ZOONOTIC DISEASES, LIVESTOCK DENSITIES, ENVIRONMENTAL & SOCIAL FACTORS IN NEW ZEALAND

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Enteric Zoonoses

- Enteric diseases pose a substantial public health and economic problem in NZ
- Annual incidence rates in NZ are high by comparison to other industrialized nations
- Dairy cattle are a known reservoir for a number of pathogens that can cause human illness, including:
  - Campylobacter
  - Cryptosporidium
  - Giardia
  - Salmonella
  - Shiga toxin-producing E. coli (STEC)
Potential Transmission Pathways
Change in Dairy Cattle Density 2000-2014
Methods

- Notified cases of campylobacteriosis and cryptosporidiosis from 1997-2015 obtained from national surveillance system
- SaTScan retrospective space-time permutation used to identify clusters
- Cluster data spatially linked to census, livestock density, and environmental variables at the river segment level
- Classification and Regression Tree analysis used to analyze potential risk factors
Cluster Detection Results

Space-time clusters (p<0.05) for campylobacteriosis in New Zealand (2011-2015) at the census area unit level as identified by spatial scan statistic in SaTScan v9.6.

Space-time clusters (p<0.05) for cryptosporidiosis in New Zealand (1997-2015) at the census area unit level as identified by spatial scan statistic in SaTScan v9.6.
CRT Analysis for Disease Clusters

Campylobacteriosis
- Most important predictors
  - Age
  - Population
  - Median river E. coli concentration
  - Drinking water quality
  - Catchment geology
  - Sheep density
  - Dairy cattle density

Cryptosporidiosis
- Most important predictors
  - Catchment source of flow
  - Median river E. coli concentration
  - Dairy cattle density
  - Age
  - Socioeconomic deprivation
  - Population
  - Catchment climate
Campylobacteriosis Clusters
Cryptosporidiosis Clusters
Modelled River Water Quality
Analysis of Average Seasonal Notification Rates

- Livestock densities were more important for seasonal notifications than for clusters
- CRT analysis doesn’t easily allow for estimation of net effects of independent variables
- Attempted to use CRT results to guide regression with interaction terms
  - Multicollinearity issue
Conclusions

- Results suggest distinct dominant pathogen sources and varied transmission routes for campylobacteriosis and cryptosporidiosis cases in New Zealand
- Waterborne transmission may play an important role in outbreaks in New Zealand
- Environmental characteristics may influence the fate and transport of pathogens
- Future research should explore interactions between risk factors
Questions or comments?

Thanks to Simon Hales, Michael Baker, Nigel French, and Jonathan Marshall

Research funded through University of Otago Doctoral Scholarship