

IMPERIAL

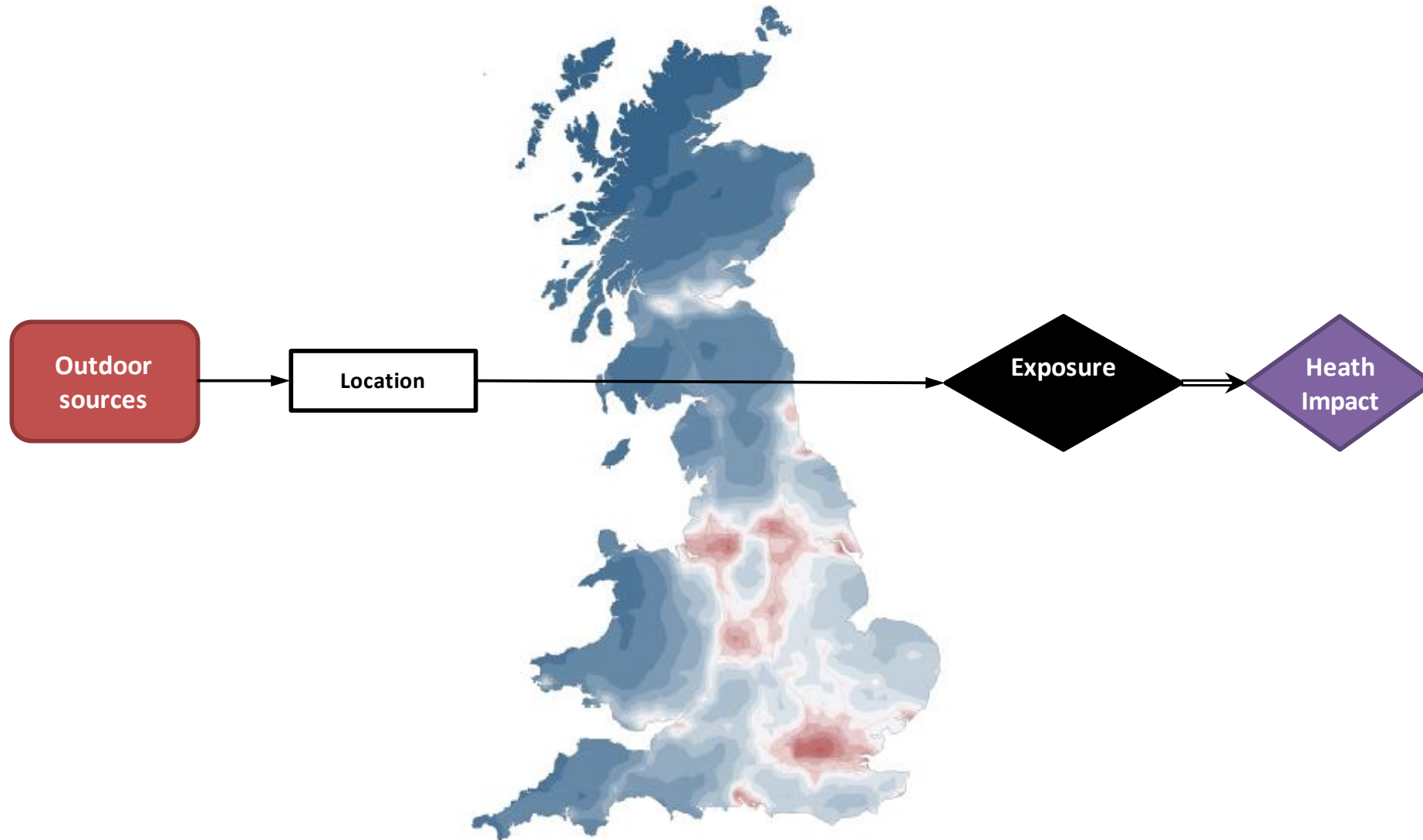
**Challenges associated with personalising
air pollution exposure models –
Experience gained from the APEx study**



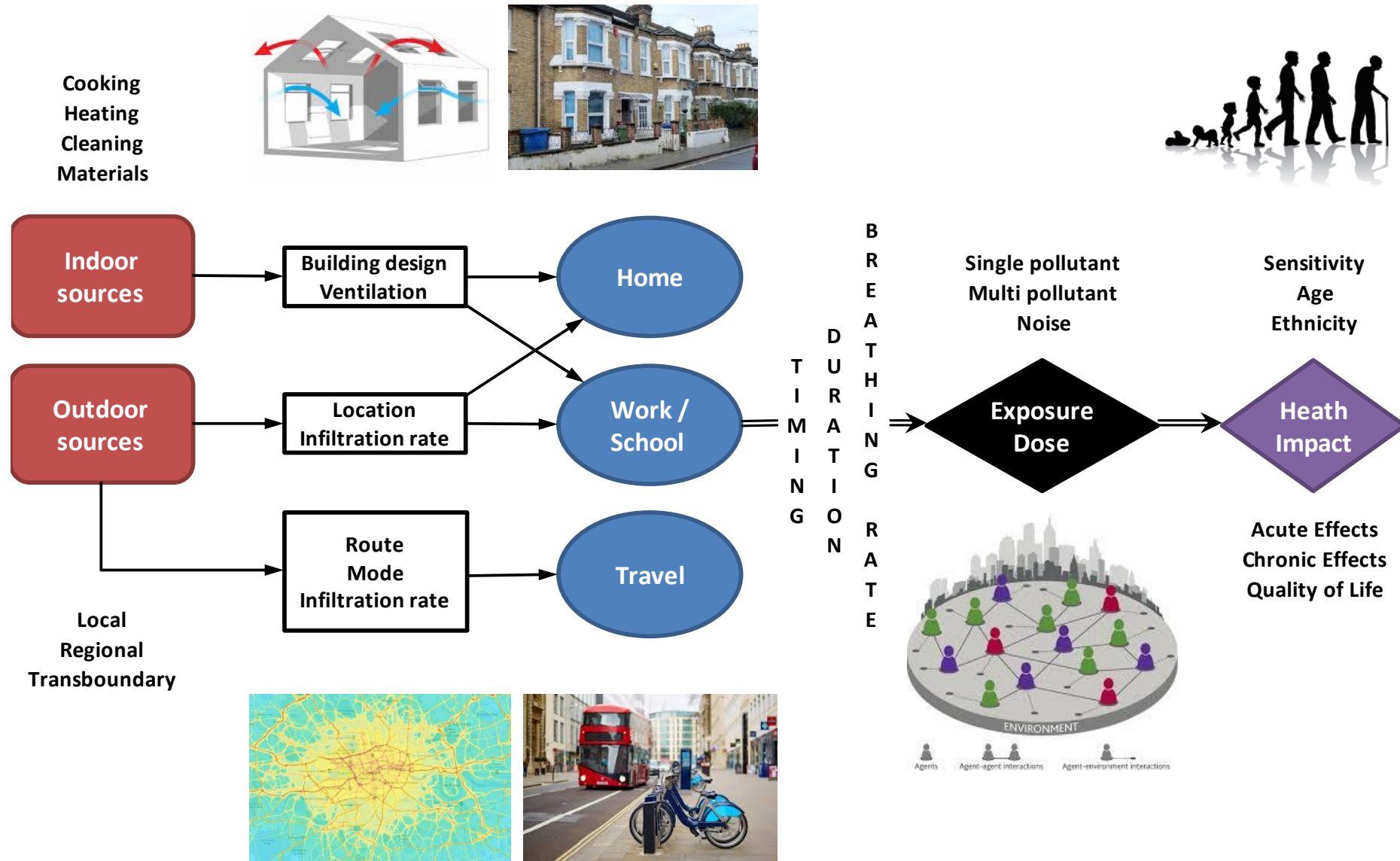
Introduction

- There is a move toward models that better reflect
- We often talk about the benefits, but the challenges are not so commonly discussed. Go through a few that we came across in APEX

Ecological method of air quality management for health protection

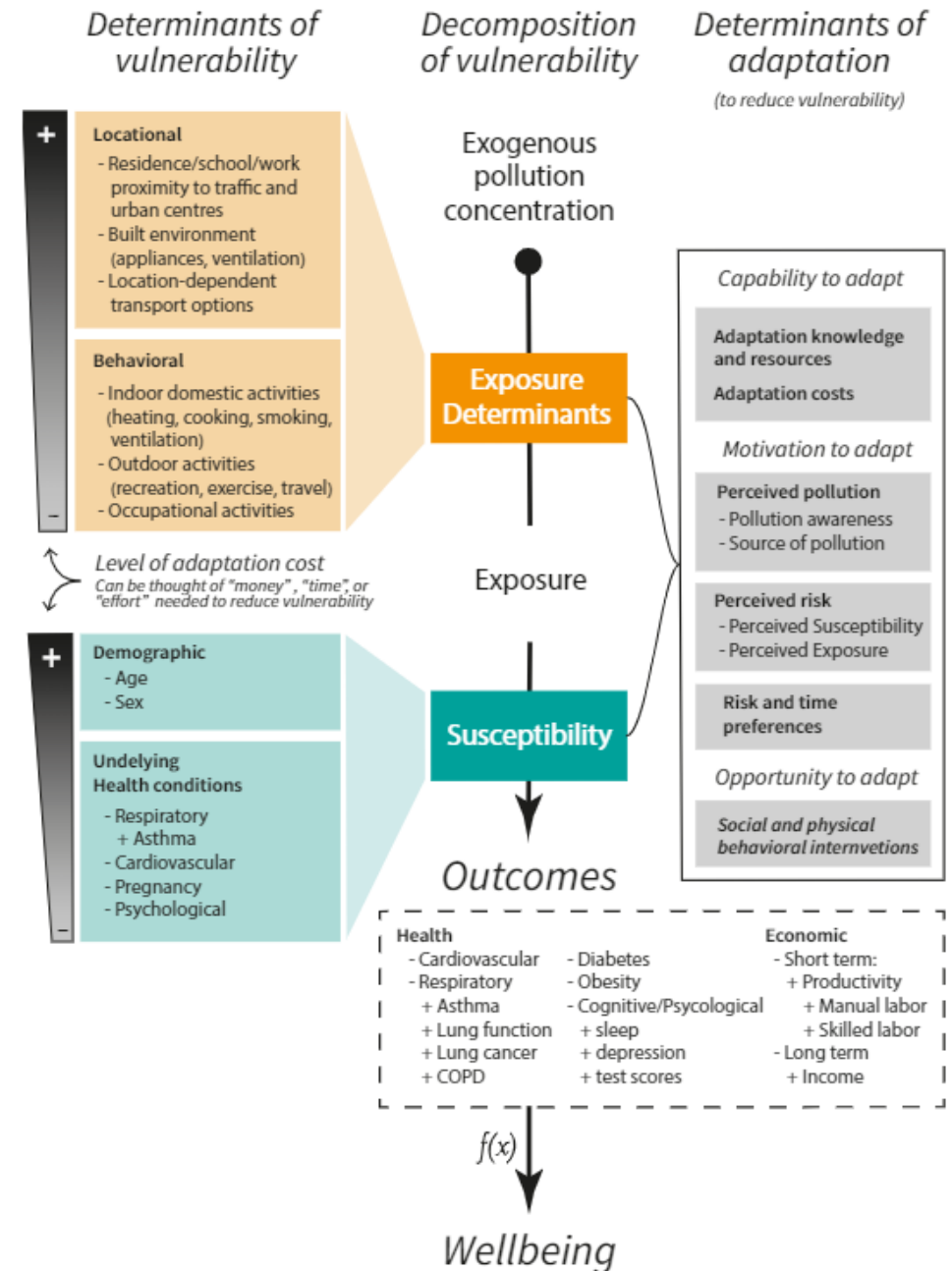


How are we really exposed to air pollution?

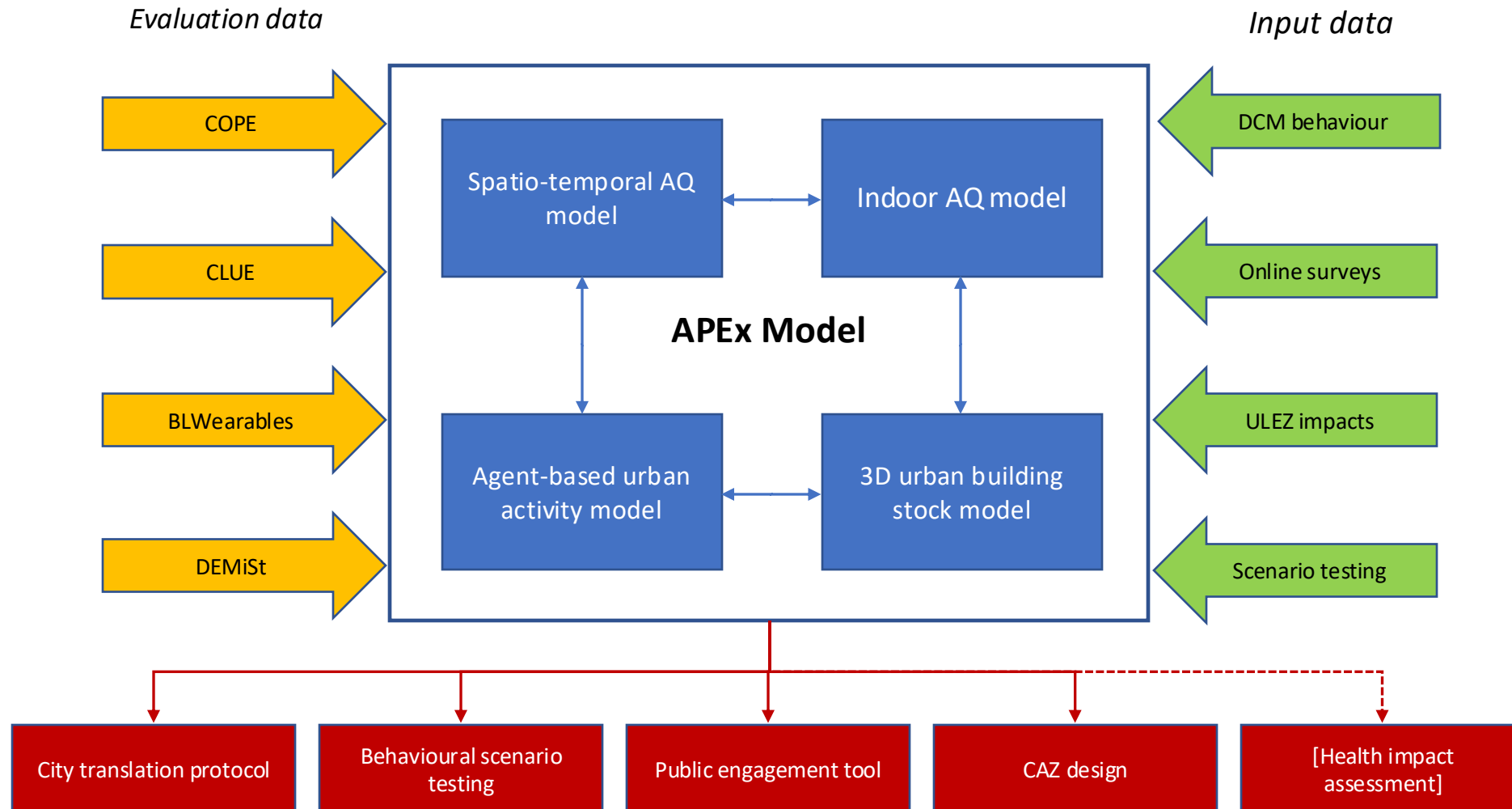


Understanding vulnerability

- An ecological approach does not incorporate consideration of vulnerability
- A dynamic approach that incorporates lived environment and behaviour does
- This approach brings many advantages, but also many challenges



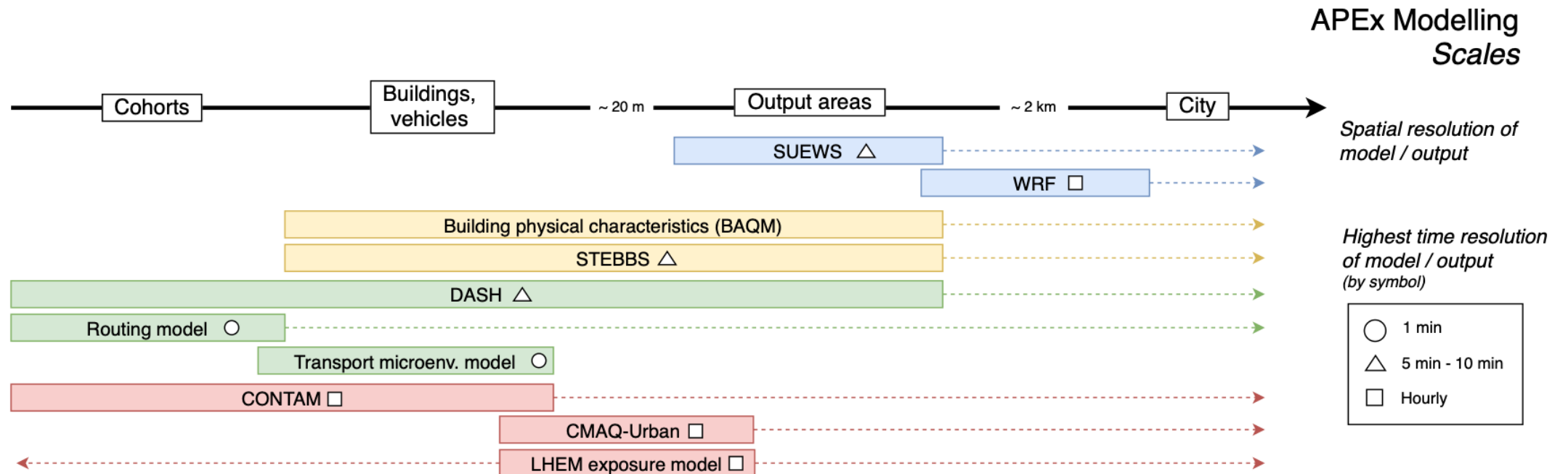
APEX - A personalised air pollution exposure model that incorporates urban behaviour



Opportunity – world leading dynamic models can be utilised

Challenge – Models have been developed independently

- Differing coding languages and platforms
- Differing spatial and temporal domains
- Established ownership and background IP



Opportunity – increasingly detailed administrative datasets

Challenge – GDPR restricts sharing of unaggregated data

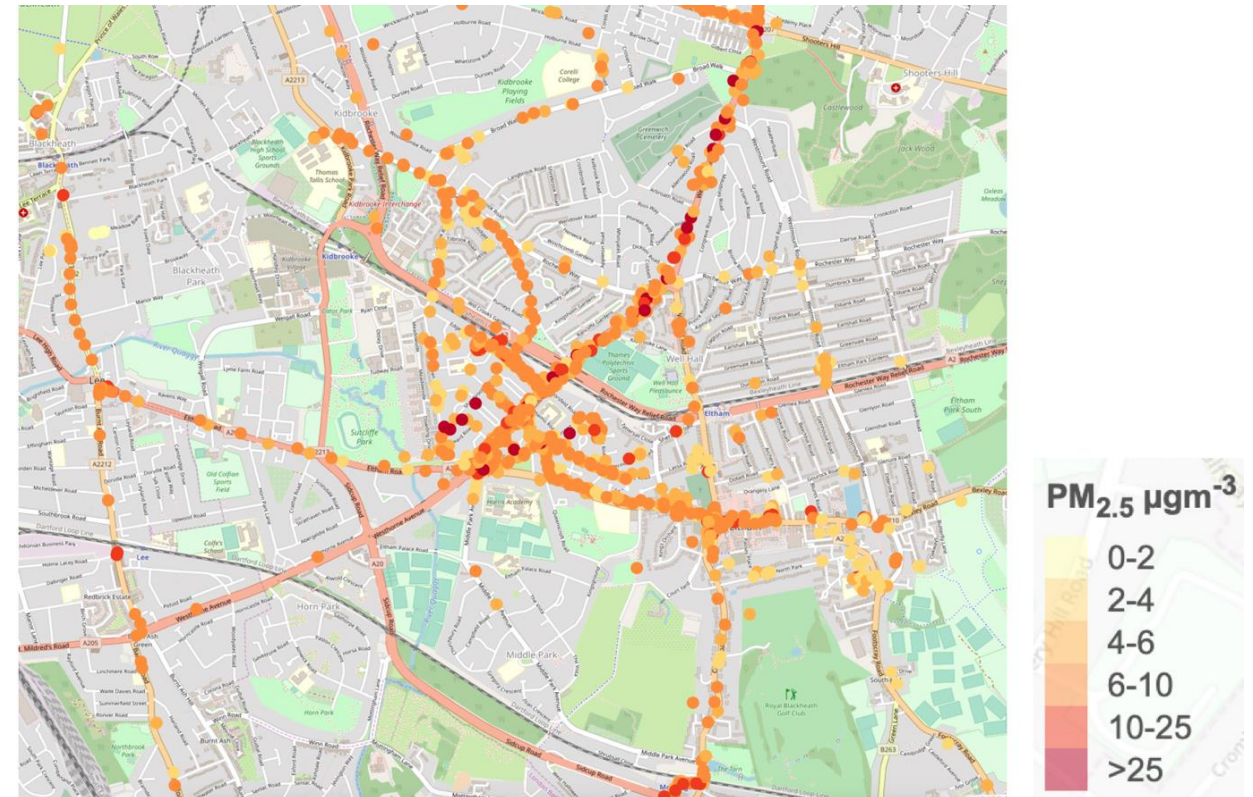
- Individual level data
- Restricted release
- Data transfer



Opportunity – personal exposure monitoring for model evaluation

Challenge – specificity prevents ‘validation’

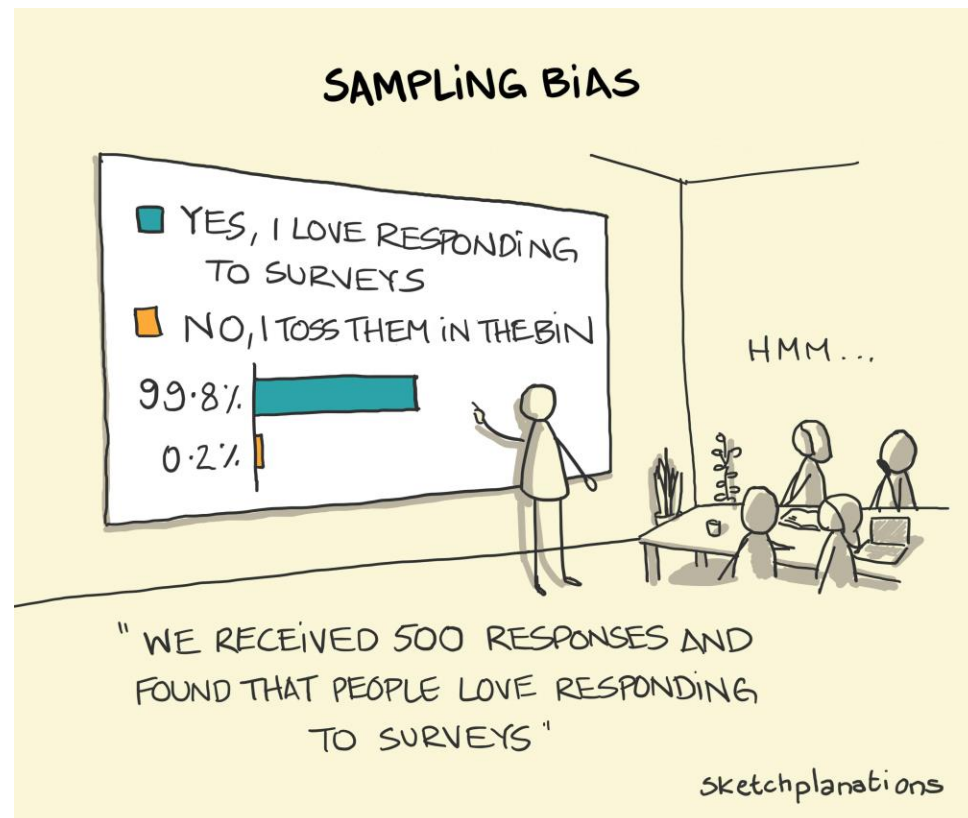
- Exact exposure pathway cannot be modelled
- Evaluation by correlation and/or training
- Limits transferability and could introduce bias
- Sensors have large uncertainties



Opportunity – exposure estimates closer to ‘truth’

Challenge – increased confounding

- Decreased [classical] measurement error with more individual exposures
- But each utilised [unaggregated] dataset adds individual level confounders



ENVIRONMENTAL

Trade-offs of Personal Versus More Proxy Exposure Measures in Environmental Epidemiology

Weisskopf, Marc G.^a; Webster, Thomas F.^b

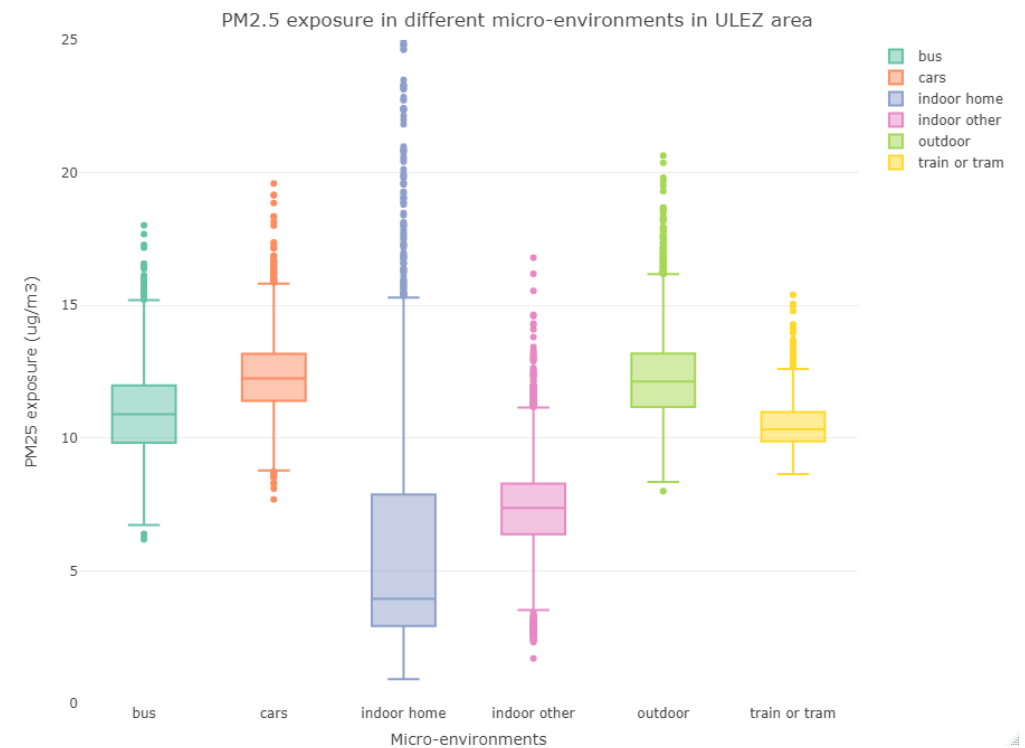
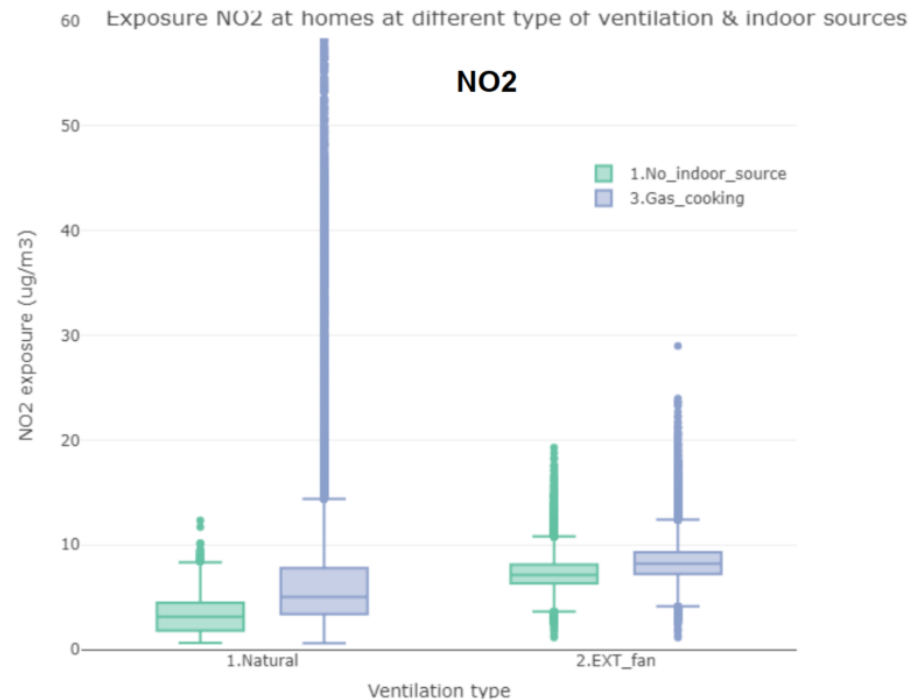
[Author Information](#)

Epidemiology 28(5):p 635-643, September 2017. | DOI: 10.1097/EDE.0000000000000686

Opportunity – more reliable results to explore vulnerabilities

Challenge – ‘what does it mean?’

- Heterogeneity driven by indoor and behaviour, not ambient concentrations
- Toxicity of different source types
- Exposure durations
- Means vs. outliers
- Assumptions



Take home challenges!

- Personal exposure models require diverse datasets not usually used in environmental models, including behavioural data. As these data become more detailed, data sharing, GDPR and ethical issues arise
- The more personal nature of the results makes them more engaging to stakeholders, but can highlight shortcomings of model assumptions.
- Designing policy scenarios is relatively straightforward, but interpreting and presenting outputs to stakeholders is not - differences in mean exposure are small, but can be very large in some population subgroups.
- The entire UK AQ management system is based on ecological models. Our dynamic modelling approaches are now well ahead of the policy agenda. Translation is restricted by questions over health metrics, areas of responsibility, ethical issues etc.
- Results are highlighting that a systems-wide approach is needed when taking this approach to health protection – transport, housing, healthcare, economics, energy use...