

US EPA ARCHIVE DOCUMENT

Multiple and Cumulative Impacts / Effects

Strengthening EJ Research
and Decision Making

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Disclaimer

- ◆ The views expressed in this presentation are those of the author and do not represent the policy of the U.S. EPA.

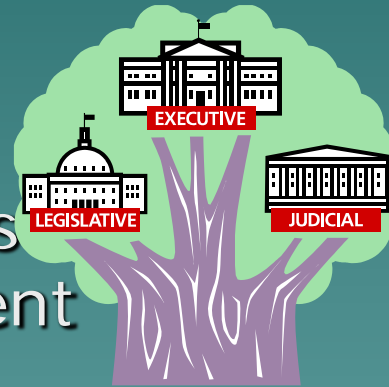
Most of this is EPA policy.

Discussion Points

- ◆ EPA is bound by laws, science, economics
 - ◆ Cumulative and aggregate risk is not easy to do (doesn't mean we ought not do it).
 - ◆ Models drive data gathering and interpretation.
 - General population vs. focused surveys
 - Allostasis, allostatic load
- 
- A stylized silhouette of a mountain range in a darker teal color, located in the bottom right corner of the slide.

Legislative Authorities for Water

- ◆ Safe Drinking Water Act (1974, 86, 96)
 - Requires EPA to set maximum levels for contaminants in water delivered to users of public water systems.
- ◆ Clean Water Act (1977)
 - Sets water quality criteria and guidelines & technology-based standards for ambient waters
- ◆ Food Quality Protection Act (1996)
 - Requires special consideration of hazards to children from pesticides in food



SDWA 1996



- ◆ Must regulate DBPs, microbes, As
- ◆ Contaminant Candidate List (CCL)
 - EPA publishes its regulatory agenda
 - Must do regulatory determination of 5 every 5 years.
- ◆ The Six Year Review -- of existing NPDWR
- ◆ Use of best available, peer reviewed, publicly available science
- ◆ Must consider water as a mixture
- ◆ Emphasis on protecting sensitive populations
- ◆ Public "right to know"

Sensitive Subpopulations

- ◆ "EPA considers the most sensitive individuals where there are data, but does not necessarily attempt to protect "hypersensitive" individuals. The degree to which sensitive individuals are protected, or explicitly defined, may vary between programs based on factors such as the need to balance risk reductions and costs as directed and constrained by statutory authority."
- ◆ CWA criteria
 - Most highly exposed populations should not exceed 10^{-4} risk level
 - Use appropriate exposure data or assumptions
- ◆ SDWA must consider sensitive sub-populations of infants, children, pregnant women, elderly, individuals with history of serious illness [§1412(b)(3)(C)(i)(V)]

To Regulate: SDWA '96

Does the contaminant adversely affect public health?

Is the contaminant known or likely to occur in PWSs with a frequency and at levels posing a threat to public health?

Will regulation of the contaminant present a meaningful opportunity for health risk reduction?

**Regulate with
NPDWR**

What is the Enforceable Level?

- ◆ Maximum Contaminant Level
- ◆ Highest concentration of contaminant allowed in PWS water
- ◆ Set as close to MCLG as feasible
 - Considers treatment options
 - Considers analytic level of detection
 - Cost / benefit analysis may be used
 - Set as close to 10^{-6} as possible. Need a really good reason to set over 10^{-4} .



Primary NPDWR for Mixtures?

Contaminant	MCL Goal (mg/L)	MCL (mg/L) or TT	Potential Health Effect
<i>Cryptosporidium</i>	Zero	TT	GI
Viruses	Zero	TT	GI
Total Trihalomethanes	None	0.080	Cancer
Chlorine	MRDLG = 4.0	MRDL = 4.0	Eye/nose irritation and stomach discomfort
Arsenic	Zero	0.010	Skin damage & cancer risk
Lead	Zero	Action level 0.015	development
Atrazine (other 'zines?)	0.003	0.003	Cardiovascular or reproductive

DBP1 -- 11 DBPs Regulated

- ◆ Bromate

- ◆ THM

- Chloroform
- Dibromochloromethane
- Dichlorobromomethane
- Bromoform

- ◆ Chlorite

- ◆ Haloacetic acids

- Chloroacetic acid
- Dichloroacetic acid
- Trichloroacetic acid
- Bromoacetic acid
- Dibromoacetic acid

But are meant to serve as indicators of all DBPs -- identified or not

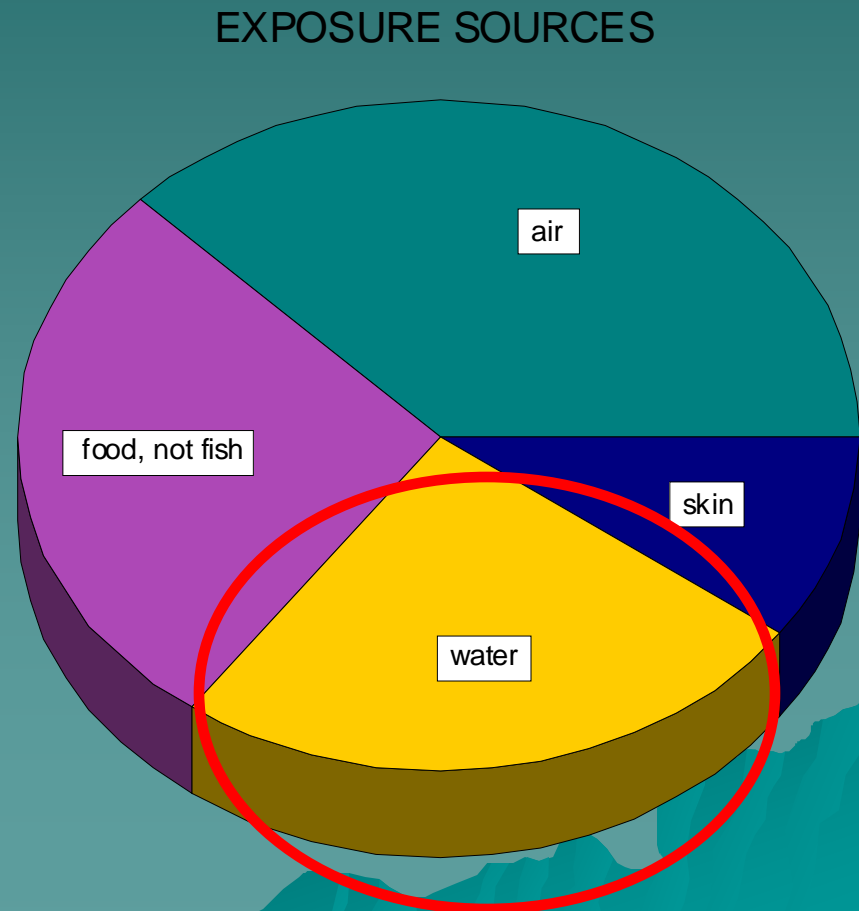
Synergism

- ◆ Theoretically plausible for some MOA
- ◆ Very difficult to demonstrate at low (environmental) levels of exposure
 - Ra and smoking, smoking and asbestos, aflatoxin and hepatitis B

What Is Relative Source Contribution?

A way to account for all sources of exposure in setting a criterion or standard

This is a part of risk assessment



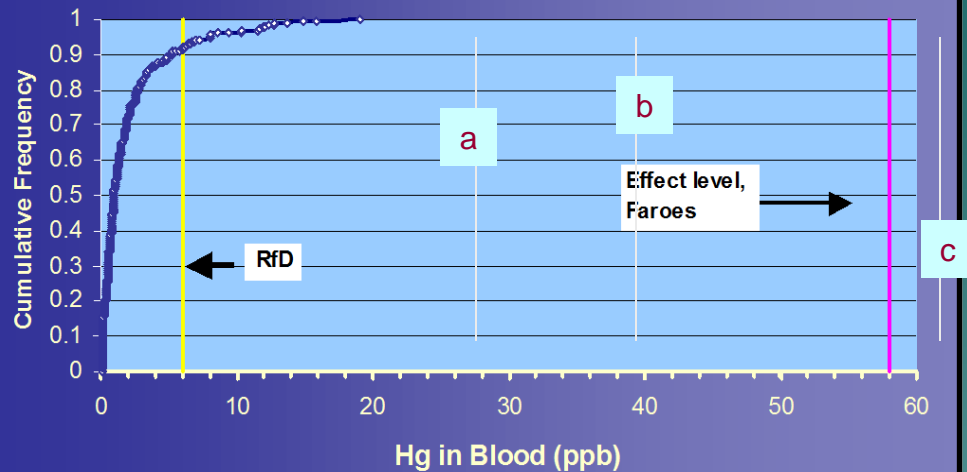
RSC for chloroform

- ◆ 34% ingestion as liquid
 - tap water, non-tap water, non-dairy liquids
- ◆ 31% inhalation
 - Shower and swimming
- ◆ 27% ingestion in food
- ◆ > 8% dermal



So DW reg could use only 20% of the RfD

Is Anyone in U.S. Exposed to MeHg?



Data from NHANES continuing CDC study indicate distribution of MeHg blood levels

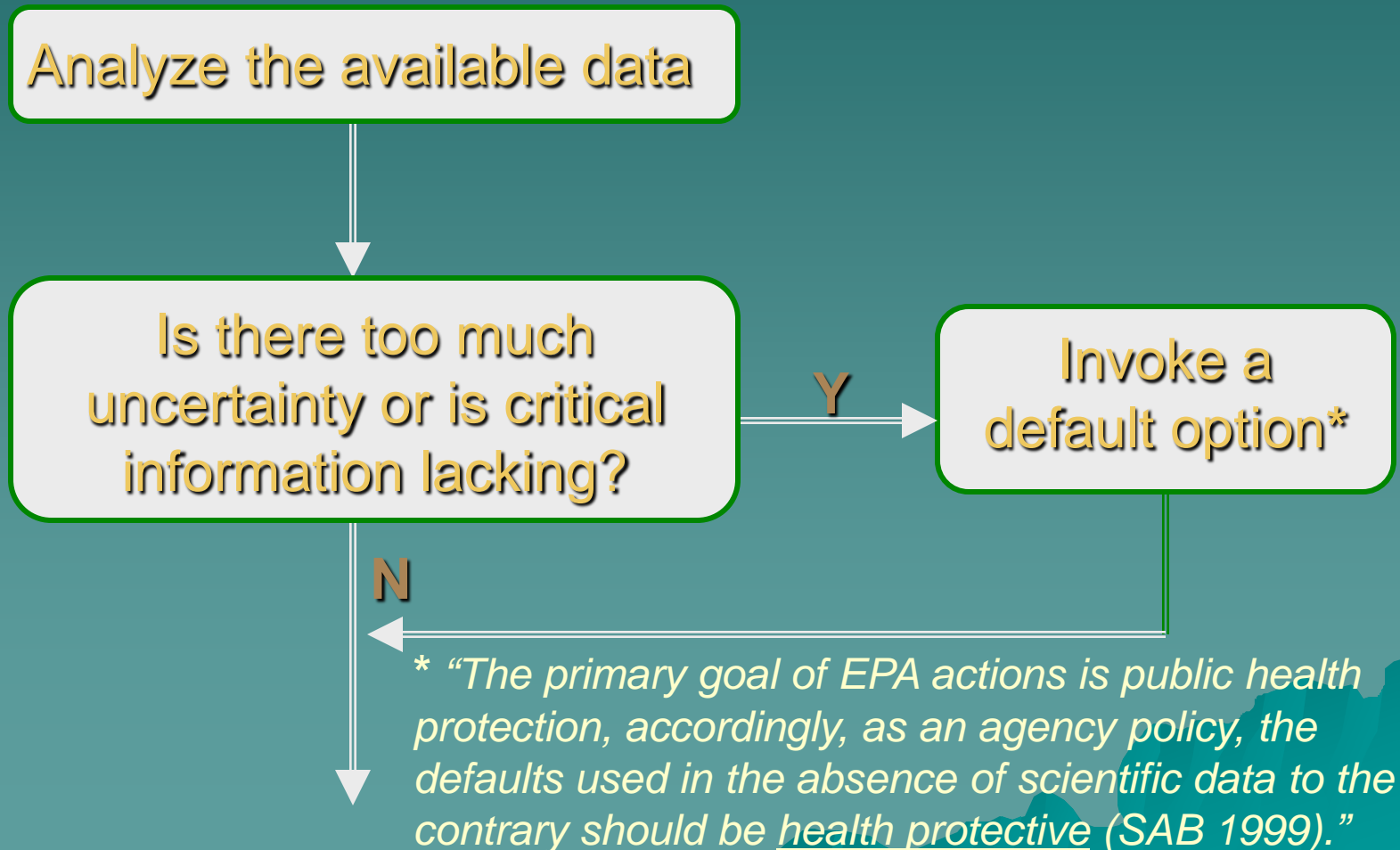
- 7.8% women of childbearing age were above RfD (99-00); ~ 5.7 (99-02)
- Blood mercury higher in some ethnic groups
- Fish consumption was associated with increased blood Hg

Data from smaller, localized surveys show higher blood mercury than NHANES

- Median blood mercury was 7.1 ppb, people eating fish from AR waters
- Median was 25 ppb in 6 commercial fishers and family in LA (a)
- Family in WI, 37- 38 ppb (ate sea bass twice /week) (b)
- High income fish-eaters had greater than 80 ppb (c)

New Paradigms Can Be Useful

Analyze all data before using defaults



Activation of Toxicity Pathway

