Climate Change Health Impact Assessments: Farmer Suicide and Drought Case Study.

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Aim

- General tools for Climate Change Health Impact Assessments (CCHIA)
- Enhanced capacity for experimentation, reviews, revisions and re-iterations

Current approach:

- historical baseline exposure-response functions, control for some covariates
- use response function with changed exposures and population at risk

Historical (Hanigan et al, 2012, *PNAS*, 109)

- Restricted Health and Drought data and
- Less Restricted Population data

(Colours refer to data storage and access rules shown in Figure 1).

$$
\begin{aligned}
log(O_{ijk}) \quad = \quad & s(ExposureVariable) + OtherExplanators \\
& + AgeGroup_i + Sex_j \\
& + SpatialZone_k \\
& + sin(Time \times 2 \times \pi) + cos(Time \times 2 \times \pi) \\
& + Trend \\
& + offset(log(Pop_{ijk}))
\end{aligned}
$$

Where:
O_{ijk} = Outcome (counts) by Age_i, Sex_j and $SpatialZone_k$
ExposureVariable = Data with Restrictive Intellectual Property (IP)
OtherExplanators = Other Less Restricted Explanatory variables
s( ) = penalized regression splines
$SpatialZone_k$ = Less Restricted data representing the $SpatialZone_k$
Trend = Longterm smooth trend(s)
Pop_{ijk} = interpolated Census populations, by time in each group

Historical (Hanigan et al, 2012, *PNAS*, 109)

- 38 years suicide rates with drought by 11 regions, age and sex
- Estimated 9% in rural males aged 30-49 due to drought over the period
- Increased for rural males 10-29 y
- Association with hot temp + spring

Future (Bambrick et al, 2008, Garnaut Review)

$$Y_{ijk} = \sum_{lm} (e^{(\beta_{ijk} \times X_{lm})} - 1) \times BaselineRate_{jkl} \times Population_{jklm}$$

Where:

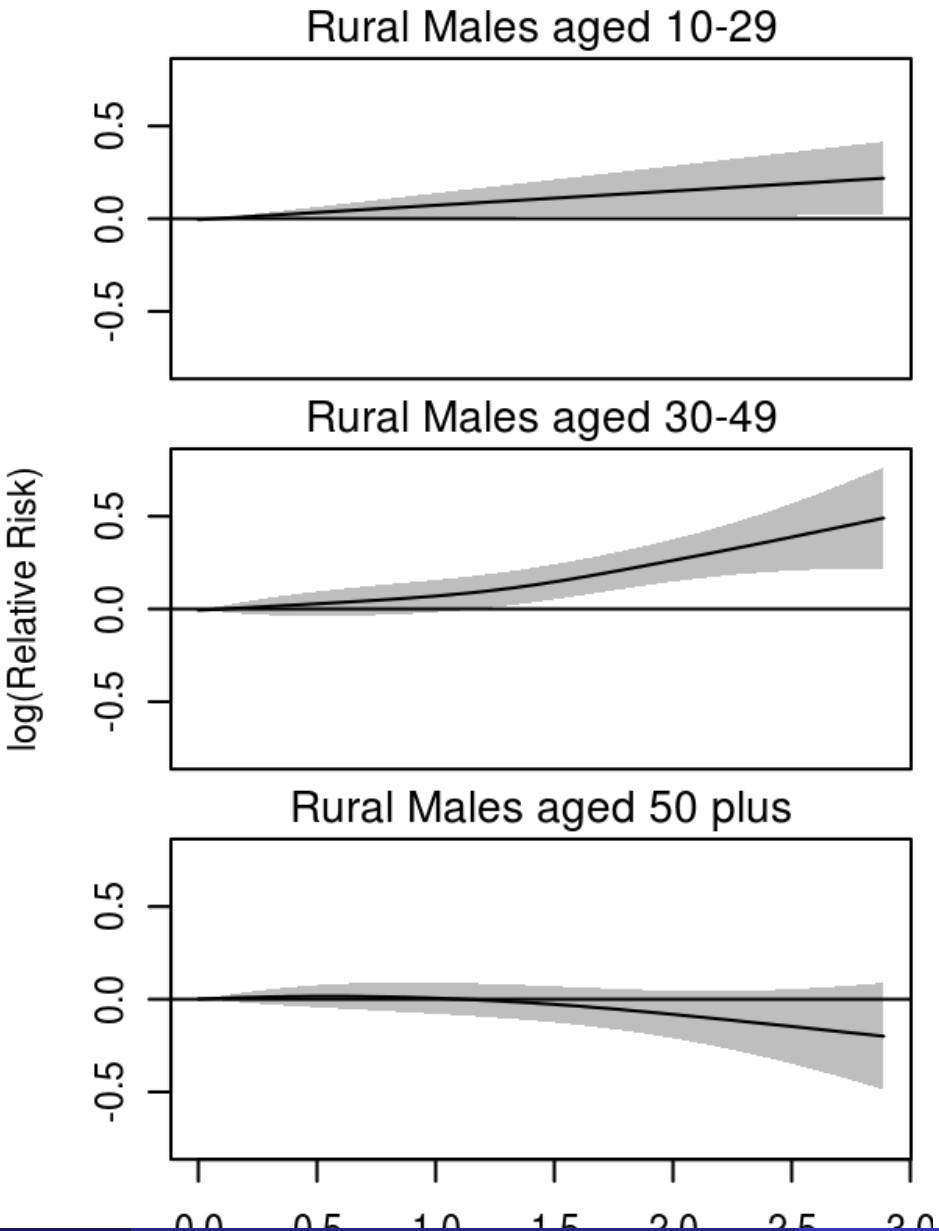
β_{ijk} = the ExposureVariable coefficient for $zone_i$, age_j and sex_k

X_{lm} = Projected Future ExposureVariables with Restrictive IP

$BaselineRate_{jkl}$ = avgDeathsPerTime/avgPopPerTime in age_j, sex_k and $zone_l$

$Population_{jklm}$ = projected populations by age_j, sex_k, $zone_l$ and $time_m$ (With Less Restrictions)

Drought-suicide response function



Criticism

This model is too static, reductionist, reality is more complex. Need to work more on interactions with non-climate factors especially:

- Natural capital
- Financial capital
- Social capital
- Physical capital and
- Human capital

Conclusion

- Drought is related to increased suicide risk in Australia
- Future Drought associated deaths can be calculated
- These estimates will be very uncertain, contentious and difficult to justify
- New technology is needed to enable rigorous and transparent exploration

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