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Complex Urban Systems for Sustainability and Health

A new model has been developed to investigate the impacts of environmental policies on health

IN BRIEF

The United Nations Sustainable Development Goals (UNSDGs) recognise the need to improve both population health and environmental sustainability together.
Researchers on the CUSSH project have developed a microsimulation model, **MicroEnv**, which calculates the impact of environmental exposures on health and health inequalities. This can help policy-makers, as It may act as an aid in selecting policies likely to yield greatest health and environmental co-benefits. **MicroEnv** allows the integration of a range of health outcomes and the generation of results at a high spatial resolution.

Methods:

- Data used included population, socio-economic deprivation, air pollution, fertility rates and mortality in London.
- People were placed into one of three health categories: free of ischaemic heart disease (IHD), diagnosed with IHD or dead from any cause and updated yearly to see if and when a disease state developed or progressed.
- It was possible to assess the probability of a healthy state, mortality from non-IHD causes and mortality from disease by different demographics, geography and characteristics.

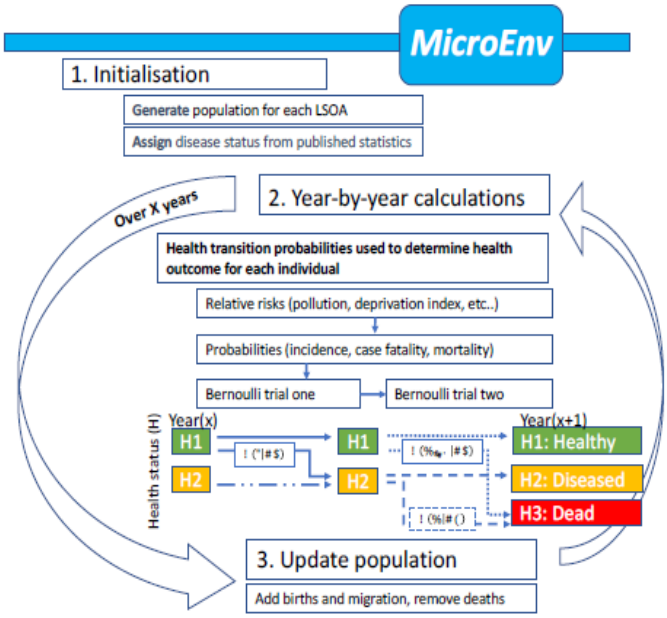

Figure 1. Schema of the microsimulation model.

Test Case: Air Pollution-Particulate Matter (PM2.5)

- The effect of PM2.5 on the overall risk for all cause mortality was then applied.
- Three intervention scenarios were considered: 1) Compliance with WHO guidelines, 2) Reductions in line with EU Directive and 3) Complete removal of PM2.5

Reference: Symonds P. et al. 2019. MicroEnv: A microsimulation model for quantifying the impacts of environmental policies on population health and health inequalities. Science of the Total Environment
https://doi.org/10.1016/j.scitotenv.2019.134105

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Microsimulation can model individual level effects of targeted health policies whilst accounting for a wide range of parameters

IMPLICATIONS

Key Outcomes:

- The model results indicate that the removal of all PM2.5 air pollution has a beneficial impact on disease prevalence for individuals of working age
- Benefits were greater in males than females, due to the fact males have a higher prevalence of underlying disease
- More deprived areas showed improvements earlier due to the earlier onset of disease, helping to address health inequalities
- Reductions in prevalence of IHD appear to be greatest in central (more polluted) and more affluent parts of London

Application:

- This framework can be adapted to both developed and developing cities where the relevant data is available.
- The model can help identify policies with the greatest potential benefits to health and health inequalities
- This learning can be applied to monitoring policy changes in areas such as transport, clean energy, waste management and urban planning.
- As the model considers each individual it can be used to test policies targeted at a particular population groups and simulate the potential effects.

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