the percentage of burden on us as a population, in other words where are most of these excess deaths occurring, even though the risk was bigger for respiratory, cardiovascular death is by far more common. You all know more people who have died of a heart attack than died of pneumonia. They're just more common in the overall population. So in fact the excess death burden is 70 percent attributable to cardiovascular. Again establishing not that it's more important than respiratory, I mean that we shouldn't overlook it in our attempts to understand the kinds of things that air pollution, particle air

pollution can do to us.

Now, I mention these newer case crossover studies, there are two that are very positive, there's one that's negative, I don't have it up here, where they have looked at the increased risk for MI related to PM 2.5 elevations not space to space or year to year or even day to day, but within two hours of a

person's reporting that they had the symptoms of their heart attacks, they went in and interviewed people, either that 800 MIs in Boston or a similar number who interviewed in Germany a few years later in the second study, and in both of these studies comparing the interview timing with the air pollution monitor, in Boston they found a 50 percent increase in MI risk, it's not deaths, this is actually hospitalized surviving heart attacks. Or 25 microgram increase in PM 2.5, or presumably about a 20 percent increase for the ten microgram benchmark. In Augsburg, Germany they did not find the relationship to the general air pollution monitor that was set for that city, but when they talked to the people, and this was reported in the New England Journal just about in November, they found almost a three-fold

increased risk for getting a heart attack one to two hours after you have either driven, walked or ridden a bus or a bicycle in traffic. People, basically, asking these questions and that is

very provocative, again, for the same hypothesis, that maybe the particles are doing it. This is all adjusted for other co-pollutants like ozone, carbon monoxide and things like that. There is extremely compelling rodent animal evidence that particles immediately, within an hour or two of placing them in an animal's trachea, these are not inhalation experiments, they're injected in, that within an hour you start to get increased clotting in the animal's blood. These are hamster studies done repeatedly, most of them though by one single group in Belgium. And similarly it's been well documented that the very little particles actually do get into the bloodstream, they don't just create inflammation in the lung which is the predominant hypothesis of how the particles have contributed to the overall burden of heart disease, but that in fact they can pass right through and float in the bloodstream. That's been shown in humans as well. And that's important because when we're

trying to explain things that happen in an hour

or two of the particle exposure or the change in particle exposure you can't really rely on our tried and true mechanism of inflammation of the lung because you can't create inflammation. You can't develop it. The white blood cells and other things that happen don't move that quickly.

Well, this is a kind of a complex statement and I'm probably running short on time, right? All right, five minutes, well, I'm not going to spend a lot of time then, I'm going to skip this mechanism thing. We'll do that some other time.

This gets to the heart of what Dr. Zhang knows about, this is our diesel engine. It's however many watt generator, electrical generator that we have up in the penthouse of our facility that puts out a standardized amount, it's been categorized by investigators from the University of New Mexico, the standardized amount of exhaust containing particles, and we're going to be doing experiments trying to understand how this one to two hour thing can happen by moving that exhaust down this pipe and into our controlled exposure facility inside -- well, the

inside of which you can see through this (inaudible), is a subject sitting in there, this is our technician sitting out in this control area watching the subject through this window. We basically have people that have been doing this for about 12 years now, breathe pollutants, sometimes they're occupational pollutants, sometimes they're air pollutants, general environmental pollutants, breathing them for one to two hour experiments at levels that are seen in the general environment where we use sophisticated biological monitoring to try to pick up the subtle little changes that we think may indicate something without subjecting the subject to the risk of the event that will be the end, the ultimate end point that we're trying to study. What are these subtle changes that we're measuring; we are not measuring heart attacks in our study of young, healthy people and we don't have any reason to believe that we're going to be inducing them, but we do think that some things will temporarily change among their platelets and their blood cells. There's a concept now in

cardiovascular risk known as dysfunction, not working right, of the lining of blood vessels.

And this is seen in a bunch of different diseases like diabetes and other things. You don't see it much in young people, people in their 20s and 30s. But when it happens and when it first, we think it affects how the blood coagulates or forms thrombi, it affects how platelets work, and it affects a whole host of other things. It's very common in smokers, diabetics, and people who have heart disease. We think it comes before plaque formation so it actually will contribute to atherosclerosis. And it also we think will happen acutely under the effect of a pollutant like particles when you walk out into the world. We can measure this, and I'll show you some pictures of them, we can measure this noninvasively basically like doing a blood pressure test and using an ultrasound machine on people to measure how the vascular epithelial changes and -- let's skip the genetic part, I'm just going to move on a little bit. This is what

another picture of what, this is the endothelium here of somebody with a plaque and a clot forming in it, it's another picture of clot. Let me skip ahead, this is the epithelial dysfunction. We basically take a transducer like an ultrasound

thing that you use to see the size of a fetus or look in an artery for something and we blow up a blood pressure cuff and we measure baseline and then after the person breathes the pollution for an hour or two we measure and look to see if there is a change in the amount, change in the diameter of the blood pressure cuff from before they went into the experiment until after. It's very noninvasive, it doesn't hurt at all. The other thing that we're doing, and I'll show you a quick cartoon here, is looking at the platelets in their blood. We will draw their blood before they breathe the pollution, we draw their blood again after they breathe the pollution, and our hypothesis is that the platelets will go from looking like this to looking like this becoming

activated. Again we think that the particles will do that. If we find these things in our subjects it helps to understand how particles might be really having these effects within an hour or two of people breathing them. All these changes are known to go back to baseline after the impact of various different stimuli is shown. We measure this by looking at the expression of proteins or the withdrawal of proteins like this

protein here going away when the platelet gets activated and that's done in our (inaudible).

These are just some pictures of what the brachii looks like. So I think in the interest of time I'm not going to go through each of the things I mentioned, all of them I mentioned each of these things to you already. I'll go with the cost piece which Jim had asked me to develop. I have data that's not quite from last year but in 2003 in New Jersey there were 22,000 heart attacks resulting in a hospitalization in the State of New Jersey. And looking at some data I found in the literature,

this is not exactly my specialty, for 1997, so seven years ago based on an average of 750 U.S. hospitals the average hospital charge for somebody who was hospitalized with a heart attack was $15,000. That did not include the physician fee, but we know those are trivial, and of course it doesn't include inflation over this seven year period, and it doesn't of course include indirect costs like lost work time, increased home care and stuff like that. Multiply it out, it's pretty simple, it's 350 million dollars in New Jersey. If we add in all these inflators if you

will, we're probably looking at 500 million a year for MIs. So if one percent were due to particle change that would be three and a half million direct health care dollars, not counting the other stuff. I think at this I need to conclude. I'll be happy to come back and talk in more detail about what we're doing, and thank you very much for the opportunity.

DR. BIELORY: Thank you very much,

Dr. Kipen.

MR. BERKOWITZ: Thank you very much, very interesting presentation. I wonder if you have been following the debate on the soot bill, the so-called soot bill in the State of New Jersey where there is an effort on their part to mandate cleaning up diesel trucks, and there have been some very significant pro and con kind of arguments, much of which falls out on economics. Those against it are saying that the fleet will eventually take care of itself until new EPA recommendations so they don't have to go through that certain period of time before those vehicles are retired, and the cost effectiveness and how people are going to afford this. Have you been following that, and where do you fall out on

these issues?

DR. KIPEN: I am reading that on occasion in the Ledger but I can't say that I fall out on or have a strong opinion. What -- the hypothesis that I'm investigating would say that soot spewing trucks both with their

contribution to the general air environment and to the more specific microenvironments in cities in certain work places where those kinds of engines are still being used, that that would be potentially the kinds of triggers that we're talking about here. We're not talking about long-term exposures and long-term effects, we're talking about short-term exposures. The levels of exposure that we're using for the particles are the kinds that we have -- that the literature tells us are found around bus depots, in train yards that run diesel engines, and of course in mines and perhaps around fire fighting scenes as well that are in that range that we're going have people breathing. So I think the argument can be made, but I can't say that I've developed an opinion on the details of the legislation.

MR. BERKOWITZ: Thank you.

MR. HANNA: Thanks for your

testimony, Dr. Kipen, very enjoyable. I think I'm going to go out and get my cholesterol tested

this Saturday.

My name is Toby Hanna, by the way. I have two quick questions for you. One, you mentioned your study, it sounds very interesting. I'd like to know if you could tell us maybe a ballpark what your schedule is for completion on that, and just let me get my second question in.

DR. KIPEN: The study is funded by the United States EPA. We hope to start studying our first subjects probably around June to July. We're doing another diesel study which will start slightly before that but it doesn't have direct heart parameters in it. So it's a four-year study. We may be able to complete it a little more quickly than that if all of our logistics work out as we hope. Our exposure facility is becoming more and more popular and crowded, and we have to avoid tripping over one another, different investigators.

MR. HANNA: The second question is related to that study, it's probably a long answer, but if you could make it short, how are you quantifying, what assumptions are you using

for the actual diesel emissions or the fine particulate emissions, is that direct measurement or are there some factors that you use?

DR. KIPEN: I'll give you the short answer and then you can talk to your colleague Dr. Zhang about the details since he's really in charge of that. We're using a number of different quantifications, both in terms of particle size, measurement, air concentrations and in chemical, measurement chemical characterization of the particles as well. I think Jim could answer at much greater length exactly how we're doing the particle measurements.

MR. ZONIS: Irwin Zonis. Doctor, I was going to ask whether there was any understanding as to whether the particulate matter existed in the bloodstream in dissolved form or particulate form, but as I look at the slide from Science that you presented to us I guess at largest the PM 2.5 is about the same size as bacteria, and it goes down from there to where the particulate matter may be the same size as a virus particle or even smaller. So I guess my question doesn't matter because we accept the

fact that bacteria are in there and certainly some of us have viruses as well.

DR. KIPEN: Well, it actually does matter though because there are legitimate questions about whether particles as we understand them and as they interact with cells and things in our lungs and in our body, whether they still exist as particles in the blood. We're actually doing a second exposure in the study with an exposure that we've done meaning people have two different exposure days. The other exposure is to some manufactured or de novo indoor air particles made by mixing volatile organics and ozone. Those particles which we think will have about the same size composition as the diesel although they won't have the carbon monoxide and they won't have some of the other (inaudible) containing components, we think that those particles are much more likely to dissolve and lose their particulate shape. And as we understand this now that has some relevance to

the field of marrow toxicology, and it has some relevance to the fact actually it turns out that the body has a lot of cells which give off their own microparticles. Very biologically active

things, they're not just inert stuff like they were testing in those hamsters in Belgium, inert poly (inaudible) particles. But it's a really important question and we're not quite ready to specifically measure it yet but we've got some parallel animal experiments that will be occurring with our diesel exhaust and those might be inhalation experiments, and with those we may be able to get at what the chemical physical nature of the particle is at different places in the body.

MR. ZONIS: Thank you.

MR. BLANDO: I was really fascinated by the acuteness of the response that you're seeing or hypothesizing, and one of the things that, and I'll be using a poor choice of a word, but I've heard epidemiologically use the term harvested, and I guess I'm curious due to the

acuteness in would you presuppose that the people that or cases in these studies that they sort of would have got the MI anyway and the particles just sort of facilitated it sooner, and I was wondering if you could just kind of comment on that.

DR. KIPEN: Well, as you know, Jim,

harvesting is a real buzz word in epidemiology. And many people who've looked carefully at it like Joel Schwartz (phonetic) and analyzed the London episode and analyzed some of our other episodes seem to feel that at least over those acute episodes that the effect seems to persist for so long that it doesn't look that much like harvesting. Acutely I would hypothesize that people who -- most people who are getting MIs are already -- are ripe for them one way or the other. That doesn't mean they were going to get it, and it doesn't mean that -- but I think they're at-risk people. I mean that is our -- we believe that very much. We don't think we're

forming whole cloth in people who have completely normal arteries and this is happening to them, although I guess some people with some of the various kinds of susceptibility in terms of their susceptibility to thrombosis, you could think about that. But I don't think harvesting is right because harvesting implies really that things were really about to go over the edge, and I don't think we know that. I don't think we can go that far.

DR. BIELORY: Any other questions

from the council? Thank you very much, Dr. Kipen. That you respectfully realize that the injury does not only occur at the contact surface but as you said by physical terms the problem can actually have the distant organs to attack. One of the other domains of the universe that I had requested at the initial side was that legislators are important in understanding we have to appreciate their input on the system as advisory, and we're very fortunate to have somebody, Herbert C. Conaway, who is also a

physician and so he can appreciate both sides of the aisle -- not Democrat or Republican, but health care versus the issue on the impact on the patient, on the individual and our citizens, and he's from Burlington County, District 7. Mr. Conaway -- Dr. Conaway, sorry.

DR. CONAWAY: Good morning. After that nonpartisan comment I'm going to have to rip up half my speech. Well, I'm here as a legislator, not as a physician quite frankly, although I always bring my sensibilities as a physician, as a health care provider to much of the work that I do in the assembly. I recognize that I am surrounded by endless scholars in this

area, and so we're not treading the grounds they know so well, but rather to come and, one, state that my own study of this has engendered in my own mind a need for the government to act in this area to reduce exposures, to improve the environment to which our citizens are exposed. We know, the evidence seems to suggest that high

levels of ozone and smog, soot and smog are detrimental to health, and we see it in dramatically increases in rates of asthma and other lung diseases among our population. We know that children in particular are -- and the elderly are more susceptible to these diseases, children because of their body mass, the air they take in compared to the body masses makes them susceptible. They're also growing, and the dynamics of the physiology make them susceptible. So that we have a special interest certainly in children at the beginning of life to make sure that they don't suffer the kinds of lung damage that will have detrimental effects on their lives as they proceed through it.

Having said that on the legislative front I do believe that there are some initiatives that the government should undertake

in order to improve the general public health. We recognize here in New Jersey that we are downwind from a lot of the sources of our problem, but there are a number of things right

here in our environment. We look at the prevalence of diesel, diesel vehicles whether they be buses or trucks, school buses, other heavy equipment used to build things here, generators and the like, power plants that we produce a lot of our own soot and smog right here. And we have a DEP that has a regulatory oversight in this area and it is for legislators to make sure that the department is empowered to protect the public health.

Similarly along those lines working with DEP on the specific initiatives that I've mentioned, I suspect, and I haven't been here all morning, I apologize for that, that there has been some talk about the Smith McKeon Manzo (phonetic) bills and the legislatures that would bring some increased regulatory oversight to diesel emissions. And as I always say to people, legislation is a work in progress. This is a start and as it works through the process we would expect those folks who are interested

environmentalists, people in the health care profession, advocates of every sort of business, et cetera will weigh in on this legislation hopefully to make it better and stronger. But it would increase the regulatory framework around diesel fleets trying to reduce those emissions over time to deal with the problem that we see in school bus -- exposures of children in school buses, in reducing those emissions over time -- emissions over time, using the powerful statement both contracting to make sure that those who are doing work for the state would apply or use implements on their machinery which would reduce the output of harmful emissions. As I said, this bill is a start, more work will need to be done, but when you, just focusing for a moment on the school bus question of the portion of this bill, and as I've already mentioned, have been mentioned here today, there is a great deal of concern about the special susceptibility of children. We need to make sure, it seems to me, that schools are able to protect children from the effects of this disease -- of these diesel engines. And are assisted in moving -- for instance, I can remember bounding out of school,

one way or another, standing out waiting here on the bus, they're all lined up in the front idling in front of the school building, there's an awning over the school building, trapping these tail pipe emissions. We need to think about how we manage the ingress and egress from schools and develop rules and regulations around that in conjunction with the school boards. We need to make sure that the school buses are retrofitted and of course that there's a dollar figure that's going to be attached to that and that puts a lot of strains of course in our budget as everyone knows. But we certainly need to be careful about imposing mandate on the school systems that are costly that will not be paid for by the state or at least and while this bill does establish a fund we want to make sure that the fund is adequate to do the job in retrofitting these school buses so that we can reduce the exposure of children to the harmful emissions of school buses.

The -- but beyond that and there are other issues related to air quality that affect

children. We need to incorporate standards in building of schools it seems to me to make sure

that we reduce gases and other vapors that might collect in school buildings, dealing with how the roofs are put together and the kinds of materials that are used in roofing, the kinds of schools are being built, care is being taken again on the construction equipment that's used to build those schools and the schools often are adding onto schools, should schoolchildren be in the area, what kinds of rules and regulations should we adopt when schools are doing major renovations, should we look at that as well.

So there -- and with an eye towards developing I believe a standard of air quality in schools, children spend a large amount of time in there and there's some emphasis to suggest that air quality in schools are not what we would like it to be. And so I think there should be some legislative activity around air quality in schools to make sure that we are providing as

healthful an environment for our children as we possibly can.

And I guess I can't help but say, and I'll end here this morning as I say, you know, we legislators depend upon the work of New Jersey Clean Air Council environmental advocates

in health to help us with the legislation that we should do in this area, express some concern about the administration and their seeming attempts to try to lessen air quality standards. If you look at our current air quality and air quality act we find that far too many people under the current standards are living in unhealthy environments, and that there are far too many counties that show inappropriate levels of ozone, smog and soot in the air. We know that when those levels spike that we'll see an increased admission to hospitals, increased rates of upper respiratory infection and asthma (inaudible). So we have a problem even with the current standard and it seems to me, glad that there was a recent defeat in the committee, as

far as I know the administration still insists on changing the rules which would allow more pollutants into the air, (inaudible) more pollutants in the air I think that's a -- well, think, I know that's a mistake and needs to be prevented. These are (inaudible) sued the Federal government when they (inaudible) standard, we need as a government to continue to push ahead and to advocate for clean air. We

need to get the Federal government to make sure that those states out in the midwest are doing the job to reduce pollution, that they should be allowed to not modernize the smokestacks, to not build new plants which would have as part of the structure just the smokestacks the best available sign of reducing smog to me is not the way we ought to be going. The Federal government really needs to with the help of everyone not only here in New Jersey but across the country needs to do the right thing in this area and make sure that we are constantly pushing the envelope on

improving air quality.

And with that I'll end, and if there are any questions I'll take them; if not I'll withdraw --

DR. BIELORY: Thank you very much. Questions from --

CHAIRMAN EGENTON: Dr. Conaway, it's certainly a pleasure having you here today, we appreciate your input and expertise and your involvement in the legislature. Do you believe that right now as it stands there's adequate funding in charity care on one of the issues that we're tackling with is as you have high ozone

days and there is an increase in asthma, obviously children and the elderly particularly in the urban areas are using emergency rooms as, you know, a place where they can get treatment. I wanted to get your input because I know that's something that you tackle with, with the state budget and with adequate funding as far as the correlation of proper funding for hospitals and charity care and delivering those services to

people that need them.

DR. CONAWAY: Well, you know, I think you are -- I appreciate the question about charity care, no, there's not enough charity care funding, but I think when it comes to the treatment and control of respiratory diseases the rubber meets the road in primary care. That is primary care involves -- rather, charity care question really involves what kind of care is rendered in the hospital. The fight needs to be in the primary care doctor's office and we need to look at Medicaid programs or other health care programs, availability of health insurance to make sure that children and particularly in those urbanized areas where there tend to be higher levels of smog and soot, that there is -- that

people are adequately insured, that there is a doctor there available to see that person, put them on the kind of regimens that will adequately treat their asthma to prevent the long-term implications on their pulmonary health. And also

to advise them about changing the environment that need to be undertaken, safety to prevent, again, asthma outbreaks. So charity care is an important question in and of itself, I think in terms of dealing with asthma exacerbations the emphasis and focus needs to be on access to primary care, getting someone into a doctor's office, developing the treatment programs to prevent asthma and the ward expenses that people need to pay and the government needs to do the job to make sure that we are working, everyone needs to work towards cleaner air.

DR. BIELORY: An extension of that is that as we heard from Valorie Caffee, we have an overuse, primary care is an ideal scenario but they're using the emergency rooms. So should we be allocating some funds in emergency rooms so we can make a conduit back to a primary care? I mean I don't see that bridge being created because we can say they should be going to a

primary care and they're not going. They're using the emergency rooms.

DR. CONAWAY: Well, they are using the ERs and one of the problems, I mean, if you -- you've got a health care system particularly looking at the Medicaid population, physicians are not paid anything like what is an adequate rate for caring for folks who have Medicaid as their primary insurance. Now, when that is the case you can expect that there will be less people providing that service, because there will be less availability and less access because, after all, physician offices are small businesses. At the end of the day you have to have more revenue coming into the business, pay yourself, pay your staff, pay your property tax, et cetera, supplies you need in the office, and that equation needs to work out. And when -- if you are in an environment where you are likely to be exposed to a large number of people who have Medicaid as their primary insurance you can expect, law of supply and demand, that there will be less availability to treat patients because the financial equation just won't work for many people.

Now, you mentioned this transition from high school back to the primary care office. A lot of that can be improved as the country moves forward (inaudible) to improve our use of electronic medical records, productivity between the physician's office and the hospital's labs, radiology, et cetera. The technology infrastructure that will need to be created help these problems, you come into the emergency room, they leave the emergency room, the primary care physician doesn't have ready access to the exam, the laboratory data that was collected, the radiology data that was collected, there's no easy access to that. And we need to develop the standards and make the investments that will create the kind of activity that will improve the quality of care that is provided and the outcomes that flow from it. So it's a very complicated question, it's one that does take a lot of thought. We're working in that direction and more needs to be done.

DR. BIELORY: In the past the Clean Air Council has heard testimony that not only diesel exhaust but traffic exhaust in general,

the vehicle miles traveled in New Jersey is

phenomenal and undoubtedly contributes to the problem that we have. One of the things that amazes me, like many New Jerseyans I spend a lot of time on Route 1, and looking at one side of Route 1 and seeing a residential development and looking at the other side of Route 1 and seeing many stores and commercial establishments and not seeing any means for a person to get from one side to the other without getting in the car and driving five or six miles, to me is astounding. When there are moneys that are allocated for work in areas like this should there not be a requirement that there be access without using a motor vehicle of any type?

DR. CONAWAY: Well, if I understand your question you're concerned about the way or the lack of organization around growth and economic development, and that we often have centers of work that are well removed from where people live so that if you live here and you work over there and there is no way to get from here

to there without using a vehicle that creates a problem. People have to get in their car, they're idling, they're running those vehicles, they are contributing to the level of ozone. We

know that's a problem. It's one of the reasons why Smart Growth initiatives I think are so important, so that we can have people, we can organize our communities in a way that will allow the co-location of work and play and home life so people can walk, ride their bike, have less time in the car, spend more quality of life -- having their quality of life improved by sitting in the car less. That is a, you know, I understand what you're saying. We're not going to get through overnight. This last administration I think the administration (inaudible) wrestling with this change, it's going to be a continued support for the concept of Smart Growth, but that as I say, you're talking about many paradigm shifts. People love their cars and people seem to love their big houses out in the country, and as long

as that is the case doesn't mean we shouldn't work toward alternatives for people so they can make a choice and live and work and play in a geographic area that makes sense, that protects open space where you can move around easily, walk to the grocery store, walk to the park with your kid and come home. You know, we've got to create those options, we don't have enough of them now.

But that's where we're going to be going I think.

MR. BLANDO: In terms of the charity care issue that you mentioned, for example pediatric asthma and so on, I recently looked at some of the data for the reimbursements for hospitals, for example, for charity care, you know, 50 percent of the hospitals were only reimbursed 40 percent of their charity care costs, and then they displace I guess that cost by charging the rates that they charge to people who do have insurance and so on. And I'm just wondering if clinics and primary care physicians because of Medicaid reimbursements are so low do they have the ability to themselves and

individually apply for reimbursements for charity care or is it only hospitals who make up that difference to increase access, because it would be cheaper for a clinic or a primary care physician to treat a child with asthma than it would be for an emergency department.

DR. CONAWAY: Well, you raise a very interesting point that has been the subject of much anxiety and angst among the physician community because we physicians as individuals don't have the ability to provide -- to apply for

charity care because there would be more people applying for charity care. It is an inefficient means of doing that. We hope -- you hope that if people do come to the office there is some reimbursement that flows following that encounter in the office. Charity care, as you know, something that's months and months delayed. Physicians provide billions of dollars in charity care today, and perhaps that's a good deal for the government and a good deal for society and so

I'm sure we think that we ought not change that. But there are consequences to uncompensated care, particularly in terms of access and particularly as you try to think a holistic way about how this is organized, our health care system to meet the needs of our citizens. And to the extent that the economics are not there for the primary care provider, and highly urbanized areas there is currently underserved, unless we do something to change that dynamic we will not be able to achieve this network of primary care physicians to provide service at less cost, more efficient, better outcome than you're going to be able to get when people rely too heavily on emergency room hospital services.

DR. BIELORY: Dr. Berkowitz.

MR. BERKOWITZ: Thank you, Dr. Conaway. I want to just mention to you the school construction corporation program and the Abbott schools that are being built. That seems to be a very hot topic in Trenton these days. I think that it's important for the legislature to

realize that a lot of these schools are being built on environmentally challenged sites, extremely environmentally challenged sites. And I would hate for us as a state to begin to short circuit or short cut the processes that need to follow as a result of political expediency to expect some of these sites to come into utilization as clean sites do at the same cost (inaudible). We are putting students on sites that are contaminated, why; because they are the sites that are available. We have very few options. If we short circuit the studies and evaluations which are costs we are going to be doing harm to students. I would just caution the legislature to be careful and look at this from an objective point of view.

DR. CONAWAY: You didn't ask the question but I want to make a comment following

on that. I have had conversations with people who've worked in the area of construction and environmental engineers and others who have

expressed a great deal of concern to me, particularly because we are talking about a costly process here, that the way that we are organizing this very important effort, an effort that I support, that we are spending far too much money than we ought to. We're going to be saving those funds perhaps to help the acquiring of better pieces of land. But there are as I understand it a number of inefficiencies in the process for getting these schools built which are driving up the costs (inaudible) the taxpayers have limited funds and which it will affect the public support for these programs incidentally. I'm glad that frankly the governor has placed a moratorium and we need to begin looking at these processes and break them down and see where we are requiring redundancies, paying people much more than they ought to be paid to do things that fewer people, less costly people can do in the area of environmental control and analysis require certainly an architecture, and you name it. There seems to be a lot of crying on

inappropriate costs in this program, and it will affect how well the program works and public support for that program. So we need to make sure we get it right. And so thank you for that comment, and I hope during the coming months that we will -- there will be a thorough review of the entire process for getting these support schools built.

DR. BIELORY: Thank you very much. Let's move on.

At this point in time I believe David Peden. Dr. David Peden is professor of pediatrics and medicine, and he's director of the UNC for Environmental Medicine, Asthma and Lung Biology, so he has an interesting perspective, as well he's a fellow allergist, so in that regard he appreciates the impact of a practical response time on disease. And I specifically asked him to come in, we've had a variety of entities today, air pollution and asthma, you've been hearing it so much, here's a report from outside that we know so much about our state; is it the same or is it different. Dr. Peden.

DR. PEDEN: Thank you for inviting me to visit New Jersey. The way I'm going to

approach my presentation today was to try to look at this question from a patient's perspective. Because I think at times when you -- while I'm going to be presenting data, it's important to understand this from the perspective of the person who actually has the disease. So one of the first things, and I think we could (inaudible) this, so I wanted to look at where air pollutants comes from; it comes from lots of places. And I think a particular response is too in particles much of these same sources contribute to ozone and gases pollutants as well. All of these are ones that you can actually regulate pretty well industrial sources, automobile and mobile source sites, diesel, we've heard a lot about diesel today, (inaudible) power plants. There are also some domestic sources that could be dealt with, there are environmental accidents although this might be mitigated by the different force management to put in policies, so a variety of sources which add to the complexity of this question.

So does air pollution cause asthma or lung disease; I think that's the -- and the short answer is yes, it does, it certainly

exacerbates asthma and exacerbates pre-existing lung diseases, which are evidence that air pollutants impact pathogenesis involved (inaudible). Those agents that are very probable in developing asthma or allergy and lung disease include diesel exhaust, and environmental (inaudible) and actually all the toxins some of those disparate. These mixtures are remarkable similar. They both derive from low temperature combustion of biological materials, whether it's fossil fuels or tobacco plant, the chemicals and the size of the particles and the color of groups (inaudible) in the airway is pretty similar, and they biochemically have about the same effect, including very much to promote allergic type biology in the airways. Others that are possible from the perspective of causing asthma and air pollutants -- I'm sorry, causing asthma and lung disease include those, you know, my outside

(inaudible) and other particulates and as was alluded to by Dr. Kipen the reality is that particles come in all shapes, sizes and shapes and colors, they include metal ions that have objectives that cause oxidant stress, chemicals from these that become intercellular oxidants,

biological materials, endotoxins, (inaudible) is actually a product of bacteria and that becomes a pollutant because (inaudible) biological sources in my state one of the biggest pollutants is actually involved in industrial hog farming. The way that it's dealt with is we have literally thousands of pigs in a barn, and pig exhaust falls through the floor and flows into a lagoon that's (inaudible) and it's sprayed back like a septic field, it sprays into the air. People who live next to dumps and other places where there's biological materials can have this happen. It's also probably an important domestic pollutant (inaudible) about indoor air quality and one of the issues -- one of the many issues involving

indoor air quality is use of tobacco in the home and also indoor humidity is actually causing a significant issue. And so it comes down to housing codes and the way housing buildings are built will be a way to deal with the air quality issue. And indeed low dose endotoxin may also contribute to causation of diseases, particularly (inaudible) from last year's New England Journal of Medicine, and this looks at oxides and nitrogen, this looks at change in lung functions

in females, this actually, girls are the lighter color and boys are -- males are the darker color. The take home point here is that people that live in areas with high mean levels of nitrogen dioxide have decreased lung girth compared to what people have in (inaudible) areas.

And this horribly defective slide is another study, and this is more recent -- well, actually, this is from the Journal of the American Medical Association and this is looking at the relationship between spikes in air pollutants and particularly ozone, and changes in

health and acute health outcomes that are relative to asthma. The take home point here is that levels that are actually below the current EPA standards, there was still a significant morbidity noted. And so even at levels that are below the current standard, .08, .05, average over eight hours there was still morbidity that exists, particularly in regard to ozone. What is notable here is that this signal is seen in people using inhaled steroids that these are by quasi definition asthmatics (inaudible) have more significant disease than asthmatics that do not. It's important to note that asthma is an

inflammatory disease, it is indeed a chronic inflammation, and in children allergy is the leading risk factor for developing asthma. But pollutants can clearly impact that whole process. And so anything that enhances inflammation is an important issue.

It's notable that most of the epidemiological studies when you see the effects

of an air pollutant to asthma exacerbation it usually doesn't happen the same day, there's a one to two day lag time. And that lag has been taken to represent the main theory requirement for induction of some inflammation before one has exacerbation. So you can argue people that they see the red air, a red ozone day, everyone is braced for it that day, some heat exhaustion that day. It's usually a day or two after, and as it's already been pointed out, it's difficult to decide which asthmatic that we've seen that day had an air pollution and who also had one because they had a virus or tract infection. So if we look at an aggregate it's very clear that a variety of pollutants including ozone and particles, ozone and particles will exacerbate disease.

Now, this is a really interesting study that was done as a result of an economic situation in Provo, Utah Valley. You've already heard reference with regards to particulate air pollutants and cardiovascular disease are also

being studied. And what happened here in Utah Valley, there was a steel mill that was closed because of a strike, there was a labor dispute and the steel mill was closed from mid 1986 to 1987. The slight bar here is in January. And what one saw before and after the strike was that in the winter there was a peak when people would make in PM 2.5, and there was also a peak in people admitted to hospital for either asthma or bronchitis. Because of the time of year this was, I think prior to this economic accident as it were, they responded this must be the viral infections. And it was thought to be do to common viral infections which occur routinely in the winter months. But intriguingly when this occurred you had a significant dip and then when everyone got happy and the plant opened up again you had immediate recurrence of respiratory disease. So this is a real live regional situation that's unique because in this

particular area this steel mill was the only

significant fixed point source of air pollutants, and when it shut down large numbers of respiratory tract admissions to hospital also increased.

So I've tried to address, you know, where the air pollutants come from and does air pollution cause asthma or lung disease. And very briefly and superficially I thought I'd try to address those points. Now, a more vexing question is how does air pollution worsen my asthma. And a point I alluded to earlier is that most pollutants one way or the other induce oxidant stress. And this oxidant stress has a lot of effects on the airway. Oxidant stress can be due to the pollutants themselves, and oxidants are generated by cells in the airway that are responding to pollutants. And I won't go through this whole cartoon, this is a cartoon, this is your airway, this is your airway on pollutants. And these cells are usually -- these are pus cells that move in and out of the airway and a lot of the studies that I'll describe to you in just a minute, one of the areas we look at is the airways, is airway inflammatory cells that don't

(inaudible) as a result of pollutants (inaudible). And they also enter the airway as a result of asthma exacerbation. So there are a variety of these pollutants, I'm not going to list them all, but the bottom line is pollutants themselves, ozone levels and pollutants from and products of cells responding to pollutants all cause stress to the airway. And the potential mechanisms by which these oxidating pollutants worsen asthma is they may enhance response to something you're already allergic to. So by itself it may not be that big a big deal, but when you're exposed to the pollutant and to something you've become allergic to, such as housedust mite, and in the inner city you usually see the cockroach allergen, you may have an increase in the response to the allergen because you've primed the airway by pollutant exposure. And then the presence of allergic inflammation itself, if you have a significant airway inflammation due to the allergy, that may modify the direct response to the pollutant, that may seem like somewhat trite points, but they are somewhat different scenarios.

25 Now, this slide is a slide from a

1 study done by a group at the University of
2 California-Los Angeles, this study was lead by
3 David Diaz-Sanchez, and they've done a lot of
4 work looking at the effect of diesel exhaust
5 particles on humans, and this is a human
6 challenge study in which volunteers agreed to
7 have some diesel exhaust particles placed into
8 their nose and you will realize for the first
9 time a material called keyhole limpet hemocyanin,
10 or KLH. This material is something that most
11 people don't see, you don't come across it, so
12 it's a really good tool to look at how a person
13 responds to a new allergy. This mimics the baby
14 exposed to cockroach or housedust mite at age
15 two. These were all volunteers. The take home
16 point I want to show you is that the molecules
17 that are associated to the development of
18 allergic response to something, IgE and IgE
19 subclass 4, these two, they were increased
20 directly against this KLH when people had been

challenged with diesel exhaust. In the absence of diesel exhaust usually down here, so here is a situation where a particular pollutant was able to drive a person's biology such that they are making an allergic response to. So this is one

of the first situations in which an air pollutant was shown to likely cause at least new allergy to mature. There is robust information that once you are already committed to being allergic an air pollutant can worsen your response to that allergen when you're subsequently exposed. Same group did a study, I'll show you the slide here, this is diesel exhaust challenge on -- this is ragweed allergy challenge on, and this is the combination of the two, and with the combination of the two you see an increase in this particular readout, this is ragweed specific IgE. IgE being the serum molecule that is essential for development of allergy, in many ways defines allergy, but if you were to look at some of these inflammatory cells such as neutrophils, pus cells, or eosinophils which are the allergic

version of those, those are also increased more so with (inaudible). In this particular slide diesel by itself wouldn't have seemed to have done much of anything, but coupled with the allergen it really did.

Now, we've done a study and at my agency is actually, it's worth pointing out that it's an agency of the University of North

Carolina but we work in a building and we work very closely with the human studies division of the United States Environmental Protection Agency. So they built this facility on the UNC campus, some argue so they'd get better parking for our basketball games. But that aside, what we found was that if we exposed people to endotoxin, this is a particulate, and we looked at the amount of allergen a person required to have a very slight amount of wheezing or in this case a drop in -- very minor drop in lung function, we require less allergens. Someone's been in a room filled with particles (inaudible)

endotoxin, the concentration of the endotoxin is the same as being reported in so-called sick building syndrome, so this is not a huge toxin exposure. These are exposures in people (inaudible) whereas compared to in a very clean air situation they require a bit more allergen. So this is a demonstration that acute response is something you're allergic to, in this case housedust mite allergen, is enhanced in the context of exposure with a pollutant. We've seen exactly the same thing with ozone, this is very similar type of experiment that our group did,

and after ozone, here you see the individual data points, and then you see the average data points. Again after exposure to a fairly high level of ozone, the one that people do see. And one reason we put this up is that the kinds of asthmatics that we can safely recruit in studies are very mild. So these are not people with really severe, serious diseases which prove the concept studies. But the take home point here is that with ozone exposure we begin to see an

increased sensitivity to the housedust mite allergen.

We've also looked at the response of an allergic individual without allergen to ozone, and done similar studies with endotoxin and other particles. And what we find is that neutrophils which everybody generates are clearly increased after the ozone exposures. But we'd also see an increase in allergen cells which are called eosinophils, so cells that are specific to the allergic state and specific -- and are significant players in asthma pathogenesis were increased in allergic individuals with response to ozone. So having an allergy very likely changes the susceptibility you have to a

pollutant.

So that brings me to the final question that -- these are actually questions I didn't (inaudible), and that's the other thing, (inaudible) research. I'm actually board certified in pediatrics, I run the pediatric

asthma and allergy clinic, so this is all -- play doctors and these are questions that people ask me during the summer months. And the next question, is there anything I can do to protect myself from air pollutants. One is to use appropriate asthma therapy. Now, depending upon the doctor you see, the severity of your asthma, you could argue what is the appropriate asthma therapy, but for people with mild, persistent, moderate, severe asthma it's very clear that inhaled corticosteroids are the state-of-the-art single best therapy to control asthma. There is absolutely no question about that. And what we do is we treated mild asthmatics with inhaled corticosteroids, then asked them to undergo an inhaled -- an inhaled endotoxin challenge, and what we found is that people that had allergic asthmatics treated with steroid and then placebo, and this was a randomized crossover study, that

during the placebo treatment they had increased pus in their lungs as it were related to the endotoxin challenge versus when they had the

steroid treatment. And we find that molecules that are present particle in the airways that have already been responding to endotoxin are diminished in the context of treatment with steroid. So the susceptibility of an asthmatic not just to allergens but to air pollutants is decreased with appropriate asthma therapy.

And this is actually a study from Italy, and this is looking at before and after ozone challenge when people were treated with placebo versus after being treated with -- actually, I'm sorry, this is before and after inhaled steroid. And the steroid did offer a protective effect. So likely what we see with endotoxin, the same is true with ozone. This is also being shown in a population study. These data derived from a study that was designed to look at asthma and after a while these data were being collected and (inaudible) inhaled nitric oxide which is another way to assess airway inflammation in asthmatics, and they looked at people who were asthmatics who were on steroids

and those who were not. And what they found was that the -- I'm sorry, people who were on steroids and people who were not, that the increase inhaled nitric oxide which is a major inflammation all increased relative to particulate pollutants only in the non-steroid use. Those that had steroid did not have any change. So the steroid users were protected from the effect of naturally occurring (inaudible).

We were funded -- aside from the funding by the Environmental Protection Agency, we're also funded, we have three different funding vehicles from the National Institutes of Health. One of them is from the National Center for Complementary and Alternative Medicine, and we were funded to determine whether or not antioxidant vitamins would have a protective effect on air pollutants, or against the effect of air pollutants. We're studying this in a couple of ways. It turns out that some people have are genetically predisposed to have an effect to ozone, and they're being so-called oxidant genes. But there's been studies in Mexico City that suggest that in populations of children treated with -- that took dietary

combinations of vitamin E and vitamin C, if you looked at the people treated with placebo during days that there was an increase in ozone exposure, they had decreased lung function compared to those that were on the supplements. This is true of all, we're looking at peak flow and also we're looking at a fairly sensitive measure of lung function the so-called 25/75, and I can explain that that is internalized. But the bottom line is that the lung function decreased with ozone if they're on the placebo therapy. And they were somewhat protected, and the ones that proved that had the best effect were the ones that were genetically likely predisposed to the effect of oxidizing pollutants.

The other thing you can do is you can avoid the pollutant or at least attempt to. Now, I heard a little bit about roadways. And it turns out that there is pretty convincing data that if you live within 500 meters of a roadway your health effects are increased compared to moving beyond that. That's just traffic dust,

there are plumes of particles that exist closer to a roadway than further away. The health signals also include put in a box under the

ground, you know, death. It clearly is -- there's a signal for increased death rates if you live within 500 meters of a roadway. Now, whether that's due to the particles per se, many studies control for that; whether it's because you are of a socioeconomic strata that forces you to live closer to a roadway, you get to the environmental justice issue and one can have that debate. But the data are increasingly compelling that living close to a roadway is not (inaudible). And so if you go a little way down the roadway, you are in a zone such that residential areas are not close to a roadway, 'that's not my job, mon'. That's clearly something. If you are an exerciser clearly the way that you get a dose of air pollutants depends on the amount that's in the air, the length of time you're exposed to it, and how much you're

breathing. So if you are exercising, you're a regular jogger, if you run in the mid to late afternoon when ozone levels are higher, your dose of ozone will be higher than if you jog in the morning. So one can modify the times at which you play outside as it were. Now, if you're forced to work outside, if you're actually a road

laborer so you don't live next to the road and you wear the orange vest, that can be a real issue for you.

And then there are larger scale societal changes, decrease in traffic, using better fuels and many of the things that have been talked about today. There is actually data that tells us that that really works. These are data that were collected from Atlanta, Georgia when they were hosting the 1996 Olympic games, and so they looked at -- the parameter here is the percent of the National Ambient Air Quality Standard, so this is 80 percent of the max quality standard for ozone, PM, carbon monoxide, NO2 and SO2. And clearly what happens, they

changed traffic patterns so there was less motor vehicle traffic during the Olympic period from before and after. And actually the Olympic sites are looked for. Traffic and pollutant load is a big deal, and it's a big deal with Athens also because you may be -- you wanted to have world records because that's what you're -- because that's what drove profits, so you wanted to have it in the kind of place those kind of impediments. The reality was is that during the

Olympic period there was a decrease in the ozone level, and coincident with that there was a 46 percent decrease in Georgia Medicaid claims for asthma, there was a 44 percent decrease in health maintenance organization, the ERs saw an 11 percent decrease in asthma events, and there was a 20 percent decrease during the Olympic period of hospital discharges ascribed to asthma compared to non-asthma events where the signal was essentially nil. So at least with regards to having asthma, this is the most recent study, and

in fact similar data has just come in from the Los Angeles Olympics, similar data exists in a variety of places where different fuels like coal and other kinds of things were changed. And one of the best was actually a city in Ireland that changed sulfur bearing coals, and their end point was literally in death rates. Their death rates decreased when they changed, you know, the availability of coal in that community.

So with that I will end my formal comments and informal ones as well, and be happy to take questions or be quiet, as you wish. Thank you very much.

DR. BIELORY: Question from council?

MR. BLANDO: I'm just going to make a comment that I found it interesting looking at the combination of exposures in particular endotoxin, just want to comment that I had worked for a facility that had some customers where they sold nylon. We did our -- we had problems with nylon flockers disease and we did our annual toxicity testing with nylon, we didn't see nearly

the effects that were observed clinically in some of the workers and some of the Indian plants and found it interesting that the hypothesis was that perhaps the endotoxins they called them flocking agents in combination. So I think it's interesting just to see any importance of the combination and I appreciate that.

DR. BIELORY: Any other questions? All right. Actually, Dr. Peden came in on my request because I actually work with the same concept of complementary medicines, and then I, you know, to evaluate the effect on antioxidants, and this is an issue public health-wise so it was a special link that I developed with him during that process.

The question I have I guess for the council as we draft our proposal, our advisory

report, is that what can you -- what do you think from North Carolina, your experience there and actually you're probably part tied to the EPA there, to the effect of how we can address this

problem here, what would be the success
(inaudible) patient, what have been successes
perhaps in your environment legislatively and
politically I guess because those are the issues
that we have to address in our environment.
DR. PEDEN: Well, there are also the
same challenges because what you have to do is
you have to balance economic well-being with
environmental well-being, and that's oftentimes,
at least on the surface, don't always agree. But
where we see a significant increase probably in
North Carolina is that actually our traffic
patterns have become much more northeastern, we
had a significant increase in automobile traffic,
and if you think it's bad here we have country
homes people want to have cars that are the size
of my home. So it's a -- from my perspective I
think frankly one of the key things one could
look at would be, you know, putting the
residences and schools in the context of whenever
it's feasible how far away from the roadway is

it. I honestly do believe that alternate fuels

and alternately fueled cars to own those or not will be a way to address this. I think it's a petroleum there's other reasons people look at those kind of cars, and it will be interesting see if we have any change in the results based on that. I do think it's a very complex issue because with better asthma control we have a whole 20 minutes before I came up talking about health care costs. Schools is actually an interesting problem not just because of the -- and also an interesting opportunity. We've been working to try to look at developing school-based asthma because the realty I think is not just economic, I think the reality is that people by law they don't have to be anywhere else except in school, you can capture them in school. And if you can (inaudible) mitigate at school particularly that have families that have single parents, that would be an area that would be -- I see that as a ripe opportunity to intervene with the Department of Health issues.

Lastly I want to point out, no pun intended, a rolling problem, we find that obesity in and of itself is also a risk factor for an

increased response to air pollutants. We have data to suggest that airway particles deposit in people who have had increased MIs, probably because of differences in breathing pattern. Then are people who are of healthy weight. Likewise it turns out that that issue tends to be (inaudible) inflammatory process. There are many who believe that it's not entirely coincidence that obesity and asthma have increased (inaudible), and whether there's an actual biological link to that is not entirely clear. So it's a multiple problem and one that we would ask to address I suspect advice on is the air quality issues, and my bias is that the state I live in, we don't have as many fixed sources except for pig farms, but we have a large amount of our cars. And I think that's what we need to address.

DR. BIELORY: Any other further questions from the council? No? I want to thank Dr. Peden for coming all the way from North Carolina. Along to address these economic points that he reflected we're going to switch only

because of time, a couple individuals have to be back in the office, to Dr. David Brown who's

going to give us a perspective of scaling factors related to human health costs as it relates to particulate matter.

DR. BROWN: Thanks for inviting me. What I'm going to talk to you about is the work in progress. Environment and Human Health is a not-for-profit organization in New Haven that I founded with seven other people, and NESCAUM is the Northeast States for Coordinating Air Use Management which you know. The other thing I do is I teach ethics in the environment in Fairfield University. People will come into this discussion.

What I wanted to talk about is human health costs as it relate to PM 2.5. This is one of a group of projects that I'm working on which is trying to take available data and determine what we could possibly do with it. The -- if you're thinking about human health costs and PM 2.5, the first place that you should think of is

the Ontario Medical Association which has done an excellent modeling of this. There's also other people who've done modeling and figures for this data and I can give you those references if you like. But what I was trying to do was use

available data that we had in Connecticut and determine what potential health risks might be. There's actually four things that you need to have control over when you do that. First you have to have some characterization of what the exposures of PM 2.5 look like. Second you have to have an idea of what's the incidence and prevalence of the disease might be. And third you have to have a plausible link between the disease and the agents you're looking at. And fourth you have to have some systematic way to look at the data and put it together so it makes some sort of sense.

My first, I want to talk first about a systematic way of looking at the data. This is the simplest model that I could think of, and

basically it said the probability of loss across here, and the cost have some relationship and I decided that a 45 degree angle was a good place to start. And I'd like to explain how I got into this by telling you, describing the project that we -- an exercise we do in my ethics course. I come in with three envelopes. One envelope I tell them contains a ticket to Paris for $200, also contains a red card and three yellow cards,

the other one contains two green cards and two yellow cards, and the other one contains three green cards. And I look at Alexis and I said Alexis, for $10 I'll show you one card and then you make a choice. So I show Alexis the one card, she makes a choice and she misses it so she's essentially lost $10 plus the $200 ticket. And I go to Andre and say Andre, you do the same thing, and Andre turns to Alexis and says, what did you pick, and Alexis says, what's it worth to you, and he says it's worth $2. She says okay, give me $2, I'll tell you what I picked. So she does it, Andre makes an error also and he fails.

So he's lost $12 and the $200 ticket, and it now goes to Bethany, Bethany turns to the other two and says, I'll give you $25 to tell me what you picked. They tell her and she makes her choice and she in fact gets the ticket for $35 to Paris.

Essentially what's happened is this, is that this green card, this green line here, shows that they have changed the risk factor by getting information, but their information costs something for them to do that. And it seemed to me as we were thinking about the air pollution processing maybe we could use this kind of a

model. There's really three things that we can do with the model. We can do what Andre did, and get a little bit of information, or we can do what Bethany did and get a lot of information, then we change the slope of the curve when we do that. This model is kind of attractive because basically this is actually total cost loss is what the blue -- is what the blue line represents here, and if you're in the A region you don't

want to buy anything because you can only lose what's on the blue line. Here in the B region you probably want to do what's going on in the green line so you want to be under the green line so you'd probably want to do that little bit. And if you're in the C region you want to do the whole group.

So the way to think about this, or I think about this, this isn't my idea, it actually came from people at Harvard, is actually what you need to do is figure out whether you're in region A, region B or region C. Now, I like that because it means I don't have to use a lot of precision to get the right number, I just have to kind of get into the right place.

Obviously if we now transfer this to

asthma, if the cost of asthma is following the broken line it's a different situation than if the cost of asthma is following the blue line. And if you look at probability of a hospitalization in Connecticut for asthma, it's very important whether this is the cost line or

that is the cost line. So we want to do our first task is to find out, see if we can get some sort of data that gives us something about the scale on this graph that I've created out of my mind. We have three pieces -- four pieces of scaling information. The first we'd like to find out is there a plausible link between exposure and disease, and you just heard that there is. Second we would like to characterize what the level of PM 2.5 exposures are in the state, we would like to know what the incidence and prevalence of the diseases related to 2.5 might be, and lastly we'd like know the size of the population of the state. In Connecticut that's between two and a half and three million people.

So is there a plausible link. I'm going to show you some data that I'm pretty sure you've already seen but I want to make a point on it. This is a study by Dockery, and basically

this study if you look at the cardiopulmonary disease rates showed that when he put the six

cities he found cardiopulmonary disease rates were significantly increased although with PM 2.5, although all causes were not because all cause of death was lung cancer appeared to be slightly and cardiopulmonary was increased. But the point I want you to notice here is that that is occurring between the 11 and about 30 micrograms of (inaudible). That's a useful piece of information when I'm trying to scale the data, so it means I need to be thinking about that number, not some other number.

The next two studies I think you've already heard about, the Peters study is an excellent study that was done in Boston which basically looked at myocardial infarctions and looked at the PM 2.5, level of increase in PM 2.5 and found that at 25 micrograms per meter cubed increase in PM 2.5 caused an increase in the appearance of people in the emergency room, and I think it was Jamaica Plains two hours after that, which suggests that the effects would be fairly rapid. Also there was increase a day after a level of increasing by 20. So the numbers that

we're thinking about are ten to 30 seem to be where we would like to be. You just heard about the Gent study where severe asthma and ozone was looked at. Most of the effects appear to be related to asthma, but to ozone and I think they are, I think there may be an interaction. But there was an increase in chest tightness reported that appeared to be significantly affected occurring between 12 and 18 micrograms per meter cubed.

So we actually have a plausible link and we know something about the number, and I'm going to throw out the number five percent increase in the health -- the incidence of a particular disease with a ten microgram per meter cubed increase in PM 2.5. I'm not sure that's right, but I'm sure it's not 50 percent and I'm pretty sure it's not 1 percent.

The next question we'd like to have is what did the exposure look like in Connecticut. I'm going to show you actual Connecticut data from the Connecticut DEP, these are PM 2.5 monitors running in New Haven, Hartford and Waterbury. I can't remember which city is which, but as you can see it doesn't make

any difference at all. And these are the PM 2.5 levels, the 24 hour PM 2.5 levels falling between ten and 30 micrograms per meter cubed, and what we see surprisingly -- not surprisingly having looked at it is that we have episodic increases, and the episodic increases are quite remarkable. So if we're looking at what's going on in Connecticut, these three cities in Connecticut, the averages of interest to it would be episodic increase in the degree of it turns out to be really a lot of interest to it.

I want to show you one more piece of Connecticut data. This is the same data in the -- this is the same type of data, sorry, spread over a three month period. Each bar is a day and each dot on it is a value at a given hour during that day. Here's our ten to 30 micrograms per meter cubed and these are -- you can see the one hour values and the other hours values are episodically falling across this value. So in this range across the three month period, and

although the averages is about ten micrograms per meter cubed, and a common kind of sarcastic anyone who knows Carmen DiMatissa (phonetic) can hear him saying that as he was getting annoyed at

some reason or another. Because we were only reporting mean levels for the year and he really wanted to see something else.

Having seen this data we became interested in the last few months and we actually went back to Connecticut data and we said how many instances are there increases of over 30 for a six hour period, and it turns out 20 percent of the days in Connecticut, 90 days a year we did an increase over 30, an episodic increase over 30. That could be -- that could be important, but what does we know about health costs in Connecticut. Here is a very quick strap on that and I'll try to move a little bit faster, this shows hospitalizations and health costs for Connecticut, and they show that there are about 8,000 heart attacks, and the earliest data I can get is 1998. For some reason getting data out of

Connecticut is really tough, this is Health Department data that was published. We get about 8,000 heart attacks, about 10,000 heart failures, around 3,500 asthma hospitalizations, and about 8,000 chronic obstructive pulmonary diseases, and these are actual hospitalizations, and the costs of hospitalization are listed on the right-hand

side of the chart. They're roughly I guess $10,000 each. That would be mean that this -- these effects in Connecticut in 1998 cost about 300 million dollars. Not all of those are due to PM 2.5, but if we get the five or ten percent of them are we're talking about figures on the order of 30 million to -- 15 million to 30 million dollars that's occurring per our state.

I want to show you that if you really can focus down on other things and other actions, and these are the -- this is data from where I live, I live in Westport, Connecticut, and this is Bridgeport, Stamford, Norwalk, and this shows us the very same -- similar kind of

information, shows us that there are other things that appear to be related to diesel, and this is some data that came out, it just came out a few weeks ago, but it shows that there are other effects. If we don't consider these effects and we create a model, we just decided that those effects cost zero. Which is not true.

I wanted to show you this slide, it's going to be very, very difficult, I know it's extremely hard to read. These are ozone and PM 2.5 attainment I promise I won't do this to

you again, and these are the nonattainment areas, and this is where Fairfield County is. And we talked about people being poor and having problems with asthma, but people being poor and having problems with asthma are not living under the Connecticut goal posts. So this is effects that we see in a relatively well-to-do population.

Show you the next slide. If you're going to look at this effect it appears people who are susceptible are more likely to respond.

Now, I'm going to show you the data from NESCAUM. This NESCAUM data is really just a look at prevalence rate for this set of diseases. Another piece of information you want, I haven't begun to use that yet but I will show you what happens when I do.

This is another slide that is difficult to read, it's actually looking at here what the peak values look like. The peak values are declining here, the average value is represented by this bar, and you can see as you reduce the peak values you in fact get benefits in Connecticut, and this is really Connecticut's curve because our average is falling around ten.

Next slide breaks that out into something maybe a little clearer. This actually shows us the numbers, amount of hypertension we have doing exactly the same thing, as we reduce the peak value we see we're getting benefits in hypertension in terms of total benefits, and these are the population percentages that will

receive those benefits.

How do we make sense out of all this? Well, the first thing we need to do is to come up with a scaling factor. I decided that the best scaling factor to use here had to be in tens of millions of dollars for the Y axis. I decided the scaling factor on the X axis had to be in the -- we would be best to look at the number of six hour episodes that exceeded 30 micrograms per meter cubed. And if you recall I said 22 percent of the days we had six hour episodes that exceed, that involve that.

The next slide you don't have -- the next graphic you don't have on your slides because it is simply too (inaudible). This is what I call a discussion outcome model, and I have to put things down to begin to think about something. Let's enter this right here, here's

our 30 million dollars that I estimated may be the cost for hospitalizations alone, here are the percent of days when I think we may be having the effect would be a good way to consider risk, our

actual number falls right here. If we see a risk at five percent increase in asthma for every ten micrograms of increase in PM 2.5 we have 20 of increases. If we go up to the blue line and see our cost would be around 30 million dollars. And our program costs if we wanted to deal with this we have to develop a program at this cost, this is kind of a (inaudible) line, and then we can come back and say if we could implement a program of this type then we might get that kind of saving. The value of this thing about the model I believe is that we're actually able to think of areas we wouldn't want to do anything for area B, we wouldn't want to do the aggressive project in area A, or in area B, we don't want to do the aggressive project, in area C we probably want to think more aggressively.

Okay, to summarize, these are the four things that we were looking at, that I looked at, and the question I would ask myself, how are we doing. In terms of characterizing the

PM 2.5 exposures, if I give my students a grade and they know this, they did this so I give them 90, the incident and prevalence of disease related to PM 2.5, I give them about an 85, maybe an 80, I'm not sure we know what that figure is. Is there a plausible link between the exposures and disease, I think yeah, I would give them an 80 on that also. And is there a systematic tool to evaluate practical policy decisions, I don't know, I would probably give them an incomplete on that piece.

So in a sense what I was trying to do is say can we use the data we have, create a model and get some sense of what the exposures might be, and that's what we did. And if I were in my classroom Christina would have her hand in the air, and she would say David, you're using a strict utilitarian model, I think you ought to use the (inaudible) model, and I would say Christina, sit down.

DR. BIELORY: Thank you very much. Questions from council?

MR. ZONIS: Dr. Brown, here in New Jersey we're struggling get down to an eight microgram reading and we see readings around 12,

but it's a very unhappy day when we get up to 15 or 18. Obviously the same approach is applicable to that, but it seems to me that the anticipated savings would be very much reduced as this graph is compressed. What did your analysis suggest that a path for New Jersey DEP to take with respect to PM 2.5, with respect to ozone levels that we're struggling to get to.

DR. BROWN: I think you have to remember first of all I'm showing you just hospitalization costs. There are other costs, and that's for a population of 250 million people. And you have I think quite a few more than that. I think we're clearly in the B/C point on my curve. I think you probably are in about the same place. I think what you want to do is find ways to reduce the exposure. I think the Gent study that said a short-term exposure will trigger an effect, the short-term may be more important so you would like to reduce the number of those and the amount of people exposed.

My strategy would be to do the following three things. First thing that comes

to mind to me is get the kids out of school buses that are full of this stuff because that's a

large (inaudible). Try to do something about land use management and deal with those vehicles that are putting particulates out near people. I would stop looking at averages and I would stop looking broadly at a year because I think you're missing the signal. I think it was clear in the second NESCAUM chart that it's very hard to see a signal when you're doing the average. You have to get to the other side. I would probably do some serious education in the population. I would probably try to tell people that have asthma there is a way to know what your level is going to be tomorrow, find it out and take appropriate action for that. If you want to do a really serious problem I would say go to alternate or sulfur fuel.

DR. BIELORY: Thank you very much. Any other further questions? Thank you very much, Dr. Brown.

It's been an excellent morning, and actually to keep ourselves on time I'm going to shave 15 minutes off lunch. We're going to take a 30 minute break, returning here at one o'clock.

(Morning session concluded at 12:30 p.m.)

C E R T I F I C A T E

I, CINDY M. MAINS, a Certified Shorthand Reporter, (License No. XI 02093) and Notary Public of the State of New Jersey, do hereby certify the foregoing to be a true and accurate transcript of my original stenographic notes taken at the time and place hereinbefore set forth.

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Notary Public of the State of New Jersey

My Commission expires 07/18/2009

Dated: May 2, 2005.

GUY J. RENZI & ASSOCIATES