# Supplementary appendix

## Supplement to: "Unnatural deaths, alcohol bans and curfews: Evidence from a quasi-natural experiment during COVID-19"

*S Afr Med J 2021;111(9):xx-xx.*

Link to original article:

*https://doi.org/10.7196/SAMJ.2021.v111i9.15813*

Link to supplementary appendix:
*https://www.samrc.ac.za/bod/UnnaturalDeathsSupplementaryMaterial.pdf*

This appendix provides additional details on sensitivity testing reported in the article and formed part of the original submission peer reviewed by the *South African Medical Journal*.

## Further details on sensitivity testing

Given the potential for the model presented in the main text to be criticised as somehow having been selected to offer a particular, partial, interpretation of the data, we present in this Appendix details and outputs of other models that might have been fitted.

There is little to be gained in terms of reconsidering the classification of alcohol restrictions as they do not readily lend themselves to such without excessive fragmentation of the data (e.g. splitting out periods where alcohol was restricted to either on-site, or off-site consumption; and by hours of sale allowed. In the case of the former, both are categorised as 'partial restrictions' and each can be identified in the results presented in the main text), so the focus here is on alternative approaches to considering the effects of curfew.

In this regard, a number of options present themselves:

1. To include duration of curfew as a continuous effect;
2. To include duration of curfew as discrete (rather than grouped) categorical effects;
3. To include the effect of lockdown using the change in Google Mobility residential data ('GMR', relative to their pre- COVID-19 baseline) instead of curfew duration;
4. To repeat the previous, using the GMR data partitioned into 4 categories, corresponding to changes in residential 'mobility' of less than 10 percent relative to the baseline; of 10-20 per cent; of 20-30 percent; and 30 per cent or more. The latter category coincides with the period of hard lockdown.

The GMR data, are, unsurprisingly, inversely correlated with mobility for work. Other measures of mobility captured by Google are likewise correlated – retail and recreation; parks; groceries and pharmacies. Rather than use an arbitrarily-constructed composite index, and since curfew is – in effect – a stay-at-home order, we elected to use the daily GMR data, averaged for each week.

At the outset, the correlation between duration of curfew (in hours) and the GMR data is high – around 67%. Including both duration of curfew and the GMR in a single model is contra-indicted due to collinearity between the two variables. We assess the relative quality of the models by comparing, first, the adjusted $R^2$ arising from these models relative to that presented in the main text. This offers a measure of the proportion of variation in the dependent variable explained, allowing for the effects of differential degrees of freedom in the various models.

As can be seen from Table A1, only the model treating each curfew duration as a distinct categorical variable fits the data better than that selected, and then only very slightly so. Models with categorical curfew or mobility data fit better than those that treat the curfew or mobility data as continuous.

| *Table A1: Description of alternative models* | | |
|---|---|---|
| **Model** | **Description** | **Adjusted $R^2$ (df)** |
| 0 | As described in the main text (grouped curfew) | 0.7308 (6) |
| 1 | Curfew duration as continuous effect | 0.6521 (3) |
| 2 | Each curfew duration modelled separately | 0.7389 (9) |
| 3 | GMR data as continuous effect | 0.6540 (3) |
| 4 | (Grouped) GMR data as categorical effect | 0.6930 (8) |

The figures below present analogues of Figure 3 in the main text for models 2 and 4 in the table above. The conclusion drawn is that a different index of mobility or curfews does not result in materially different conclusions.

## Model 2

The data with each duration of curfew treated distinctly results in fragmented data, although the results are congruent with that presented in the main text. Full restrictions on alcohol are protective for unnatural deaths, regardless of duration of curfew. The estimate for partial restriction with zero curfew was discussed in the main text. All other estimates (Figure A1) are not statistically significant in protecting against unnatural deaths, while (unlike before, when the effect was in the same direction but not significant) the absence of restrictions, combined with a short curfew was significant ($p$=0.049) in increasing unnatural excess deaths.

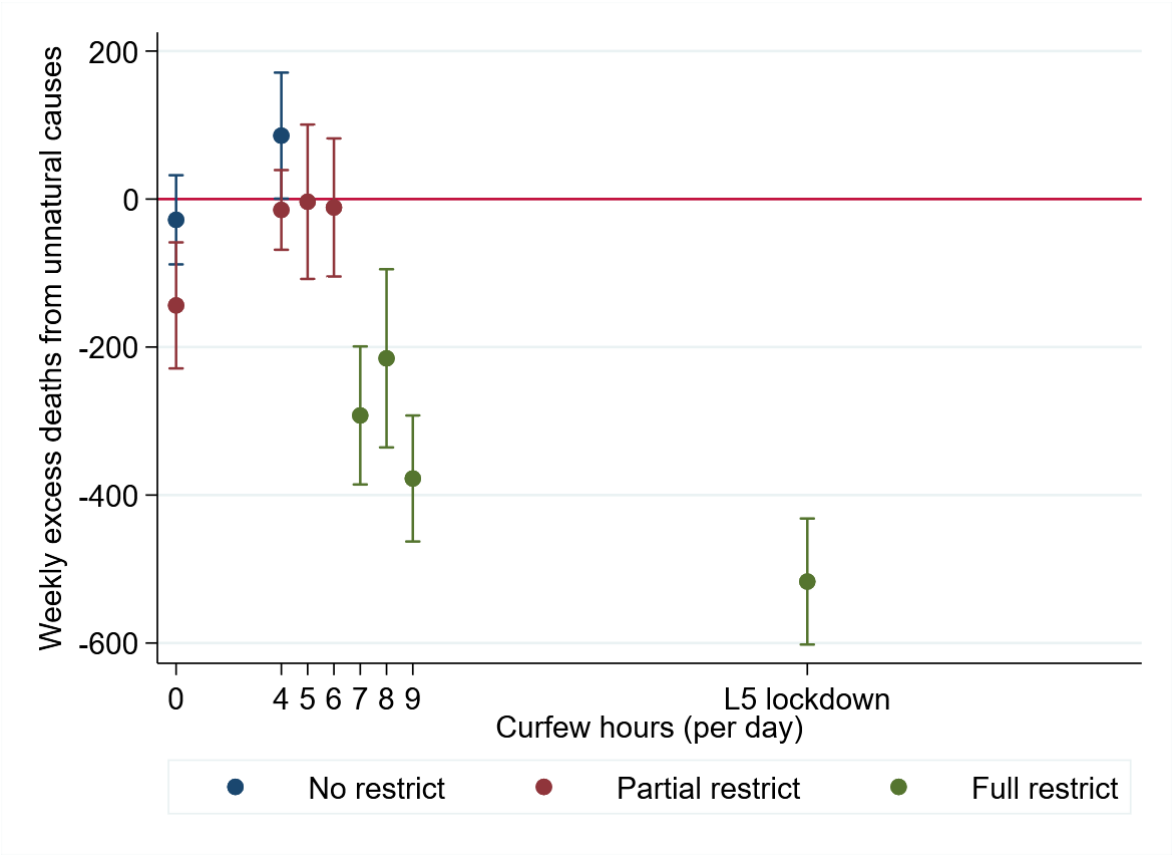


***Figure A1: Modelled excess unnatural deaths, by extent of alcohol restriction and treating curfew durations as distinct categories***

## Model 4

Again, the results from this model are essentially identical, although it is possible to fit two additional points to the GMR data (Figure A2). Even with limited change in mobility, the effect of a full restriction on alcohol sales is significant in depressing excess unnatural deaths. The previously observed significant protective effect against unnatural deaths associated with no curfew and a partial restriction on alcohol sales falls away. All other effects are of a similar order of magnitude and direction.

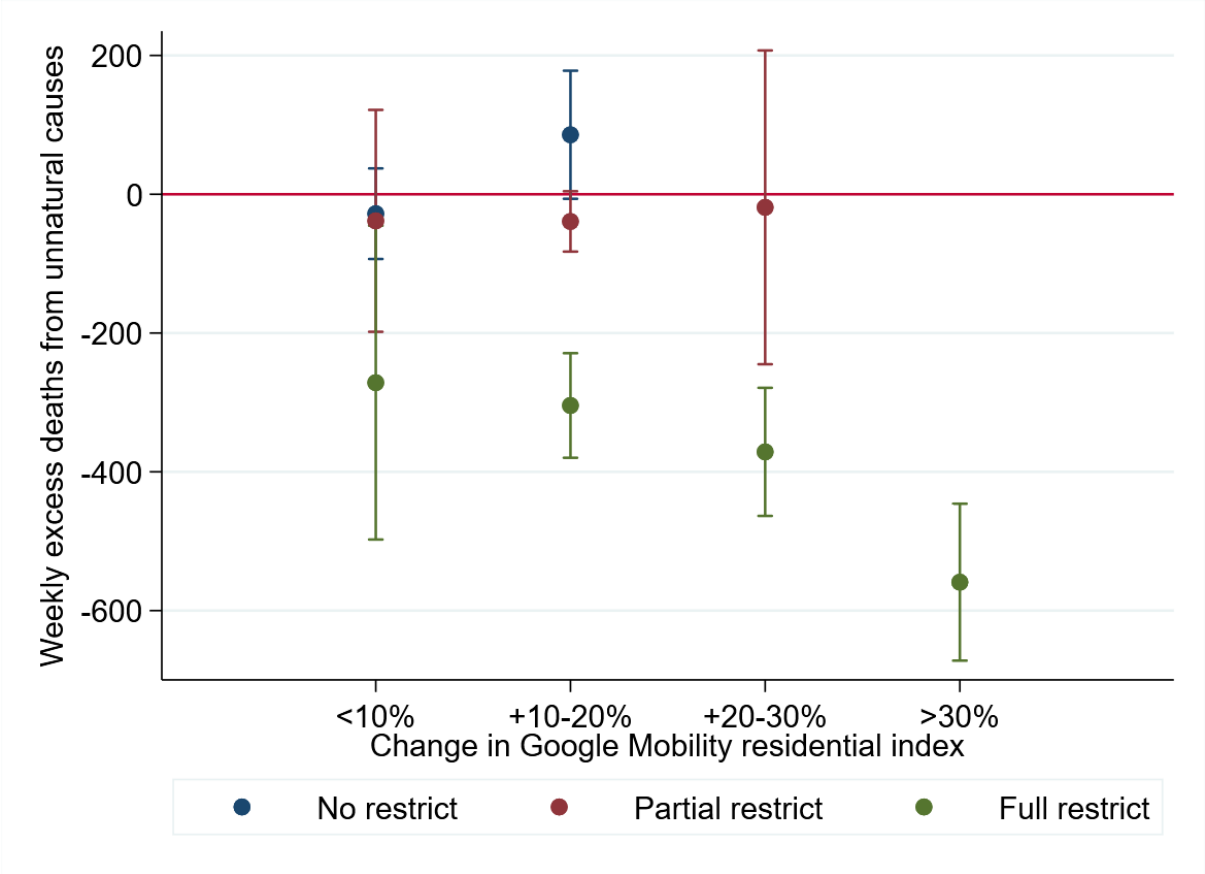


***Figure A2: Modelled excess unnatural deaths, by extent of alcohol restriction using Google Mobility data***