Towards a more dynamic health geography.
Tracking and tracing daily movement and exposure

Malcolm Campbell, Lukas Marek, Angela Curl and Simon Kingham
Department of Geography, University of Canterbury

Malcolm.campbell@canterbury.ac.nz
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The story so far... in maps and numbers

- From ‘static’ to ‘dynamic’ exposure – moving beyond the ‘home’
- Linking this for each person/patient in time and space to see if patterns or relationships emerge and the extent of differences
  - By person or for the population
- Collecting location data from two sample groups
  - COPD patients (CRCSI/FPX) [limited-movers?] and with
  - Geography students (UC) to help teaching dynamic / static differences [maximum-movers?]
- Ongoing study in NZ and SWEDEN

My risk ‘profile’ over a year

Dynamic: real-time place + exposures
n=525,600 per year @ 1min intervals

Static: Census [5-yearly] or Survey data [annually], n=1 location

Real time ‘risk’: spatio-temporal dynamics

- Accurately assigning exposure
- How do environmental conditions alter as one moves around the city?
  - ‘Person X’ knows when and where pollution is higher + almost real time

- How interpolation, averaging / method affect the result
- Winter (average), winter (daily), winter (hourly), winter (by minute)

1 = 1 year
1 = 1 day
**Scaling up – student tracks**

- Are there home versus daily exposure differences for individuals and groups? How large might this effect be?
- Results are mixed (and student generated...)
- Some preliminary descriptive results (table)
- Small differences in NO2 exposure (1 home, 1 carried) of 0.7ppb
- Reasonable differences in static or dynamic exposure to greenspace and roads (-11.5%, -7.5%)

<table>
<thead>
<tr>
<th>Exposure variable</th>
<th>NO2 (Static)</th>
<th>NO2 (Dynamic)</th>
<th>Greenspace (Static)</th>
<th>Greenspace (Dynamic)</th>
<th>Roads (Static)</th>
<th>Roads (Dynamic)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.9ppb</td>
<td>10.6ppb</td>
<td>54% E</td>
<td>22.5% E</td>
<td>18% E</td>
<td>10.5% E</td>
</tr>
<tr>
<td></td>
<td>66% NE</td>
<td>77.5% NE</td>
<td>82% NE</td>
<td>89.5% NE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

E = Exposed, NE = Not Exposed

**Conclusions**

- Tricky, high effort, never do this.... (particularly challenging for vulnerable patients who have never using a smartphone / internet)
- Reasonably expensive and resource intensive (but changing over time) – still a significant barrier
- However, early indication is that potentially significant differences in exposures which could impact on individual and population health
- Potential to expand approach to other disease or well-being areas of research? [comments appreciated]

**Next Steps / Future Work**

- On-going data collection in SWE (close to 30 patients)
- Second round of tracking in CHCH, NZ (aim to recruit 30)
  - Both patients (n=30) and Citizens (n=30)
- Personal (real time) air exposure collection (TZOA)

**Questions?**

- We also have post-doctoral / phd / masters opportunities if you (or anyone you know) may be interested in joining us in NZ