

Fine Particles a Major Threat to Children?

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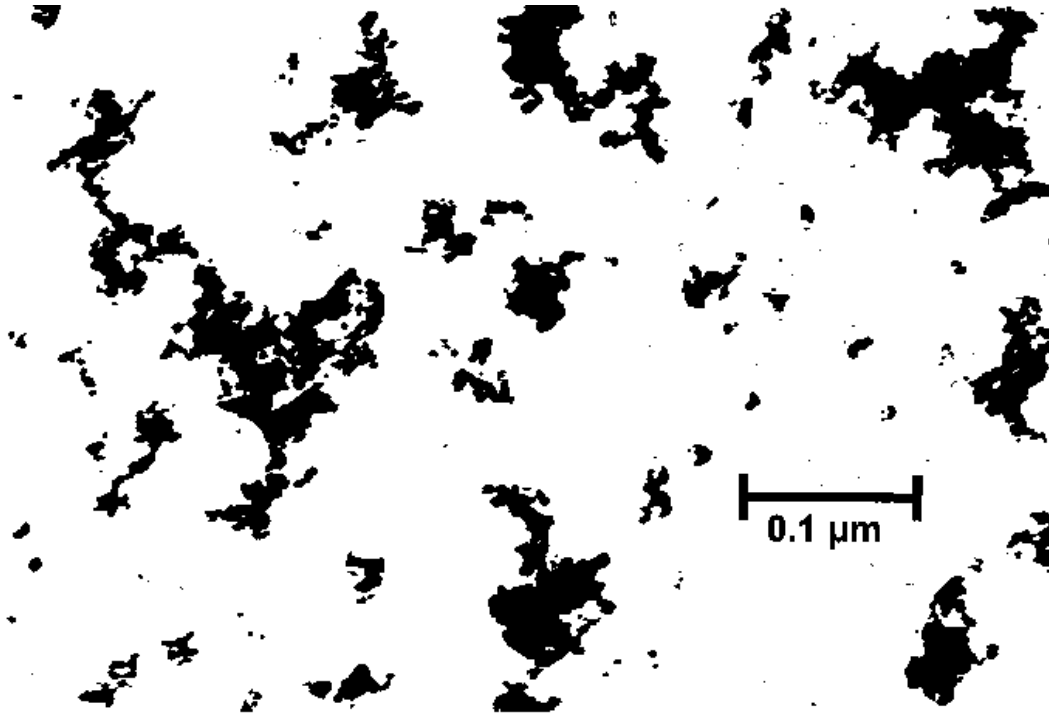


Content

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Characteristics of ambient particles



Mass
Number
Chemical
composition
Etc.



Why are fine particles a major threat to children? Physiological characteristics children vs. Adults

**Toxico-kinetic differences between children/infants/foetus and adults:
lower body weight, higher relative weight of liver,
higher ratio between body weight and body surface,
smaller lung calibre, immature lungs (24 mio alveoli
at birth and 257 mio at age 4), immature lung
epithelium**

**Higher exposure, because children breathe 50% more air
per kg of body weight than adults**

**Higher deposition rate: 50% increased averaged
deposition rate, per unit surface it is even 500-600%
increased due to small airway calibre, small surface
area**



Why are fine particles are major threat to children? Characteristics of exposure: children vs. adults

Higher exposure, because

Spending more time outdoors

Higher physical activity and consequently higher ventilation rates

Breathing zone is closer to the ground

Mouth breathing more common; it affects inhalation and deposition of PM

Improved exposure assessment, because

less biased by commuting, traveling, smoking, workplace exposures, etc.

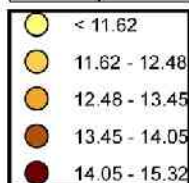
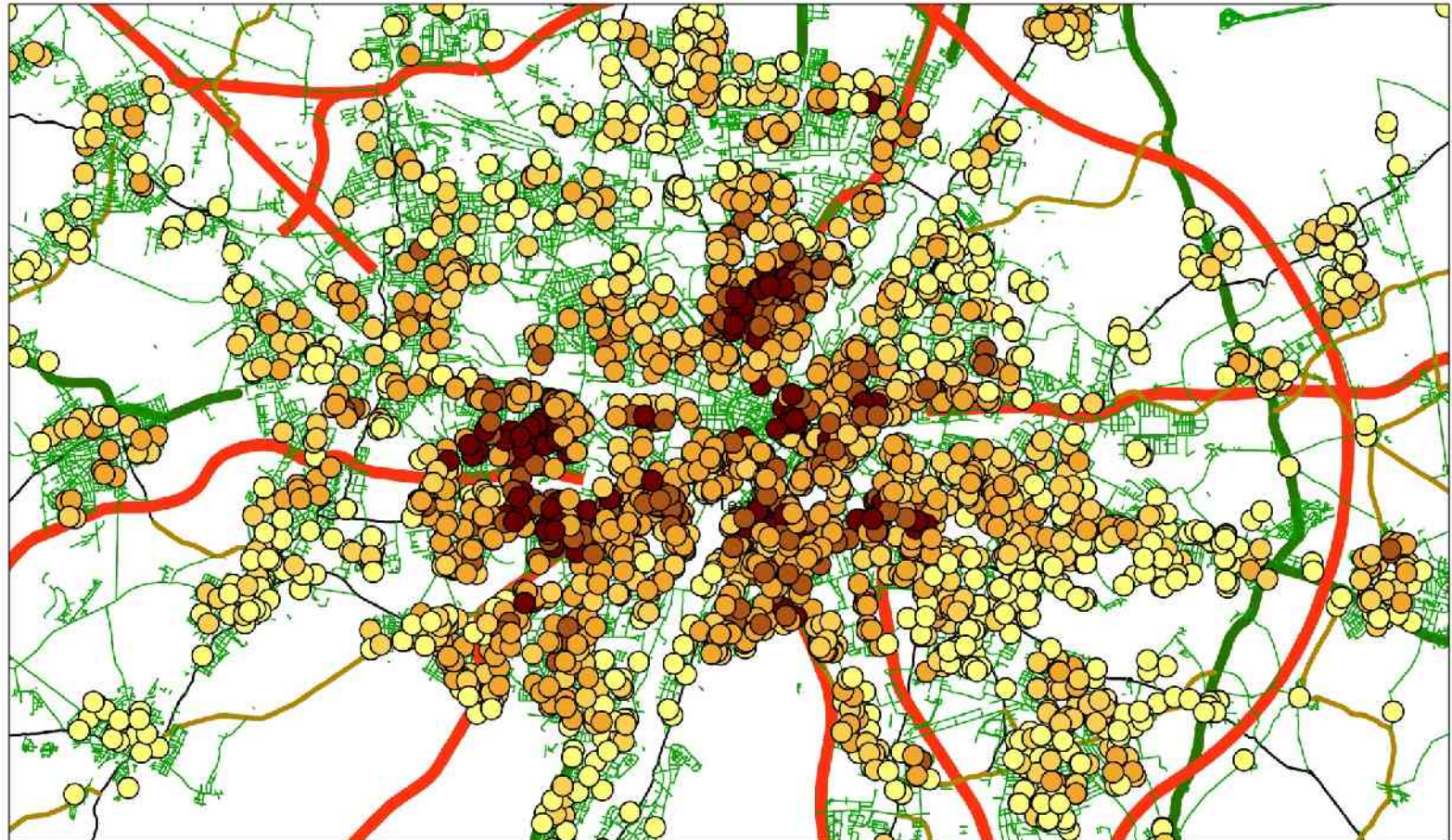


New aspects

- **Exposure:** Individualized exposure assessment (at residential address)
- **Outcome:** Pregnancy/Birth outcomes
Otitis
- **„Natural intervention“:** Improved health after improved air hygiene
- **Genetically defined susceptibility, SES as an effect modifier, traffic and allergies still controversial**
- **Summary and conclusions**



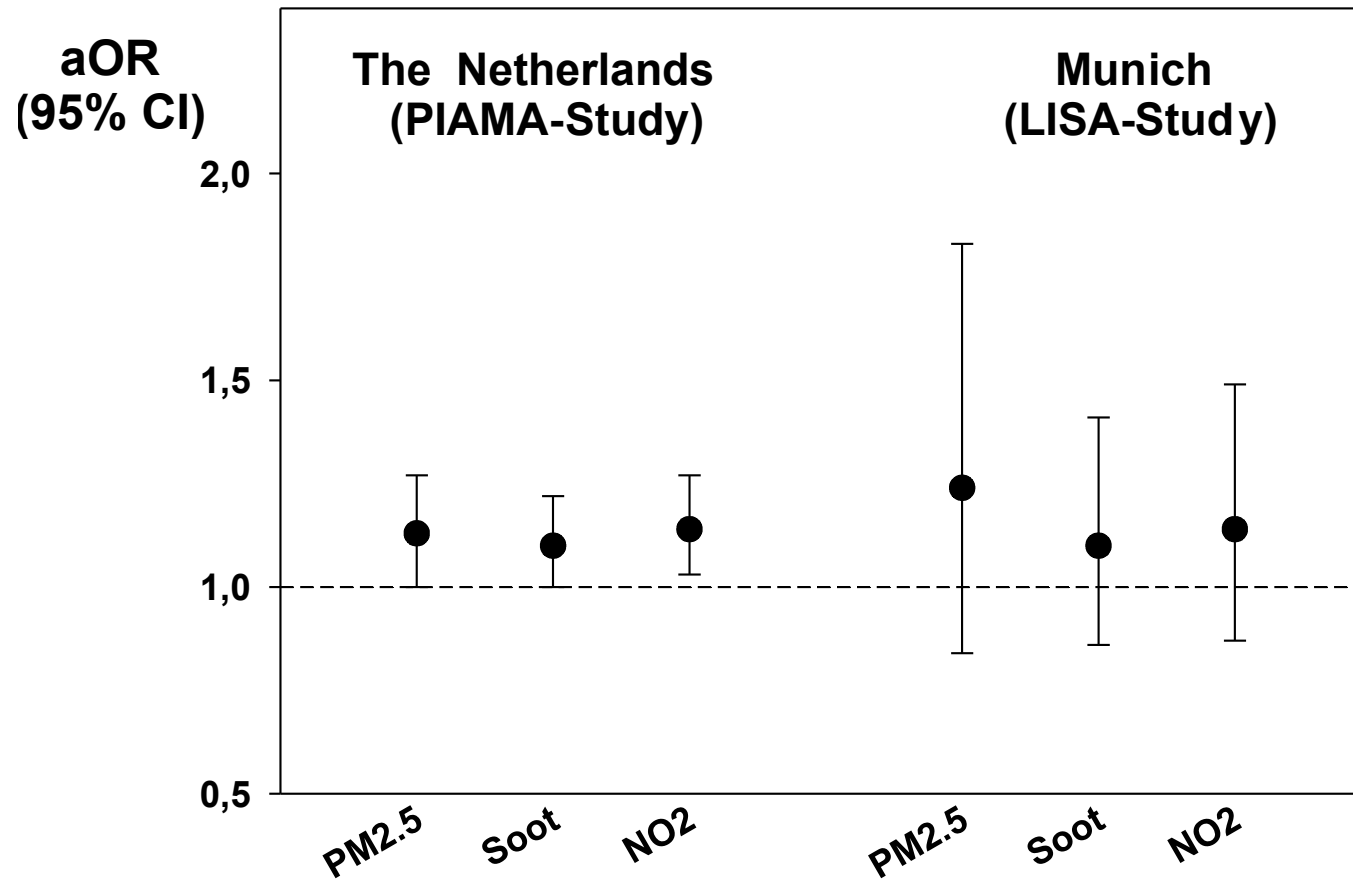
Modelled PM_{2.5} Exposure in Munich



PM_{2.5} modelled exposure



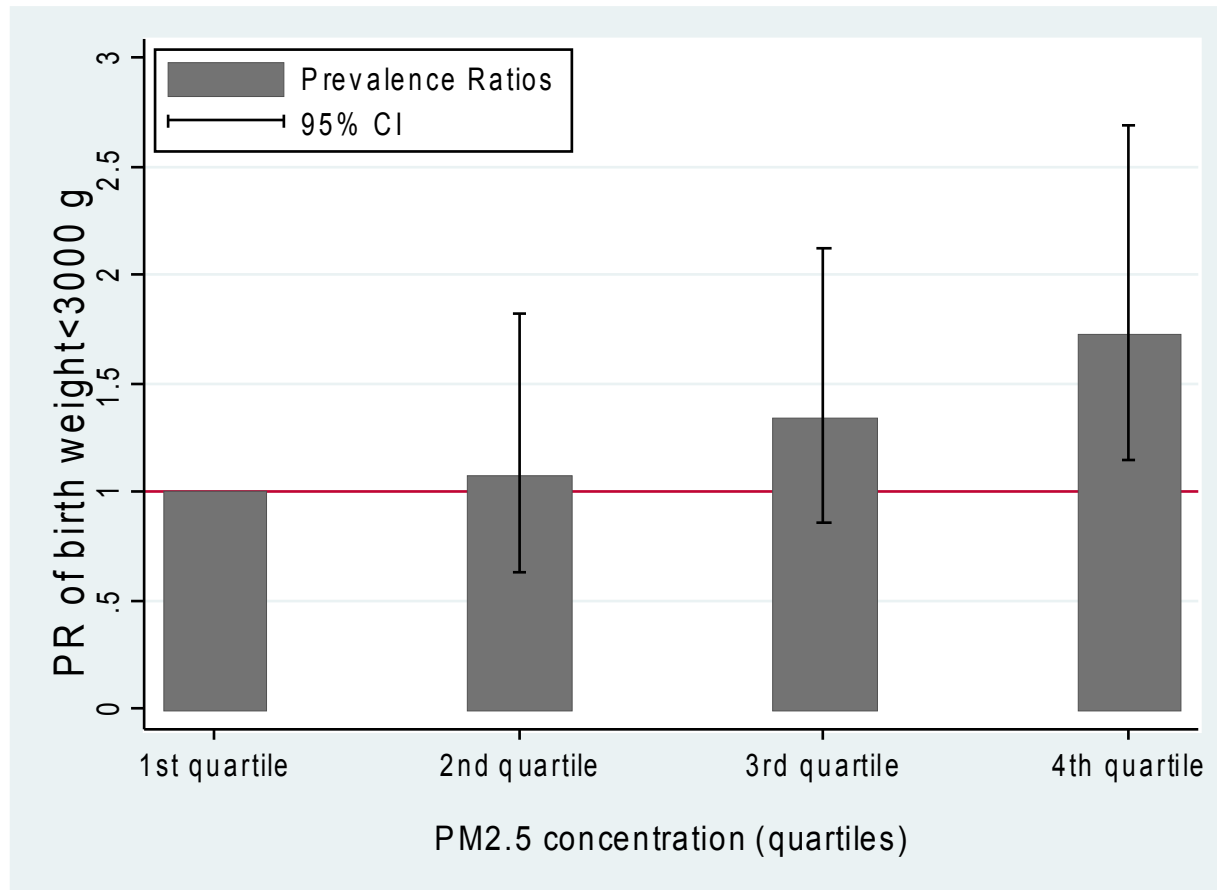
Ambient Air Pollution & Otitis Media



Increase of otitis media per increment of PM_{2.5} by 3 µg/m³, of soot by 0,5 (light absorbance) and of NO₂ by 10 µg/m³

Prevalence Ratios of birth weight <3000 g associated with maternal PM_{2.5} exposure during pregnancy

987 term newborns from the Munich LISA cohort

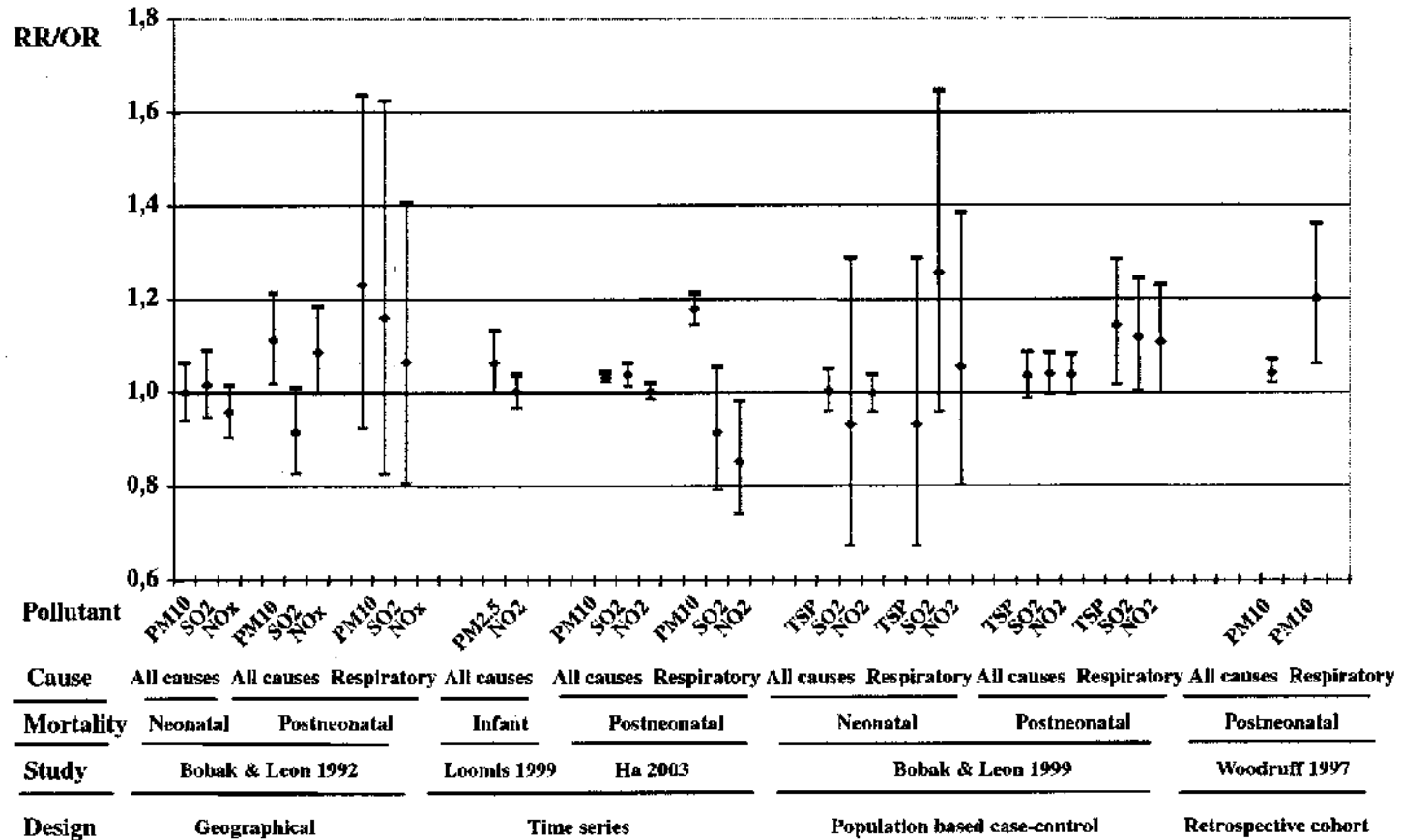


PRs were adjusted for gestational duration, sex, maternal smoking, height, pre-pregnancy weight, parity, education.

Slama et al., *Env Health Perspect*, epub ahead

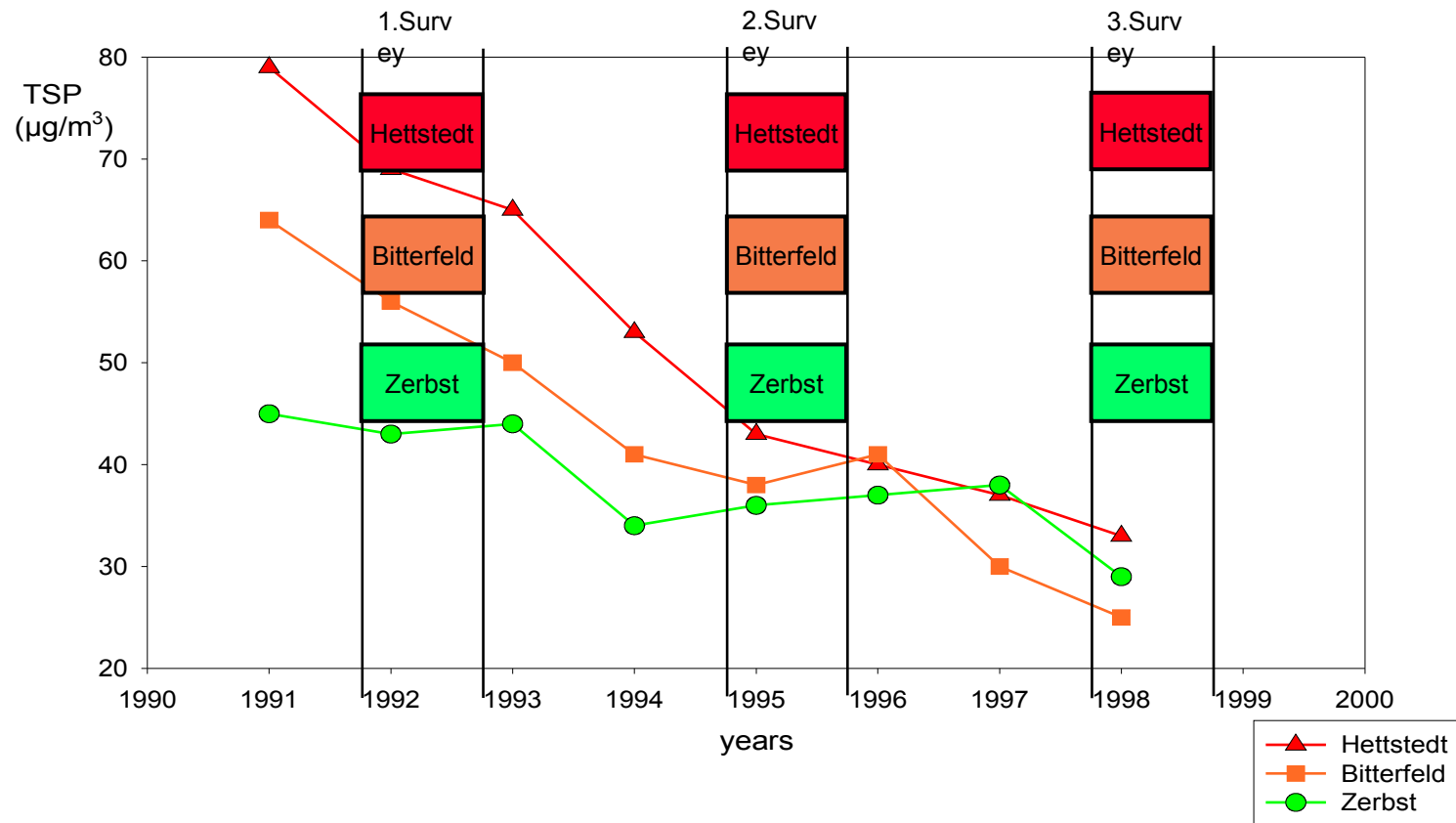


Mortality Risk During First Year of Life and Air pollution (PM₁₀, SO₂, CO)

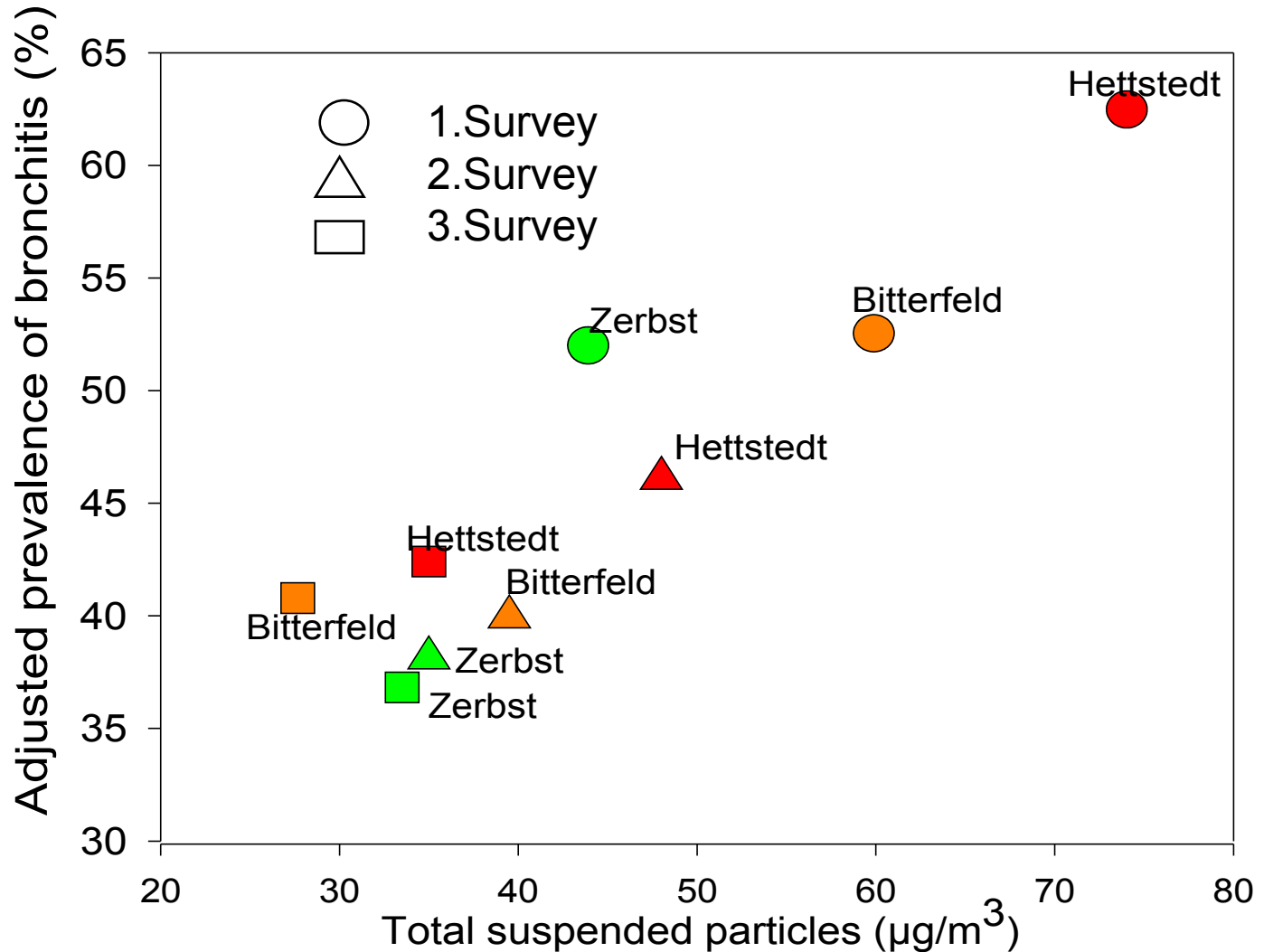


Risk estimates per increase of 10 µg/m³ particles, SO₂ or NO₂

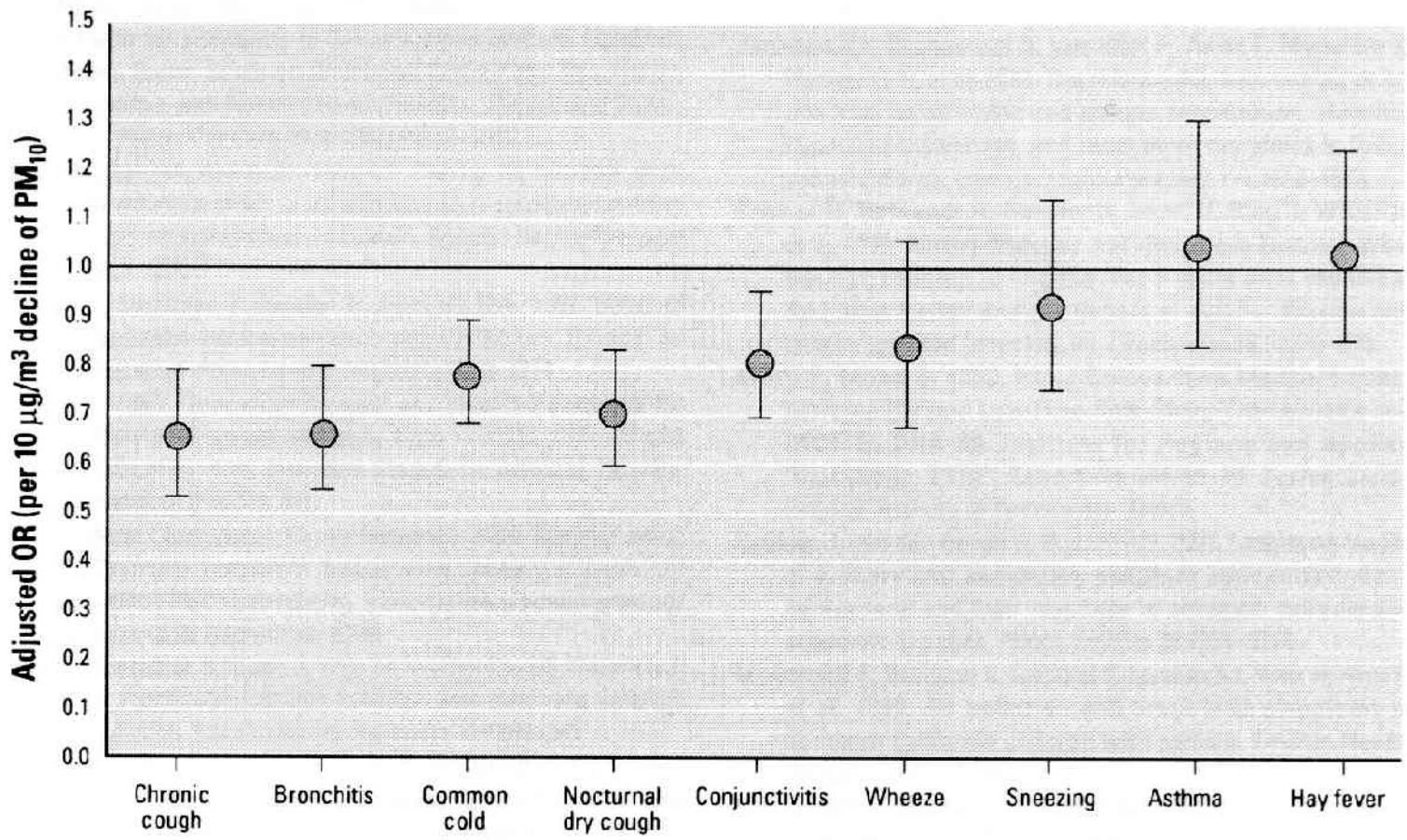
Is health improving after air hygiene levels improved?



Bronchitis and TSP



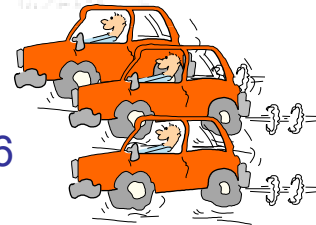
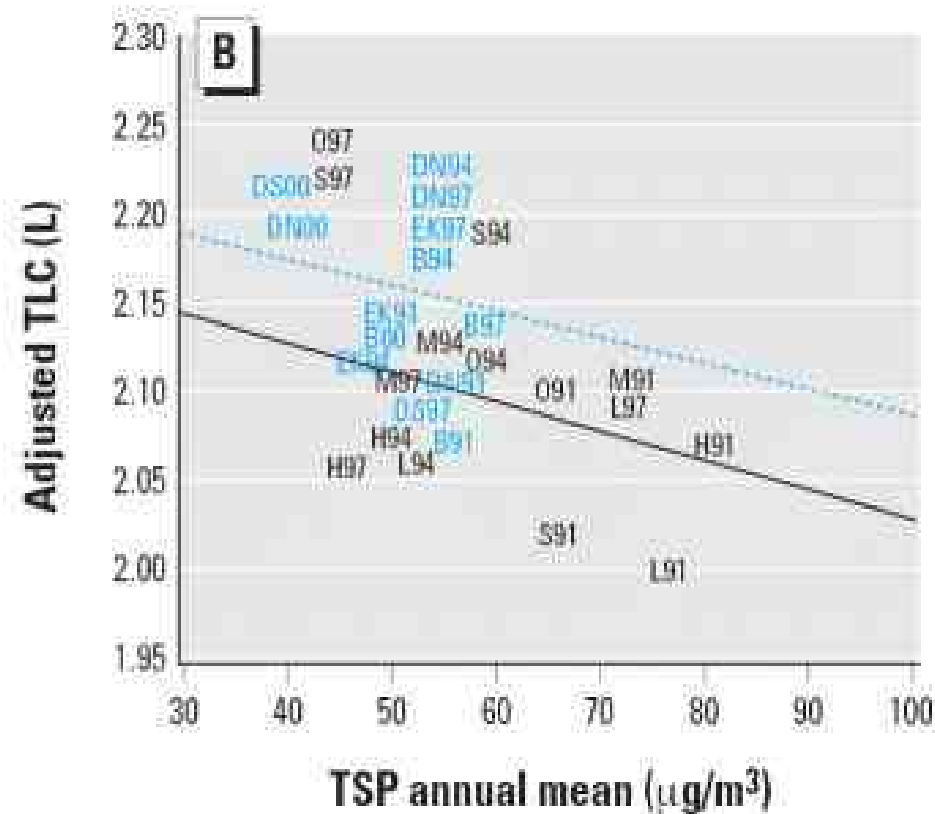
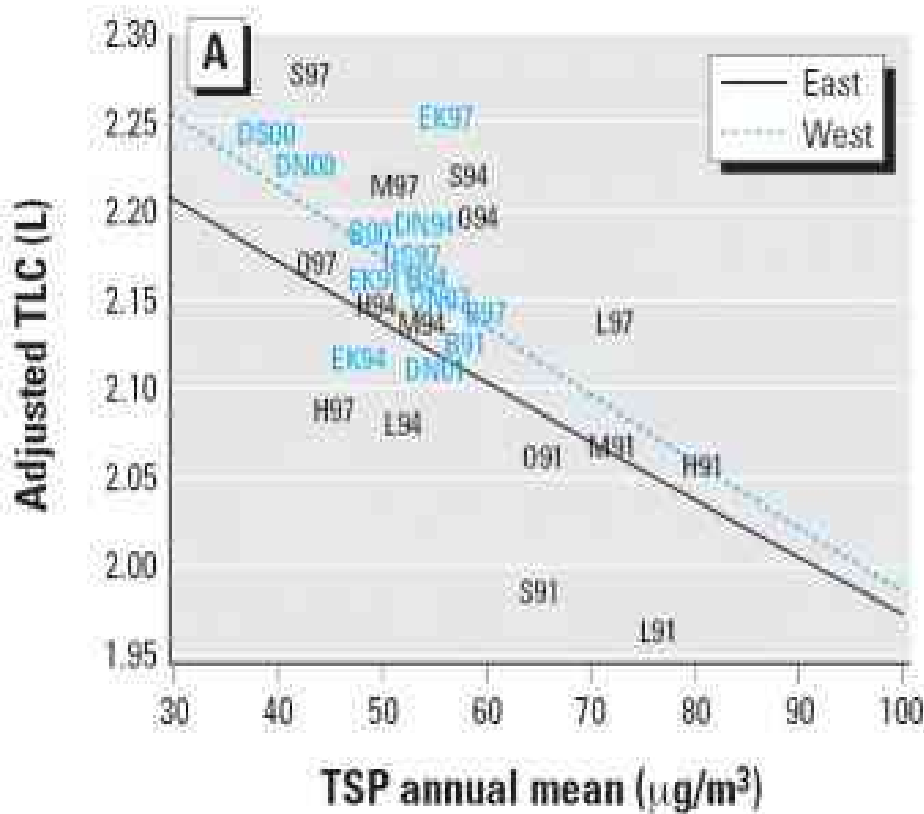
Decline of children's respiratory disorders after improved air hygiene levels in Switzerland



Lung function (Total lung capacity) and Particles

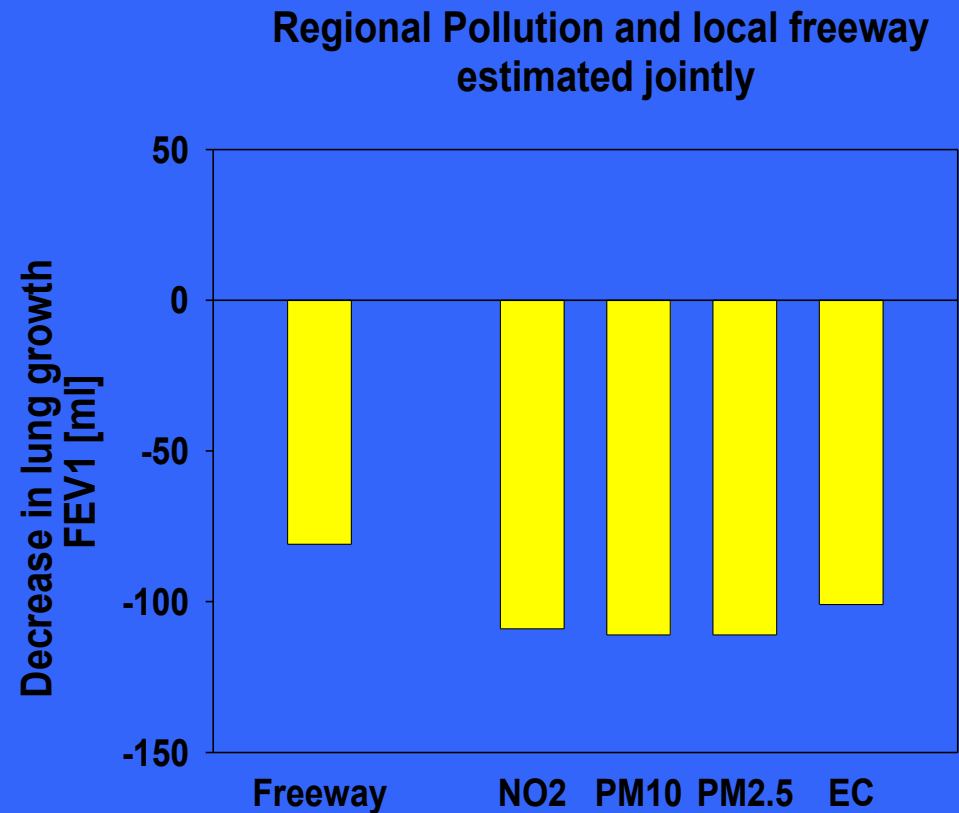
Children living >50 m from busy roads

Children living <50 m from busy roads



Decreased Lung Growth in Children living close to Freeways

- 3.677 children from South California in 12 communities
- Lung growth follow up for 8 years
- Boys living within 500 m versus boys living farther than 1500 m: -6,3% of the FEV1



Gauderman et al. Lancet 2007



Summary and Conclusion

**Fine PM is a major threat to children, because
higher exposure to PM
immature state of the lung and possibly also of the
immune function**

**Children, infants and pregnant women need specific
protection against PM exposure**

Children benefit from improved air hygiene levels

