

RAPID RESEARCH IN COVID-19 PROGRAMME

Quantitative Epidemiology of COVID-19 in Rural Scotland

AIMS

The overall aim of this project was to characterise the spread of COVID-19 and to examine the factors that contributed to such spread in rural Scotland, ultimately to develop and inform optimal approaches for disease surveillance and utilisation of resources to best inform eventual relaxation of lockdown rules for rural communities.

KEY FINDINGS

- By mid-May (week 20) of 2020, 105 people had died of COVID-19 in the NHS Highland, NHS Orkney and NHS Western Isles areas. Despite this, the North of Scotland has had considerably lower rates of recorded cases and deaths than Scotland as a whole.
- Rural areas were subject to the same nationwide restrictions related to COVID-19 as the rest of the country, including closure of schools, pubs, restaurants, gyms, and other social venues, and stay-at-home orders. The necessity of this response in rural Scotland could be questioned, on the assumption that rural areas could have experienced less cases and deaths than more populous areas.
- We have developed a computational simulation model for the spread and control of COVID-19 suitable for application in small populations and communities, like those which typify rural areas.
- Based on our research, we estimated that potentially thousands of deaths were averted in rural areas of Scotland by the implementation of national disease control measures.

WHAT DID THE STUDY INVOLVE?

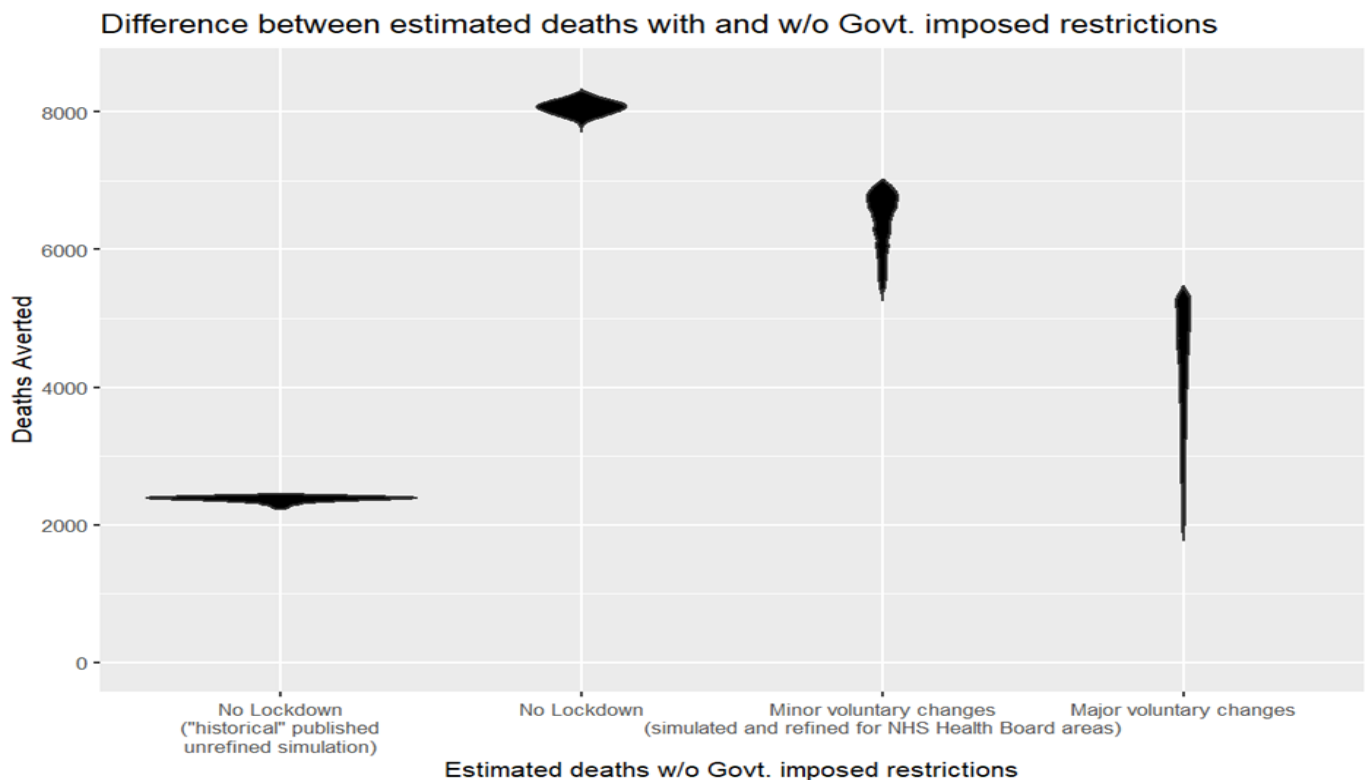
In order to provide an evidence base for the application of these policies in rural Scotland, we explored what deaths would have been likely to occur in Argyll and Bute, Highland, Orkney and Western Isles in this first wave of COVID infection without active intervention.

We used two methods to estimate the deaths that would have likely occurred under less restrictive conditions by June 5th, 2020:

- We extrapolated a curve fitted to reported hospital cases in the NHS Highland, NHS Orkney, and NHS Western Isles Health Board areas and applied a ratio of COVID-19 attributable deaths to number of predicted COVID-19 cases. This ratio was based on UK and Scottish COVID-19 death and case data. We varied this extrapolation to assume that a) no infection was introduced from higher prevalence areas, and b) that there is continuing introduction of new cases into the area.
- Simulation of deaths with current restrictions based on fitting an adapted Imperial College London (ICL) model to reported positive cases in the NHS Highland, NHS Orkney, and NHS Western Isles Health Board areas.

WHAT WERE THE RESULTS AND WHAT DO THEY MEAN?

The figure below illustrates the number of estimated COVID-19-associated deaths that might have occurred under different scenarios, based on the modelling work described above. In plausible scenarios that represent changes in behaviour among the public, we estimated that between 5,300 and 6,800 deaths would have occurred. In scenarios that simulate government-imposed restrictions, the number of estimated deaths ranges between 1,800 and 5,500.



The results of these analyses, which accounted for a variety of initial conditions and circumstances, estimate that potentially thousands of deaths were averted in rural areas of Scotland by the implementation of national disease control measures. The work suggests that the impact of COVID-19 in the North of Scotland would have been far worse without Government action, and widespread population engagement in preventive actions.

WHAT IMPACT COULD THE FINDINGS HAVE?

This section should cover the implications for

Rural areas could be expected to be protected from spread of viral respiratory disease compared to urban areas because of population sparsity. Acting against this, most people live in, or use, community hubs – shops, community centres, cafes - that are also frequented by their neighbours. Rural populations in Scotland also tend to be older, and this has increased demand on limited Intensive Care provision in recent years.

The response to COVID-19 has varied widely between countries, and there has been considerable controversy about variations in government actions. This report seeks to provide estimates of simulated deaths in the NHS Board areas of Highland, Orkney and Western Isles with different levels of intervention.

The work suggests that the impact of COVID-19 in the North of Scotland would have been far worse without Government action, and widespread population engagement in preventative actions. Actions to control spread will be essential as restrictions ease.

HOW WILL THE OUTCOMES BE DISSEMINATED?

This work was published in a joint report issued by SRUC and the NHS Highland Public Health Intelligence Team (Humphry, R.W., Duncan, A., Stark, C., Hunter-Rowe, C., Reeves, A., and Gunn, G.J. 2020. COVID-19: Deaths Averted in the North of Scotland) and was distributed to NHS Highland, NHS Orkney, and NHS Western Isles. In addition, it was presented to a group of at least 130 professional staff in NHS Highland; to an additional 40 Public Health Scotland staff on line. A manuscript intended for publication in the scientific literature will be submitted for publication, pending final approval by NHS Highland staff (Humphry, R.W., Duncan, A., Stark, C., Hunter-Rowe, C., Reeves, A., and Gunn, G.J., in preparation. Estimating COVID-19 attributed deaths averted within rural communities due to Government lockdown: Highlands & Islands of Scotland as an example).

In conjunction with NHS Highland, we developed plans for several other activities to address time-sensitive questions regarding disease control policy and resource deployment. Knowledge of spatial clustering of Covid-19 cases in rural Scotland, and determine a statistically appropriate estimation of the size of areas to be considered for characterising disease risk, for example, would have been useful in early stages of the outbreak, to help inform decisions regarding deployment of limited health care resources.

CONCLUSION

The results of these analyses, which accounted for a variety of initial conditions and circumstances, estimate that potentially thousands of deaths were averted in rural areas of Scotland by the implementation of national disease control measures. The work suggests that the impact of COVID-19 in the North of Scotland would have been far worse without Government action, and widespread population engagement in preventive actions.

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ADDITIONAL INFORMATION

This project, which received £36,118 in funding, was completed in January 2021.