



L'inquinamento atmosferico e combustioni di biomasse

PadovaFiere Pad. 8—1° piano Sala 8A

19 marzo 2013

9.30 — 13.30

Combustione di biomasse: effetti sulla salute

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Università di Padova





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Sommario

- **Why: plausibilità biologica**
- **Where: esposizione umana**
- **Which: quali effetti**
- **What: interventi**



Fumo di sigaretta



Contenuto:

- $PM_{2.5}$
- $PM_{0.1}$
- Sostanze chimiche (>4000)

Effetti cronici:

- neoplastici
- non neoplastici



IARC Monographs volume 83, 2004

Cancerogeni nel fumo di tabacco

- **Idrocarburi policilici aromatici**
 - benzopirene (BaP)
- **Nitrosamine del tabacco**
 - N-nitrosoornicotine (NNN)
 - 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)
- **Amine aromatiche**
 - 4-aminobiphenyl (4-ABP)



IARC Monographs volume 83, 2004

5.5 Evaluation

There is *sufficient evidence* in humans that tobacco smoking causes cancer of the lung, oral cavity, naso-, oro- and hypopharynx, nasal cavity and paranasal sinuses, larynx, oesophagus, stomach, pancreas, liver, kidney (body and pelvis), ureter, urinary bladder, uterine cervix and bone marrow (myeloid leukaemia).

There is *evidence suggesting lack of carcinogenicity* of tobacco smoking in humans for cancers of the female breast and endometrium.

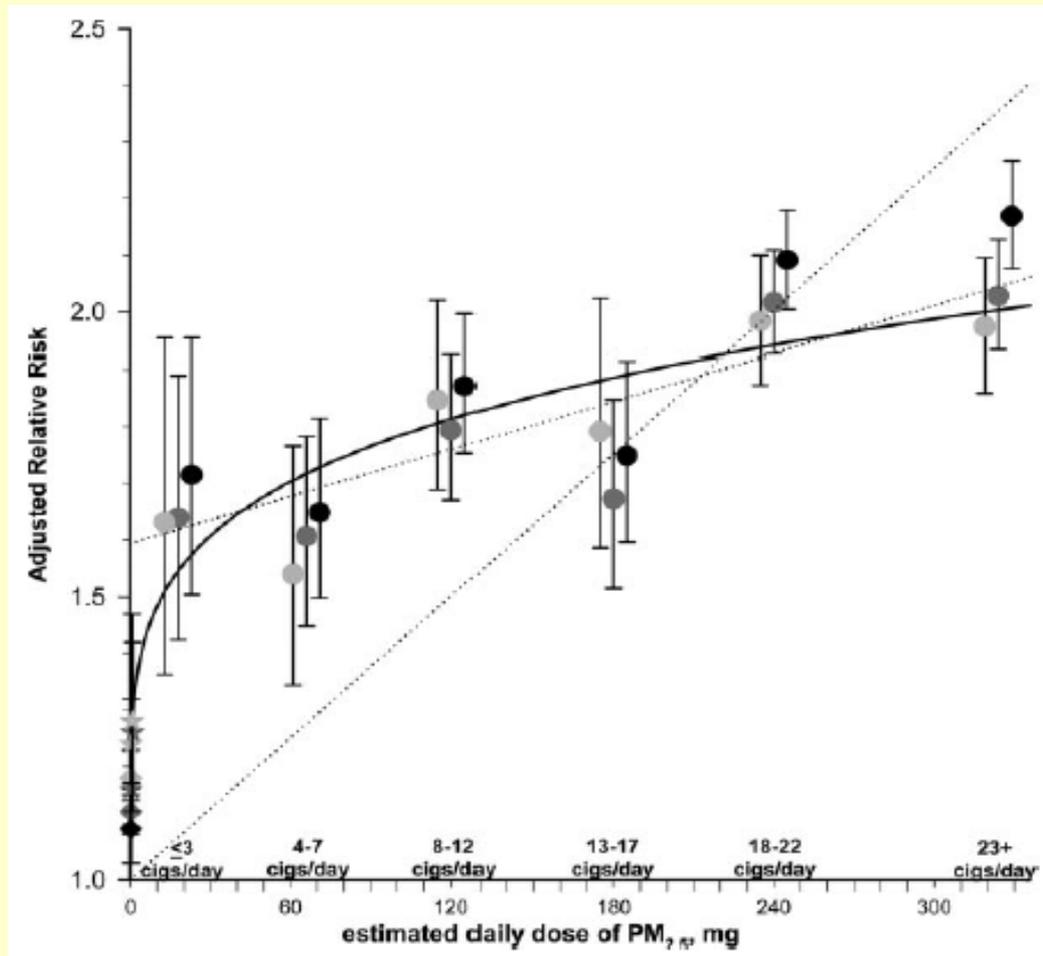
There is *sufficient evidence* in experimental animals for the carcinogenicity of tobacco smoke and tobacco smoke condensates.

Overall evaluation

Tobacco smoking and tobacco smoke *are carcinogenic to humans (Group 1)*.



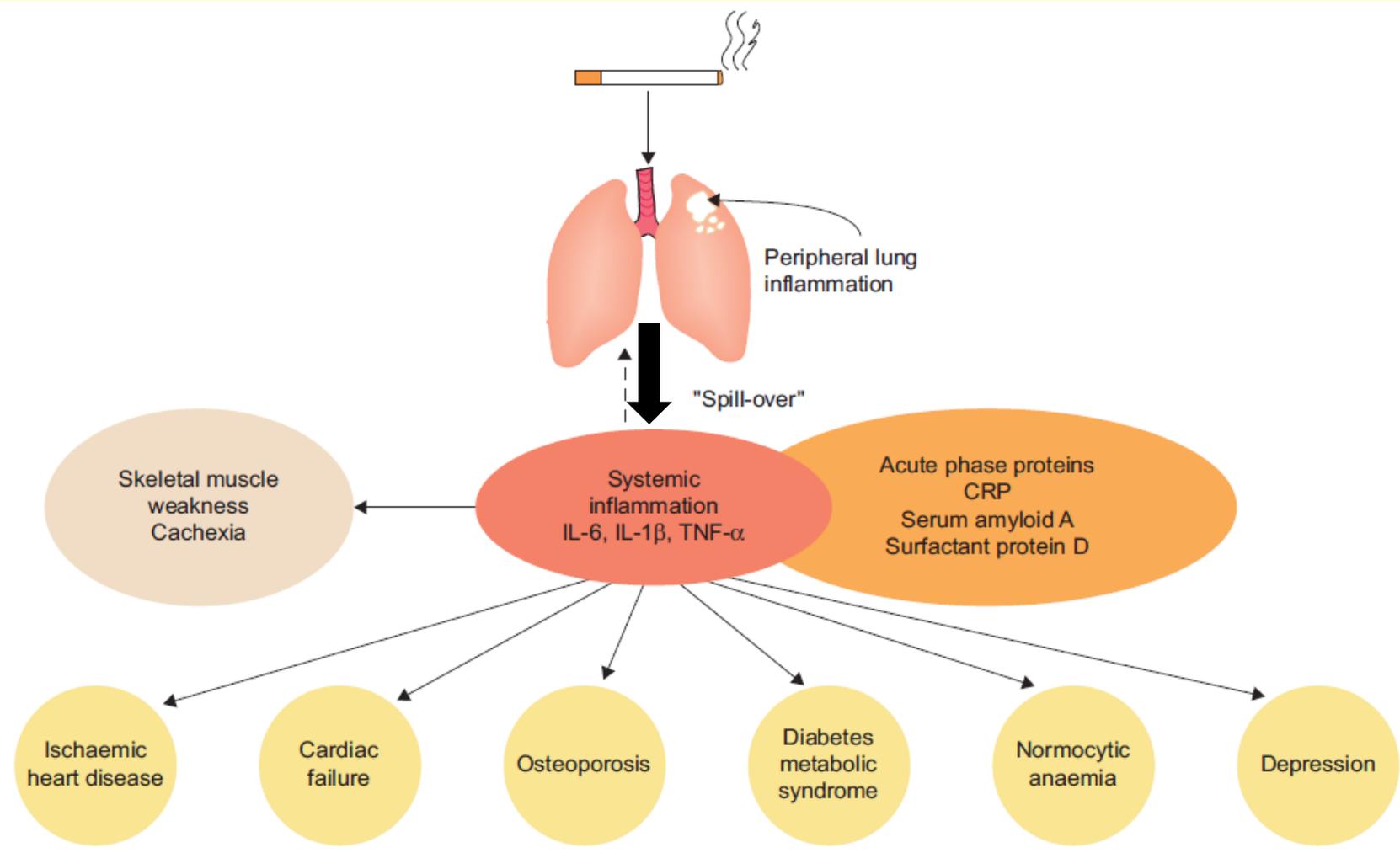
Adjusted relative risks of ischemic heart disease (), vascular disease (), and pulmonary disease () mortality plotted over increments of current cigarette smoking





Systemic manifestations and comorbidities of COPD

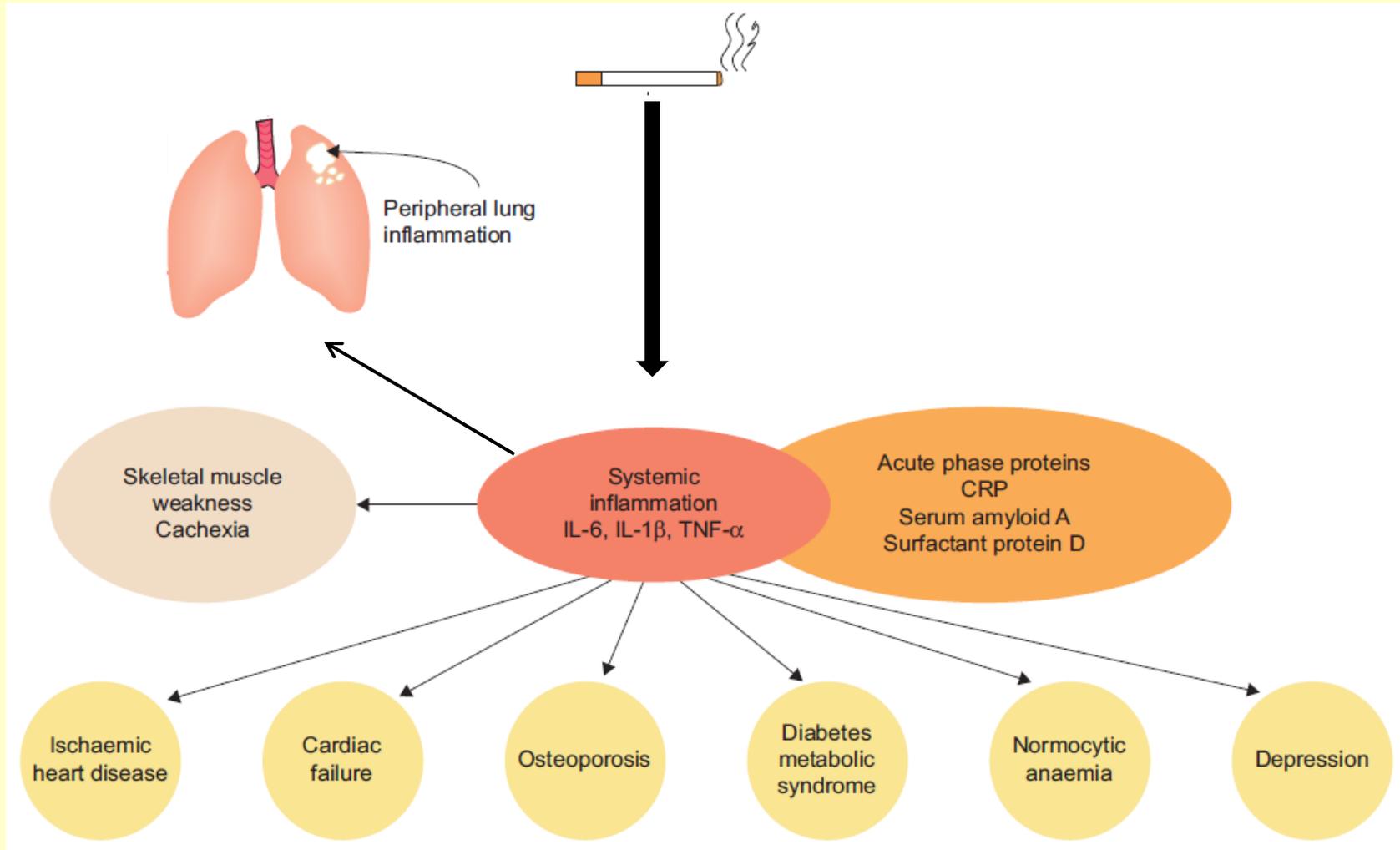
P.J. Barnes* and B.R. Celli#





Systemic manifestations and comorbidities of COPD

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Chest Research Foundation, Pune, India

Figure 3: Use of biomass fuel for cooking in an Indian village



Effects of smoking and solid-fuel use on COPD, lung cancer, and tuberculosis in China: a time-based, multiple risk factor, modelling study



Lancet 2008;

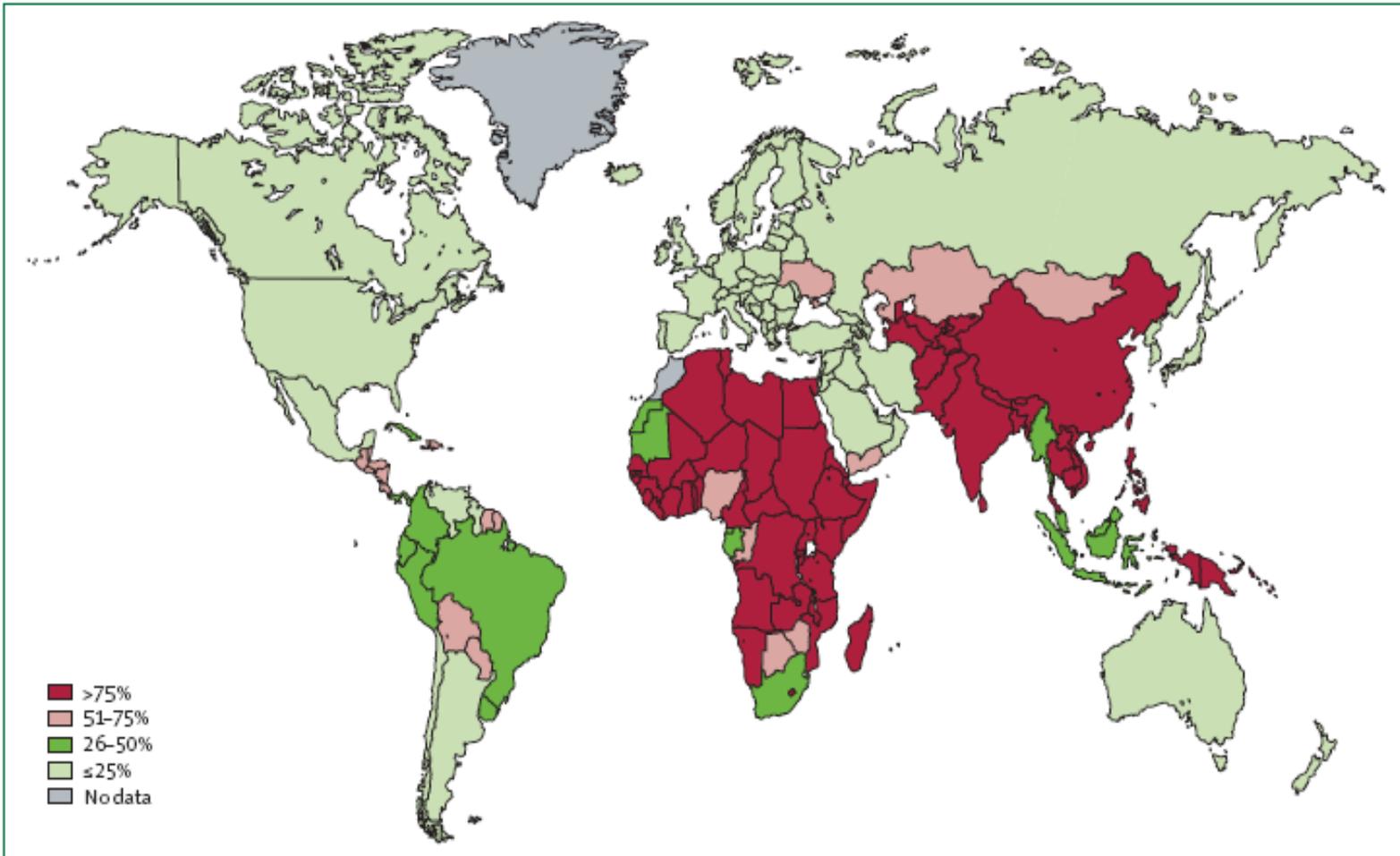
Hsien-Ho Lin, Megan Murray, Ted Cohen, Caroline Colijn, Majid Ezzati



Getty Images



Figure 2: Proportion of households using biomass fuel for cooking worldwide
Data sourced from WHO³⁵ (data from 2000 or latest available data).





File: Burning a field of sugar cane, vicinity of Guanica (LOC fsac.1a34033)

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Published online 2012 September 27. doi: [10.1371/journal.pone.0046142](#)

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Figure 2



PLOS One

PLOS One



File:Greece Forest Fire June 18 2007.jpg

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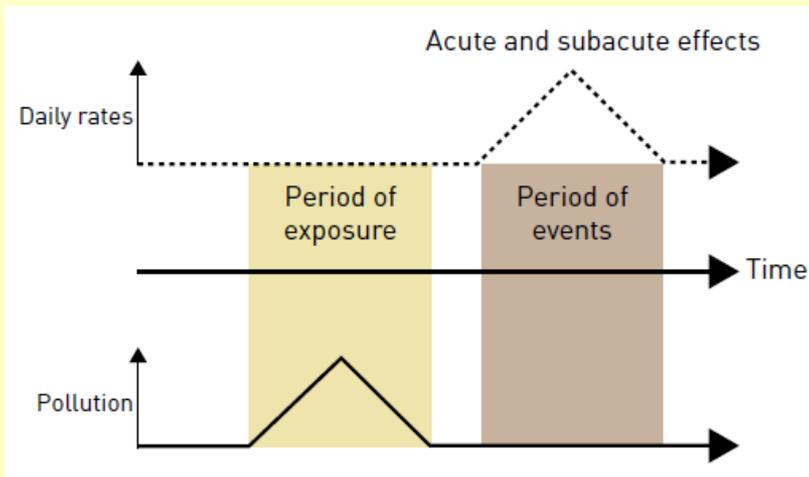
Sommario

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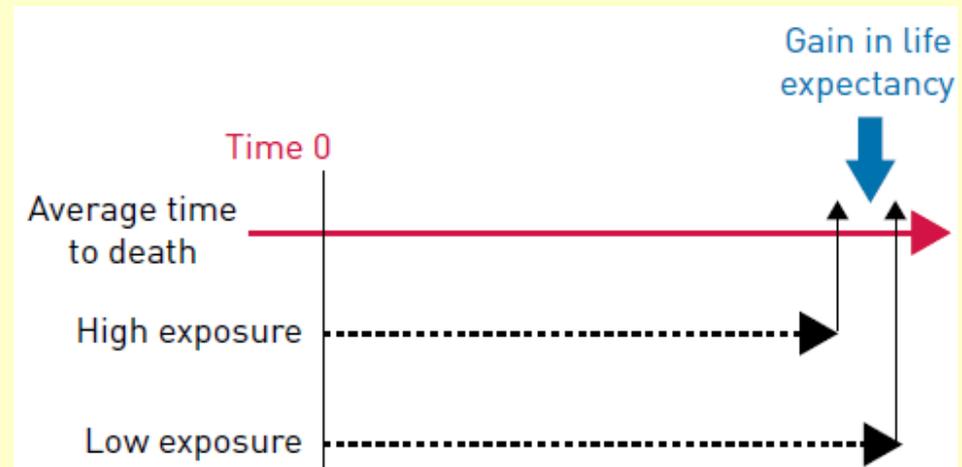
Health effects of air pollution

short-term



outdoor biomass smoke

long-term



indoor biomass smoke



A review of diseases associated with household air pollution due to the use of biomass fuels

Ki-Hyun Kim*, Shamin Ara Jahan, Ehsanul Kabir

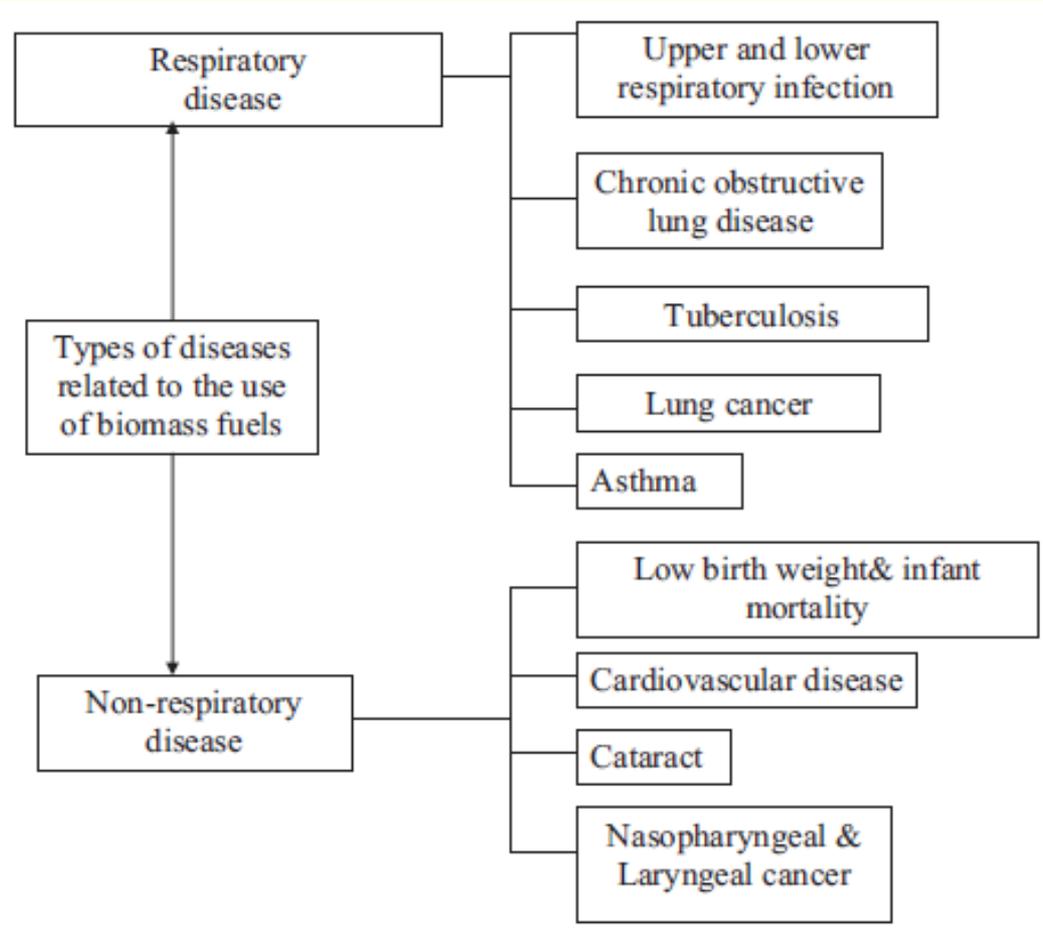


Fig. 1. The impact of biomass fuel smoke on respiratory and other diseases.



IARC Monographs volume 95, 2010

6.1 Combustion of coal

There is *sufficient evidence* in humans for the carcinogenicity of household combustion of coal. Household combustion of coal causes cancer of the lung.

There is *sufficient evidence* in experimental animals for the carcinogenicity of emissions from combustion of coal.

There is *sufficient evidence* in experimental animals for the carcinogenicity of extracts from coal-derived soot.

Overall evaluation

Indoor emissions from household combustion of coal are *carcinogenic to humans (Group 1)*.

6.2 Combustion of biomass

There is *limited evidence* in humans for the carcinogenicity of household combustion of biomass fuel (primarily wood). Household combustion of biomass fuel (primarily wood) causes cancer of the lung.

There is *limited evidence* in experimental animals for the carcinogenicity of emissions from combustion of wood.

There is *sufficient evidence* in experimental animals for the carcinogenicity of wood-smoke extracts.

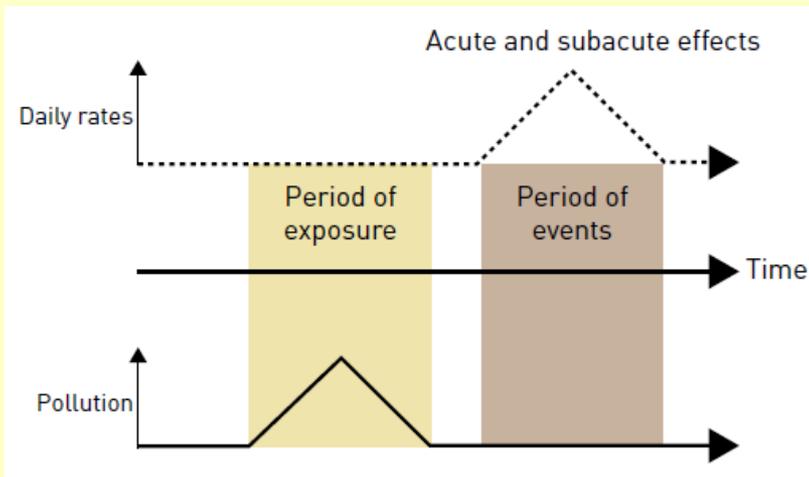
Overall evaluation

Indoor emissions from household combustion of biomass fuel (primarily wood) are *probably carcinogenic to humans (Group 2A)*.



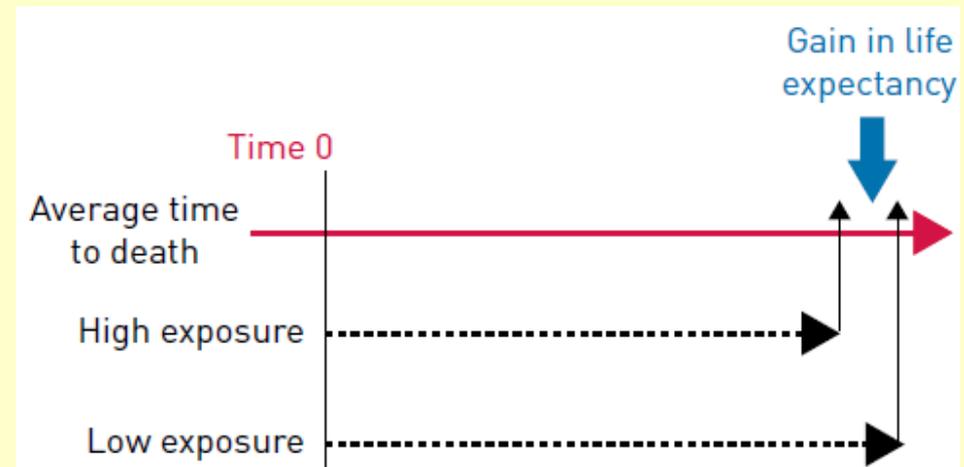
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long-term



indoor biomass smoke



Forest fires are associated with elevated mortality in a dense urban setting

Antonis Analitis, Ioannis Georgiadis, Klea Katsouyanni

Figure 1 Map of the study area indicating the greater Athens area, the location of the large fire and the usual locations of the smaller fires as well as the four fixed site monitors for black smoke during the study period.

| Forest fire 1998-2004 | Days |
|-----------------------|------|
| No | 770 |
| Small | 252 |
| Medium | 42 |
| Large | 7 |

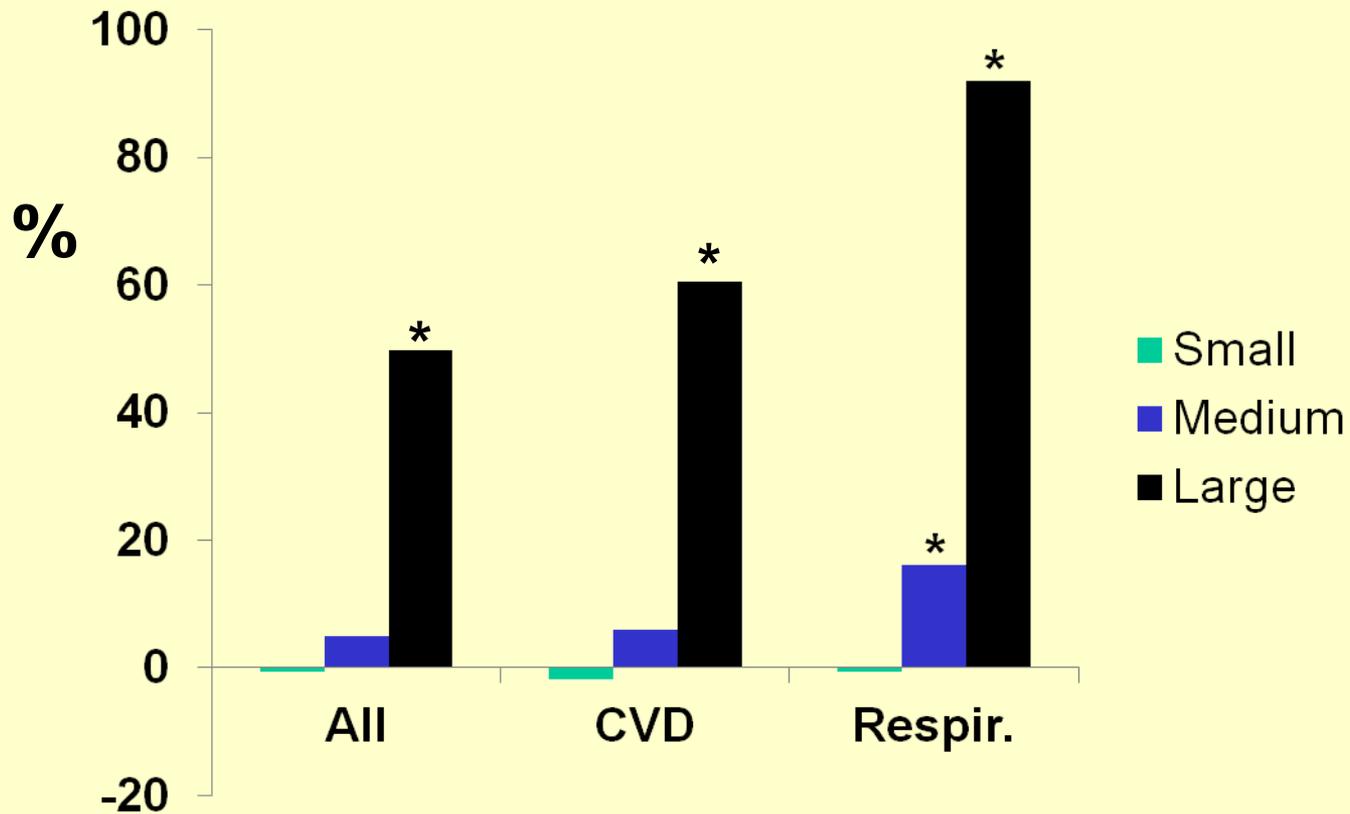




Forest fires are associated with elevated mortality in a dense urban setting

Antonis Analitis, Ioannis Georgiadis, Klea Katsouyanni

Adjusted increase in daily number of deaths

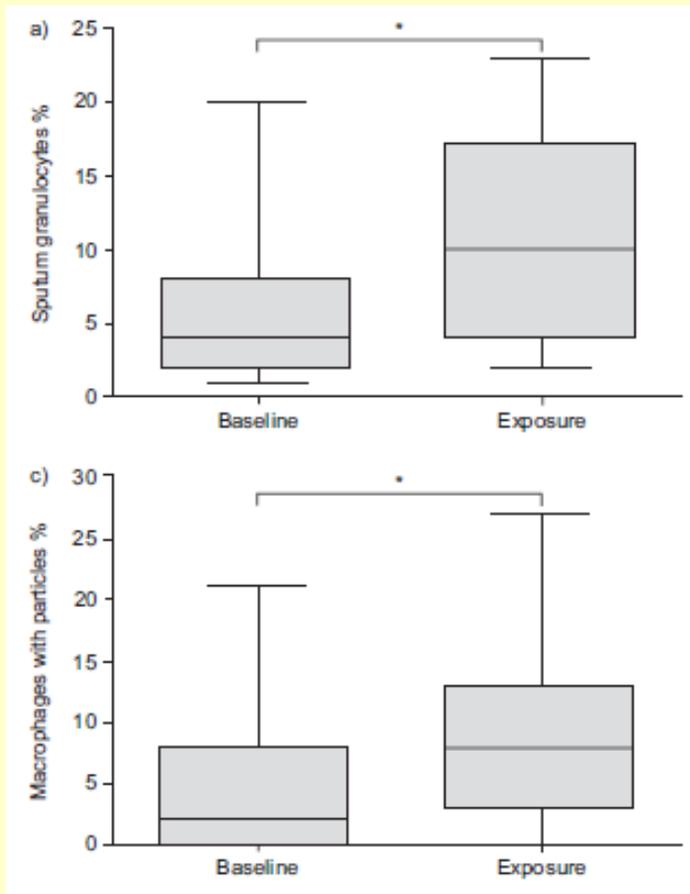


* p<0.05



Wood smoke exposure induces a pulmonary and systemic inflammatory response in firefighters

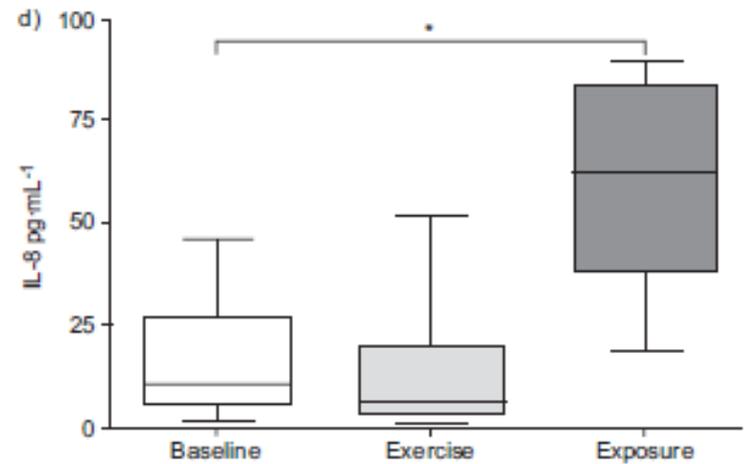
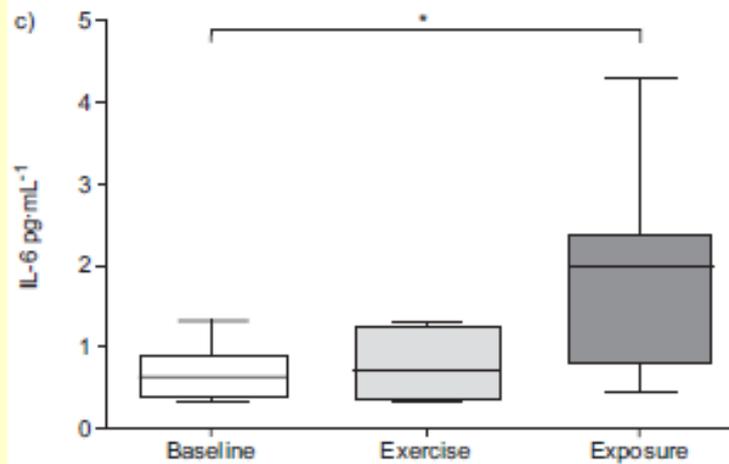
J.R. Swiston*, W. Davidson#, S. Attridge*, G.T. Li*, M. Brauer† and S.F. van Eeden*





Wood smoke exposure induces a pulmonary and systemic inflammatory response in firefighters

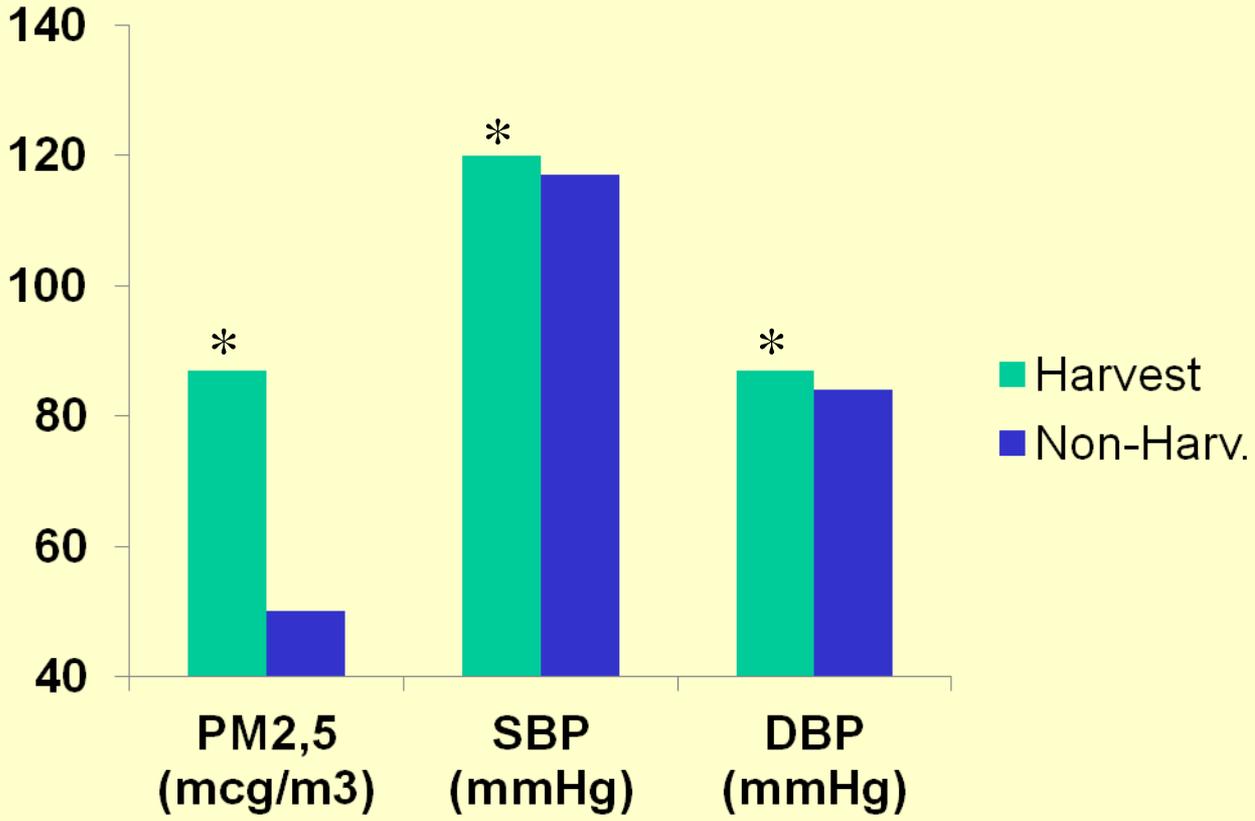
J.R. Swiston*, W. Davidson#, S. Attridge*, G.T. Li*, M. Brauer[†] and S.F. van Eeden*





Burnt Sugarcane Harvesting – Cardiovascular Effects on a Group of Healthy Workers, Brazil

Cristiane Maria Galvão Barbosa^{1,2}, Mário Terra-Filho¹, André Luis Pereira de Albuquerque¹, Dante Di Giorgi³, Cesar Grupi⁴, Carlos Eduardo Negrão⁵, Maria Urbana Pinto Brandão Rondon⁵, Daniel Godoy Martinez⁵, Tânia Marcourakis⁶, Fabiana Almeida dos Santos⁶, Alfésio Luís Ferreira Braga^{7,8}, Dirce Maria Trevisan Zanetta⁹, Ubiratan de Paula Santos^{1*}



* vs non-harvest adjusted p<0.05



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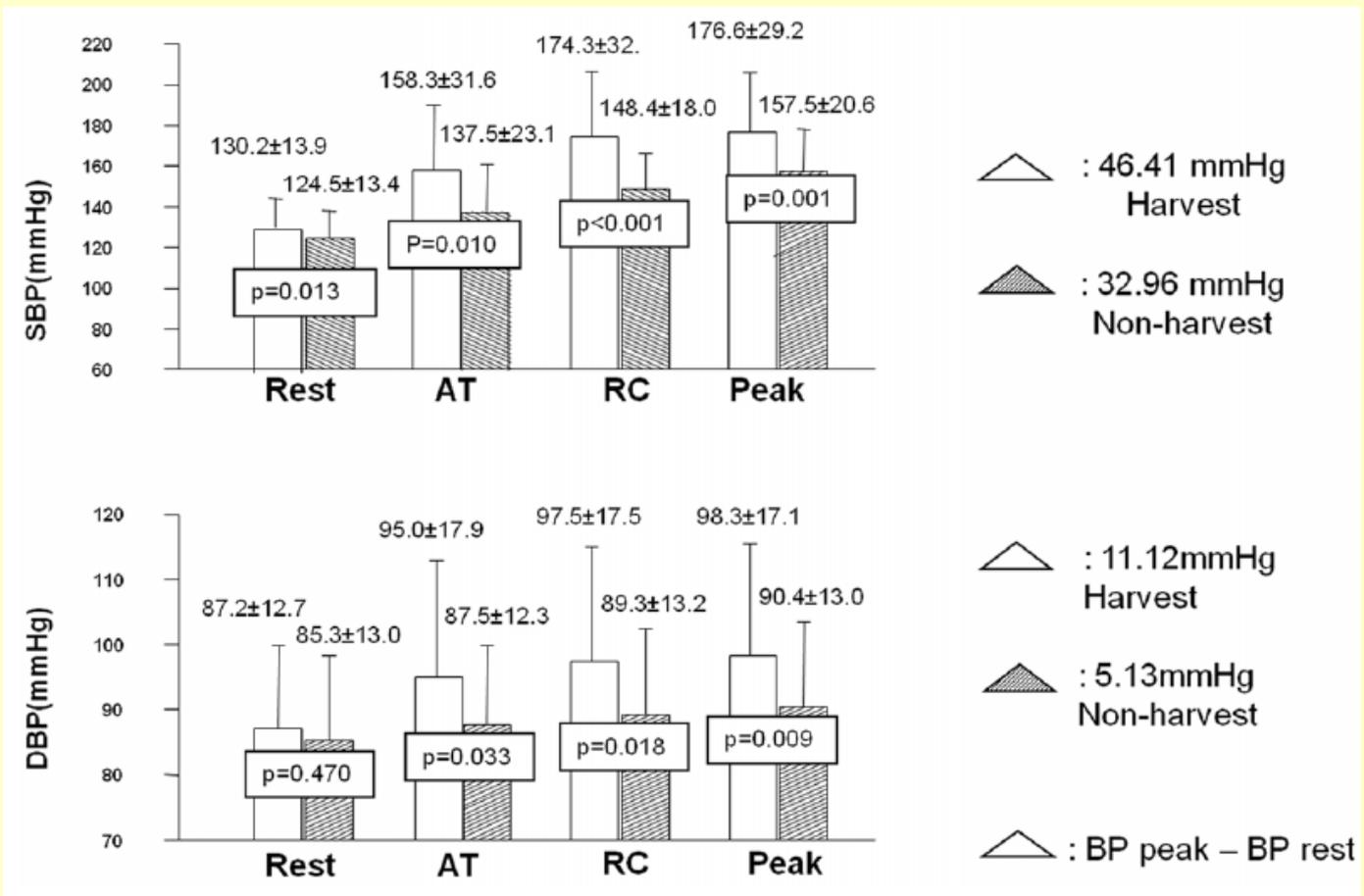


Figure 4. Systolic (SBP) and diastolic (DBP) blood pressure variation during cardiopulmonary exercise



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RESPIRE, a randomized trial of an improved cookstove 2002-2004



Figure 1 Traditional open fire.

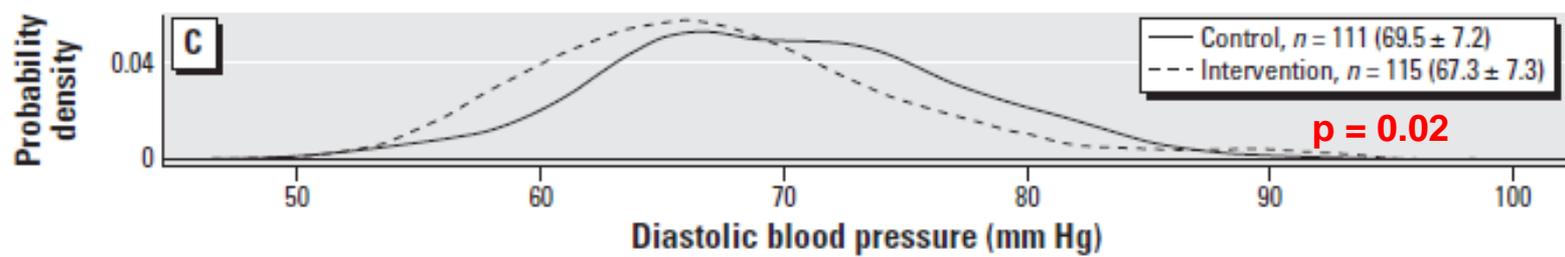
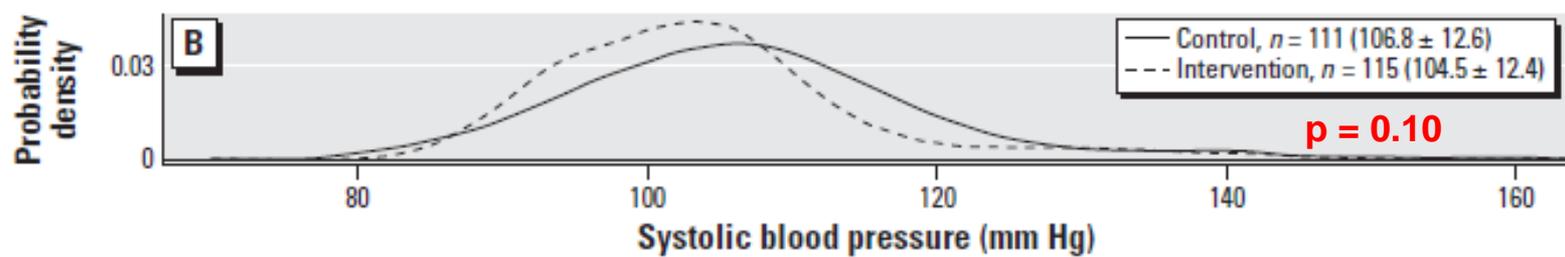
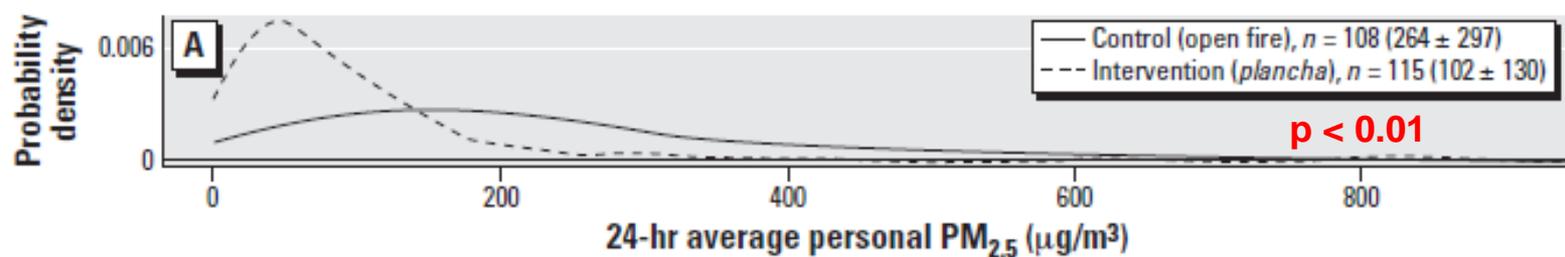


Figure 2 Plancha stove.



Chimney Stove Intervention to Reduce Long-term Wood Smoke Exposure Lowers Blood Pressure among Guatemalan Women

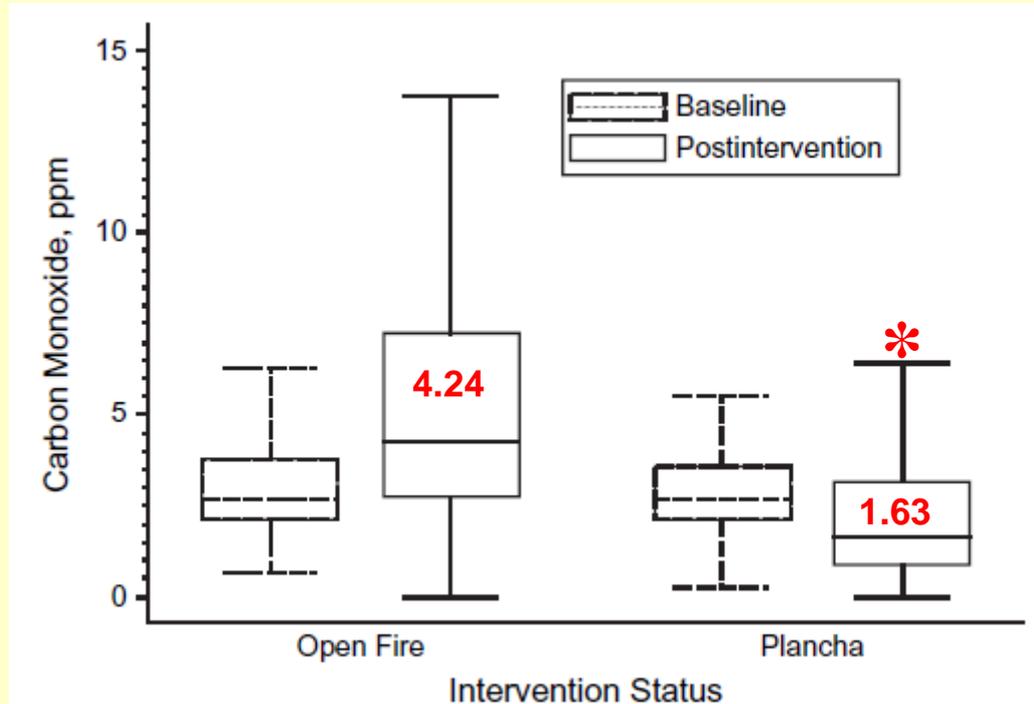
John P. McCracken,^{1,2} Kirk R. Smith,³ Anaité Diaz,⁴ Murray A. Mittleman,^{1,5} and Joel Schwartz^{1,2}





Effect of Reducing Indoor Air Pollution on Women's Respiratory Symptoms and Lung Function: The RESPIRE Randomized Trial, Guatemala

Tone Smith-Sivertsen, Esperanza Díaz, Dan Pope, Rolv T. Lie, Anaite Díaz, John McCracken, Per Bakke, Byron Arana, Kirk R. Smith, and Nigel Bruce



* $p = 0.0001$



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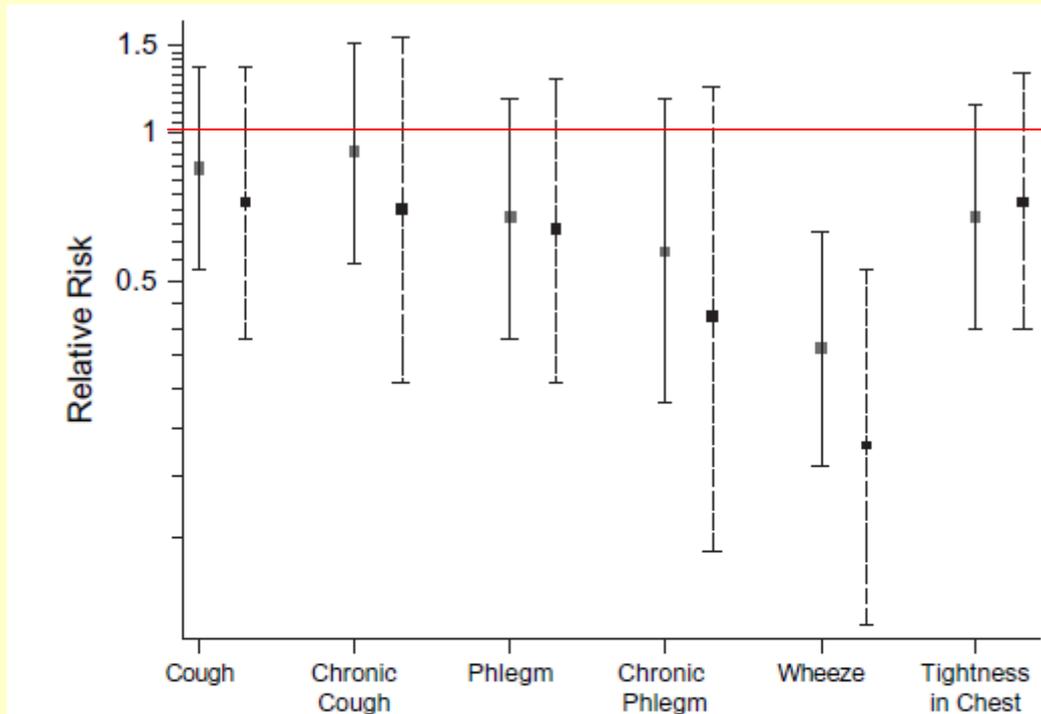


Figure 4. Relative risk of respiratory symptoms in the intervention group (women who received a plancha), San Marcos, Guatemala, 2002–2004. Relative risks were derived using generalized estimating equations. For each symptom, the solid line represents all postintervention assessments and the dashed line represents only the 12- and 18-month assessments. For questions and definitions, see Appendix 2. Bars, 95% confidence interval.



Effect of reduction in household air pollution on childhood pneumonia in Guatemala (RESPIRE): a randomised controlled trial

Kirk R Smith, John P McCracken, Martin W Weber, Alan Hubbard, Alisa Jenny, Lisa M Thompson, John Balmes, Anaité Diaz, Byron Arana, Nigel Bruce

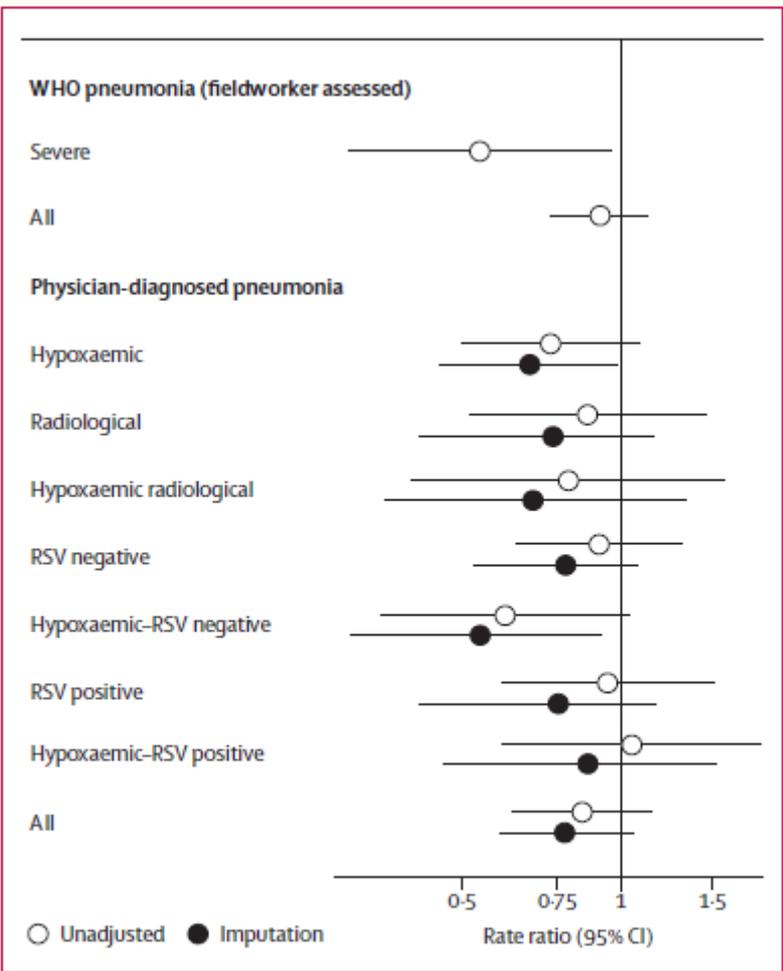


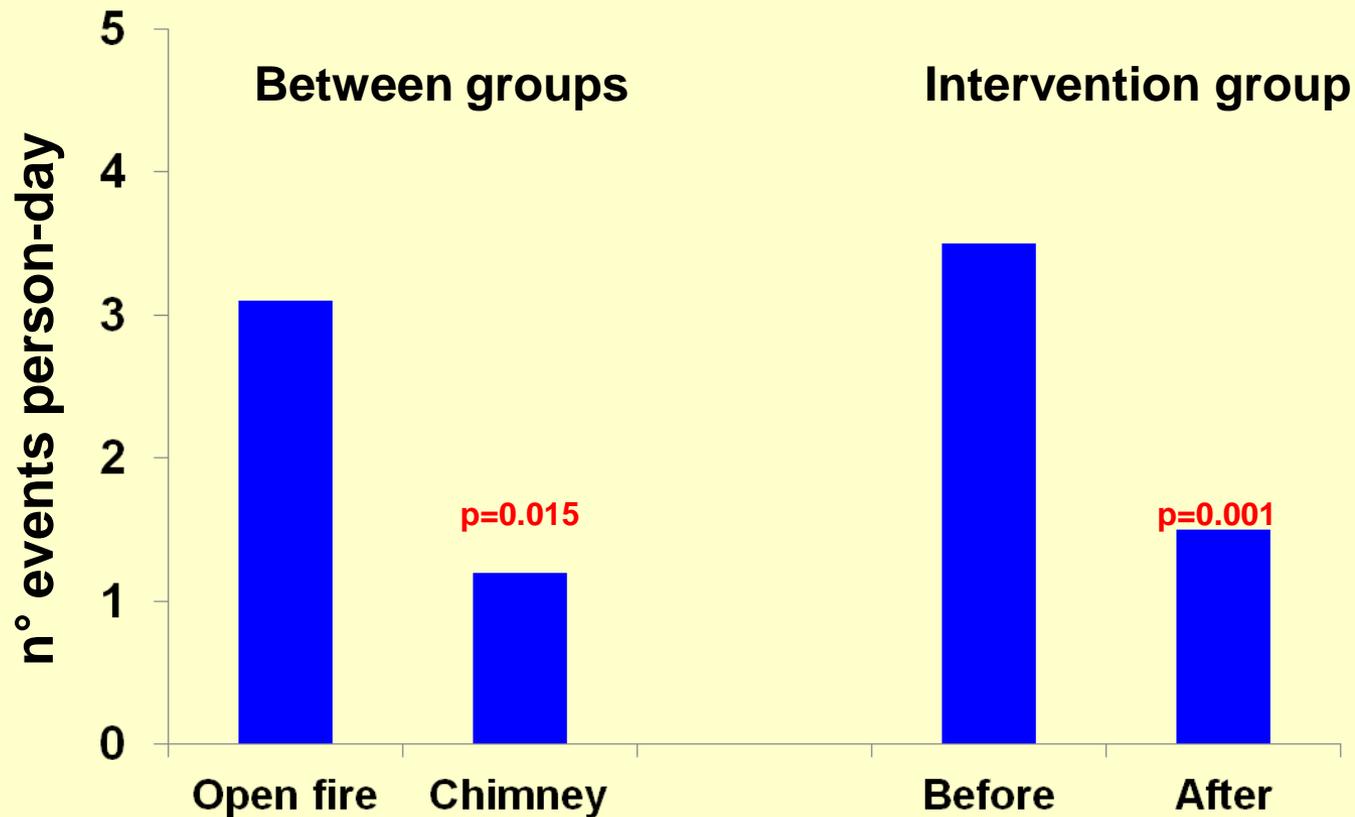
Figure 3: Comparison of effect estimates of chimney stove intervention across the ten outcomes examined (fieldworker-assessed [WHO] pneumonia and severe pneumonia, and the eight outcomes based on physician diagnosis)



Intervention to Lower Household Wood Smoke Exposure in Guatemala Reduces ST-Segment Depression on Electrocardiograms

John McCracken,^{1,2} Kirk R. Smith,² Peter Stone,³ Anaité Díaz,⁴ Byron Arana,⁴ and Joel Schwartz¹

ST-segment depression





Evaluation of interventions to reduce air pollution from biomass smoke on mortality in Launceston, Australia: retrospective analysis of daily mortality, 1994-2007

OPEN ACCESS

Fay H Johnston *research fellow*¹, Ivan C Hanigan *research associate*^{2,3}, Sarah B Henderson *epidemiologist*⁴, Geoff G Moran *associate professor*^{5,6}

Winter PM₁₀

Pre (1997-2000)

43.6 $\mu\text{g}/\text{m}^3$

Post (2001-2007)

27.0 $\mu\text{g}/\text{m}^3$



Wood stoves: **66%**



30%

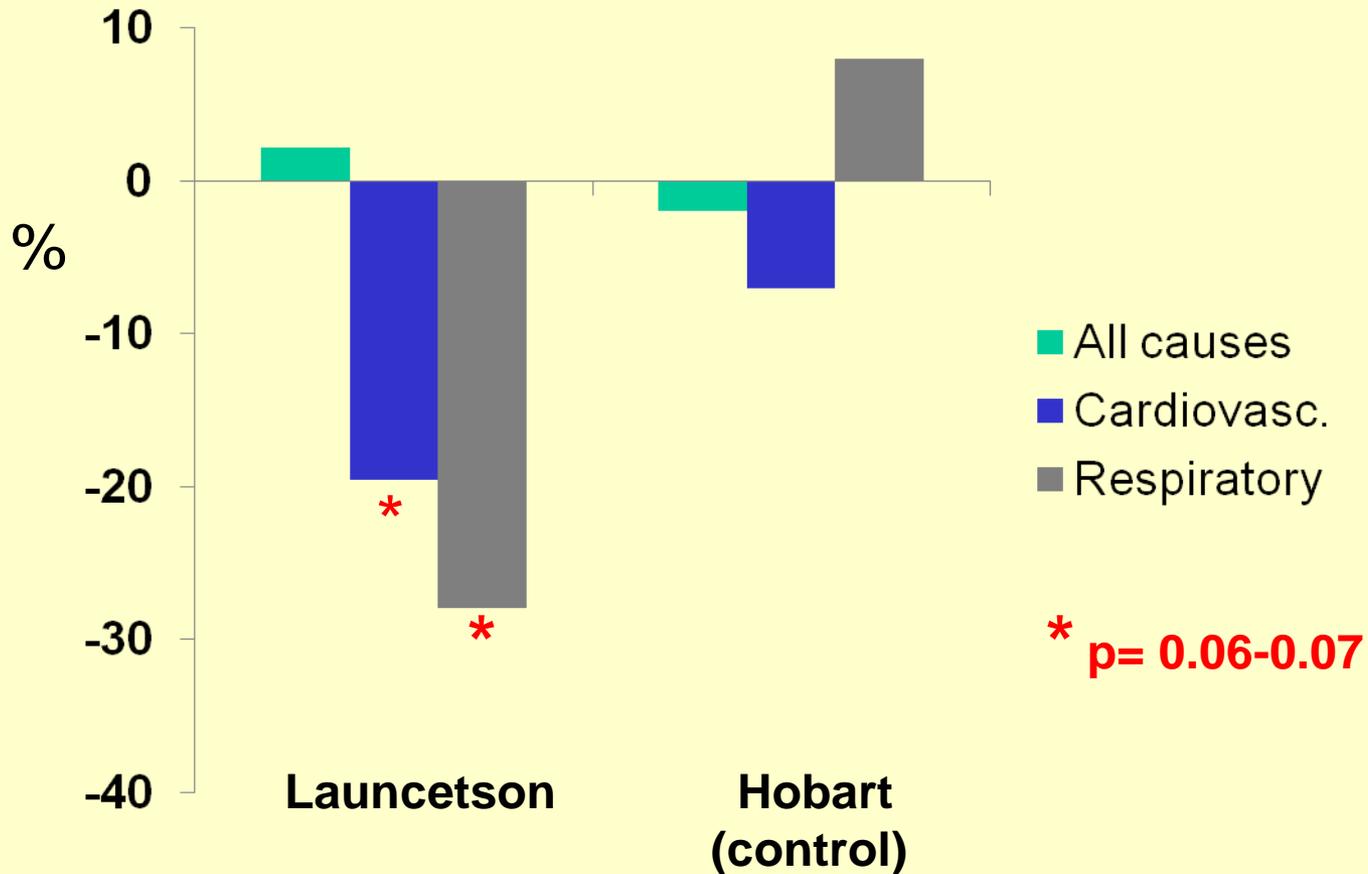


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Adjusted changes in mortality



Combustione di biomasse: effetti sulla salute

Sommario

- **Plausibilità biologica:**
 - modello fumo di sigaretta
- **Esposizione umana:**
 - indoor e outdoor
- **Effetti:**
 - cronici: respiratori, non respiratori, neoplastici
 - acuti: respiratori e cardiovascolari
- **Interventi:**
 - limitati