Health effects of traffic-related air pollution:

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Glasgow conurbation :

- Some of poorest public health statistics in Europe
- Complex geographical patterns in socio-economic (s-e) circumstances
- High dependency on road transport & poor provision for active travel
- Rel. high concs of traffic-related air pollution

Extant cohort studies:

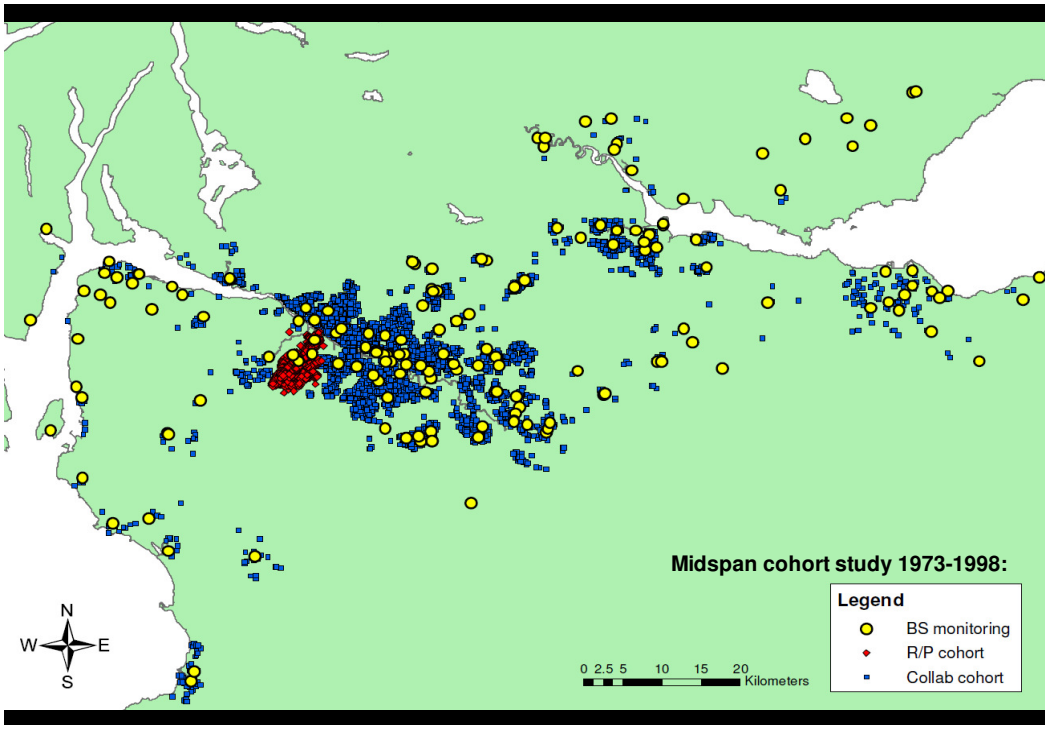
- Long follow up: r.linked CV, resp o/c.
- Data rich: longitudinal s-e; genetic; biomarker; cognitive metrics

Ongoing clinical studies:

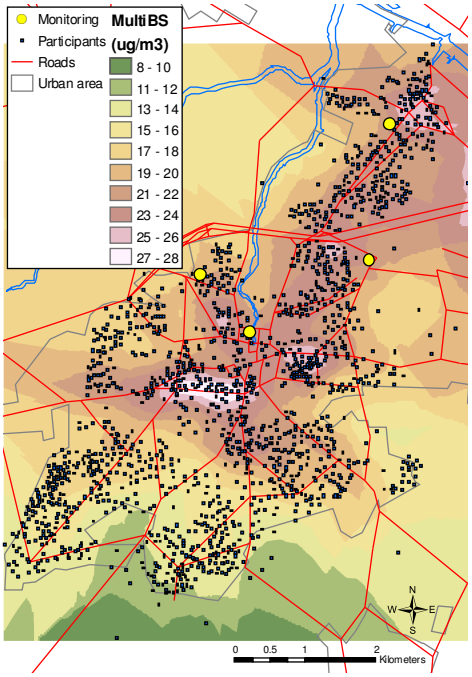
- Clinical/behav. interventions
- Longit. biomarker / physiol. assessment
- Record linked outcomes.

Research opportunities:

- **Assess assoc. between residential exposure & o/c in cohorts**
- **Assess assoc. between personal exposure & o/c in clinical studies**
- **Assess impact of traffic, air quality management & public health interventions**

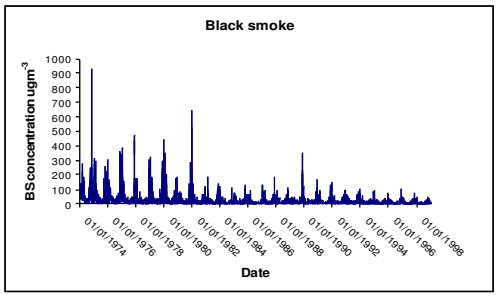


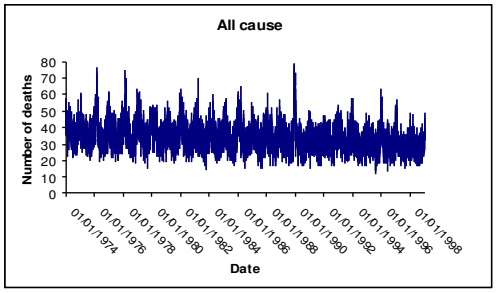
Exposure model predictions for Renfrew/Paisley cohort study:

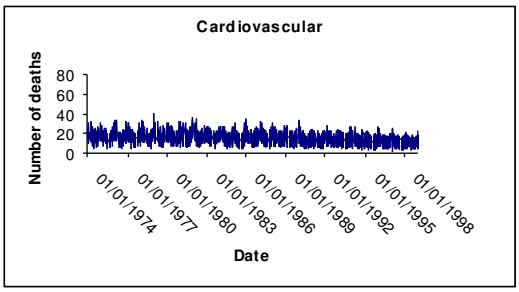


[1,632 postcode centroids for 15,331 participants]

Time series plots of daily black smoke & mortality - Glasgow 1974 –1998:







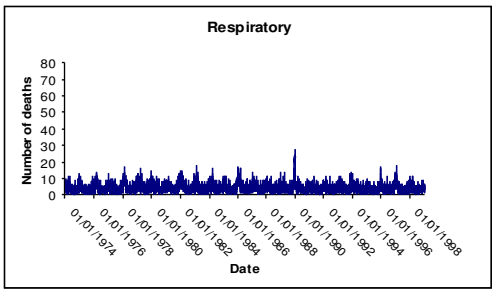


Table 3. Comparison of estimated magnitudes of associations [percent change (95% CI)] between short- and long-term exposure to BS and mortality in the Renfrew–Paisley and Collaborative cohorts and in the population > 50 years of age of Glasgow, Renfrew, and Paisley conurbation with follow-up to 1998.

Mortality/population group	Short-term (3-day)[a,b]	Medium-term (31-day)[a,b]	Long-term (1970–1979)[c]
All-cause			
Time-series[a]	0.2 (0.0, 0.4)	0.9 (0.3, 1.5)	—
Renfrew–Paisley cohort[b]	1.8 (0.1, 3.5)	3.4 (–0.7, 7.7)	10 (4, 17)
Collaborative cohort[b,d]	1.1 (–1.4, 3.8)	2.0 (–3.4, 7.6)	1 (–4, 6)
Combined cohort[e]	1.6 (0.2, 3.0)	2.9 (–0.5, 6.2)	5 (1, 9)
Cardiovascular			
Time-series[a]	0.1 (–0.2, 0.4)	0.3 (–0.7, 1.2)	—
Renfrew–Paisley cohort[b]	1.4 (–1.2, 4.0)	4.1 (–2.2, 10.7)	11 (1, 22)
Collaborative cohort[b,d]	–0.6 (–4.3, 3.2)	0.4 (–7.5, 8.9)	3 (–5, 12)
Combined cohort[e]	0.8 (–1.4, 2.9)	2.7 (–2.4, 7.8)	7 (0, 13)
Respiratory			
Time-series[a]	0.3 (–0.2, 0.8)	3.1 (1.4, 4.9)	—
Renfrew–Paisley cohort[b]	–0.4 (–6.4, 6.1)	7.2 (–7.5, 24.2)	26 (2, 55)
Collaborative cohort[b,d]	1.1 (–7.8, 10.9)	–19.5 (–37.7, 4.0)	–3 (–21, 18)
Combined cohort[e]	0.1 (–5.1, 5.3)	–2.6 (–15.2, 10.0)	11 (–3, 28)

Table details percent increases in mortality associated with 10-μg/m^3 increments in average BS.

Association between long-term exposure to air pollutants & mortality in Scotland - Interim Conclusions:

- Associations between mortality & long-term (10 y.) exposure > medium-term (31 d.) > short-term (3 d.) exposure in same population
- Consistency: √, Coherence: √, Confounding effects: √
- Exposure classification – **absolutely critical!**

Health effects of long-term exposure to air pollutants in Scotland - publications:

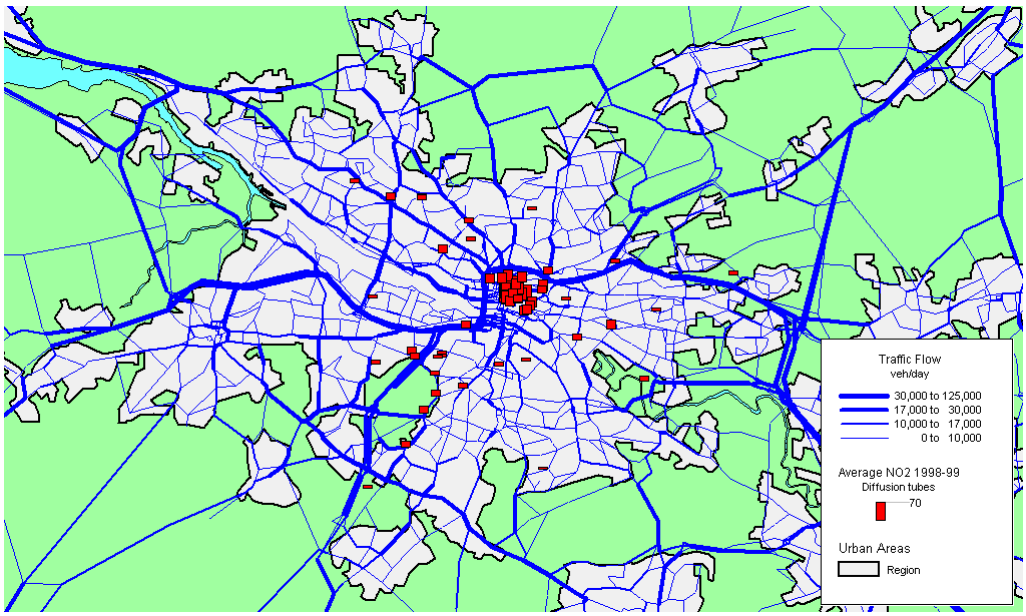
Beverland IJ, Cohen GR, Heal MR, et al. (2012) A comparison of short-term and long-term air pollution exposure associations with mortality in two cohorts in Scotland. *Environmental Health Perspectives* **120**, 1280-1285.

Beverland IJ, Carder M, Cohen GR, et al. (2014) Associations between short/medium-term variations in black smoke air pollution and mortality in the Glasgow conurbation, UK. *Environment International* **62**, 126–132.

Beverland IJ, Robertson C, Yap C, et al. (2012) Comparison of models for estimation of long-term exposure to air pollution in cohort studies. *Atmos. Env.* **62**, 530-539.

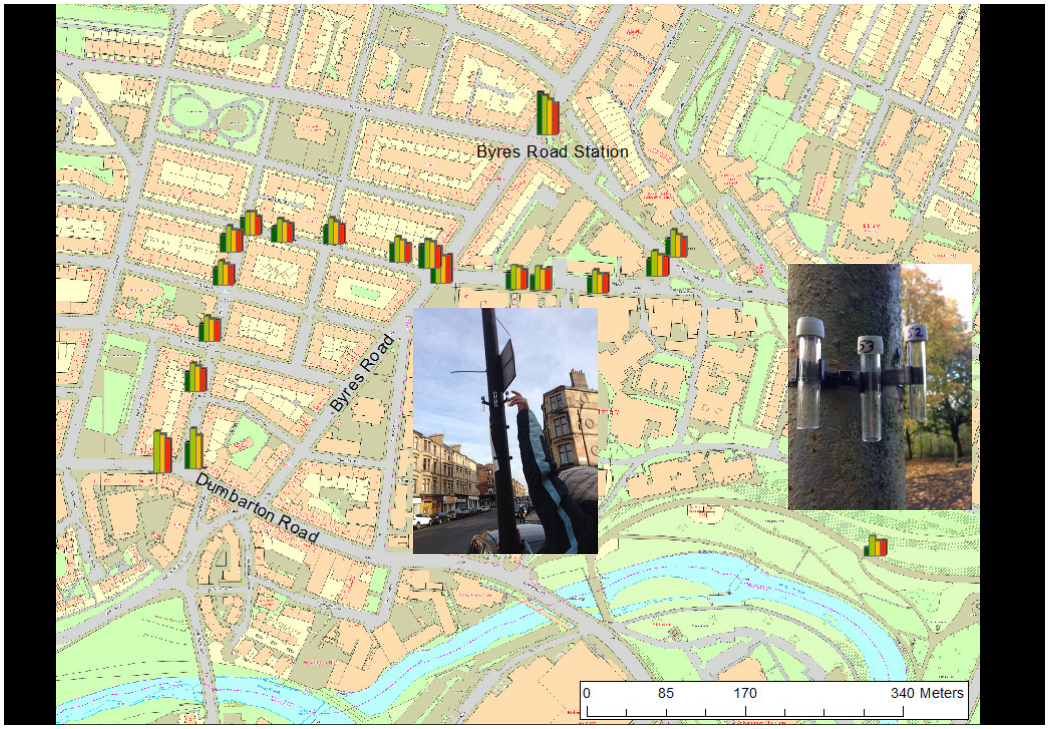
Yap C, Beverland IJ, Heal MR, et al. (2012) Association between long-term exposure to air pollution and specific causes of mortality in Scotland. *Occupational & Environmental Medicine* **69**, 916-924.

NO_2 & traffic in Glasgow – optimisation of monitoring network design:

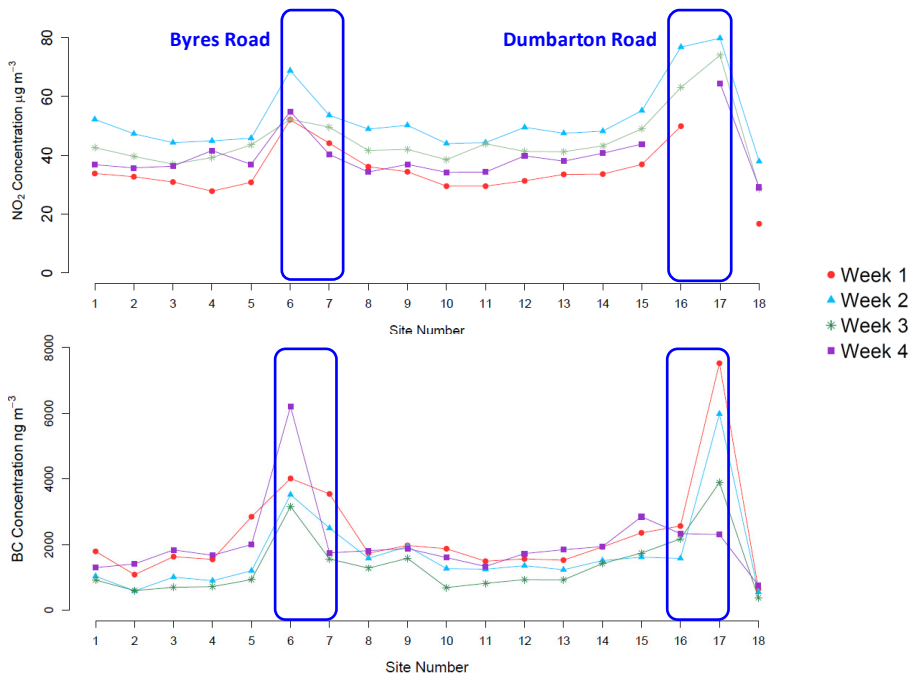


NO_2, NO_x, O_3 Passive Diffusion Samplers:

'Yoof resistant' version



NO_2 and BC by site and week: :



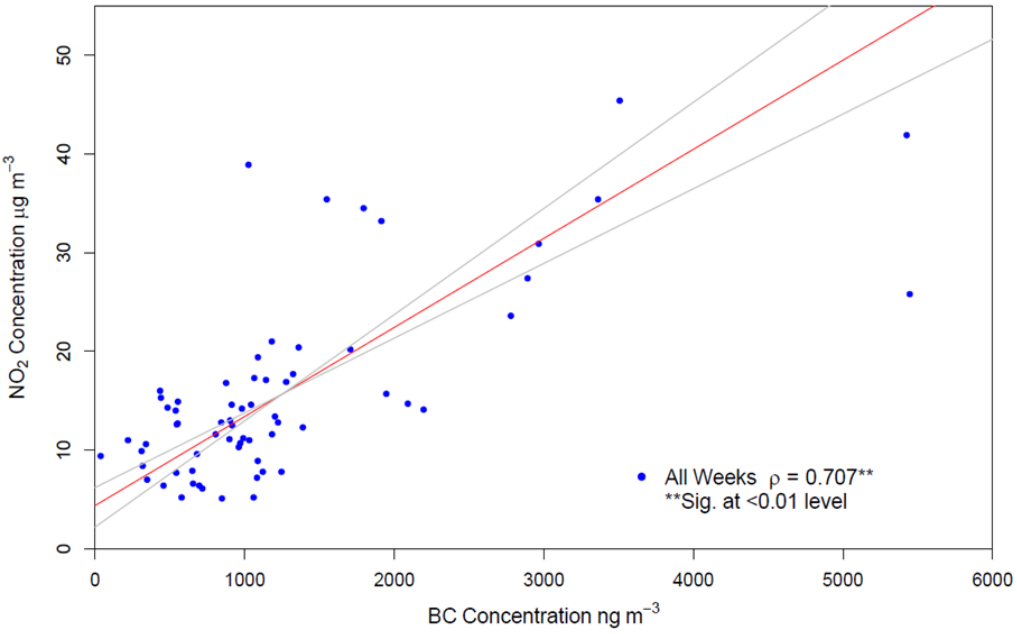
Air quality monitoring - real-time sensors:

Black carbon

Particle numbers

NO_2 & O_3

Correlation between 1-week NO_2 PDT & 2 x 5-min BC observations at 18 sites over 4-week period:



J. Gillespie:
- Development & evaluation of hybrid LUR & dispersion exposure models.
- Combination - passive, active & real-time monitoring for model dev & eval.

RICARDO-AEA

N. Masey:
- Development of high resolution passive & r-time sensor methods
- Optimised monitoring networks – diff. measurement timescales

NERC SCIENCE OF THE ENVIRONMENT RICARDO-AEA

Core activities:
- Monitoring spatial-temporal variations in traffic-related air pollutants: passive & active systems for NO_2, O_3, $PM_{2.5}$, black carbon, & particle no.
- Development & evaluation of land-use regression exposure models
- Application of exposure models to env epidemiology & LAQM

E. Ezani & A. Tadsanaprasittipol:
- Novel particle sampling methods - portable low power instruments
- ID markers of particle composition - env & occ settings

vito vision on technology

J. Barr:
- Evaluation of real-time sensors
- Exposure monitoring in development of intelligent transport systems (ITS)

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