

# California's Particulate Matter Standards

ARB Research Division

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Air Resources Board

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California Environmental Protection Agency

# Overview

- **PM standards review process**
- **Standard recommendations**
- **Issues raised in public comments**
- **Status of short-term standards activities**
- **Next steps**

# History of California's PM Standards

- **1959 Particulate Standard**
  - visibility <3 miles
  - established by the State Department of Public Health
- **1969 Suspended PM Standards**
  - 60  $\mu\text{g}/\text{m}^3$ , annual
  - 100  $\mu\text{g}/\text{m}^3$ , 24 hr
- **1983 PM<sub>10</sub> Standards**
  - 30  $\mu\text{g}/\text{m}^3$ , annual
  - 50  $\mu\text{g}/\text{m}^3$ , 24 hr

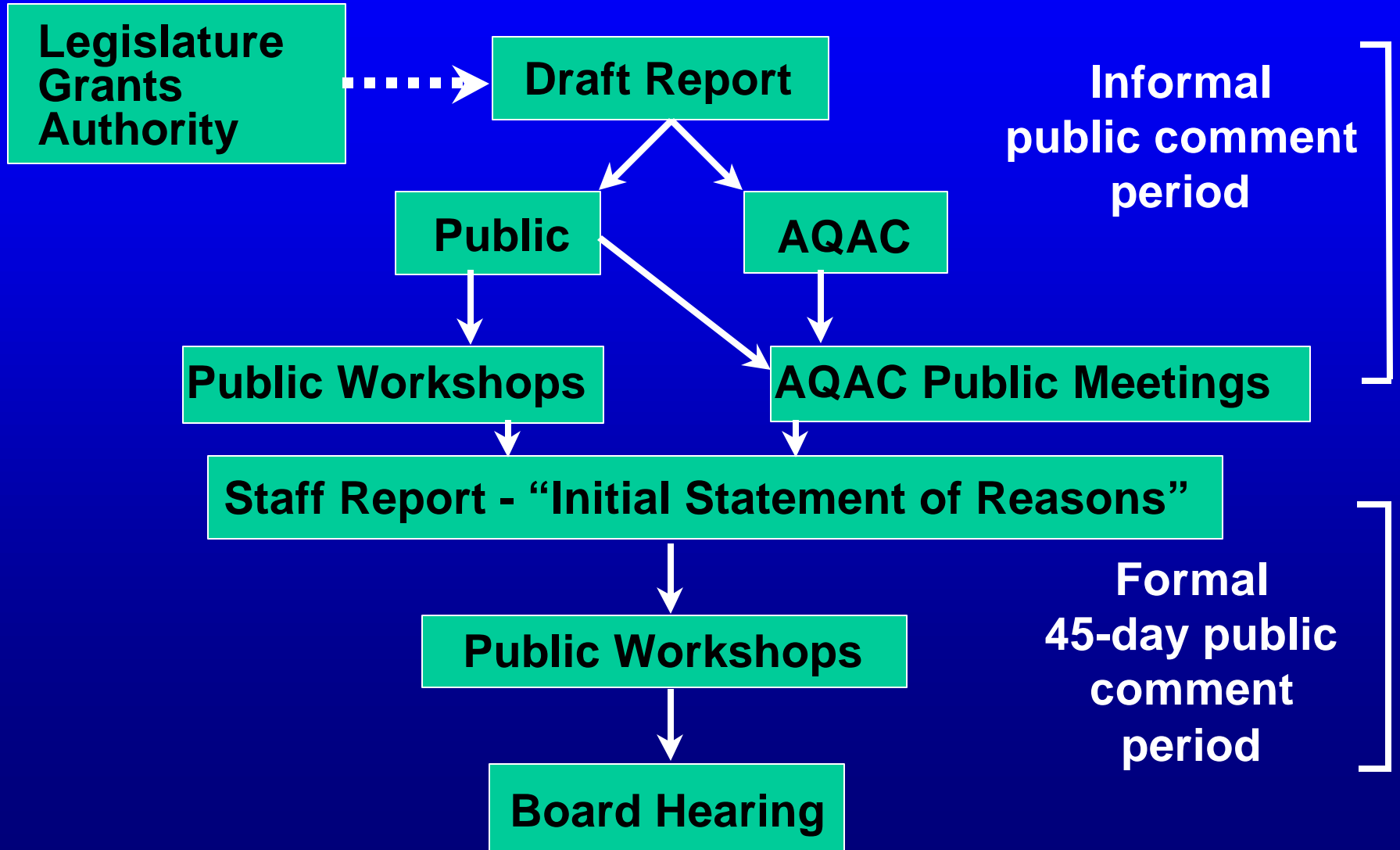
# **Children's Environmental Health Protection Act Review (SB25) Requirements**

- **Determine which standards not protective of public health**
- **Prioritize review of those standards determined inadequate**
- **Review highest priority standard by Dec. 2002**
- **High priority criteria pollutants:**
  - **PM10 (including sulfates)**
  - **Ozone**
  - **Nitrogen dioxide**

# **Particulate Matter Standards Highest Priority for Review**

- **Compelling body of evidence**
- **Significant health effects including premature death and cardiorespiratory disease**
- **Vulnerable groups include infants & children, asthmatics, the elderly, and those with pre-existing heart or lung disease**
- **High exposures in California**
- **Substantial health benefits from lowering PM levels**

# Standards Review Process



# Recommendations for PM Standards

## Annual Standards:

- Reduce PM10 annual-average standard from 30 to 20 mg/m<sup>3</sup>
- Add PM2.5 annual-average standard of 12 mg/m<sup>3</sup>

## 24-Hour Standards:

- Continue review of 24-hour standards (Current PM10 24-hour standard of 50 mg/m<sup>3</sup> remains in effect)

## Sulfates Standard:

- Retain 24-hour standard of 25 mg/m<sup>3</sup>
- Establish alternate monitoring method

# **Recommendations for Monitoring Methods**

- **Adopted Federal Reference Methods (FRMs) for PM10 and PM2.5**
- **Replace TSP-based sulfate method with PM10-based sulfate method**
- **Designated continuous methods as acceptable for PM10 and for PM2.5**



# **Deferral of Staff Recommendations for Short-term Standards**

- Problem with statistical software package used in recent short-term studies**
- ARB and OEHHA staff determined long-term exposure estimates not affected**
- Some short-term studies need reanalysis**

# **Why Proceeded with Annual Standards?**

- Long-term studies not affected by statistical software issue**
- High level of PM exposure in most of California**
- Studies provide conclusive evidence of significant health effects from PM exposure**

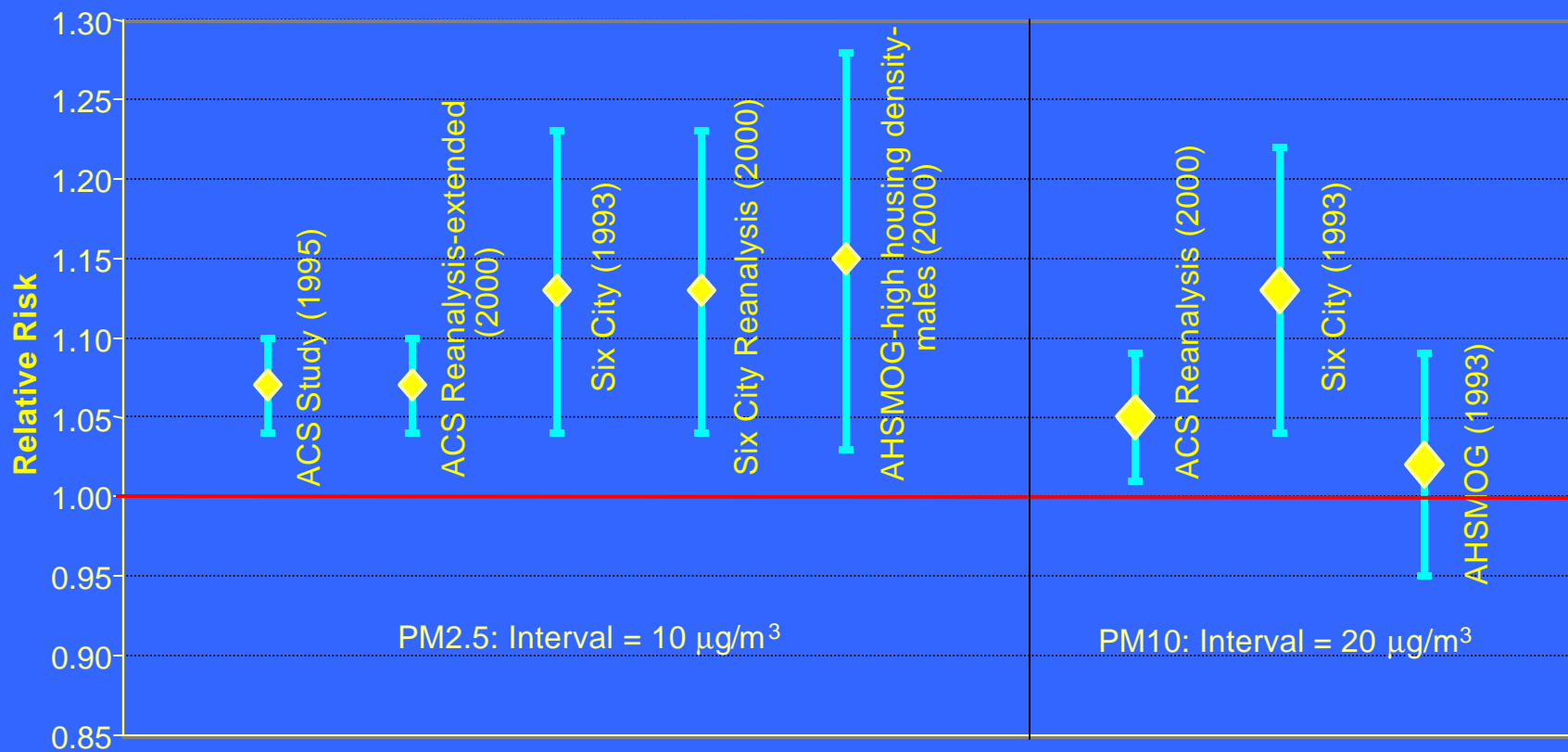
# **PM Standards Based Mainly on Epidemiological Data**

- **Represent real-world exposures and health outcomes**
- **Can examine different population segments (e.g. children, asthmatics, elderly)**
- **Since PM composition is complex, epidemiological studies are relevant**
- **Does not show cause/effect relationship**

# **Key Studies for Annual PM Standards**

- **Newly adopted PM10 and PM2.5 standards based mainly on studies analyzing:**
  - **Harvard Six-Cities data**
  - **American Cancer Society (ACS) data**
- **Important aspects:**
  - **both studies involved broad spatial and temporal coverage**
  - **multiple reanalyses of data reaffirmed and increased robustness of original findings**

# Comparison of Studies of Chronic Exposure and Mortality



# Existing and Proposed Annual-Average Standards for PM

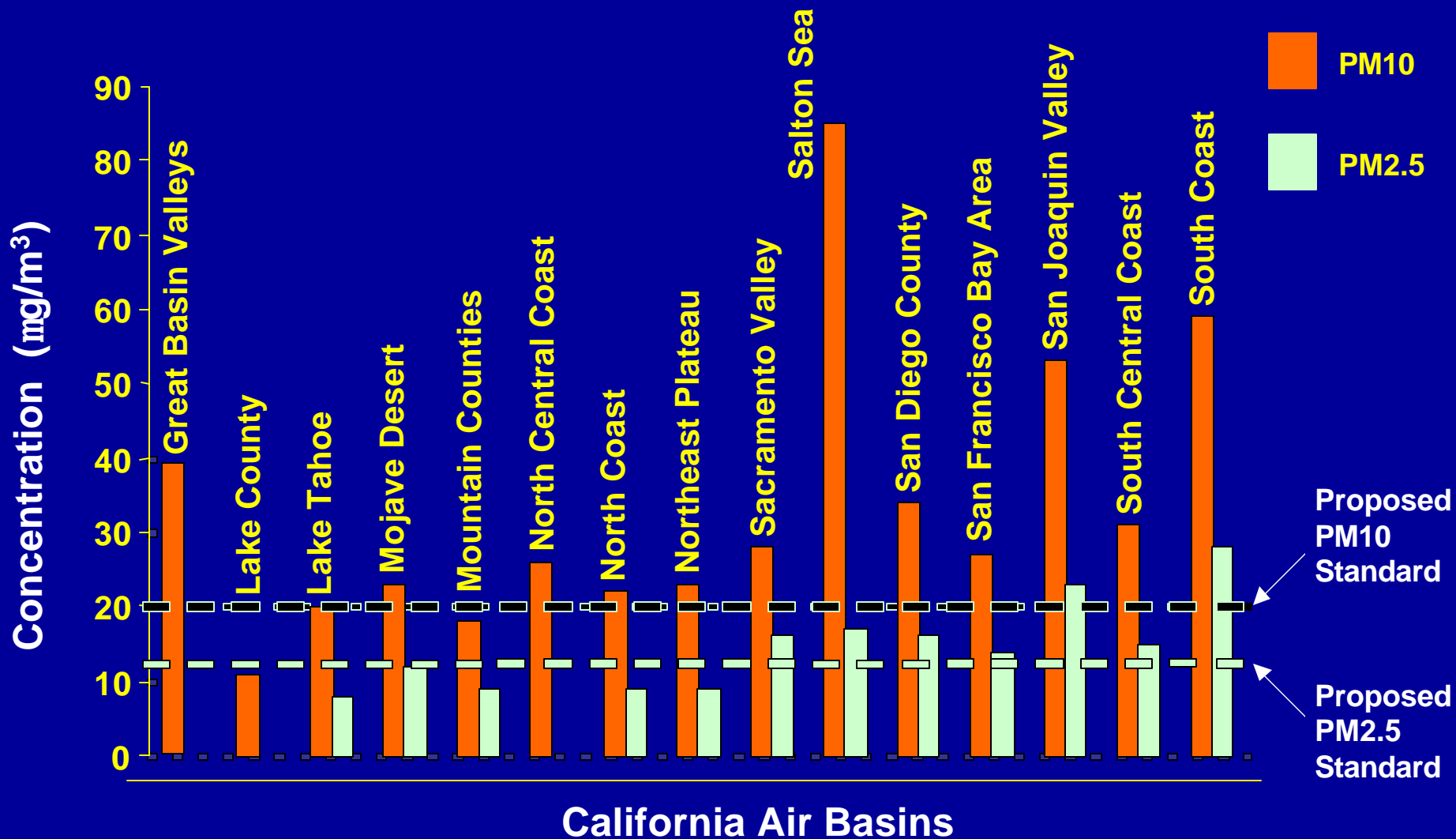
Year Adopted		PM10 ( $\mu\text{g}/\text{m}^3$ )	PM2.5
1983	California	30	--
1997	USEPA	50(40-50)*	15 (12.5 -20)*
1999	EU (2005)**	40	--
1999	EU (2010)**	20	--
2000	UK	40	--
<b>2002</b>	<b>California (adopted)</b>	<b>20</b>	<b>12</b>

\* Ranges based on staff recommendation, USEPA 1996

\*\* Attainment target date; 2010 goal subject to review

# PM10 and PM2.5 by Air Basin

## 2000 Annual Average



# **Expected Health Benefits from Attaining Proposed Standards**

**Meeting the proposed annual-average PM standards would prevent about:**

- 6,500 deaths per year**
- 32,000 cases of bronchitis in children (ages 8 to 12)**
- 340,000 asthma attacks**
- 2.8 million lost work days**
- Thousands of cardiovascular and respiratory hospitalizations among those older than 65**



# Comparative Causes of Death in California

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Cause	Number of Deaths (1999)
PM Air Pollution	6500 (estimated)
Motor Vehicle Accidents	3140
Homicides	2042
HIV/AIDS	1558
Drownings	397

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# **Major Issues Raised in Public Comments**

- Insufficient review time**
- Economic impacts of future controls not considered**
- Lack of EJ consideration (standards too lenient)**
- Recent statistical issues undermine all studies--recommendations should be delayed**
- Bases of standards weak**

**(Note: also hundreds of letters of support)**

# Environmental Justice Considerations

- **Environmental Justice (EJ):** equal consideration of all individuals regardless of income or ethnic backgrounds
- **Standards set public health goal for all communities statewide**
- **Issue: did not address communities concerns to their satisfaction; issues deferred to planning and attainment process**

# **Current Activities on Short-term PM Standards**

- **U.S. EPA facilitating reanalysis of 35 key studies**
  - **Reanalyses presented in Nov. 2002**
  - **Results will be peer-reviewed by HEI coordinated panel**
  - **Final report due in late spring 2003**

# Examples of Corrected Estimates of Mortality in Time Series Studies

“S-PLUS software misapplication biased risk estimates upward...”

**Mortality increase per 10  $\mu\text{g}/\text{m}^3$  increase  
in pollutant concentration (in percent %)**

<b>Study</b>	<b>Pollutant</b>	<b>S-PLUS (original)</b>	<b>S-PLUS (corrected)</b>	<b>Alternative Model</b>
<b>NMMAPS</b>	<b>PM10</b>	<b>0.41</b>	<b>0.27</b>	<b>0.21</b>
<b>Harvard Six-Cities (Schwartz reanalysis)</b>	<b>PM2.5</b>	<b>1.5</b>	<b>1.4</b>	<b>1.2</b>

# **Status of Standards Review Process**

- **Final approval of annual standards in Spring 2003**
- **Short-term PM standards review**
- **Other standards review:**
  - **Ozone**
  - **NO<sub>2</sub>**

# ARB-Sponsored PM Research

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- **Emissions**
  - CNG/Diesel
  - Heavy duty/light duty gas vehicle roadside measurements
- **Exposure**
  - Particle Center exposure facility
  - 12-station ultrafine monitoring network
  - In-home and in-vehicle measurements
  - Upcoming mobile monitoring study
- **Health**
  - Mechanisms of PM toxicity
  - Children's Health Study
  - FACES
  - Upcoming proposal for Southern CA epidemiology study