



Picture source: <https://static.pexels.com/photos/70088/cigarette-smoke-embers-ash-70088.jpeg>

Modelling policy relevant small area smoking simulations at neighbourhood level to add new insights and information

Team:

Dr Melanie Tomintz, GeoHealth Laboratory, University of Canterbury*

Dr Malcolm Campbell, GeoHealth Laboratory, University of Canterbury

Dr John McCarthy, Ministry of Health

Last update: December 2017

*Main contact: melanie.tomintz@canterbury.ac.nz

Project summary

This project was developed between the Ministry of Health and the GeoHealth Laboratory to provide additional knowledge and data in the area of **tobacco smoking**, by including spatial data analysis.

The **aim** of this project was to use a geospatial simulation methodology to model three different scenarios, i.e.:

- Scenario 1: Number of Māori smokers
- Scenario 2: Smoking behaviour expressed as smoking bands
 - Occasional smoker: less than one cigarette per day
 - Light smoker: smokes between 1 and 5 cigarettes daily
 - Moderate smoker: smokes between six and 15 cigarettes daily
 - Heavy smokers: smokes 16 or more cigarettes daily
- Scenario 3: People who quit smoking for more than a week

Key results

- Scenario 1: Simulated Māori smokers were compared to Maori smokers for 1,620 neighbourhoods (census area units) to see if the model was correct. The model fit was 0.9925 (where 1.0 means a perfect fit).
- Scenario 2 showed that areas outside the main cities have higher percentage of smokers. When comparing with NZ deprivation score, then the trend shows a higher percentage of occasional and heavy smokers for least deprived areas; and a higher percentage of light and moderate smokers for most deprived areas.
- Scenario 3 shows people from main cities had higher quit attempts or actually quit more than people from rural areas.

The project results are visually presented as an **interactive online story map** that guides you through all three scenarios. The story map provides background information and interactive online maps. All can be accessed via this link: <http://arcg.is/1Hmfyj> (internet access required).

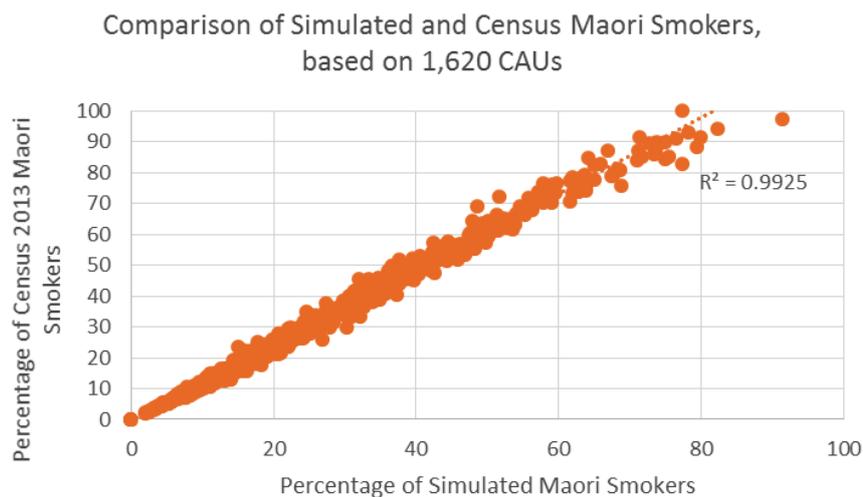
Background

The smoking behaviour (current/ex-smoker, never smoked) is accessible from the census down to small geographical areas. The New Zealand Health Survey (NZHS) collects many smoking related information for larger geographical areas.

This project uses spatial microsimulation modelling, which is an estimation process, to combine these datasets to produce information for neighbourhoods that was unknown. This provides additional related information to support tobacco cessation and prevention policy planning by area.

Results: Scenario 1

Simulated Māori smokers were compared to Census Maori smokers for 1,620 census area units (neighbourhoods) for model validation. The simulation modelled numbers of Māori that were expressed in percentage for each area. The model fit was 0.9925 (where 1 means a perfect fit) and the graph is shown below.



Results: Scenario 2

Smoking bands were modelled for census area units (neighbourhoods) to provide additional smoking related information about the smoking habits of people. This type of data is not collected and available for neighbourhoods at national level.

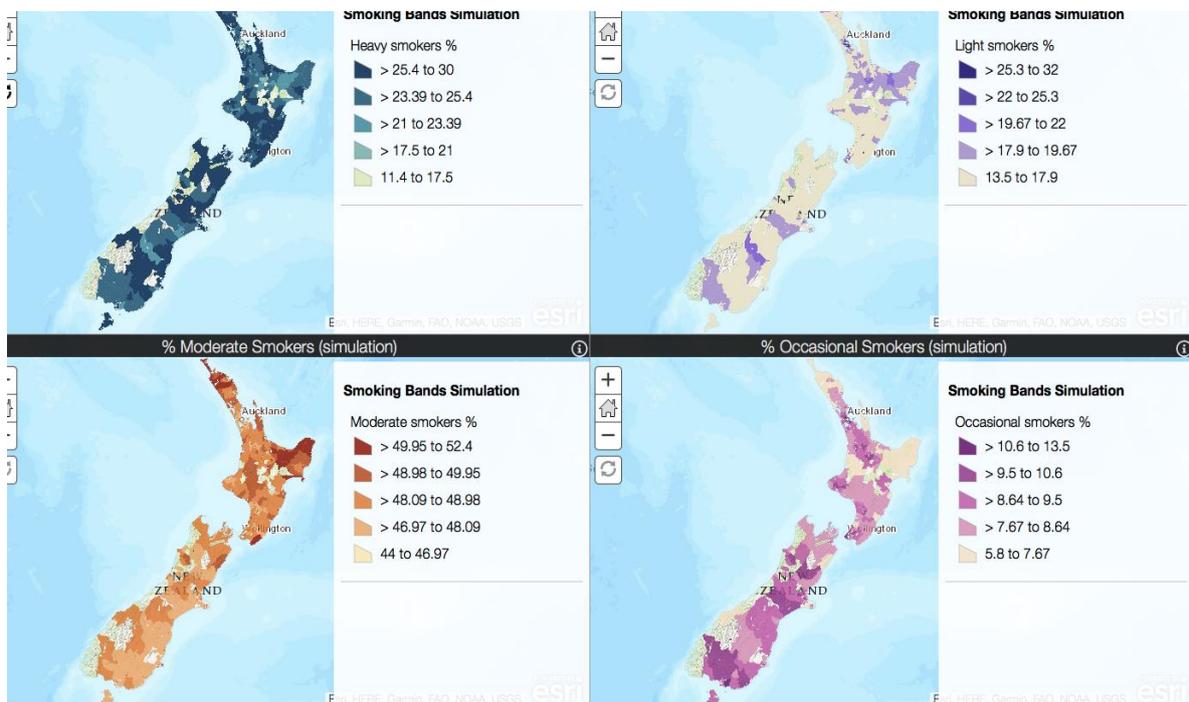
Smoking bands are classified in four categories:

- Occasional smoker: Smokes cigarettes, but not daily
- Light smoker: Smokes one to five cigarettes a day
- Moderate smoker: Smokes 6 to 15 cigarettes a day
- Heavy smoker: Smokes 16 or more cigarettes a day

Results for 1,620 neighbourhood areas show the variation between areas:

Smoking band	Numbers Mean (Min – Max)	Percentage Mean (Min – Max)
Occasional	25 (3-156)	8.9 (5.8-13.6)
Light	57 (8-419)	19.5 (13.6-32.2)
Medium	138 (23-617)	48.6 (44.1-53.4)
Heavy	63 (8-282)	23.2 (11.5-30.0)

Below, these results are mapped. Lighter colours represent lower percentages of each; darker colours present higher percentages of each.



Note: For interactive online visualisation click on the link below

<https://ucnz.maps.arcgis.com/apps/CompareAnalysis/index.html?appid=f839fa58f5fd4c0d85151720a4bd7908>

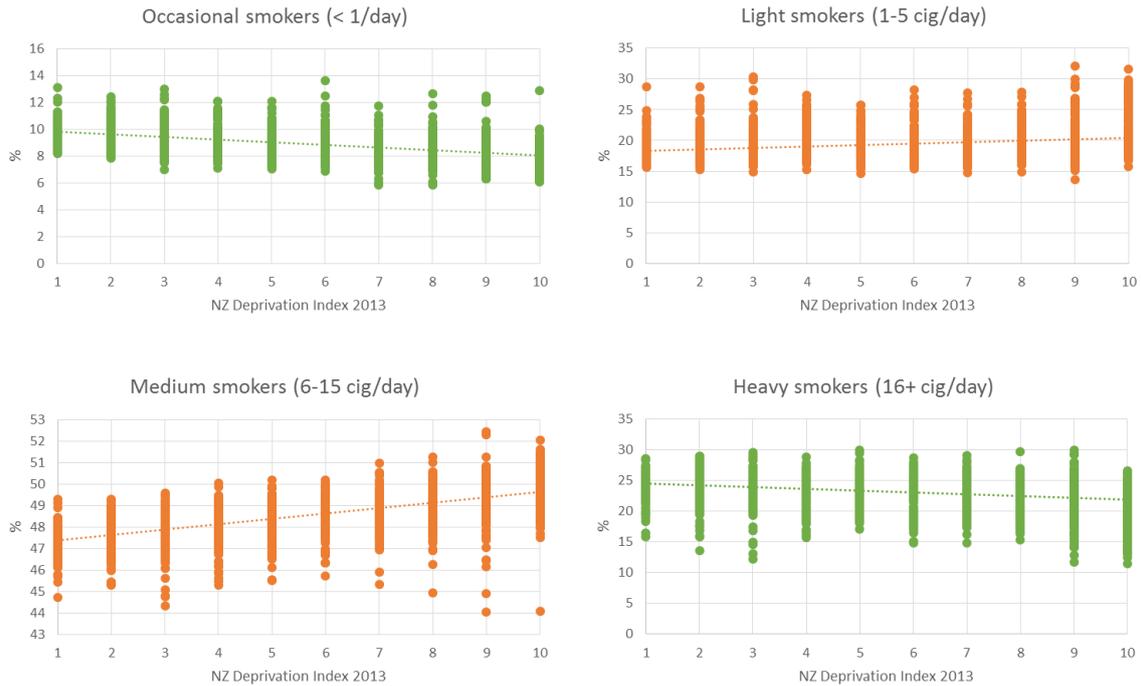
Results were compared with the NZ deprivation index, reported on a scale from 1 to 10; 1 are areas with lowest deprivation and 10 are areas with highest deprivation.

Relationship between smoking bands and deprivation (reported for percentages):

Areas classified as least deprived have

- higher rates of occasional and heavy smokers;
- lower rates of light and moderate smokers

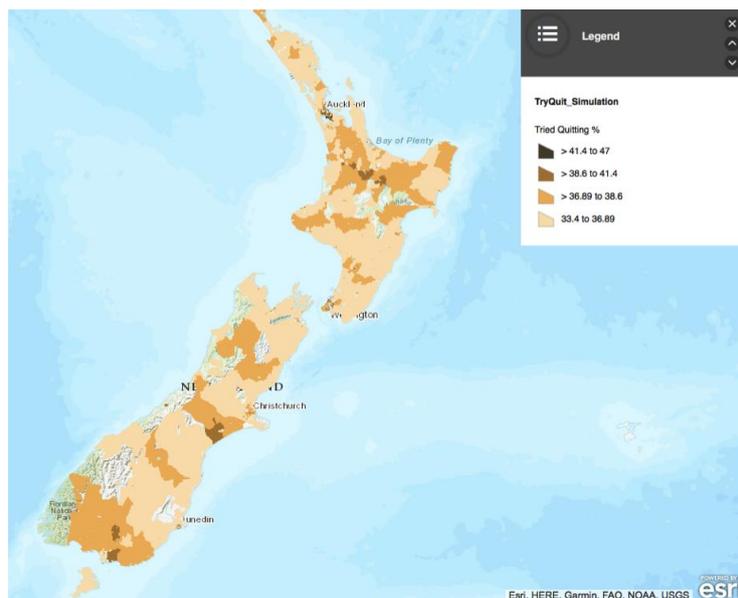
in comparison to most deprived areas. For light and heavy smokers it is a weak relationship.



Results: Scenario 3

This scenario shows the modelled areas for neighbourhoods where smokers tried to quit smoking for a week or eventually quit. Those areas with higher rates are found mostly in cities. This indicates a urban rural divide.

More areas with lower quit attempts and higher rates of heavy smokers were found in more rural areas (outside the main cities in New Zealand).



Note: For interactive online visualisation click on the link below

<https://ucnz.maps.arcgis.com/apps/View/index.html?appid=dcaa1c78cc1b496eabe64aed274b781d>

Conclusion

There are neighbourhood variations for different types (occasional, light, moderate, heavy) of smokers. Highest variations are found for light (13.6% - 32.2%) and heavy (12.5% – 30.0%) smokers, i.e. in some neighbourhoods there are only around 13 percent of heavy smokers and in some it increases to almost a third, of all smokers in each area.

Stronger relationships between deprivation and smoking bands at neighbourhood level are found for occasional and moderate smokers. Areas with higher rates of occasional and heavy smokers are found more often for less deprived areas compared to the most deprived areas. The opposite is true for light and moderate smokers.

Neighbourhoods with higher rates of smokers, who deliberately tried to quit for at least a week or successfully quit after that, varied between 30 and 47 percent in each area. A urban rural divide was noticed, with lower rates in more rural areas, meaning that people from rural areas were less likely to try to quit smoking for at least a week.

Future outlook / next steps

Exploring information about taxation levels to investigate if taxation has an influence on reducing heavy smokers from deprived neighbourhoods. This could show that people from more deprived areas do not necessarily quit, but reduce the amount they smoke. Identifying this for Māori smokers in particular will be of interest.

Also combining this estimated smoking data with other sources, such as smoking cessation figures, tobacco outlets, and so on, can provide value information for future smoking reduction as well as prevention.

Limitations

The results reported here are based on secondary datasets and simulations, which come with some bias (as with all statistics). Scenario 1 showed that this error is marginal. Scenario 2 uses deprivation scores for census areas, which are accessible in aggregated form from Meshblocks (smallest geographical areas in New Zealand) and therefore an average. This means one neighbourhood can include a mix of low and high deprived areas.

Supplement: Maps and Methodology

The project results are visually presented as an **interactive online story map** to provide background information and interactive online maps. All can be accessed via this link: <http://arcg.is/1Hmfyj> (internet access required).