

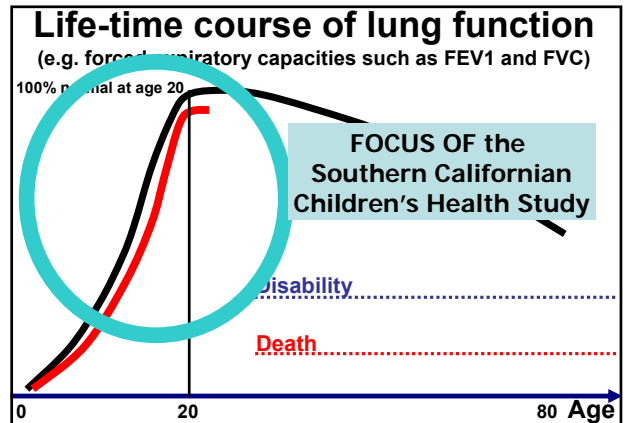
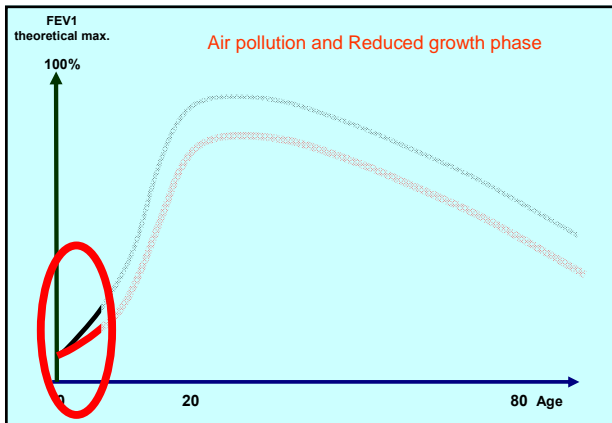
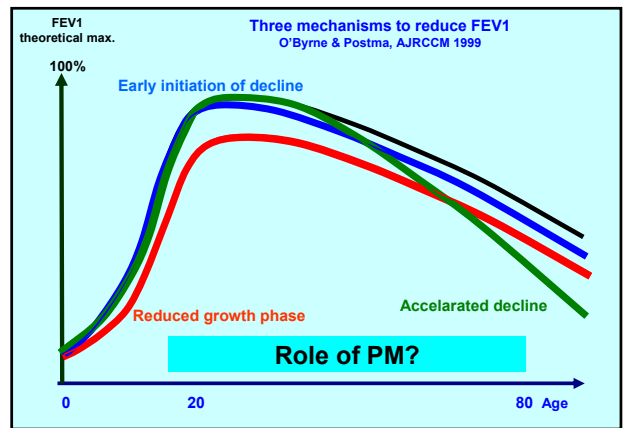
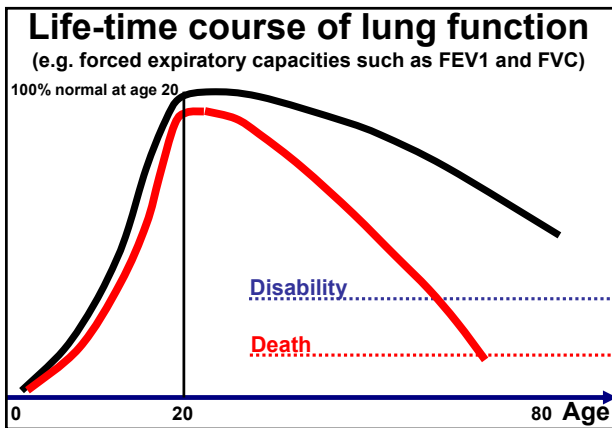
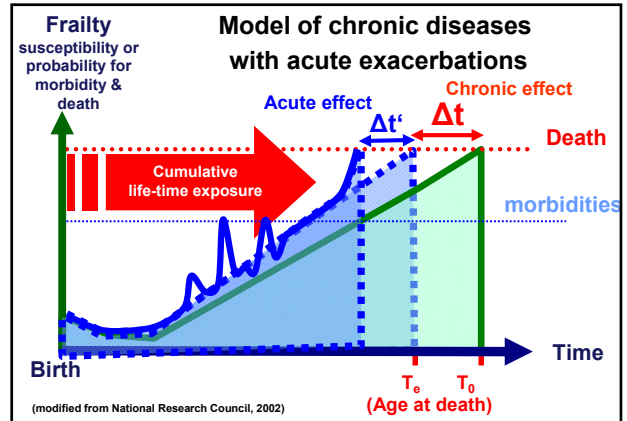
**Chronic pulmonary effects of ambient nano-PM:  
Lessons learned from PM**

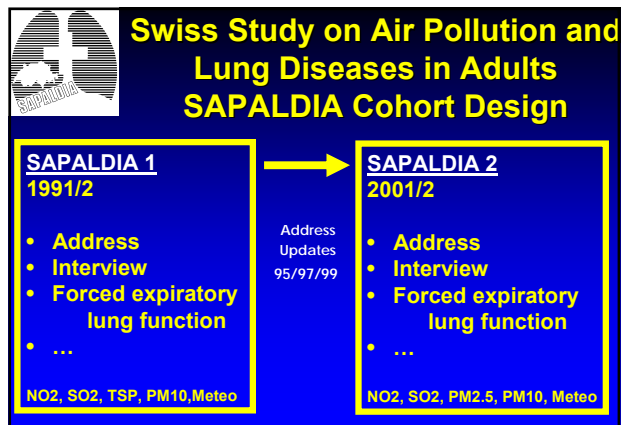
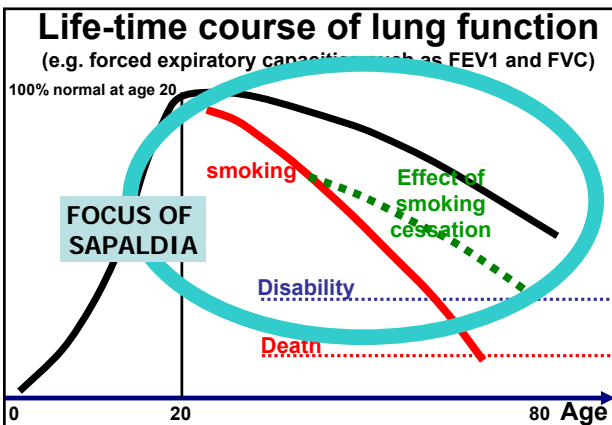
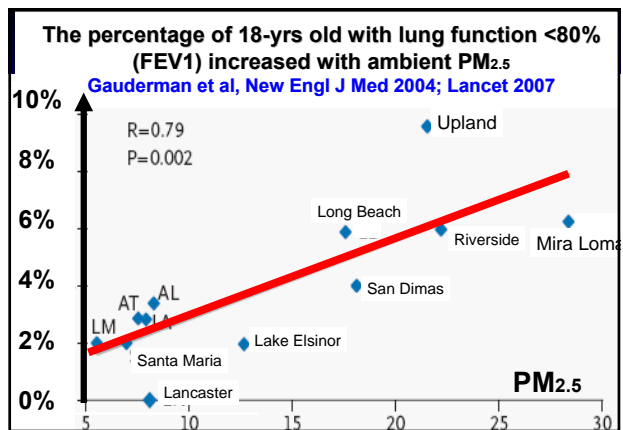
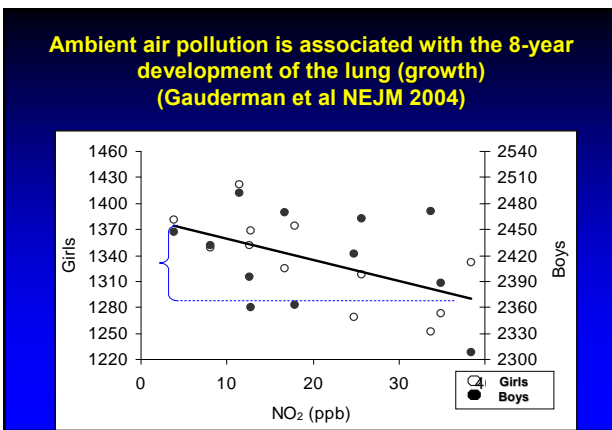
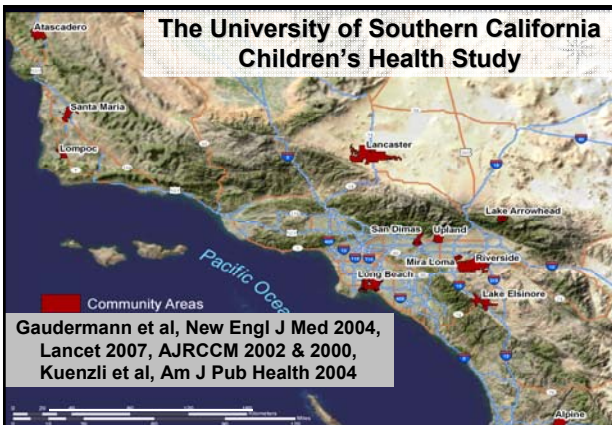
**Nino Künzli, MD PhD**


As of May 1st 2009:  
Chair of Public Health, University of Basel Medical School  
Institute for Social and Preventive Medicine  
at Swiss Tropical Institute Basel, Switzerland

Jan 2006-April 2009: ICREA Research Professor, at Centre for Research in  
Environmental Epidemiology – CREAL Barcelona - Spain

Prepared for 13th ETH Conference on Combustion  
Generated PM – 23.6.2009 8:30h, Zurich

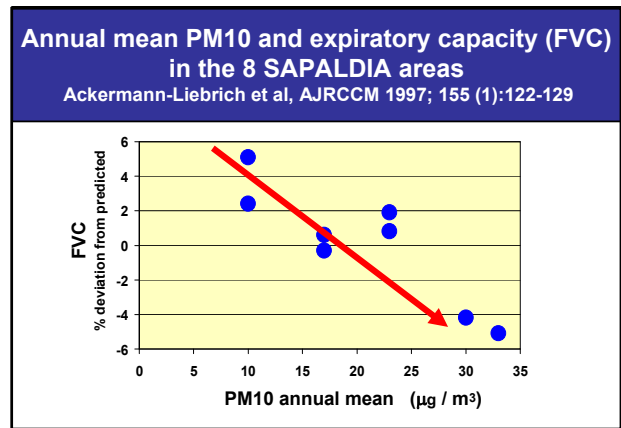
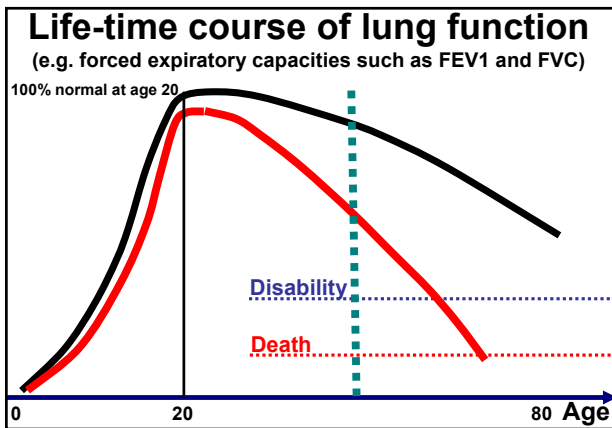
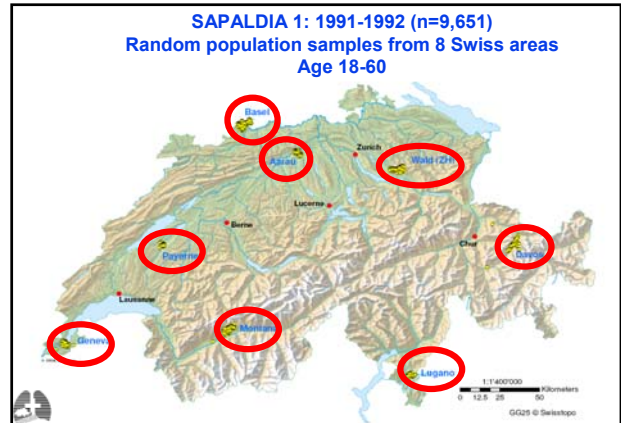






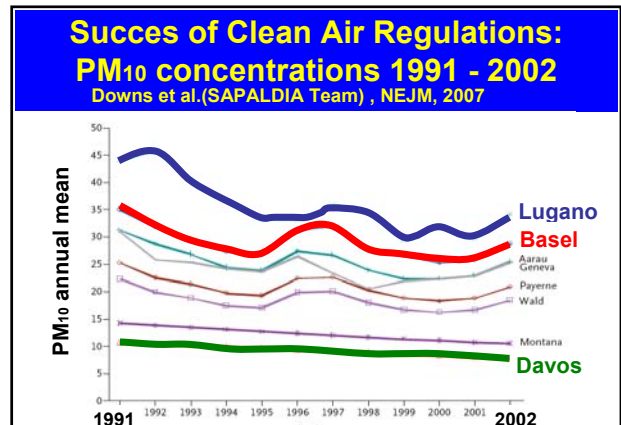
- Identical protocols
- Same devices
- Comparison test across devices 1991 and 2001

Künzli et al, ERJ 1995; 8:371  
Künzli et al, Swiss Med Weekly 2005; 135:503

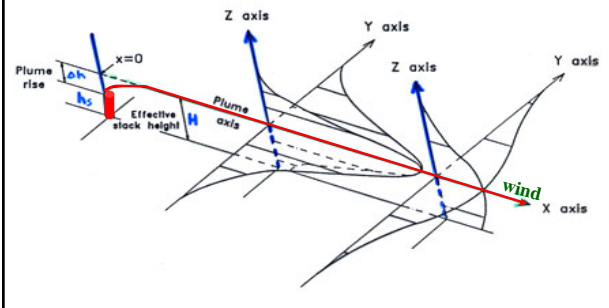


**Important changes between baseline (1990/91) and follow-up (2001/2)**

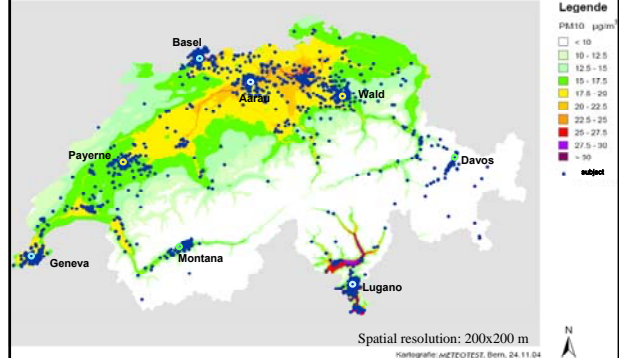
1. Air quality improved
2. Advancement of exposure assessment science
3. Many subjects changed residence



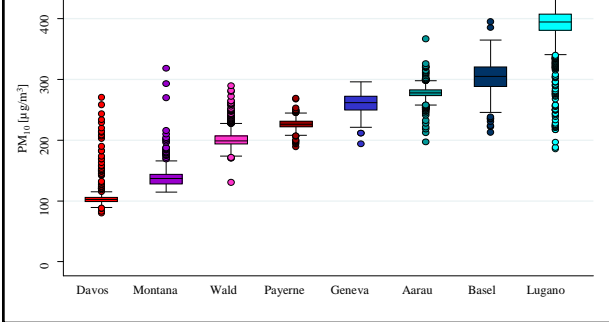
Gaussian plume dispersion models, using emission registries, meteorology, and secondary processes to model the pollution space for Switzerland  
 Liu et al, *Env Health Perspect* 2007



**Dispersion model predictions for PM<sub>10</sub>**  
 Liu et al, *Env Health Perspect* 2007



**Distribution of individually assigned cumulative PM<sub>10</sub>" (concentration x years)**  
 Downs et al, *NEJM* 2007



The NEW ENGLAND JOURNAL of MEDICINE

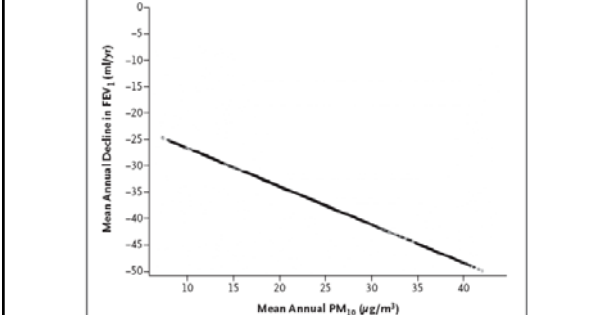
ORIGINAL ARTICLE

**Reduced Exposure to PM<sub>10</sub> and Attenuated Age-Related Decline in Lung Function**

Sara H. Downs, Ph.D., Christian Schindler, Ph.D., L.-J. Sally Liu, Sc.D., Dirk Keidel, M.A., Lucy Bayer-Oglesby, Ph.D., Martin H. Brutsche, M.D., Ph.D., Margaret W. Gerbase, M.D., Ph.D., Roland Keller, M.D., Nino Künzli, M.D., Ph.D., Philippe Leuenberger, M.D., Nicole M. Probst-Hensch, Ph.D., Jean-Marie Tschopp, M.D., Jean-Pierre Zellweger, M.D., Thierry Rochat, M.D., Joel Schwartz, Ph.D., Ursula Ackermann-Lieblich, M.D., M.Sc., and the SAPALDIA Team\*

*N Engl J Med* 2007;357:2338-47.

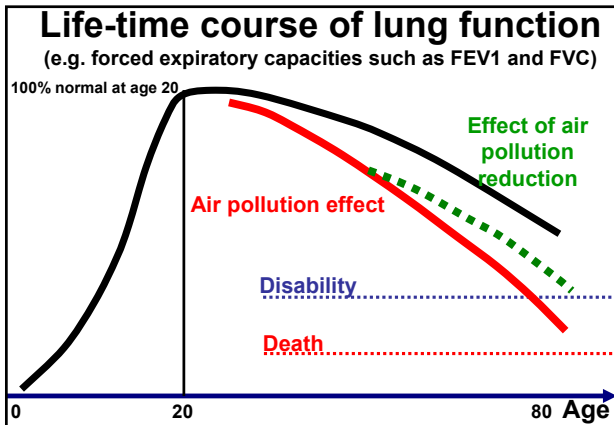
**Estimated effect of interval exposure (1991-2002) on decline of FEV<sub>1</sub>**  
 Downs et al, *NEJM* 2007



**Attenuation of lung function decline per 10 µg/m<sup>3</sup> reduction in home outdoor PM<sub>10</sub> among 2'213 SAPALDIA never smokers**

Downs et al, *NEJM* 2007

	effect	p-value
-FVC	2.2 ml	0.43
-FEV <sub>1</sub>	4.2 ml	0.06
-FEV <sub>1</sub> in %FVC	0.05%	0.18
-FEF <sub>25-75</sub>	11.3 ml/s	0.03



SWISS MED WKLY 2008;138(27-28):387-391 www.smw.ch 387

### Translocation and cellular entering mechanisms of nanoparticles in the respiratory tract

Christian Mühlfeld, Peter Gebr, Barbara Rotben-Rutisbauer  
Institute of Anatomy, University of Bern, Bern, Switzerland

### Ambient air pollution: complex mixture of 100's of pollutants

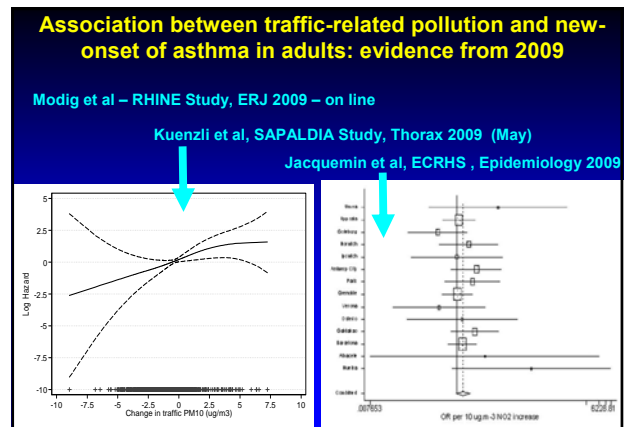
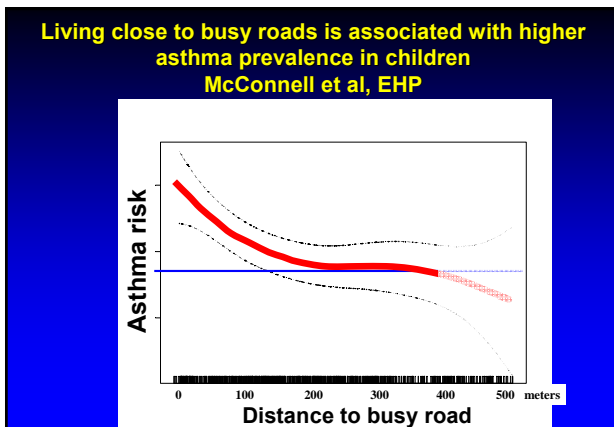
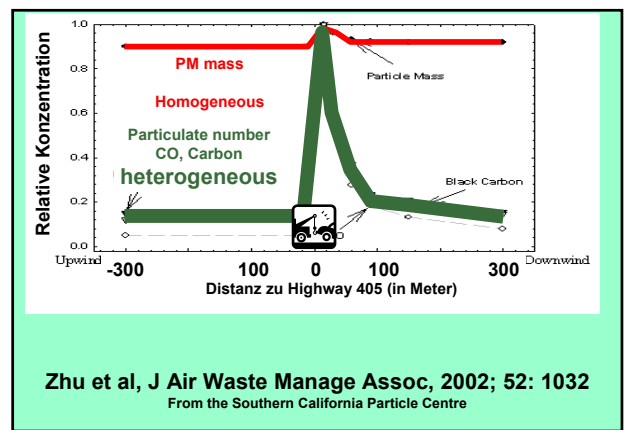
Gases: NO<sub>x</sub>, SO<sub>x</sub>, Ozone, CO etc.  
Particles: various sizes and constituencies

(Science, 2005; 307:1858)

Molecules 0.01 µm, Virus 0.05 µm, Bacteria 0.5 µm, RBCs 5 µm, Cell 10 µm, Pollen 50 µm, Pin 100 µm, Hair 100 µm

Particulate matter size distribution

UFP (PM<sub>0.1</sub>) Ultrafine particles, PM<sub>2.5</sub> Fine particles, PM<sub>10-2.5</sub> Coarse fraction, PM<sub>10</sub> Thoracic particles



## Research needs summary

- Investigate specific contribution of nano-PM versus other size fractions
- Investigate spatial distribution of nano-PM and its constituents, to be linked to cohort studies
- Understand link between acute respiratory events, early life time exposure, and chronic development of lung pathologies (SAPALDIA 3)
- Understand exogenous and endogenous susceptibility factors (SAPALDIA 3)

## SUMMARY

- Ambient air pollution affects lung development in the long term
- Particulate matter play a causal role
- Specific contribution of nano-PM ?
- Specific contribution of PM sources?

## ESCAPE



European Study of Cohorts for Air Pollution Effects  
(consortium PI: Bert Brunekreef, IRAS)

[www.escapeproject.eu](http://www.escapeproject.eu)

25 European partners, 17 countries,  
32 existing cohort studies,  
>50 cities and regions

WP 4: RESPIRATORY COHORTS (Adults)  
PI: Nino Kuenzli

COHORT	ESCAPE-related PI	PI of COHORT
European ECRHS	Jordi Sunyer	Peter Burney
Swiss SAPALDIA	Nicole Probst-Hensch	Thierry Rochat
German SALIA	Ursula Krämer	Ursula Krämer
UK1946 Birth Cohort	Anna Hansell	Diana Kuh
French EGEA	Francine Kauffmann	Francine Kauffmann
French E3N (EPIC - F)	Isabelle Romieu	Francoise Clavel-Chaplon

Thank you

[Nino.Kuenzli@unibas.ch](mailto:Nino.Kuenzli@unibas.ch)

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Institute of Social and Preventive Medicine at Swiss Tropical Institute Basel

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International Journal of Epidemiology 2008;37:1-10  
doi:10.1093/ije/dyn136

## Air pollution and lung function in the European Community Respiratory Health Survey

Thomas Götschi,<sup>1</sup> Jordi Sunyer,<sup>2,3,4</sup> Susan Chinn,<sup>5</sup> Roberto de Marco,<sup>6</sup> Bertil Forsberg,<sup>7</sup> James W Gauderman,<sup>8</sup> Raquel Garcia-Esteban,<sup>2,4</sup> Joachim Heinrich,<sup>8</sup> Bénédicte Jacquemin,<sup>2,4</sup> Deborah Jarvis,<sup>9</sup> Michela Ponzo,<sup>9</sup> Simona Villani<sup>9</sup> and Nino Künzli<sup>1,2,4,10\*</sup>

The inability to refuse the null hypothesis may reflect (i) no effect of urban air pollution on lung function or (ii) inherent biases due to the study design. Examples of the latter are lack of individual-level air quality assignment, not quantified within-city contrasts in traffic-related pollution, or the heterogeneity of the studied populations and their urban environments.

Within-city contrasts in air pollutants are larger than contrasts between cities

