Using routinely collected cancer data to infer risk factor patterns

Susanna Cramb1,2, Peter Baade3,4, Karlie Mengersen5
1 Viertel Centre for Research in Cancer Control, Cancer Council Queensland, Australia
2 School of Mathematical Sciences, Queensland University of Technology, Australia
3 Griffith Health Institute, Griffith University, Australia
4 School of Public Health and Social Work, Queensland University of Technology, Australia

1. Cancer risk factors
Key preventable risk factors for developing cancer include:
- Tobacco smoking
- Radiation exposure (including ultraviolet)
- Overweight and obesity
- Lack of physical activity
- Excessive alcohol consumption
- Unhealthy diet

Of these, tobacco smoking was the leading cause of mortality and morbidity in Australia, with an estimated 8% of Australia’s total burden of disease, and 20% of the cancer burden of disease, attributable to tobacco smoking.1

However, only limited data on risk factors are available. Generally these are collected through self-reported surveys. Spatial-temporal patterns of risk factors are poorly understood. In this study we focused on those patterns for lung cancer.

2. Aim
To use routinely collected, population-based lung cancer incidence data to estimate the spatio-temporal patterns in the underlying risk, of which tobacco smoking is a major component.

3. Statistical model
Data proceeded to the statistical local area (SLA) of residence for all lung cancers diagnosed among Queensland residents during 1997-2000 were obtained from the Queensland Cancer Registry.

Applied a Bayesian hierarchical spatio-temporal shared component model2 with a zero-inflated Poisson (ZIP) distribution. The model was run using Matlab interfaced with WinBUGS with 500,000 iterations discarded and 50,000 iterations monitored (kept every 10th).

3.1. Relative Risk

Relative Risk (RR) = \frac{\text{Observed rate}}{\text{Expected rate}}

3.2. Level of uncertainty

Level of uncertainty (80% CIs)

4. Results
Spatial pattern of the underlying risk

Males

Females

Level of uncertainty (80% CIs)

Level of uncertainty (80% CIs)

Relative Risk (RR)

Relative Risk (RR)

Ranked SLA

Ranked SLA

Spatial pattern of the underlying risk by category

Males

Females

No adjustment

Adjusted for remoteness

No adjustment

Adjusted for remoteness

No adjustment

Adjusted for disadvantage

No adjustment

Adjusted for disadvantage

No adjustment

Adjusted for Indigenous

No adjustment

Adjusted for Indigenous

5. Does this underlying risk reflect smoking prevalence?
Tobacco smoking is the leading risk factor for developing lung cancer in Australia,2 and the detected underlying risk component is likely to strongly reflect smoking patterns. However some caution is required since 15-15% of lung cancers are diagnosed among non-smokers.3 In addition, the smoking component of the underlying risk is likely to reflect smoking prevalence up to 30 years previously.4

Patterns in the underlying risk are consistent with that reported for tobacco smoking based on survey data – higher in remote, socioeconomically disadvantaged or high Indigenous population areas.5

Temporal trends in the underlying risk are also consistent with known trends in smoking.6

6. Conclusions
- The large amount of spatial variation in the underlying risk highlights the potential for interventions.
- Similar methodology could be used to explore spatio-temporal variation in other cancer risk factors.
- Further work is planned to investigate the smoking specific component of the underlying risk.

References