

# **Children's Health Study: Latest Findings and Implications**

**October 29, 2004**

**California Air Resources Board**



**California Environmental Protection Agency**

**Air Resources Board**

# Why Did ARB Fund CHS?

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- **Air Standards Setting**
- **Children are a Vulnerable Population**
- **Long-term Effects Unknown**



# Air Quality Standards

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- **Public Health Protection Goal**
- **Protect Vulnerable Subgroups**
- **Supported by ARB Research**



# Children and Air Pollution

- **Children are sensitive to air pollution**
  - growing and developing
  - more time outdoors
  - more active and greater exposures



# Long-term Effects

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- **Little was known about long-term effects of air pollution on children**
- **Most previous studies based on short-term exposures to adults**



# **Southern California Children's Health Study**

- **10+ year study of air pollution impact on lung health and growth**
- **Over 5,500 children studied**
  - **12 communities with different pollution profiles**
  - **increased community monitoring**
  - **lung function testing and questionnaires**





# Annual Lung Function Testing



# Lung Function Growth

- 1% per year deficits in lung function growth associated with mix of pollutants (PM, NO<sub>2</sub>, acids)
- 2nd group study replicated results of first (plus effects from elemental carbon)

Gauderman WG et al. 2000. Association between air pollution and lung function growth in southern California Children. *Am J Respir Crit Care Med* 162:1383-1390.

Gauderman WG et al. 2002. Association between air pollution and lung function growth in southern California Children: Results from a second Cohort. *Am J Respir Crit Care Med* 166:76-84.



# Lung Function at Age 18

- **Reduced lung function growth from age 10-18**
- **Children in high air pollution areas had significantly lower values on lung function tests at age 18**
- **Associated with mix of pollutants (PM<sub>2.5</sub>, NO<sub>2</sub>, acids, elemental carbon)**
- **Motor vehicle link to pollutants**

Gauderman WG et al. 2004. The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age. N Engl J Med 351:1-11.

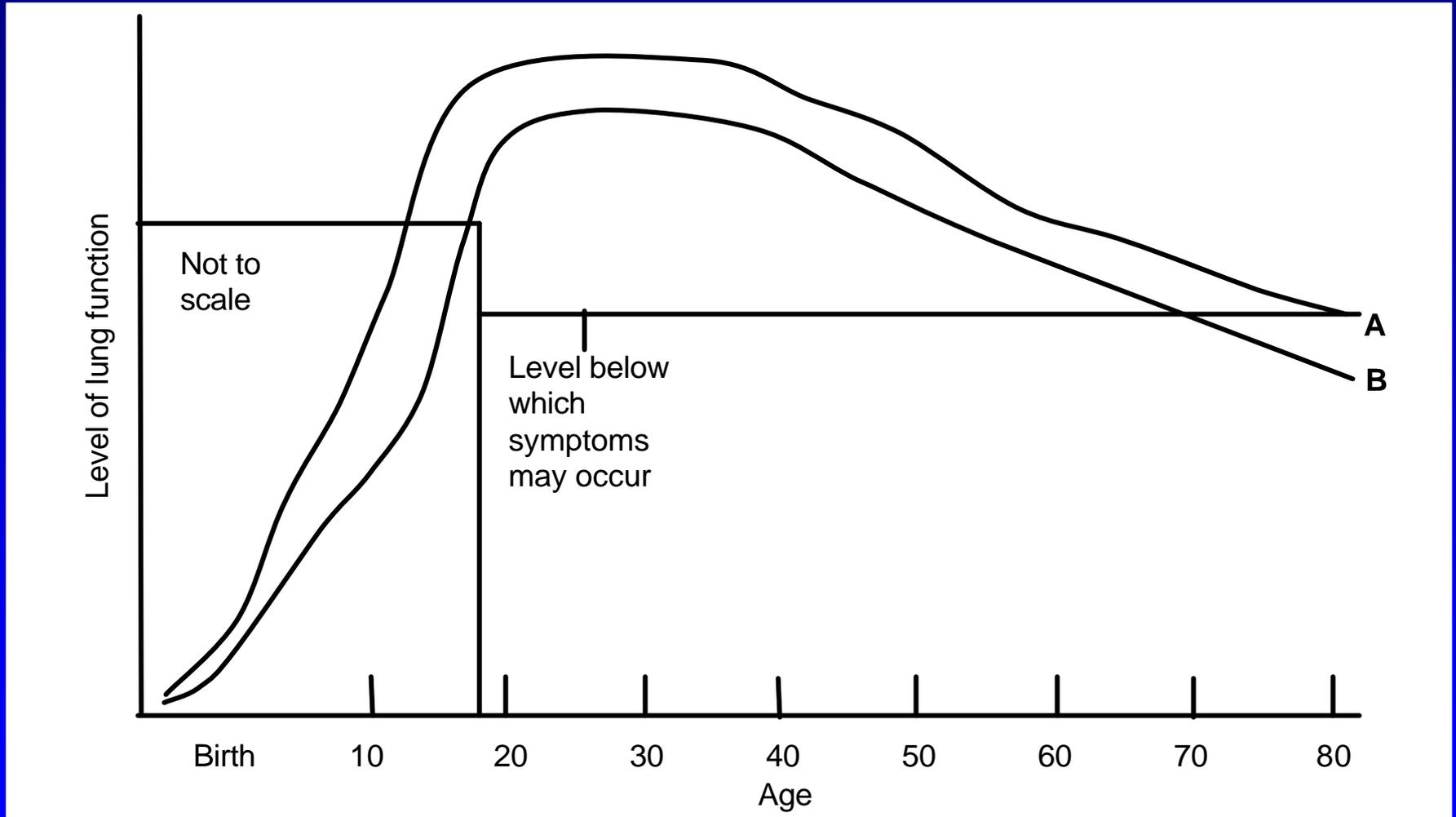


# Implications

- **18 year olds are nearing the end of their lung development**
- **Likely that changes are permanent**
- **Long-term health implications**
- **Greatest effect may occur later in life (reduced lung function - a risk factor for adult respiratory illness and death)**



# Lung Function Growth



Adapted from Strachan et al 1997; Courtesy of USC



# Lung Function Growth “The Solution”

- **2001 Study on Relocation**
  - relocation to lower PM10 areas associated with increase in lung function growth
  - air quality improvements can improve children’s health

Avol EL et al. 2001. Respiratory effects of relocating to areas of differing air pollution levels. *Am J Respir Crit Care Med* 164:2067-2072.



# Asthma

- Asthma causation related to high ozone and exercise
- Bronchitic symptoms related to air pollution only in asthmatics
- High traffic increased risk of asthma

McConnell R, et al. 2002. Asthma in exercising children exposed to ozone: a cohort study. *Lancet*. 359:386-91

McConnell R, et al. 1999. Air pollution and bronchitic symptoms in southern California children with asthma. *Environ Health Perspec* 107:757-760.

McConnell R, et al. 2003. Prospective study of air pollution and bronchitic symptoms in children with asthma. *Am J Respir Crit Care Med* 168:790-797.

McConnell R, et al. 2002. Traffic and asthma prevalence in children. *Amer J Respir Crit Care Med*. 165(8) A492



# School Absenteeism

- **School absenteeism associated with ozone increases**
- **Upper and lower respiratory symptoms and illness**

Gilliland FD, et al. 2001. The effects of ambient air pollution on school absenteeism due to respiratory illnesses. *Epidemiology* 12:43-54.



# Gender Differences

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- **Boys more susceptible to respiratory symptoms and asthma**
- **Girls more susceptible to lung function development effects**



# Conclusions

- **Air pollution associated with:**
  - short- and long-term respiratory effects in children
  - reduced lung function growth
  - asthma causation
- **Air quality improvement leads to better lung function in children (and adults)**
- **Greatest impact of lung function deficits may be in adulthood**



# Thank you

