

# Practical Decision-Making Tools for Identifying Safer Alternatives

## **Prioritization of Toxic Air Contaminants Under Children's Environmental Health Protection Act**

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# Children's Environmental Health Protection Act (SB 25)

- Enacted in 1999
- Establishes new requirements aimed at protecting Children's Health
- Air Resources Board and Office of Environment Health Hazards Assessment



# SB 25

- OEHHA required to develop a list of “up to five toxic air contaminants ...that may cause infants and children to be especially susceptible to illness.”
  - First cut, only 5; subsequent updates not as constrained.
- In developing the list, the office shall take into account public exposures to toxic air contaminants, and the following factors



# Factors to Consider in Statute

- (A) **Exposure patterns** among infants and children that are likely to result in disproportionately high exposures
- (B) **Special susceptibility** of infants and children to ambient air pollutants in comparison to the general population
- (C) The effects on infants and children of exposure to toxic air contaminants and other substances with a **common mechanism of action**
- (D) The **interaction of multiple pollutants**.



# Initial Prioritization of >200 TACs

- Initial selection of TACs for focused literature review
  - 1. Considered ARB's (and other sources) ambient concentration data – is there widespread exposure?
  - 2. Rank chemicals by toxicity and exposure:
    - Divided ambient concentration data by noncancer chronic Reference Exposure Level (REL) and ranked by the resulting ratio.
    - Multiplied ambient data by Unit Risk Factor (URF) to rank carcinogens by ambient cancer risk.



# Initial Prioritization, cont.

- This initial procedure provided a ranking based on existing RELs and URFs and ambient concentration data.
- Still needed to evaluate other sources of exposure information.
- Still needed to consider toxicological properties and whether there is a known or suspected sensitivity of young organisms.



# Initial Prioritization, cont.

- We therefore also considered emissions inventory data from the Air Toxics Hot Spots program (stationary sources) and mobile source inventories.
- We reviewed the entire list of TACs to look for any chemicals with known toxicological properties (not just TACs w/ ambient air measurements) that would be of concern (e.g., mercury).
- Over half TACs dropped out in this first cut.



# Focused Literature reviews

- Limited resources required choosing a subset for review (36 TACs).
- Focused on those that ranked high based on  $REL/[conc]_{air}$  or  $URF \times [conc]_{air}$
- But also weighted those with known toxicological properties that have been shown or might be expected to demonstrate differential sensitivities in young vs. mature.



# Focused Reviews

- Evidence indicating infants or children may be more susceptible to the toxicity.
- Nature and severity of the effect; irreversibility.
- Potential difference in susceptibility to carcinogenesis by age-at-exposure.
- Extent of exposure and/or magnitude of risk at ambient concentrations.
- Indications that infants and children may be more heavily exposed.



# Toxicological “Red Flags”

Considered that the following toxicological endpoints raise concern about increased susceptibility in early life stages:

- Developmental toxicity (especially if most sensitive endpoint)
- Neurotoxicity
- Endocrine disruption
- Immunotoxicity
- Respiratory
- Genotoxicity
- Carcinogenicity

# Asthma and Differential Impacts

- Asthma in children
  - prevalence rate higher than adults.
  - smaller airways; constriction causes greatly increased resistance.
  - Hospitalization rates highest for 0-4 year olds
  - Asthma prevalence rates increasing

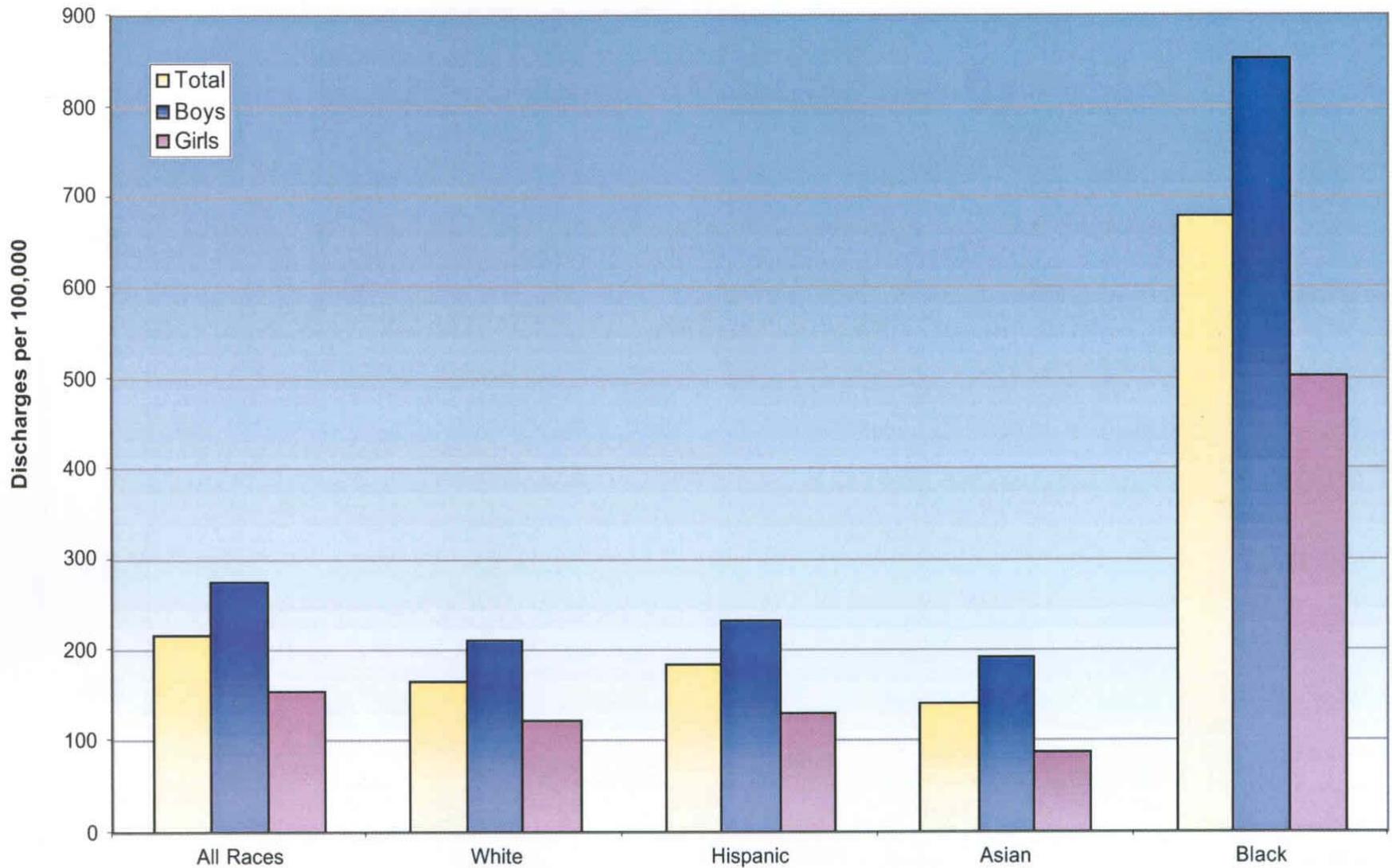


## Office visits, ER visits, and hospitalization for asthma by age (CDHS, 2000)

Age	Office per 1000	ER per 1000	Hospital per 10,000
0-4 yrs	50.3	120.7	49.7
5-14 yrs	51.5	81.3	18.0
15-34 yrs	22.8	69.2	10.0
35-64 yrs	41.7	64.4	15.2
> 65 yrs	44	29.5	25.5



Figure 11: Age-Adjusted\* Asthma Hospital Discharge Rates for Children (Ages 0-14 years) by Race and Sex, 1995-1997.



\* Age-adjusted to the 1990 California population.

# 17 Candidates for Listing

- We chose 17 chemicals or chemical classes for potential listing based on focused literature reviews and Scientific Review Panel input (peer review panel of UC scientists)
  - known toxicological properties; strong evidence for differential toxicity weighted heavily
  - evidence of widespread exposure also weighted.
- Proposed listing 5 (Tier 1)



# Public and Peer Review Process

- Documentation of prioritization reviewed by public and by the State's Scientific Review Panel (SRP) on Toxic Air Contaminants.
- SRP composed of 9 University professors with variety of expertise.
  - Panel met 6 times and had extensive input.
- Five TACs were selected for initial listing.
- List to be updated periodically.

# TACs that may disproportionately impact infants and children.

<b>Toxic Air Contaminant</b>	<b>Endpoints of Most Concern</b>
Acrolein	Exacerbation of asthma
Chlorinated dioxins and dibenzofurans (dioxins)	Developmental toxicity, immunotoxicity, endocrine disruption; thyroid effects
Lead and compounds	Developmental neurotoxicity/CNS effects
Particulate Emissions from Diesel-fueled Engines	Enhancement of allergic response; exacerbation of asthma; genotoxicity and lung cancer.
Polycyclic Aromatic Hydrocarbons	Developmental effects, genotoxicity, and lung cancer

# Tier 2 TACs

- Formaldehyde – respiratory irritant, carcinogen (widespread exposures)
- Arsenic, manganese, mercury, CS<sub>2</sub>, methyl bromide – neurotox (average exposures low; some hot spots)
- Benzene – hematopoeitic (widespread exposure)
- Methylene chloride – CO metabolite (low overall exposure, CO contribution minimal)

# Tier 2 TACs

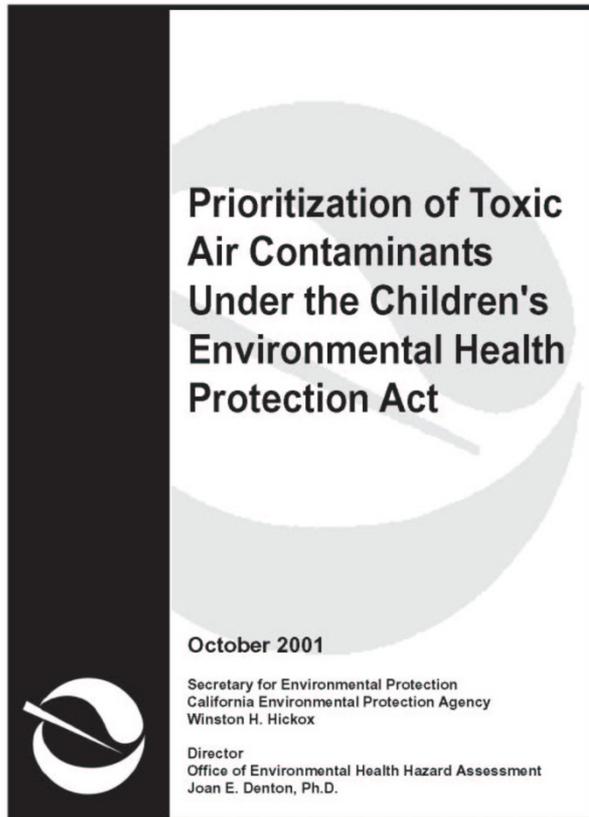
- Ethylene glycol ethers – developmental (but emissions mostly EGBE?)
- PCBs – developmental, neuro, endocrine (air route less important; partly covered under dioxins)
- Vinyl Chloride – carcinogenicity (low average exposures)
- Chlorine – respiratory irritant (low typical exposures)

# Updating List

- Environmental Tobacco Smoke recently added when identified as a TAC in 2005 (many adverse health effects in infants and children).
- As part of our update of risk assessment guidelines, OEHHA will be updating list over next year.
- Listing triggers ARB risk management activities.

# For further information, see:

[http://www.oehha.ca.gov/air/toxic\\_contaminants/SB25finalreport.htm](http://www.oehha.ca.gov/air/toxic_contaminants/SB25finalreport.htm)



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