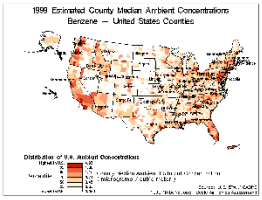
EPA
United States
Environmental Protection
Agency

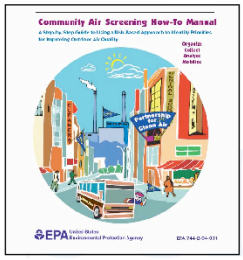
Publicly Available Assessment Tools

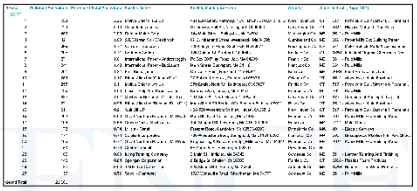
Tools available to communities for conducting cumulative exposure and risk assessments

(In press, *J Expo Sci Environ Epidemiol*)

Timothy M. Barzyk Kathryn C. Conlon, Teresa Chahine, Davyda M. Hammond, Valerie G. Zartarian, Bradley D. Schultz



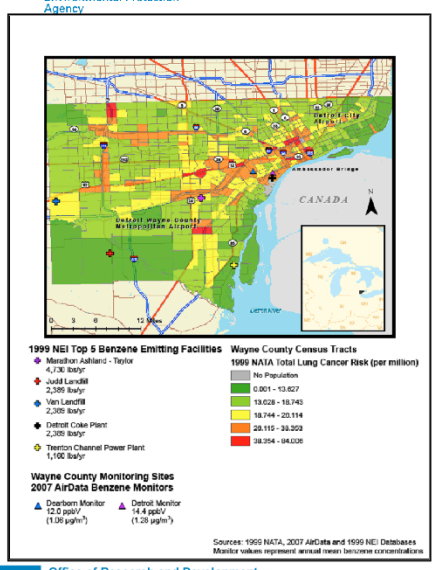


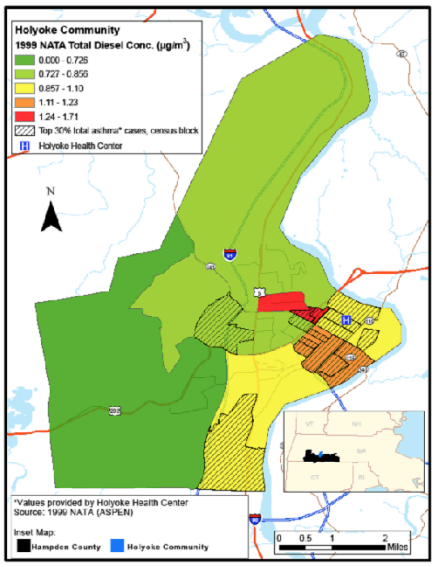


Office of Research and Development
National Exposure Research Laboratory

Several Issues, Separate Tools

Compiling Information is Challenging





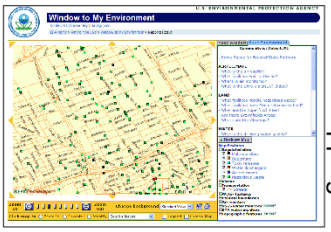
Office of Research and Development
National Exposure Research Laboratory

Hammond et al. (In Review) Application of National Databases and Mapping Tools at the Local Level to Two Community Case Studies

3

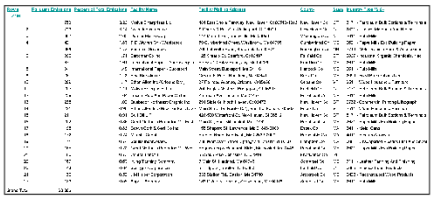
EPA
United States
Environmental Protection
Agency

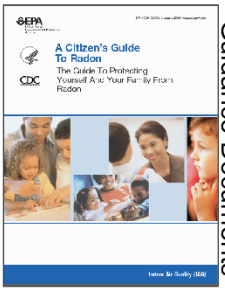
Types of Available Tools
(most on-line)



GIS Mapping

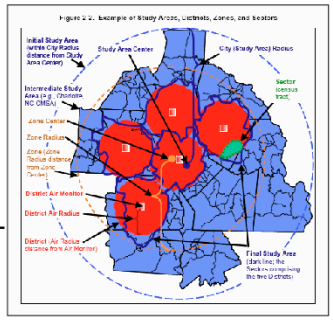
Databases

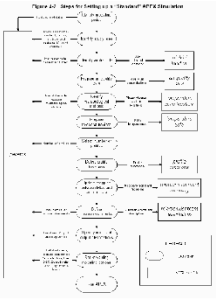




Guidance Documents

Exposure Models





Office of Research and Development
National Exposure Research Laboratory

http://www.epa.gov/heasd/risk/projects/c3a_risk_assessment_tools.htm

4

Scientific Tools

- Measurements
  - Medina-Vera et al. (2009) did address publicly available test kits
- Biomarkers
- Modeling
- Epidemiology

Ongoing Question

How can components of these be used by and for communities?

Chemical-Related Community Concerns

Accidental Releases - Oil Spills	Criteria Air pollutants	Industrial Solid Waste Sites	Physical Degradation of Water & Wetlands
Accidental Releases - Toxics	Diesel Exhaust	Industrial Waste Discharges to Surface Waters	Point Sources - Major Other than Landfills
Agriculture	Direct Point Source Discharges to Water	Integrated Pest Management / Pesticides	Printers
Airport	Dredging/PCBs	Land Use / Redevelopment/ Smart Growth	Radiation (Other than Indoor Radon)
Air Quality	Drinking Water	Lead	Radon
Mobile Source Pollution (Highways)	E. Coli at Beaches	Mercury	School Buses (Including Diesel)
Air Quality - Point Source Emissions	Environmental Tobacco Smoke	Methamphetamine Labs	Schools/Hazardous Waste
Ambient Air Pollutants	Energy Conservation	Mining Waste	Soil – Unlined Sumps
Arsenic in Soil	Fish Consumption	Mold	Solid Waste Disposal (Bulky Items, Landfills)
Asbestos	Groundwater Contamination	Municipal Solid Waste Sites	Recycling
Asthma	Hazardous /Toxic Air Pollutants	Municipal Waste Discharge to Surface Waters	Storage Tank Releases
Autobody Shops / Recyclers	Hazardous Waste / Pharmaceuticals	New Toxic Chemicals	Super-Emitting Cars
Brownfields	Hazardous Waste Sites – Active	Nonhazardous Waste Sites - Industrial	Ozone Depletion (UV Exposure)
Burning	Hazardous Waste Sites – Inactive	Nonhazardous Waste Sites - Municipal	Uranium Mines
Children's Health	Hazardous Waste Sites - Abandoned/ Superfund	Nonpoint Source Discharge to Surface Water	Vector Diseases
Coal Dust	Healthy Homes (Cleaning Products, Allergens)	Odor and Noise Pollution	Water Quality - Wastewater / Sewage
Consumer Exposure to Chemicals	Indirect Point Source Discharges to Water	Particulate Matter (Fine)	Water Quality - Stormwater Runoff
Contaminated Sludge	Indoor Pollution	Pesticide Application	Chemical Exposures (Industry & Agriculture)
Creosote	Indoor Vapor Intrusion	Pesticide Residue on Foods	Worker Health

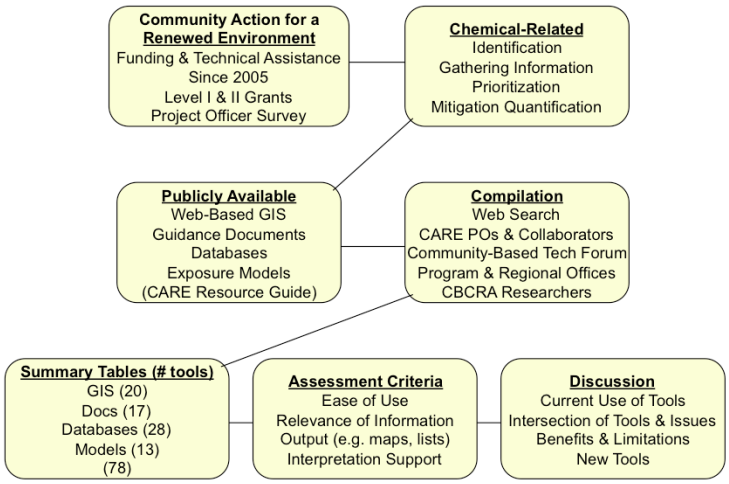
From 10 References

Hammond et al. (in preparation) – Expanding on this topic

EPA United States Environmental Protection Agency

Assessment of Current Tools

Methods



Assessment of Current Tools
Results – Chemical-Related Community Stressors

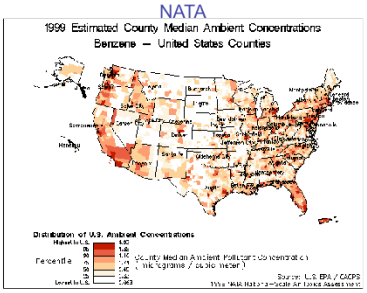
Description (References)	Results
• EPA 1987 Report • EPA 1990 SAB Report • EPA 1993 Report • 1999 NATA • Region 5 Assessment • Pacoima CARE • Detroit CARE • CARE Workbook • CARE Directory • CARE PO Survey	• Each community different • List as reference for stressor identification • Expanding with other initiating factors • Non-chemical Stressors: – National Environmental Justice Advisory Council (2004) • Emerging issues, e.g., – caulk PCBs – turf lead

Assessment of Current Tools
Results – GIS

Description

- Features (information, resolution)
- Databases Accessed

NATA



Results, e.g.

- Particulate Matter
- Regulated Facilities
- Demographics
- Watersheds

Additional Tools

- Scorecard.org – Ranking
- AirNow.gov – Real-time AQ + Educational Resources

Assessment of Current Tools
Results – Guidance Documents

United States Environmental Protection Agency

Description

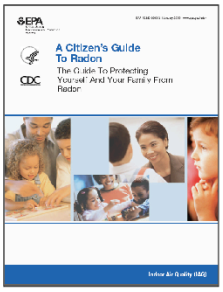
- Stand-Alone Publications
- Step-by-step process
- Air toxics, lead, radon, asbestos, etc.

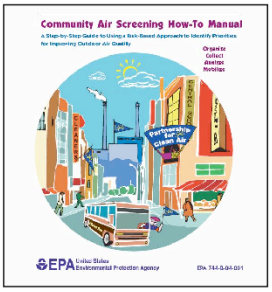
Results

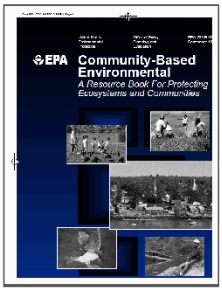
- Table describes application & audience
- ~1/4 designed for community groups

Non-EPA

- PACE EH – ID & Rank
- THRIVE – Environmental & Social Factors





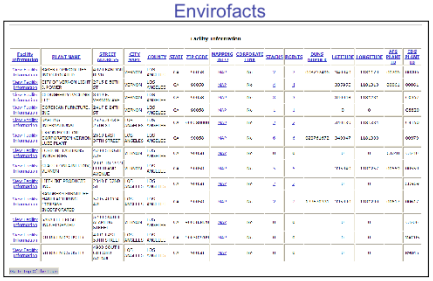


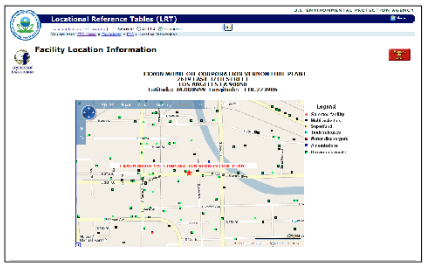
Assessment of Current Tools
Results – Databases

United States Environmental Protection Agency

Description	Results
• On-line Query • Multi and Single Media	• Table describes updates and content • Envirofacts Data Warehouse & EnviroMapper • NATA • Found across agency websites

Envirofacts





EPA United States Environmental Protection Agency

Assessment of Current Tools

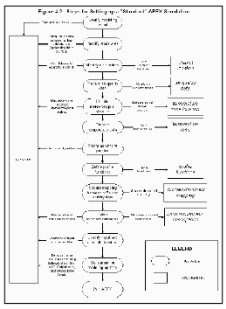
Results – Exposure Models

Description

- Chemical contact with skin, nostrils, mouth, etc.
- Fate & Transport, and Dose Models not included

Results

- Table – Objectives, Inputs, Outputs, Availability
- As a group – all routes covered
- Most are inhalation
- Human activity patterns
- Quite technical – few screening level



Assessment of Current Tools
Discussion – Current Use

Findings	Implications
• Majority not used	• Round table discussions
• PACE EH popular	• Risk perception
• TRI & NEI by technical users	• Myriad issues – prioritization difficult due to challenge of gathering information (health effects, predominance, mitigation steps)
• Non-chemical not addressed by tools	
• General lack of awareness of available tools	• Interpreting & presenting tool output

Assessment of Current Tools
Discussion – Intersection of Tools & Needs

Findings

- Issues addressed independently
- Output formats incompatible
- Comparative risk unavailable
- Integrated risk unavailable

Implications

- Group covers range of media & pollutants
- GIS – air, water, facilities
  - Enviromapper – 10 tools, different databases
- Docs – Few geared towards communities, typically for specific issue
- Databases – multimedia & data-rich – analysis and interpretation difficult

Assessment of Current Tools
Discussion – Benefits & Limitations

Overall
Benefits – Wide breadth of coverage
Limitations – Risk ranking, cumulative & integrated risk

Tool	Benefits	Limitations
GIS	Issue identification Mapping	Separate tools Different outputs
Guidance Documents	Overview of cumulative risk	Singular issues
Databases	Data-rich Multi media, pollutants	Analysis & interpretation Coverage of community issues
Exposure Models	Thorough exposure & risk characterizations	Technical expertise Environmental inputs

EPA United States Environmental Protection Agency

Assessment of Current Tools
Discussion – New & Improved Tools

Development	Features
• Feedback from communities, POs, CBCRA researchers • Allow communities to: 1. Define the problem 2. Supply local knowledge 3. Interpret results in local context • Transparent • Accessible to non-scientists • Reflective of local input • Targeted to solutions • Quick output	• Cumulative exposure & risk • Integrated exposure & risk • Non-chemical stressors 1. Socio-economic 2. Behavioral factors 3. Built environment • Ecosystem effects

Community-Focused Exposure & Risk Screening Tool C-FERST

- Web-based tool to assist with identification & prioritization
- One-stop Shop:
  - View EPA information at national or local scale
  - Access report on community-specific exposure & risk characterizations
    1. General information
    2. Susceptible populations
    3. Sources
    4. Concentrations
    5. Exposures
    6. Health risks & effects
    7. Reduction actions
  - Access fact sheets, technical papers, web links, dynamic maps
  - Links to other tools
- Initially C-FERST is being developed for EPA project officers working with community partners
  - Future end users could include other federal, state, or local agencies working with community partners, or community partners themselves

Measurement Kits

Medina-Vera M., Van Emon J., Melnyk L., Bradham K., Harper S., Morgan J. (2009) An overview of measurement tools available to communities for conducting exposure and cumulative risk assessments. *J Expo Sci Environ Epidemiol*

1. Screening level measurement methods
2. Quantitative screening methods – Instruments or lab
3. Refined quantitative methods – EPA methods

Table 1. Screening measurement methods: examples of commercially available test kits.

Analyte(s)	Estimated price range as of 2009	General description
Indoor air		
Mold and bacteria Formaldehyde, nitrogen dioxide, carbon monoxide and carbon dioxide	$69.95 for one; $109.95 for two	Spot tests for rooms and forced hot air heating and air conditioning systems for mold, yeast and fungus. User needs to count colonies formed. Dosimeter tube tests for other gases.
Ozone	$14.95	Kit includes four One-Hour Ozone Test Cards. If ozone is present, the card changes color. The color is compared with a color chart.
Toxic black mold, bacteria and yeast	$19.95	Air from vent tested for 1 min. Results in 24–72 h by comparing growth with the provided chart.
Mold spores, bacteria and fungus	$13.95 per set	Air is sampled on a pretreated petri dish. Results after 36–40 h. User visually counts the number of mold colonies.
Water		
Phosphate, chlorine, ammonia, nitrogen and chloride	50 tests — $71.90 50 tests- $61.70 50 tests — $46.50 50 tests — $39.50	For each analyte, swirl or dip strips according to instruction. Read color change and compare with color chart.
Bacteria/mold Pesticides — atrazine and simazine, ammonia, nitrate and nitrite, iron, chlorine, copper, hydrogen sulfide and lead	$8.99 to $35.95	Bacteria test results after 48 h of collection, a positive or negative color response is obtained. For lead and pesticides, a positive/negative visual line is obtained. Test strip results are compared against the color charts provided.
Arsenic	$25.95 for two tests	Requires addition of three reagents. Colorimetric change is compared with a chart.
Ammonia, nitrogen, calcium, magnesium, free carbon dioxide, chloride, chlorine, chromium (chromate), copper, cyanide, iron, nitrate, phosphorus (phosphate) and sulfide	Options ranging from $164.35 to $516 depending on the number of samples and analytes to be detected.	Individual test kits with colorimetric detection in a carrying case. Each kit contains multiple tests (40–50), report forms and handbooks.
Drinking/tap water		
[illegible]	[illegible]	[illegible]

Assessment of Current Tools
Conclusions

1. Tables present an overview based on a comprehensive sample of tools, stakeholders and researchers
2. Can be used to facilitate community-based cumulative exposure & risk assessments
3. Current tools cover a wide breadth of information, but separately
4. Cumulative & integrated risk, and risk ranking, typically not addressed
5. Compiling information from separate tools is challenging
6. Comparing risks is challenging
7. Communities generally unaware of available tools
8. C-FERST being developed as a user-friendly, web-based resource to address research needs

Acknowledgements

- CARE administrators, project officers and community members
- Matt Lakin, Region 9
- Hank Topper (retired) CARE Program
- Myriam Medina-Vera, U.S. EPA, NERL
- Stephen Graham and Eric Hall
- Everyone who contributed feedback and suggestions

References

1. Zartarian, V.G., Schultz, B.D. (2009) The EPA's human exposure research program for assessing cumulative risk in communities. *J Expo Sci Environ Epidemiol*

2. Medina-Vera M., Van Emon J., Melnyk L., Bradham K., Harper S., Morgan J. (2009) An overview of measurement tools available to communities for conducting exposure and cumulative risk assessments. *J Expo Sci Environ Epidemiol*

3. Barzyk, T.M., Conlon, K.C., Chahine, T., Hammond, D.M., Zartarian, V.G., Schultz, B.D. (2009) Tools available to communities for conducting cumulative exposure and risk assessments. *J Expo Sci Environ Epidemiol*

4. Hammond, D.M., Conlon, K.C., Barzyk, T.M., Zartarian, V.G., Schultz, B.D. (In Review) Application of National Databases and Mapping Tools at the Local Level to Two Community Case Studies.

5. Conlon, K.C., Barzyk, T.M., Hammond, D.M., Lakin, M., Zartarian, V.G. (In Preparation) Community-Based environmental assessments and mitigation efforts: Results from a survey of US EPA CARE project officers.

6. CARE Program – www.epg.gov/care

1,2 and tables from 3 available:
www.epa.gov/heasd/risk/projects/c3a_risk_assessment_tools.htm

Contact information (and proofs for #3)
Tim Barzyk, barzyk.timothy@epa.gov, 919-541-1520

United States Environmental Protection Agency

Disclaimer

- Although this work was reviewed by EPA and approved for presentation, it may not necessarily reflect official Agency policy.

EPA United States Environmental Protection Agency

Thank You

After viewing the links to additional resources, please complete our online feedback form.

Links to Additional Resources

Feedback Form

Office of Research and Development
National Exposure Research Laboratory