Air pollution and noise from road traffic: acute effects in young healthy subjects

A panel study by:
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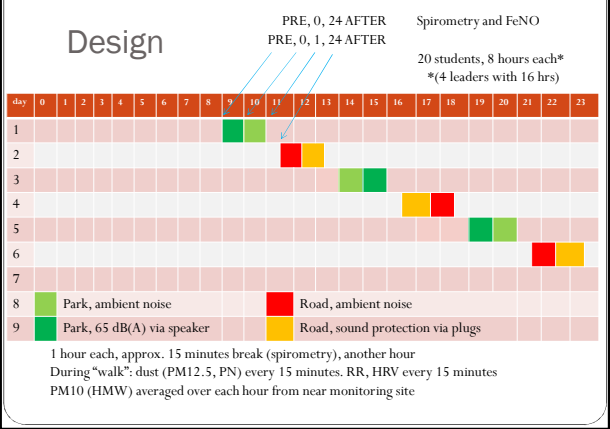
Introduction

- Asthmatic patients in London (Oxford Street versus Hyde Park):
  McCreanor J et al. Respiratory effects of exposure to diesel traffic in persons with asthma.N Engl J Med. 2007 Dec 6;357(23):2348-58.
- KHK patients and inflammatory markers
  Mirowsky JE et. Al. Ozone exposure is associated with acute changes in inflammation, fibrinolysis, and endothelial cell function in coronary artery disease patients. Environ Health. 2017 Nov 21;16(1):126.
- Diabetics and exhaled NO
  Li H et al. Acute effects of ambient temperature and particulate air pollution on fractional exhaled nitric oxide: A panel study among diabetic patients in Shanghai, China. J Epidemiol. 2017 Dec;27(12):584-589
- Healthy subjects?
  YodaY et al. Acute effects of air pollutants on pulmonary function among students: a panel study in an isolated island. Environ Health Prev Med. 2017 Apr 4;22(1):33.

Design



1 hour each, approx. 15 minutes break (spirometry), another hour
During "walk": dust (PM12.5, PN) every 15 minutes. RR, HRV every 15 minutes
PM10 (HMW) averaged over each hour from near monitoring site

Setting

Exposure

1 hour values each. P always < 0.001

	AKH	PM10	PM2.5	PM1	PN
AKH		0.9367	0.9604	0.9627	0.7698
PM10	0.9367		0.9710	0.9653	0.7624
PM2.5	0.9604	0.9710		0.9994	0.7313
PM1	0.9627	0.9653	0.9994		0.7231
PN	0.7698	0.7624	0.7313	0.7231	

PM2.5 = 1.565737*AKH + 4.226977*ROAD - 7.288967 (p_1, p_3<0.001, p_2=0.016; adj R^2= 0.9247)
PN = 484.7116*AKH + 18536.06*ROAD - 1361.221 (p_1, p_2 < 0.001, p_3 = 0.163; adj R^2=0.82)

Not much!

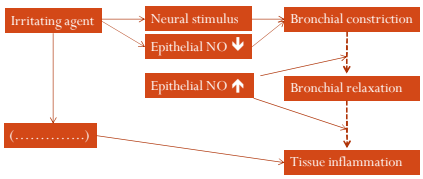
PM10(AKH) = 28.0 µg/m³ ± 26.5 (5-95)
PM2.5 = 38.7 µg/m³ ± 43.5 (2-146)
PN = 21347.8/cm³ ± 18826.5 (4198.9-80059.6)

Winter - Spring

15 minutes intervals: PM2.5 and dB (ambient): r = ~~0.2595~~
PM2.5 = 21.30972*ROAD – .2080163*DAY – 111.8313*HOUR + 8994.279 (all p <0.001)
PN = 24135.39*ROAD – 65.95211*DAY – 20994.9*HOUR + 2843439 (p_{HOUR}=0.011)
dB(A) = 9.903056*ROAD + .0898845*DAY – 2. 385443*HOUR – 3797.16 (p_{HOUR}=n.s.)

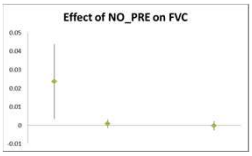
FeNO and spirometry

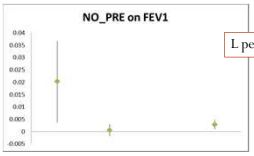
- NO in exhaled air
  - From endothelial cells: inflammation & increased blood flow
  - From epithelial cells: relaxation of bronchial muscle tone
  - From (eosinophilic) inflammatory cells



FeNO before, Spirometry after

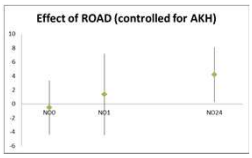
- 0, 1, and 24 hours after walk

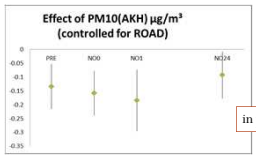




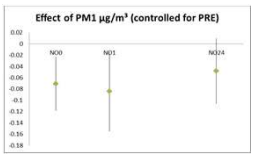
L per ppb

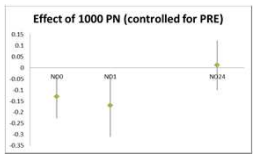
FeNO by exposure





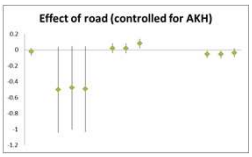
in ppb

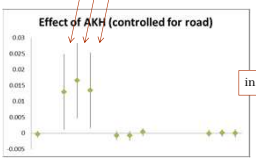




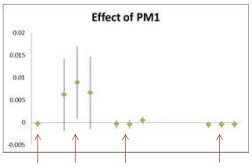
FVC by exposure

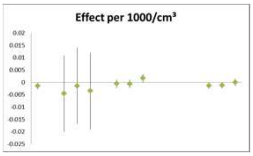
Unadjusted
Adjusted for FVC PRE
Adjusted for NO PRE





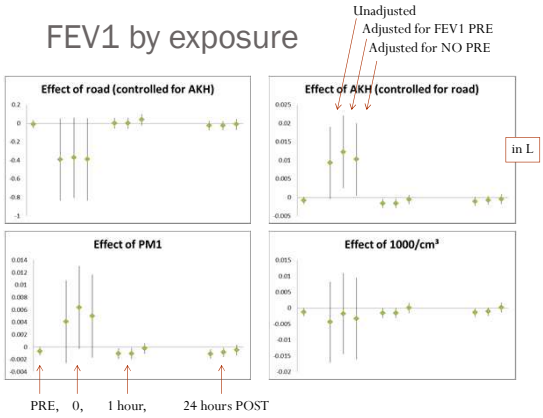
in L



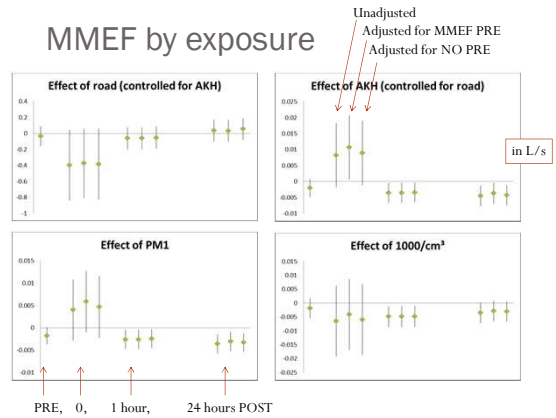


PRE, 0, 1 hour, 24 hours POST

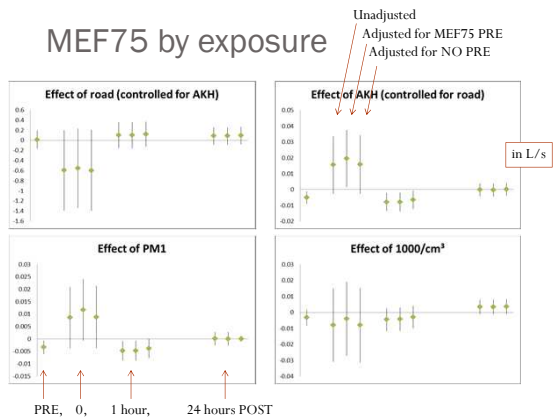
FEV1 by exposure



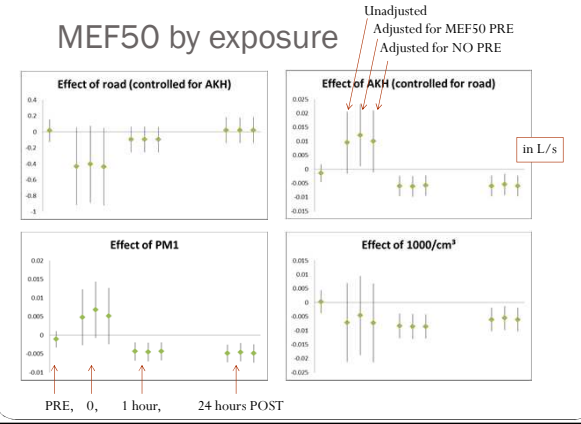
MMEF by exposure



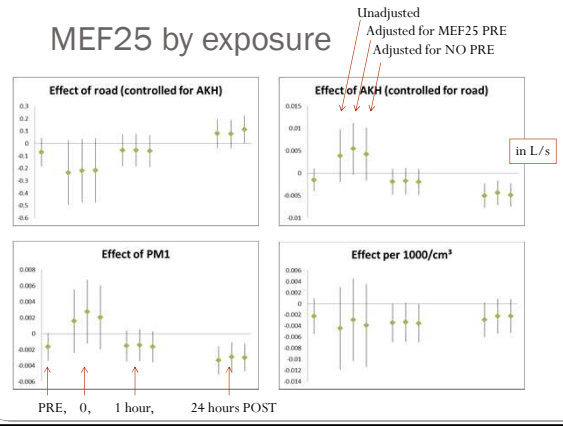
MEF75 by exposure



MEF50 by exposure



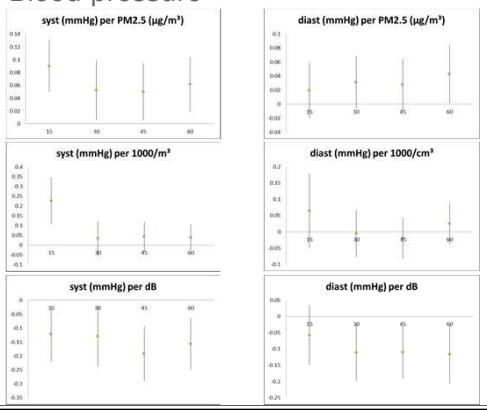
MEF25 by exposure



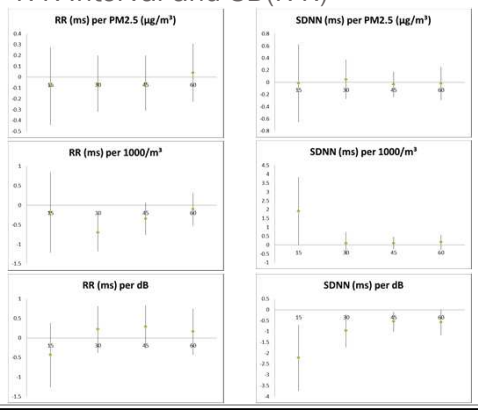
Noise & cardiovascular regulation

HRV, Blood pressure

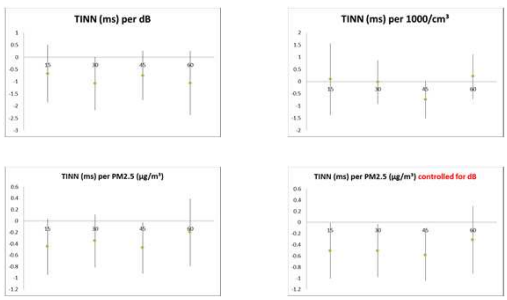
Blood pressure



R-R-Interval and SD(R-R)



TINN: triangular interpolation of NN interval histogram



Effects of noise only