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NATIONAL-SCALE AIR TOXICS ASSESSMENT FOR 1999: ESTIMATED EMISSIONS, CONCENTRATIONS AND RISK

TECHNICAL FACT SHEET

TODAY'S ACTION

- On (insert signature date) the Environmental Protection Agency (EPA) made available an updated assessment of the nationwide health risk estimates for air toxics. EPA's first national-scale air toxics assessment, for calendar year 1996, was published in 2002. The assessment is a state-of-the-science national-scale screening tool to help regulatory agencies and communities as they assess their air toxic priorities. The first assessment was peer reviewed by SAB in 2001. This assessment should not used for regulatory purposes, for estimating risk at the local level, for quantifying benefits of reduced air toxic emissions, or for identifying localized hotspots.

- Toxic air pollutants, or air toxics, are those pollutants known or suspected of causing cancer or other serious health problems, such as birth defects. This latest assessment covers 177 of the Clean Air Act's list of 188 air toxics plus diesel particulate matter (diesel PM). For 133 of these air toxics (those with health data based on chronic exposure) the assessment includes estimates of cancer and/or non-cancer health effects including non-cancer health effects for diesel PM. Five important air pollutants are not included in the list of air toxics because the Clean Air Act addresses them separately as "criteria pollutants:" particulate matter (PM), nitrogen oxides (NOx), sulfur oxides (SOx), and carbon monoxide. (Lead is both a criteria pollutant and an air toxic).

- This assessment includes heavy metals, such as lead; volatile chemicals, such as benzene; combustion byproducts, such as acrolein; and solvents, including carbon tetrachloride and methylene chloride.

- The assessment expands on EPA's first national-scale assessment by:
  - using an improved emissions inventory (1999 vs. 1996) including almost double the number of point sources,
  - including risk assessments for all the air toxics with health data based on chronic exposure (133 vs. 32), and
  - using the latest health effects information.

- The assessment provides a snapshot of air quality and the risks that would result if 1999 emissions levels remained unchanged. It does not reflect reductions in air toxics that have occurred since 1999 or those anticipated to occur in the future.

- The risks estimated in the assessment are associated with breathing the pollutants -- it does not address other methods of exposure such as eating or drinking. For the majority of air toxics, most exposure comes from breathing. For some air toxics, a separate assessment of other exposures is important. For example, the majority of the risk associated with PCBs

emissions into the atmosphere come from ingestion rather than breathing contaminated air. Those kinds of risks are not reflected in the national-scale assessment.

- EPA developed the national-scale assessment primarily as a tool for state, local and tribal agencies and others to prioritize pollutants, emissions sources and locations of interest for further investigation. For example, community-based assessments have relied on the previous national-scale assessment to prioritize data and research needs to better assess local risk from outdoor emissions of air toxics. EPA collaborated with state, local and tribal agencies to develop the information that is contained in the assessment.

- EPA also uses the results of these assessments to set priorities for improving emissions inventories, and to help direct priorities in expanding EPA's air toxics monitoring network. All of this will enable air toxics programs at the national and more local level to more effectively target risk reduction activities.

- The results are best used to determine geographic patterns across broad geographic areas. The assessment is <u>not</u> designed as a definitive means to pinpoint specific risk values within a census tract or to characterize or compare risks at local levels such as between neighborhoods. For analysis of air toxics in these smaller areas, EPA, state, local and tribal agencies rely on other tools such as monitoring and local-scale assessments to evaluate potential hot spots using more refined and localized data.

- Given its broad scope, this assessment is subject to a number of limitations and uncertainties [online version will link to limitations page]. Generally, the limitations and uncertainties relate to assumptions that simplify our national air models, and assumptions needed to cover gaps in the large database used as model input.

- EPA plans to develop new national-scale assessments as inventory data from subsequent years become available. The next such analysis will focus on 2002 emissions inventory data which EPA is in the process of compiling. We expect to release the 2002 national-scale assessment by the end of 2006.

ABOUT THE RESULTS

- This nationwide risk characterization considers the risk of cancer and other serious health effects from breathing these air toxics, in both urban and rural areas. This information will help EPA and our partners at the State and local level identify pollutants and industrial source categories of greatest concern, and to set priorities for the collection of additional information to improve our understanding of the risk from air toxics. This national-scale assessment is <u>not</u> designed to be used as the basis for regulatory action.

- In general, the results show the following:

    - From a national perspective, benzene is the most significant air toxic for which cancer risk could be estimated, contributing 22 percent of the average individual cancer risk identified

in this assessment. Based on EPA's national emissions inventory, the key sources for benzene are onroad (49%) and nonroad mobile sources (19%), and open burning, prescribed fires and wildfires (14%). EPA projects that onroad and nonroad mobile source benzene emissions will decrease by about 60% between 1999 and 2020, as a result of motor vehicle standards, fuel controls, standards for nonroad engines and equipment, and motor vehicle inspection and maintenance programs. Most of these programs reduce benzene simultaneously with other volatile organic compounds.

- For most of the noncancer health effects EPA assessed (e.g., liver, kidney, developmental effects), the estimated exposures were below levels at which adverse health effects are expected. EPA's assessment indicates the potential for two types of noncancer effects: respiratory and neurological. Of these, respiratory health effects show a higher potential for adverse effects to the greatest number of people; considerably higher levels than neurological.

- Of the 40 air toxics showing the potential for respiratory effects, acrolein is the most significant, contributing 86 percent of the nationwide average noncancer hazard identified in this assessment. Note that the health information and exposure data for acrolein include much more uncertainty than those for benzene. Based on the national emissions inventory, the key sources for acrolein are open burning, prescribed fires and wildfires (61%), onroad (14%) and nonroad (11%) mobile sources. The apparent dominance of acrolein as a noncancer "risk driver" in both the 1996 and 1999 national-scale assessment has led to efforts to develop an effective monitoring test method for this pollutant. EPA projects that acrolein emissions from on-road sources will be reduced by 53% between 1996 and 2020 as a result of existing motor vehicle standards and fuel controls.

- The assessment estimates that most people in the U.S. have a lifetime cancer risk between 1 and 25 in a million. This means that out of one million people, between 1 and 25 people would contract cancer as a result of air toxics, over the course of their lifetime. The assessment estimates that most urban locations have air toxics lifetime cancer risk greater than 25 in a million. Risk in transportation corridors and some other locations is greater than 50 in a million. In contrast, one out of every three Americans (330,000 in a million) will contract cancer during a lifetime, when all causes are taken into account. Based on these results, the risk of contracting cancer is increased less than 1% due to inhalation of air toxics from outdoor sources. In addition, the national risk of contracting cancer from radon exposure is on the order of 1 in 500 (2,000 in a million). Note that any risk comparison often considers the voluntary or involuntary nature of the risk and whether the emissions are human-made or naturally-occurring, in addition to its numerical value.

- Over 60% of counties have "hazard index" values for respiratory toxicity (a measure of the relative hazard for effects other than cancer) greater than 1.0 and over 2% of counties have "hazard index" values greater than 10. Because these exposures exceed the no-effect levels (1.0 or less) for effects to the respiratory system, this result suggests that some people may experience respiratory irritation or other effects of air toxics.

  - Although we greatly expanded the number of air toxics in the assessment since the 1996 assessment (an additional 145 air toxics), the 1999 assessment confirmed the 32 air toxics we focused on in the 1996 assessment (what EPA calls "urban air toxics") as primary risk drivers. These are the same pollutants for which, based partly on the 1996 assessment results, EPA is focusing our air toxics monitoring network development. These are also the same pollutants on which EPA bases selection and prioritization of area sources of air toxics to regulate.

- In this assessment, the potential cancer risk from diesel exhaust emissions is not addressed in the same fashion as other pollutants. This is because data are not sufficient to develop a quantitative estimate of carcinogenic potency for this pollutant. However, EPA has concluded that diesel exhaust is among the substances that the national-scale assessment suggests pose the greatest relative risk. First, several human epidemiology studies link increased lung cancer associated with diesel exhaust. Furthermore, exposures in several of these epidemiology studies are in the same range as ambient exposures throughout the United States.

- In addition to the potential for lung cancer risk, there is a significant potential for diesel exhaust to pose noncancer health effects as well, based on the contribution of diesel particulate matter to ambient levels of fine particles. Exposure to fine particles has been linked to significant public health impacts, including respiratory and cardiovascular effects, as well as premature mortality. These effects are not specifically presented in the national-scale assessment analysis but are considered in setting and implementing EPA's National Ambient Air Quality Standards for PM-2.5. In addition, the national-scale assessment results show population exposures above the level EPA has designated for noncancer respiratory hazard (called a “reference concentration” which is based on specific noncancer effects found in several animal studies, which showed adverse changes in lungs such as inflammation and lesions).

- Because of improvements in EPA’s methodology, it is not meaningful to compare the 1999 and 1996 national-scale assessments. Any change in emissions, ambient concentrations, or risks may be due to either improvement in methodology or to real changes.

BACKGROUND

- The National-Scale Assessment comprises four steps, all of which focus on 1999 air toxics data:

1. **National inventory of air toxics emissions** from sources in the U.S. plus Puerto Rico and the Virgin Islands. The types of emissions sources in the inventory include large sources such as waste incinerators and factories and smaller sources, such as dry cleaners, small

manufacturers and wildfires. Also included in the inventory are emissions from highway and non-road mobile sources, such as cars, trucks and boats.

2. **Estimates of average concentrations** of toxics in the outdoor air. These estimates are developed using a computer model that analyzes a number of factors, including total emissions, the number of emissions sources in a particular area, weather patterns and pollution source characteristics.

3. **Estimates of population exposures** based on estimated outdoor concentrations and on a model that looks at the amount of an air toxic a person is likely to inhale in a year's time. The average concentration of a pollutant that people breathe is known as an *exposure concentration.* Estimating exposure is a key step in determining potential health risk.

4. **Characterization of potential public health risks** including both cancer and other adverse health effects, using available information on air toxics health effects, current EPA risk assessment and risk characterization guidelines, and estimated population exposures to outdoor sources of air toxics.

- In 2002, EPA released the results of its first National-Scale Air Toxics Assessment of 33 air pollutants (a subset of 32 air toxics on the Clean Air Act's list of 188 air toxics plus diesel particulate matter (diesel PM)). That assessment included estimates of 1996 emissions, ambient concentrations, exposure concentration and risk. The new National-Scale Air Toxics Assessment is based on more recent data (1999), relies on an improved emissions inventory, and includes 177 air toxics plus diesel PM (note: the assessment does not estimate cancer risks for diesel PM, only exposures and noncancer risks).

- The 1999 national-scale assessment is based on 1999 emissions data because emissions inventories from that year are the most complete and available to date. However, the 1999 data do not reflect pollution reductions that have taken effect since 1999, including those from federal, state and local regulations or from industry initiatives or facility closures.

- For example, the 1990 Clean Air Act Amendments require EPA to regulate emissions of 188 toxic air pollutants. As of June 2005, EPA has issued 96 standards for 174 different types of industrial sources of air toxics, such as chemical plants, oil refineries, aerospace manufacturers and steel mills. The agency also has issued regulations for fifteen categories of smaller sources of air toxics, such as dry cleaners, commercial sterilizers, secondary lead smelters and chromium electroplating facilities. The requirements in a number of these regulations took effect after 1999, and thus the air toxics reductions are not reflected in this assessment.

- Together, these standards are projected to reduce annual emissions of air toxics by about 1.7 million tons from 1990 levels when fully implemented.

- In addition, many motor vehicle and fuel emission control programs of the past have reduced air toxics and will continue to provide significant emission reductions in the future. EPA estimates that existing programs will result in over an 80 percent reduction in emissions of gaseous air toxics from highway mobile sources between 1990 and 2030 despite large increases in vehicle miles traveled. By 2020, EPA expects to see on-highway diesel PM emission reductions of 94 percent from 1990 levels.

- EPA's most recent program to reduce air toxics emissions is the Clean Air Nonroad Diesel Rule. As a result of this rule and other nonroad standards, nonroad diesel PM emissions in 2020 will be reduced by over 85% from year 2000 levels. EPA estimates that gaseous air toxics emissions from nonroad equipment will be reduced over 50% between 1990 and 2030, despite significant increases in activity. EPA is also assisting states, communities and citizens in identifying and implementing voluntary programs, such as diesel retrofits and Clean School Bus USA to achieve additional reductions.

- Although the national-scale assessment looks only at outdoor sources of air toxics, EPA also is concerned about the risks to the public from air toxics indoors. Indoor air toxics come from many sources, including the use of consumer and commercial products, the off-gassing of building materials and furnishings, the use of appliances such as stoves, heaters and fireplaces, and activities such as cooking, cleaning and cigarette smoking. EPA plans to include an indoor emissions component in future national-scale assessments.

- Even though this assessment focuses on exposure to outdoor pollution, it is important to note that EPA has developed programs that have reduced indoor air toxics. For example, close to two million homes have been built with radon resistant construction or fixed to reduce radon levels. Approximately 25,000 schools have implemented effective indoor air quality management plans, reducing children's exposure to pollutants; and health care providers, parents and caregivers are taking action to reduce children's exposure to secondhand smoke and other asthma triggers in the home.

FOR MORE INFORMATION

- The National-Scale Air Toxics Assessment website is available at http://www.epa.gov/ttn/atw/nata1999 . Because of its scope, this assessment is subject to a number of limitations. For details see the “Limitations” section on the assessment Website.

- For more information about the National-Scale Air Toxics Assessment, contact the following people at EPA’s Office of Air Quality Planning & Standards: Ted Palma at (919) 541-5470 or palma.ted@epa.gov ; and Ellen Wildermann at (919) 541-5408 or wildermann.ellen@epa.gov.