

Speaker: Dr. Wayne Cascio

(Diagram of Air Pollution and Health Effects) [which is] In the form of a pyramid, with excess deaths at the apex. As one moves downward in the pyramid, the severity of the health effect diminishes yet the number of people effected increases. The point I want to make here is that the deaths represents only the smallest number of people impacted. Hospitalization, utilization of the healthcare system and discomfort impacting work or enjoyment of live contribute substantially to the overall societal burden of ambient air pollution.

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This slide of the U.S. shows us the annual 24 hour particulate matter at 2.5 mass levels by county. The concentrations are color coded with yellow, orange and red when exceeding the annual standard at the time the figure was made, which was 15 micrograms per cubic meter. So while the data here is somewhat dated, it's still useful in providing a scale to the size of the population potentially affected. The point is that millions of our citizens still live in communities that exceed the annual standard and that these levels can contribute to premature cardiovascular mortality.

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Estimates of the impact of mortality can be seen in this slide that was generated using another of EPA's tools called BenMap. BenMap is a window-based computer program that uses geographic information systems-based methods to estimate health impacts and economic benefits occurring when populations experience changes in air quality. BenMap is powerful enough to perform a comprehensive benefits analysis, but simple enough for non-technical users to estimate benefits after a short tutorial. On this map one can easily see, when considering the pollution distribution from the previous slide, that mortality across the U.S. depends on the levels of air pollution and the size of the population affected.

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Now the next slide is from an American Heart Association publication, and shows the total annual mortality from heart disease in the U.S. over the last century. The cardiovascular deaths reached in the U.S. its peak in the mid-1970s. Despite the substantial improvements in cardiovascular mortalities since then, it still remains the number one killer in the U.S. The improvements in mortality have largely stemmed from our knowledge of the traditional risk factors for cardiovascular disease that emerge from the findings of the Framingham Study and the implementation of programs to modifications to these risk factors in the population. In the last two decades we have learned that air pollution, particularly particulate matter, is a risk factor for heart and vascular disease, and we now have the opportunity to modify the risks associated with air pollution exposure in much the same way that we have done this with high-blood pressure, cholesterol and smoking.

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This is not only important for the individual, but as shown in this slide, cardiovascular disease is costly. The U.S. currently spends close to \$400 billion annually, and this is expected to nearly triple by 2030. So given the current impact of cardiovascular disease and costs, we are obviously motivated to look at ways to decrease the burden.

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An opportunity for the EPA to favorably affect the adverse impact of heart disease in the U.S. came in 2009 when the EPA published the Integrated Science Assessment for Particulate Matter. This document provided a comprehensive review of the available data linking particulate matter exposure and health effects. The conclusion of this review, which is shown in the slide, was that epidemiological evidence is sufficient to conclude that a causal relationship exists between short-term and long-term exposure to PM_{2.5} and mortality. Subsequently the PM_{2.5} annual standard was lowered from 15 to 12 micrograms per cubic meter, a change that should decrease cardiovascular death across the country over time.

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Independent of the EPA and its scientific advisors, a group of cardiologists and environmental experts published a scientific statement sponsored by the American Heart Association in 2010 in the journal circulation that concluded that exposure to outdoor fine particles can trigger heart attacks, strokes, heart rhythm disturbances and worsen heart failure. They also recommended that heart disease patients reduce their exposure to air pollution when levels are high.

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European cardiologists and environmental experts followed suit in 2015 in a European Heart Journal when they said, and I quote, "Air pollution should be viewed as one of the several major modifiable risk factors [and I emphasize modifiable] in the prevention and management of cardiovascular disease" and that quote helped, "health professionals including cardiologists have an important role to play in supporting educational and policy initiatives as well as counseling their patients."

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This slide illustrates something called the population attributable fractions for a risk factor, and how it contributes to triggering a heart attacks in a population. This paper came from Nawrot et. Al Lancet in 2011. I just want you to notice that a change in ambient fine PM concentration by 10 micrograms per cubic meter or 30 micrograms per cubic meter are circled in blue, might be the trigger for around 2 to 5 percent of heart attacks. So while the relative risk of air pollution is very small compared to the other risks shown here, the effect on the population can be big. In contrast, cocaine use, which is an extremely dangerous activity, contributes much less to the numbers of clinical heart attacks in the overall population because the risks are experienced by a much smaller number of people.

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So Healthy Heart was developed to meet the need to inform those at risk of air pollution in hopes to reduce the adverse health effects. The key messages of the Healthy Heart Program are that air pollution can affect heart health and can trigger cardiac events, and that people with heart disease can use the Air Quality Index to help reduce their exposure to air pollution and protect their heart. The Healthy Heart Toolkit is an EPA website that provides the links to the key messages. The URL of the website is shown on the slide and in the final slide of the webinar. I encourage you to explore the website and available information, some of which I'll now review

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The website provides basic information about when and where air pollutants are expected to be high and who is at greatest risk. In addition, the website provides links to environmental research that the EPA is conducting to better understand the health effects of air pollutants.

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Research studies shows that there are groups within our population who are at higher risk or more vulnerable from exposures to air pollutants and these include aged adults, and those with cardiovascular disease, diabetes, lung disease and some genetic conditions that effect our ability to essentially detoxify oxidative stress. New data is also emerging that air pollution can affect pregnancy and the developing fetus.

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I added this slide of the prevalence of cardiovascular disease in the population to point out that when we speak about people with cardiovascular disease being at higher risk from air pollution, age is the strongest determinate of having cardiovascular diseases and that about 70% of people who are in their 60's and 70's will have at least one or more cardiovascular diseases present. The percentage increases even further as people get older. This makes the population at risk for the adverse cardiovascular health effects from air pollution in the U.S. quite large.

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We have a number of short downloadable fact sheets that provide information about heart disease and air pollution. For example here is the Healthy Heart flyer that can be downloaded and provides key messages that include information for people with heart disease. It provides an answer to the question "are you at risk from air pollution?" and it provides recommendations to check the AQI (Air quality index) and steps to take to reduce exposure and risk. It also provides the warning signs for heart attack and stroke.

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The Healthy Heart Program stresses the fundamental recommendations to prevent heart disease and its progression. This is to eat healthy foods, exercise according to your health provider's recommendations, control blood pressure, control cholesterol levels and if you're smoking – stop. Take aspirin and heart medications as directed. If you're familiar with CDC Million Heart Initiative, you'll notice that these recommendations are the same, and the EPA supports CDC as a partner.

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The Healthy Heart Program emphasizes importance of exercise. It warns people to use prudent judgement to avoid unnecessary exposures to high levels of air pollution. So the messages to reduce risk are simple. Delay outdoor activity until the air is cleaner if that's an option, reduce activity levels to decrease respiratory rate, which decrease the dose of pollutants one gets, if possible move exercise indoors, and avoid exercising near busy roadways. Another example might be to exercise early in the day before the afternoon heat generates ozone, if one lives in an area where ozone is a problem.

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The air quality index shown here provides the key information to help individuals make decisions about reducing exposures in outdoor activities. The general availability of the air quality index for current and forecasted air quality conditions throughout the U.S. makes this a very useful tool for guiding responses of individuals to air pollution levels.

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The AirNow website, provided by the EPA is a great place to get nation and local air quality information and to get up to date information on wildfire conditions. It also serves as a conduit for obtaining a lot of useful air quality information in general, environmental health information for individuals and health care providers.

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The EPA now provides a Smart Phone application, which you see on this slide through AirNow called EnviroFlash. The app provides daily air quality forecasts and action day notification to your email. It's available through iPhone and Android and made available through a partnership between and the EPA and state and local air quality agencies. It's available at the URL [www. Enviroflash.info](http://www.Enviroflash.info) and the information can be used to plan outdoor activities. On this slide you can see that one has the option of then putting in a zip code of interest, or the current location of the device.

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This slide shows a screen shot of the health care provides page on AirNow. Links are available to a CME course and health information in the form of these downloadable flyers or posters.

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We are also working to provide up to date online medical education courses to public health and environmental officials, health care providers, and health care educators on the topic of the health effects of air pollution. Here you see ozone and your patients health CME program that is available now. CME credit is provided by the Academy of Family Physicians. We anticipate releasing a CME program later this year on particulate matter and your patients' health CME credit, in this case, will be provided by the CDC.

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The next slide shows another flyer with our colleagues of the Office of Air and Radiation we produced as a downloadable patient information flyer providing useful information on heart disease, stroke and air pollution. It includes recommendations on how to avoid exposures when outdoor concentrations of particulate air pollution are high. The fact sheet also lists the warning signs of heart attack and stroke and what to do if one experiences those symptoms.

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I also want to point out that the fact sheet is supported by both the American College of Cardiology and the American Heart Association, two highly respected professional organizations in the U.S. related to cardiovascular medicine and disease.

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The next slide shows a poster that can be downloaded and printed that describes the health effects of common air pollutants and provides information about the air quality index and its health messages. The poster is well suited for display in offices or waiting rooms, and is available in Spanish.

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To summarize, heart disease and stroke impose a substantial social and economic burden to the U.S. Ambient air pollution contributes to this burden, and the burden will only grow as our population ages. Aged individuals and those with prevalent heart and lung disease are more susceptible to the adverse health effects of ambient air pollution. EPA's Healthy Heart program supports the goals of CDC's Million Hearts® Initiative to decrease heart attacks and strokes by providing information and tools to reduce exposure to air pollutants and possibly lower risk of heart attacks and strokes.

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For more information please visit the websites listed on the slide. The slides will be available through your link to the webinar and perhaps Ms. Matthews can provide more information about how to get that. I hope you've found this useful and will give consideration to promoting this information particular in the health care field and those who care for aged adults and those with cardiovascular disease. I'd be pleased to answer your questions, so thank you very much for your time and your attention.