1999 National-Scale Air Toxics Assessment (NATA) – Published in 2005

An Overview

Outline

- **Background on NATA**
- **Summary of results**
  - Which air toxics are most important & what are the key source categories?
  - Where are the air toxics risks of concern?
- **What do the NATA results mean?**
- **NATA's impact on the air toxics program**

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What is NATA?

- **Characterization of air toxics across the nation**
  - Nationwide assessment with *census tract* resolution for 177 air toxics plus diesel PM
  - Emissions, modeled ambient concentrations and estimated *inhalation exposures* from *outdoor sources*
  - *Cancer and noncancer* risk estimates for the 133 air toxics with health data based on *chronic exposures*
- **Tools for State/Local/Tribal Agencies (and EPA) to prioritize pollutants, emission sources and locations of interest**
  - Provides a starting point for local-scale assessments
  - Focuses community efforts
  - Informs monitoring programs
- **A few pieces of the air toxic puzzle**

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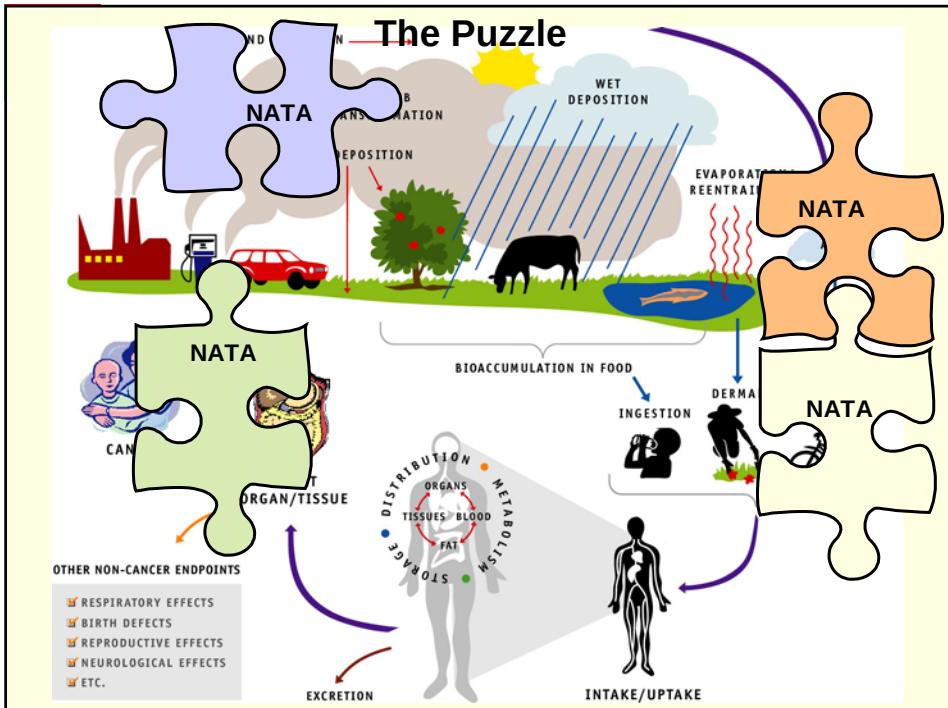
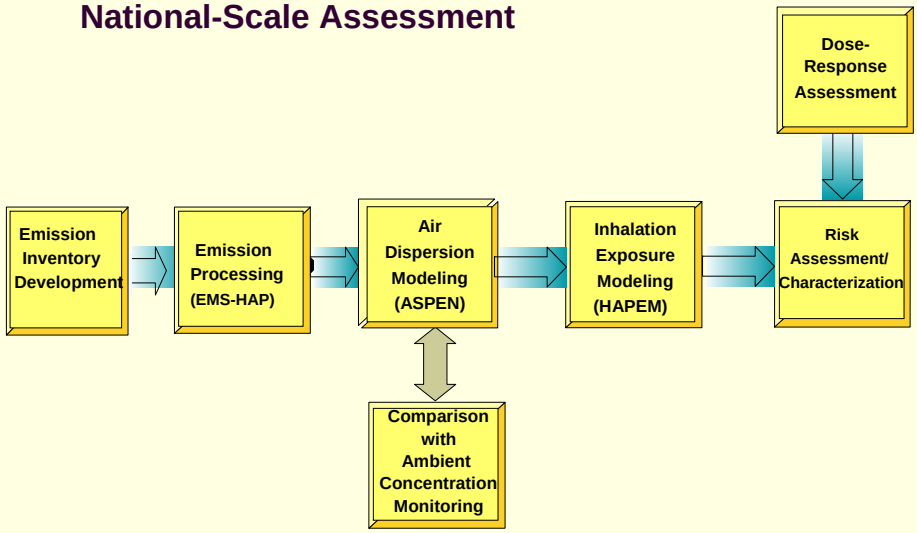


Components of the NATA National-Scale Assessment



History of National Air Toxics Assessments

- Cumulative Exposure Project (CEP)
  - 1990 data
  - Released in 1998
  - No peer review
- 1996 NATA
  - 1996 data
  - Released in May 2002
  - Internal and Science Advisory Board peer reviews
- 1999 NATA
  - 1999 data
  - Internal reviews
  - Published in 2005

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Improvement from the 1996 NATA

- Improved quality of inventory
- Expanded coverage to include nearly all air toxics
- Improved technical quality of modeling analyses
  - Responded to many of Science Advisory Board comments
- Used latest health risk information
- Improved presentation of results
  - More transparent and accessible website data
  - Local scale mapping tools

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Room for Future Improvements

- Misses some local impacts (e.g. next to major sources, near roadways)
- Modeling science
- Tends to underestimate metals (based on limited data)
- Inventory issues

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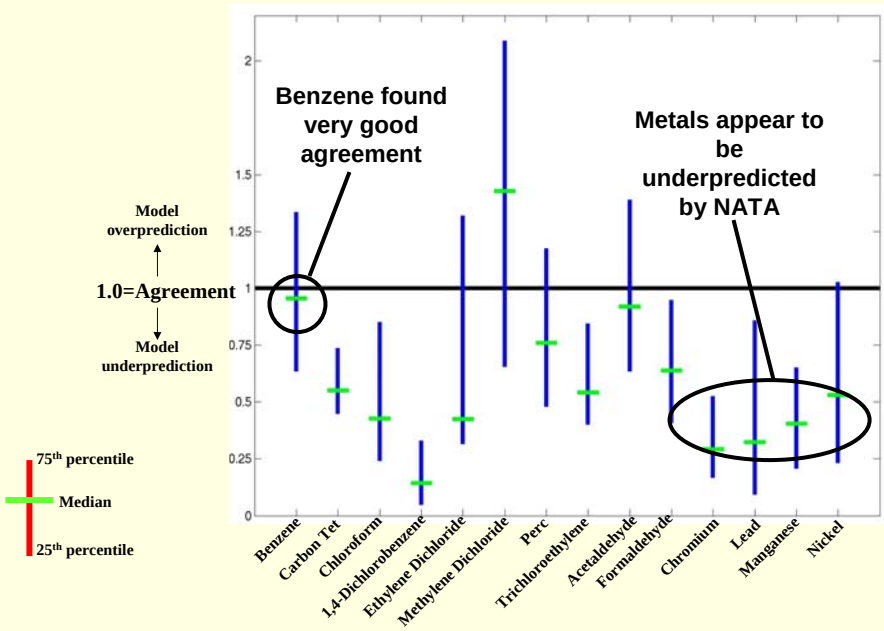
NATA Model to Monitor Comparisons



Pollutant Issues

- **Diesel PM**:
  - **Did not** calculate cancer risks – based on epidemiological studies would be among pollutants posing greatest relative risk
  - **Did** calculate noncancer risks
- **Formaldehyde:**
  - Used the cancer unit risk estimate developed by the CIIT Centers for Health Research, published in 1999
- **Naphthalene:**
  - Included in assessment as carcinogen
- **Dioxin:**
  - not included because EPA is conducting a separate assessment project specifically for dioxin (was not in 1996 assessment either)

Risks from PM and other criteria pollutants are not included in this assessment.

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Summary of 1999 NATA Results

Overall Summary of 1999 NATA Results

- The **average cancer risk** for 1999 is **48 in a million (1 in 20,800)**
  - This represents the subset of total air toxics cancer risk which can be quantified
  - **Benzene** is most significant carcinogen*
  - Comparable to 1996 NATA of 55 in a million (1 in 18,200)
  - To put this in perspective:
    - radon presents a risk of 2,000 in a million (1 in 500)
      - However, emissions of radon are naturally produced
    - it is estimated that one out of every three Americans will contract cancer during a lifetime, when all causes are taken into account.
      - Two thirds of this risk is due to smoking or lifestyle factors
- The **average noncancer risk** for 1999 is **6.4** (hazard index for respiratory)
  - **Acrolein** a majority of this risk
  - Comparable to 1996 NATA of 5.2
- Some new air toxics added to list of significant pollutants
- Confirmed list of 33 urban air toxics as primary risk drivers

Note: This is an estimate of the average American's chance of contracting cancer from breathing the air toxics analyzed here, if they were exposed to 1999 emissions levels for 70 years. This assessment does not include indoor air, diesel emissions, non-inhalation exposure pathways. Risks from PM and other criteria pollutants are not included in this assessment.

Which air toxics are most important & what are the key source categories?

1999 National-Scale Assessment Risk Characterization - Significant Pollutants

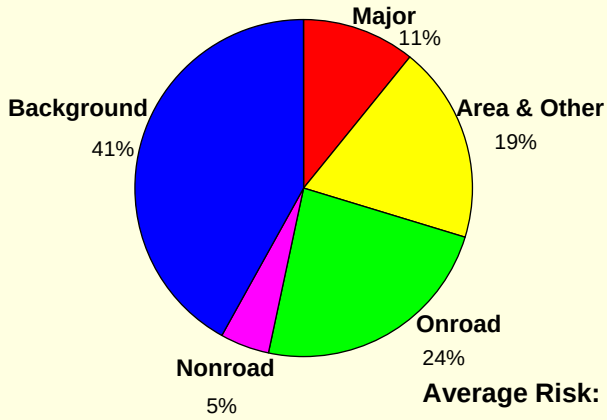
- **Cancer**
  - **National drivers** [1]
    - Benzene
  - **Regional drivers** [2]
    - Arsenic compounds
    - Benzidine
    - 1,3-Butadiene
    - Cadmium compounds
    - Carbon Tetrachloride
    - Chromium 6
    - Coke oven
    - Ethylene oxide
    - Hydrazine
    - Naphthalene
    - Perchloroethylene
    - POM

[1] At least 25 million people exposed to risk > 10 in 1 million
[2] At least 1 million people exposed to risk > 10 in 1 million OR At least 10,000 people exposed to risk > 100 in 1 million

- **Non-Cancer**
  - **National drivers**[3]
    - Acrolein
  - **Regional drivers**[4]
    - Antimony
    - Arsenic Compounds
    - 1,3-Butadiene
    - Cadmium compounds
    - Chlorine
    - Chromium 6
    - Diesel PM
    - Formaldehyde
    - Hexamethylene 1-6-diisocyanate
    - Hydrazine
    - Hydrochloric acid
    - Maleic anhydride
    - Manganese compounds
    - Nickel compounds
    - 2,4-Toluene Diisocyanate
    - Triethylamine

[3] At least 25 million people exposed to a hazard quotient (HQ) > 1.0
[4] At least 10,000 people exposed to HQ >1
Blue indicates new drivers since 1996

1999 NATA Cancer Risk
Source Sector Contributions



Average Risk: 48 in a Million

Note: NATA does not include radon, indoor air, diesel emissions, dioxins, or non-inhalation exposure pathways.

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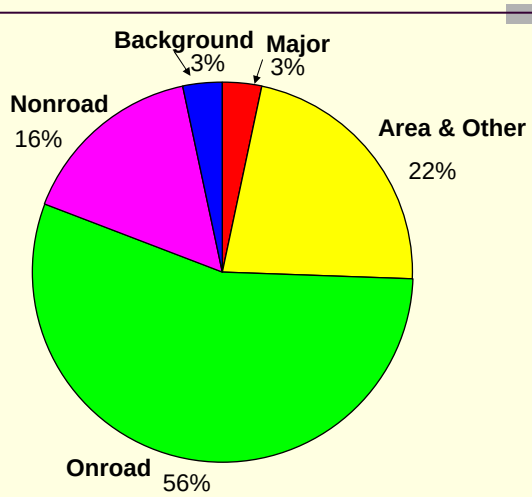
1999 NATA Noncancer Respiratory Risk
Source Sector Contributions



Average Hazard Index = 6.4

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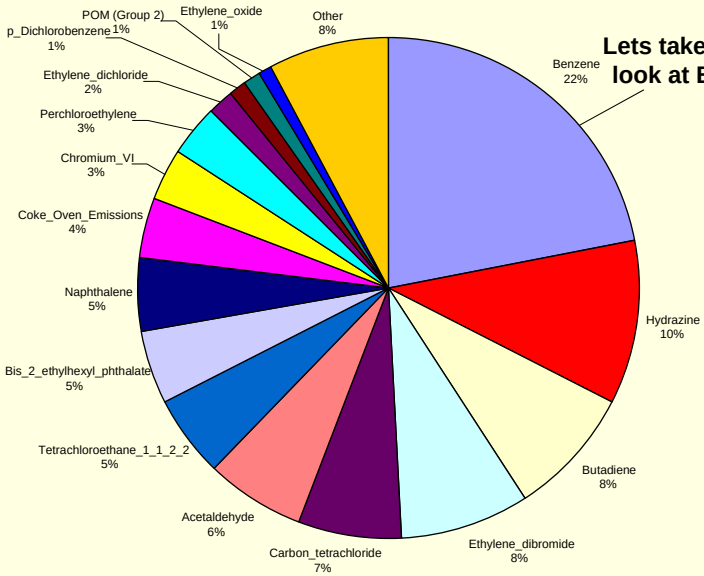
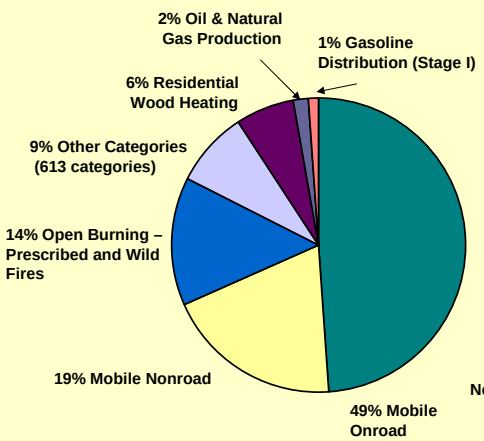
1999 NATA - Pollutant Contribution to Average Cancer Risk (48 in a million)



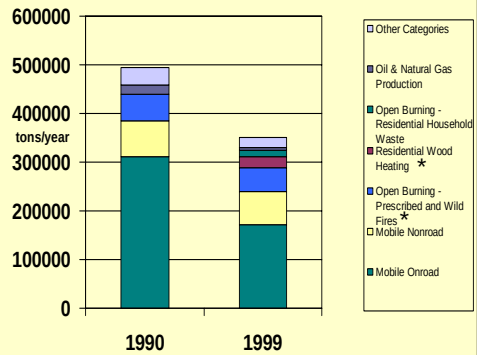
Note: NATA does not include radon, indoor air, diesel emissions, dioxins, or non-inhalation exposure pathways.

We Can Analyze Emissions Further to Identify Key Source Categories: Benzene

1999 Emissions



Emissions Trends in the 1990s



Net emissions reductions ('90 to '99) = 142,657 tons

Mobile Onroad:	140,343 tons
Oil & Natural Gas:	11,892 tons
Petroleum Refineries:	5,654 tons
Mobile Nonroad:	4,591 tons

* 1990 estimates do not reflect latest methodology used in 1999 estimates

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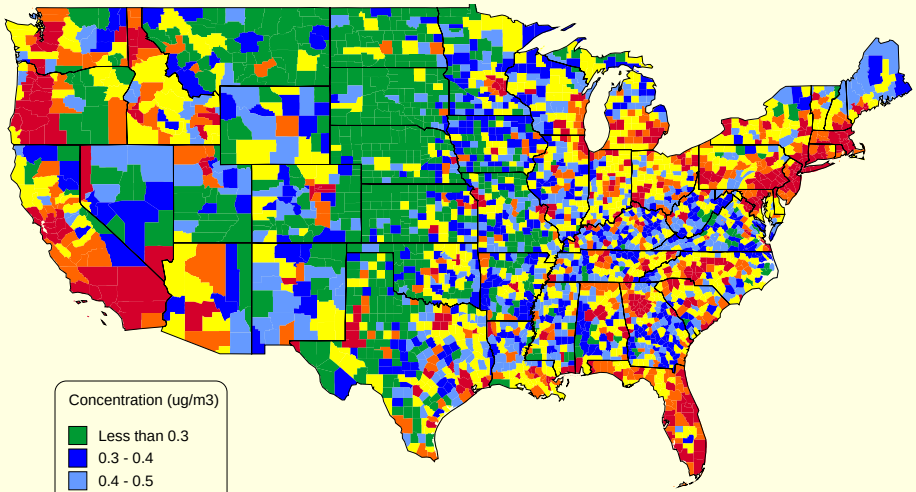
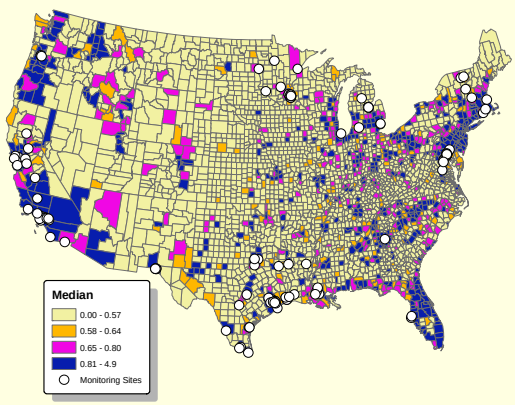
1999 NATA - National Scale Assessment
Predicted County Level
Ambient Benzene Concentrations



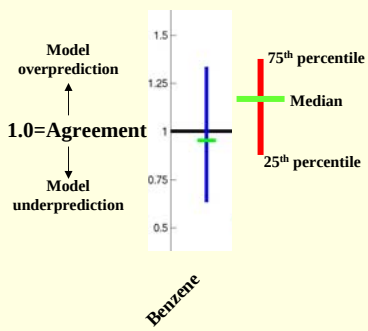
We can look at the geographic distribution of each pollutant



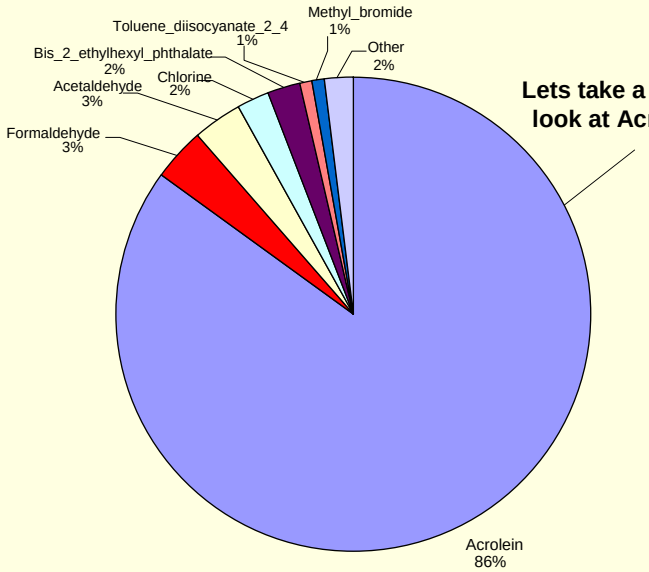
- **Found very good agreement with NATA 1999 ambient concentrations**

Model-to-Monitor Comparison for Benzene

- **Compared 115 monitored values from 1999**

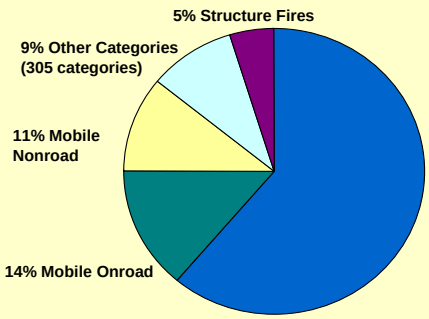


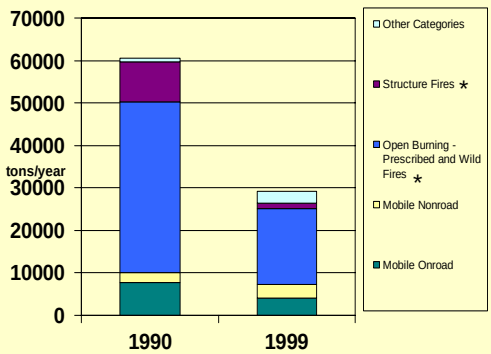
1999 NATA - Pollutant Contribution to Average Noncancer Risk (HI=6.4)



We Can Analyze Emissions Further to Identify Key Source Categories: Acrolein

1999 Emissions





Emissions reductions from 1990 to 1999

Mobile Onroad:	3,730 tons
All Categories	31,273 tons

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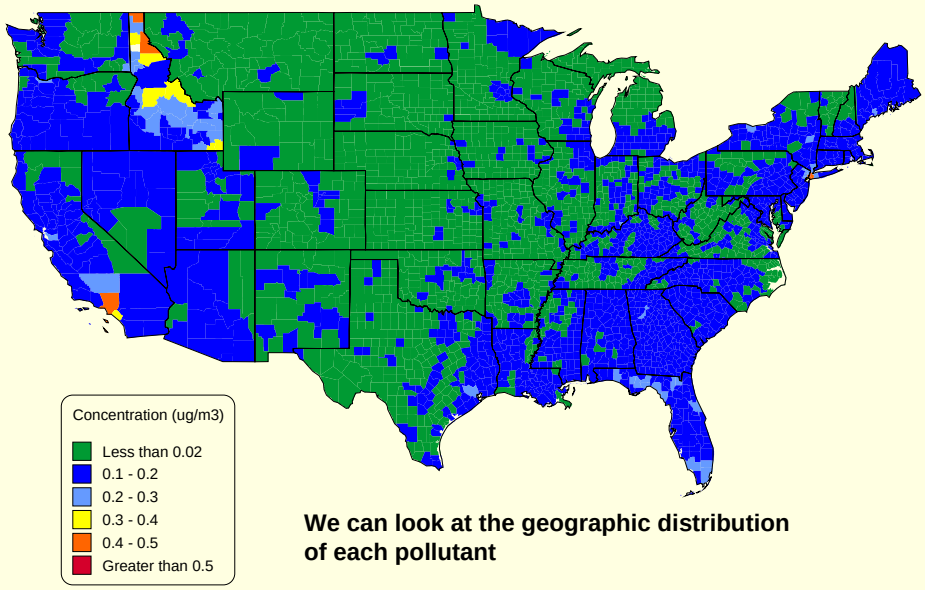
* 1990 estimates do not reflect latest methodology used in 1999 estimates

1999 NATA - National Scale Assessment
Predicted County Level
Ambient Acrolein Concentrations



We can look at the geographic distribution of each pollutant

Acrolein Monitoring Status

- Model to monitoring comparison not done for acrolein
- Issue with method sample stability
- EPA is working on a new monitoring method that may improve reliability
- Resolution pending within the year

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Where are the air toxic risks of concern?

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Geographic Risk Distribution

- **Cancer Risk**
  - Spatially, majority of country predicted to have risk between 25 in a million (1 in 40,000) and 1 in a million
  - Most urban locations greater than 25 in a million (1 in 40,000) risk
  - Transportation corridors and some locations greater than 50 in a million (1 in 20,000) risk
  - Several counties greater than 100 in a million (1 in 10,000) risk
  - In comparison, the average risk of contracting cancer from radon is about 2,000 in a million (1 in 500) and the probability of contracting cancer overall is about 330,000 in a million (1 in 3)
- **Noncancer**
  - Over 40% of counties hazard index greater than 1
  - Several counties hazard index greater than greater than 10
  - High values in Florida and Idaho from forest fires
- **Highest risk counties coincide with locations where criteria pollutant issues are significant**

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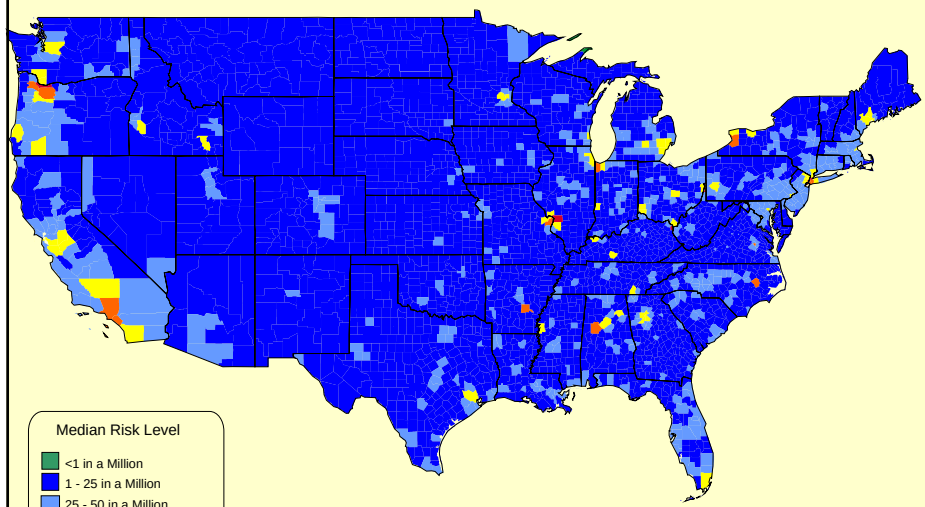
1999 NATA - National Scale Assessment
Predicted County Level Cancer Risk – County Medians



Spatially, most of country predicted to have risk between 1 and 25 in a million
Most urban locations greater than 25 in a million
Transportation corridors and some locations greater than 50 in a million
Several counties greater than 100 in a million

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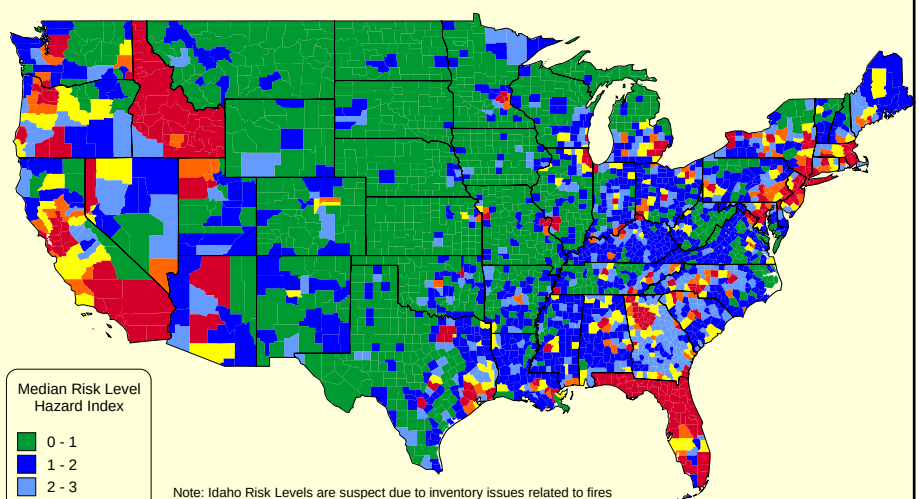
1999 NATA - National Scale Assessment
Predicted County Level Noncancer (Respiratory) Risk



Note: Idaho Risk Levels are suspect due to inventory issues related to fires

Over 40% of counties hazard index greater than 1
Several counties hazard index greater than greater than 10
High values in Florida and Idaho from forest fires

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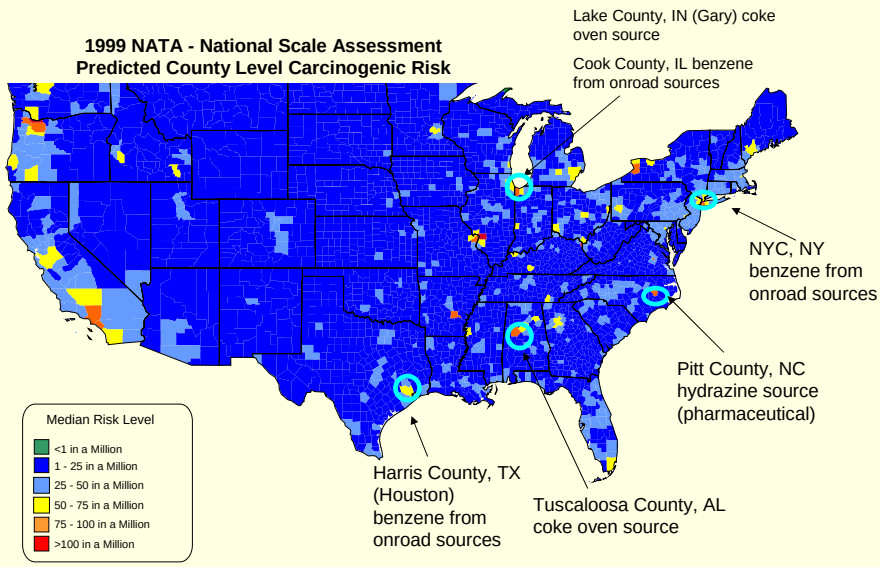
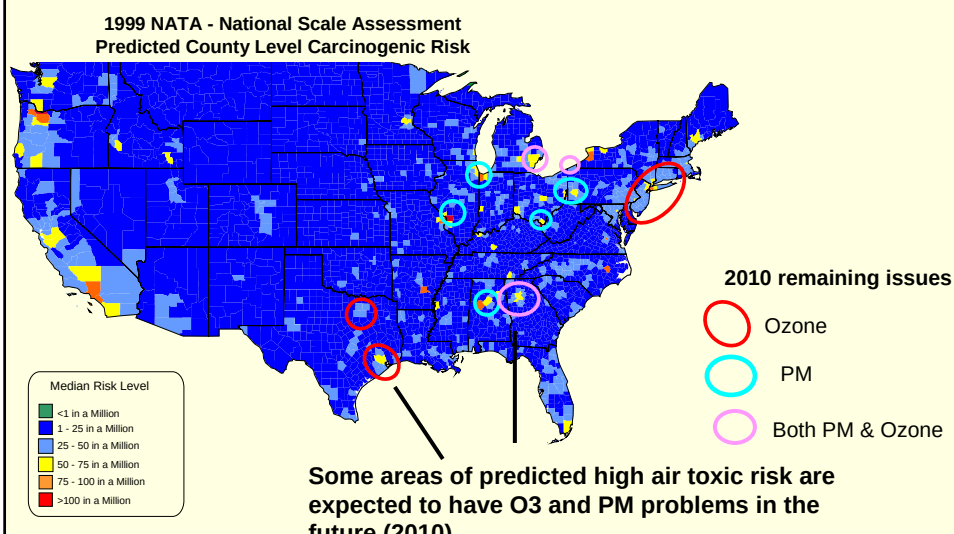
NATA can be used as a tool for states/locals/tribes to begin to analyze their risks



Using NATA we can begin to conduct multi-pollutant assessments



What do the NATA Results Mean?

- Generally cancer risks more significant than noncancer
- Identified cancer risks from NATA are significantly less than the average risks from indoor exposures to radon.
- Risk results highly variable from location to location
- Like any assessment of this magnitude, the results have their limitations and contain a degree of uncertainty
  - Model-to-monitor results generally show good agreement for volatiles and underprediction for metals
  - Model resolution can miss local impacts (e.g., near large polluters)
  - Inhalation pathway, chronic exposures only
- Higher risks levels highlight areas for further refinements (i.e., local scale assessments, inventory improvements)

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What is NATA's impact on the air toxics program?

- A few pieces of the puzzle to help us track progress of program
- Starting point for local-scale assessment (prioritize pollutants of interest and locations of interest)
- Improving emissions inventories - inspiring greater participation and enhanced quality control
- Impacting the new air toxics monitoring network
- Facilitates future multipollutant assessments
- All of this will enable the Air Toxic Program to more effectively target risk reduction efforts

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