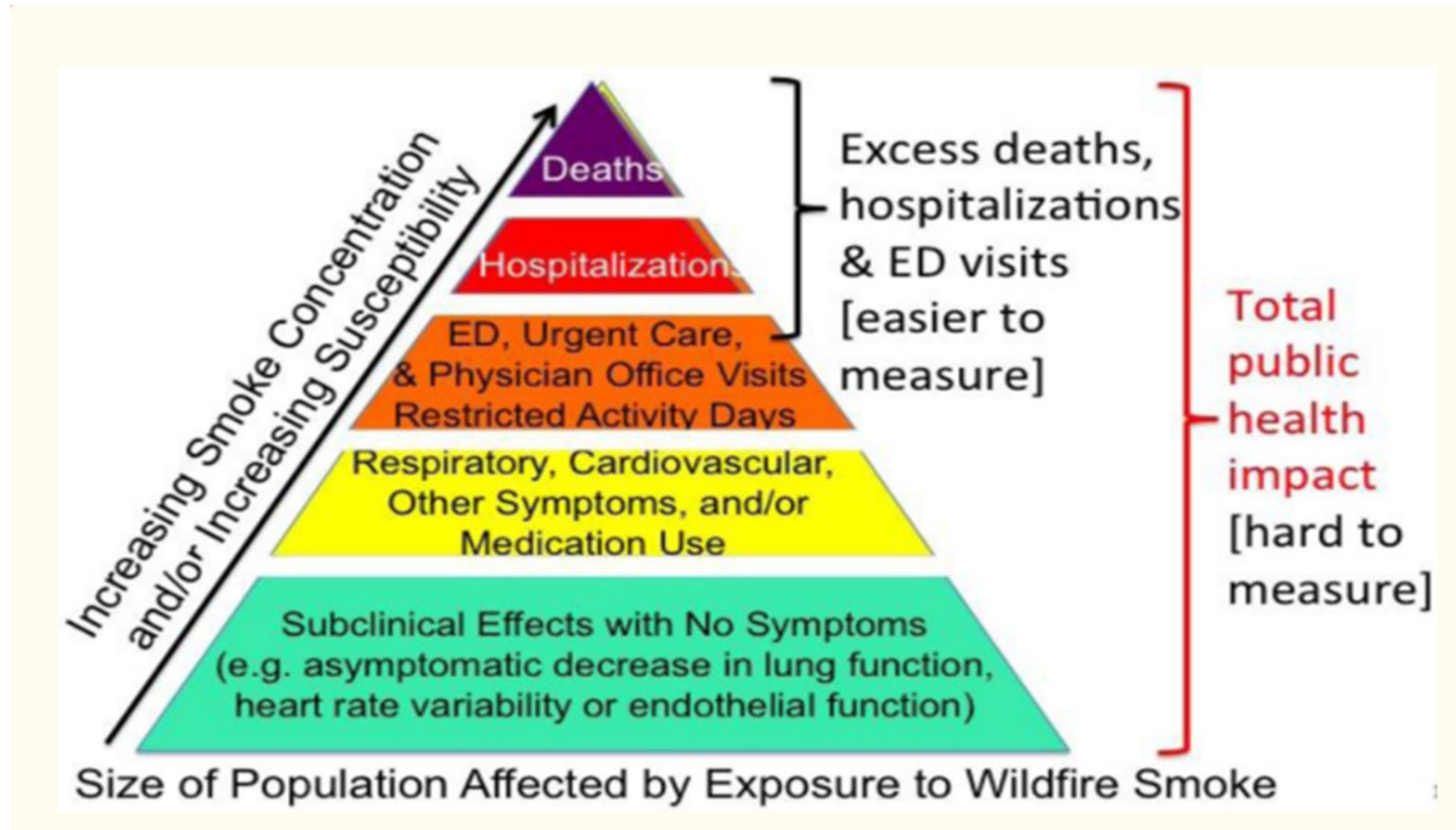


The hidden cost of bushfires

Dr Pierre SOUVET

Wildland Fire Smoke and Human Health

[Wayne E. Cascio, Sci Total Environ. 2018](#)



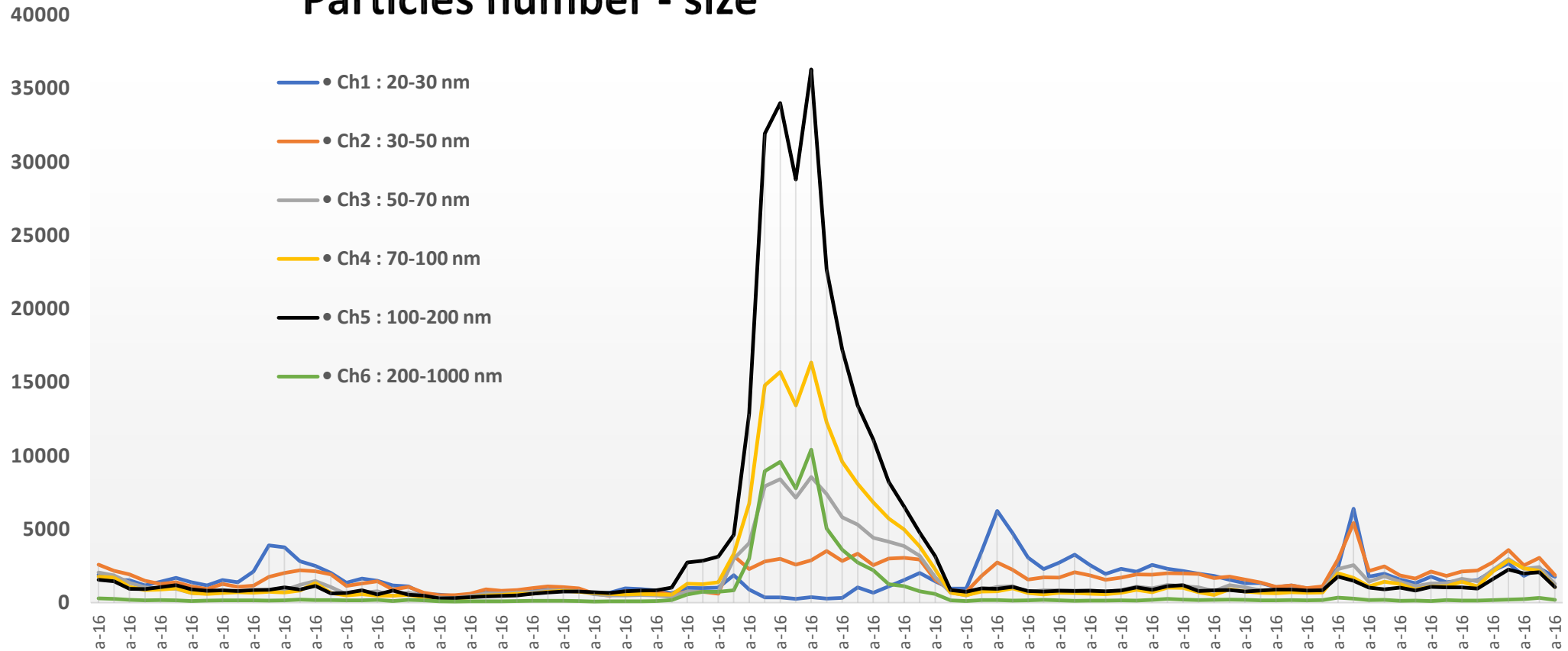
Woodsmoke Health Effects: A Review

Inhalation Toxicology · February 2007 **Luke P. Naeher and coll**

- Pollutants:carcinogenic compounds (polycyclic aromatic hydrocarbons..
- benzene, styrene ,aldehydes, acrolein,particulate matter, carbon.....
- monoxide [CO], nitrogen oxides,SO2 ,ammonia, methane,mercury, O3 formation.....
- 4000 compounds identified

• Pollutants measurement

Particles number - size



UFP Marseille 2016
Most important size 100 to 200nm
composition different of urban source

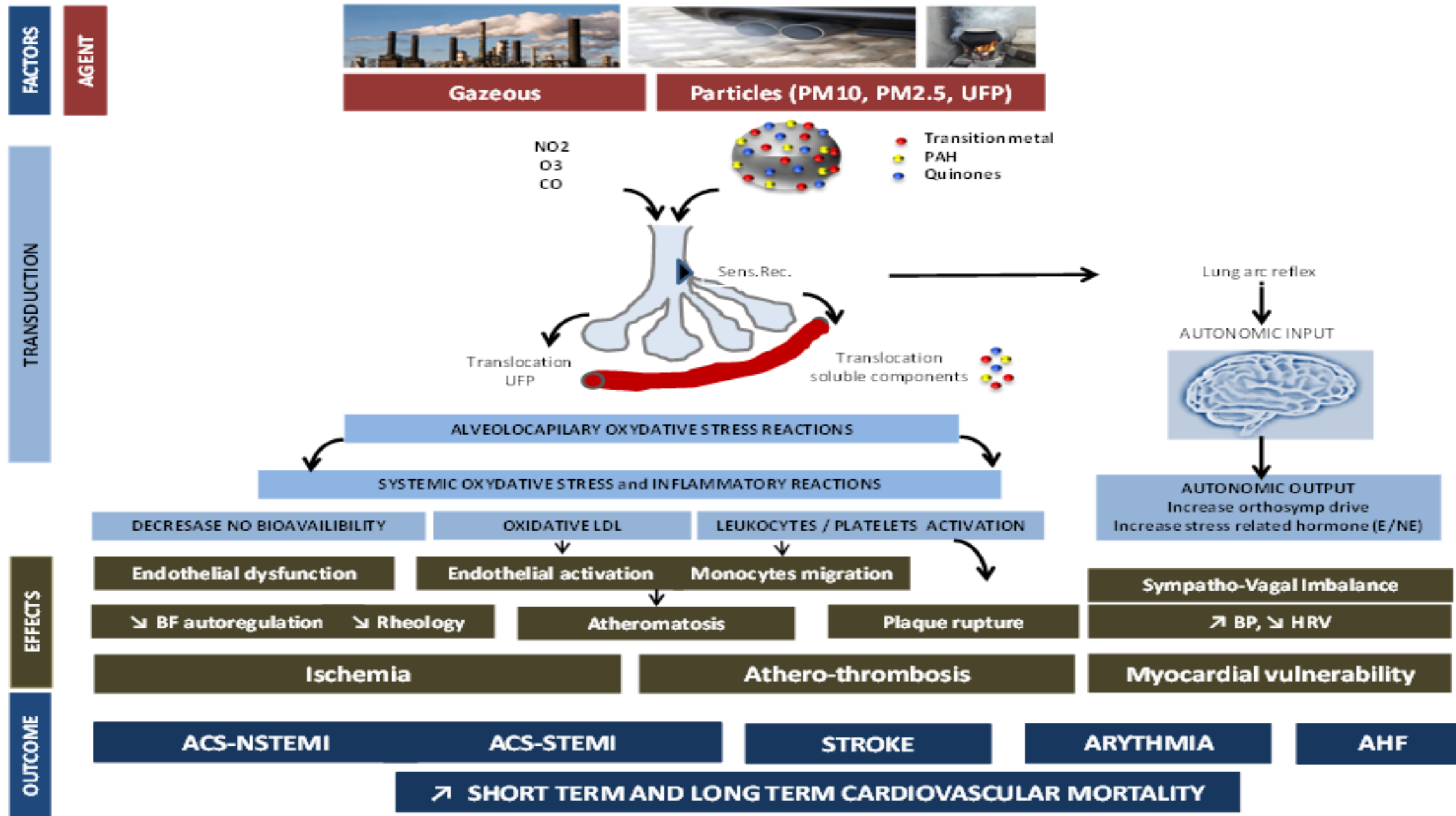


Cardiac arrest impacts in the first 48 h
greater effects seen in Males
Ischaemic Heart Disease (IHD) intervals of
2–3 days
stronger in females and Indigenous
Australians

The high number of OHCA do not
survive to the point of hospital
admission (78.4%) offer a potential
explanation for the comparatively
smaller and less consistent associations
found in hospital versus ambulance
data..

Table 4 Australian LFS associations with cardiovascular disease

Study reference	Location	Exposure	Outcome	Study design	Significant results
Salimi (2017) ¹	Sydney	10 $\mu\text{g}/\text{m}^3$ increase of $\text{PM}_{2.5}$	Emergency ambulance dispatch	Time series	Lag 2 increase in 'other' heart problems (RR: 1.05, 95% CI: 1.01–1.09). No association with same-day arrest
Haikerwal (2015) ¹⁵	Victoria	IQR increase (9.04 $\mu\text{g}/\text{m}^3$) of $\text{PM}_{2.5}$	Out of hospital cardiac arrest (OHCA) and ED attendances	Case cross over	Lag 0–1 increase in OHCA of 6.98% (95% CI: 1.03–13.29%) Lag 2 increases of IHD ED admissions of 2.07% (95% CI: 0.09–4.09%) and hospital admissions of 1.86% (95% CI: 0.35–3.44%) Lag 2 increase in AMI hospital admissions of 2.34% (95% CI: 0.06–4.67%)
Dennekamp (2015) ¹⁶	Melbourne	IQR increases of $\text{PM}_{2.5}$ (6.1 $\mu\text{g}/\text{m}^3$), PM_{10} (13.7 $\mu\text{g}/\text{m}^3$), CO (0.3 ppm) and number of study 'fire hours'	OHCA	Case cross over	Increases of 8.05% (95% CI: 2.30–14.13) for $\text{PM}_{2.5}$, 11.1% (95% CI: 1.55–21.48) for PM_{10} and 35.7% (95% CI: 8.98–68.92) for CO. 174 fire hours were associated with an excess 23.9 (95% CI: 3.1–40.2) OHCA due to elevations in $\text{PM}_{2.5}$
Johnston (2014) ²	Sydney	LFS event days	ED attendances	Case cross over	Lag 2 increases in IHD (OR: 1.07, 95% CI: 1.01–1.15) and inverse association for arrhythmias (OR: 0.91, 95% CI: 0.83–0.99)
Martin (2013) ³	Sydney, Wollongong, Newcastle	LFS event days	Hospital admissions	Case cross over	No associations
Crabbe (2012) ⁴	Darwin	10 $\mu\text{g}/\text{m}^3$ increases of PM and FPM	Hospital admissions	Time series	Strongest associations for CV hospital admissions; same-day FPM (RR: 1.044, 95% CI: 0.989–1.102)
Johnston (2011) ¹⁷	Sydney	LFS event days	Mortality	Case cross over	Same-day associations only noted when temperature was removed from the model; cardiovascular mortality (OR: 1.10, 1.00–1.20)
Morgan (2010) ⁵	Sydney	10 $\mu\text{g}/\text{m}^3$ increase of PM_{10}	Mortality and hospital admissions	Times series	No associations
Hanigan (2008) ⁷	Darwin	10 $\mu\text{g}/\text{m}^3$ increase of PM_{10}	ED admissions	Time series	No significant associations. Weak trend at lags 2 and 3 for circulatory and IHD admissions in Indigenous sub-population only
Johnston (2007) ⁶	Darwin	10 $\mu\text{g}/\text{m}^3$ increase of PM_{10}	ED admissions	Case cross over	Lag 3 association of IHD in sub-population of Indigenous Australians (OR: 1.71, 95% CI: 1.14–2.55)



Bourdrel et al. *Arch Cardiovasc Dis.* 2017 Nov;110(11)
 Argacha, Bourdrel et al. *Trends Cardiovasc Med.* 2017 Aug 4

More effects

- **Link Global warming** and health : heat stroke , local food production , vectors infectious , aggravation of chronic pathologies (each 1° increase is associated to 5 to 7% increase of mortality in COPD and chronic disease)

Long term effect

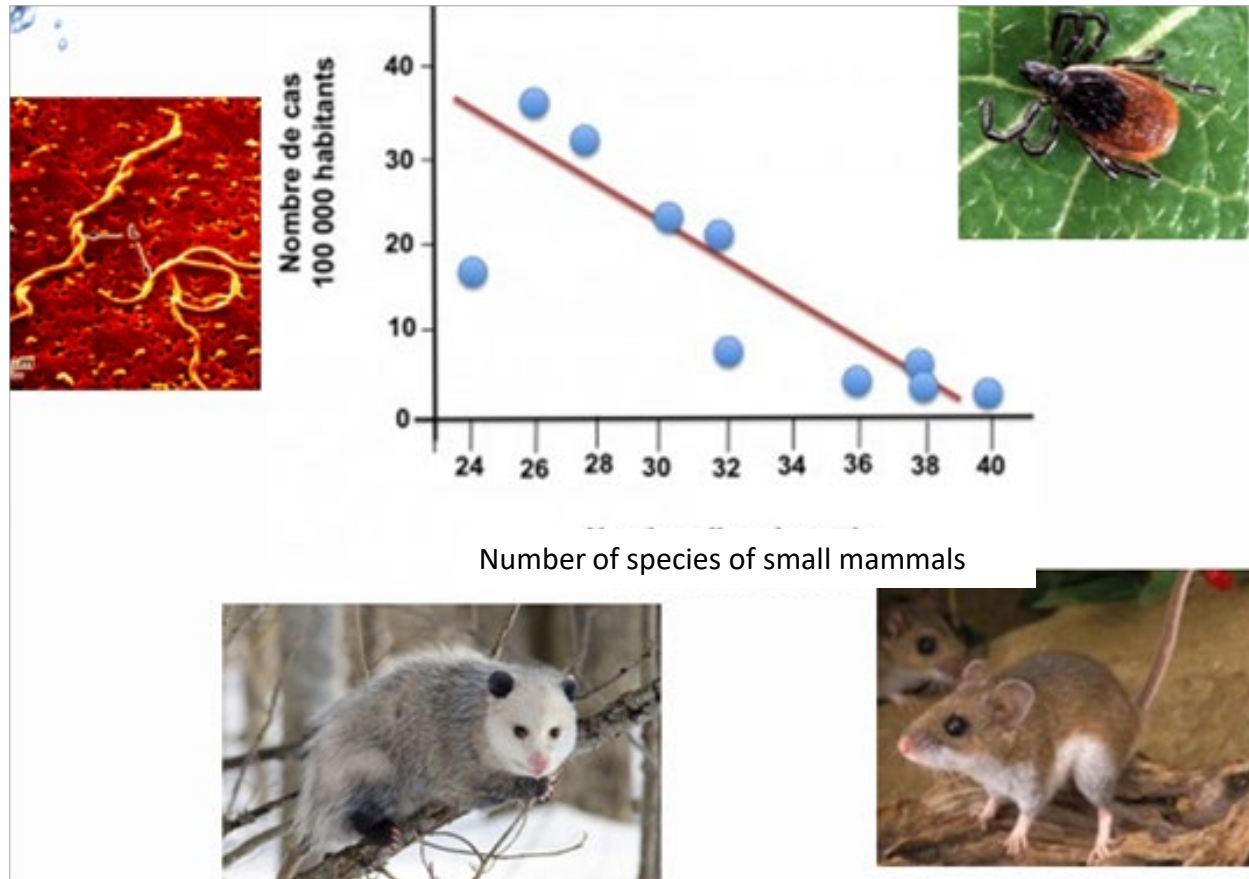
- reduction of **immun defense** (Naeher et al 2007) by oxydative stress
- moderate impairment of **lung fonction** (jacquin and al 2011 ,Adetona et al 2011 ..)
- **mutagenic** character of wood smoke

- **Cardiovascular**
- **Effect on pregnancy and Low birth** weight or prematurity
- **Water** quality

- **Mental effet** :short and long term

PRESERVING BIODIVERSITY IS ALSO PROTECTING HUMAN HEALTH

Example of DILUTION EFFECT : Lyme disease



EU: 1Md/an

Biodiversity as a source of medicines

- antibiotics: 75% of natural origin
- WHO:
 - 30% of modern medicines sold around the world contain components directly derived from plants
 - 11% of the 252 drugs considered essential by WHO were exclusively of plant origin (Veeresham, 2012) and 8.7% of animal origin
- Only 5 to 15% of vascular plant species have been the subject of pharmacological and medical studies
- The dynamics of the collapse of biodiversity put in danger its value linked to the potential use of biodiversity in the future (**option value**)

How protect

- fire fighting action strategy
 - use in-home HEPA filtering
 - wear an N-95 or FFP2 respirator when outdoors
 - Will pharmacological or dietary supplements taken before and during exposure curtail the health effects of wildland fire smoke?
 - Health care professionals, hospital systems, and even health insurers :increasing the awareness of their at-risk patients about actions they can take to limit exposure to smoke from landscape fire.
-
- The hidden cost of wildfires: Economic valuation of health effects of wildfire smoke exposure in Southern California . Richardson et al [Journal of Forest Economics](#) 2012
 - cost of illness estimate is \$9.50 per exposed person per day.
 - cost of defensive actions: \$84.42 per exposed person per day.