From: 1. Professor Ian Young, Chief Scientific Advisor
2. Dr Michael McBride, CMO

Date: 3rd November 2020

To: Robin Swann, MLA

SUB/xxxx/2020 – Modelling the course of the COVID epidemic and the impact of different interventions and recommendations.

SUMMARY

ISSUE:	Current COVID restrictions have been in place since 16th October. Immediate consideration and decisions are required by the Executive in relation to whether restrictions should be extended with a view to avoiding the need for further intervention in the run up to Christmas.
TIMING:	Urgent, desk immediate
PRESENTATIONAL ISSUES	Significant implications subject to decisions by the Executive.
FOI IMPLICATIONS	Policy in development exclusions may apply
EXECUTIVE REFERRAL:	Urgent consideration and decision by the Executive required. Modelling has been updated to reflect the current position.
FINANCIAL IMPLICATIONS:	Significant wider economic implications at the Northern Ireland level for the Executive.
LEGISLATION IMPLICATIONS:	Any decisions by the Executive under the Coronavirus Act may be subject to challenge.
EQUALITY AND HUMAN RIGHTS IMPLICATIONS:	

RURAL NEEDS:	As above.
SPECIAL ADVISOR COMMENTS:	
RECOMMENDATION:	Having considered the status of the epidemic, the response to current restrictions and the modelling of the various interventions, as CMO and CSA we recommend that the current restrictions should be extended for a period of a further two weeks. With this extension, it may be possible to avoid further intervention before Christmas, though this cannot be guaranteed.

Introduction

1. On the 16th October the Executive introduced a range of restrictions to limit the transmission of COVID and to avoid the risk that the Health and Social Care system would be overwhelmed. The restrictions are due to expire on 13th November, and the Executive will need to consider what measures should be put in place following this period. The response to restrictions to date is summarised in the separate "R" paper. However, in the initial 2 weeks of restrictions R for cases has been reduced to a little above 0.7 in NI as a whole, in line with previous modelling assumptions.

Background

2. Modelling the course of the COVID epidemic and the impact of different interventions depends on assumptions about the value of Rt (the reproductive number) at different time points in the future. The Executive has previously indicated that maintenance of Rt at less than 1 should be viewed as a key policy objective. During the current period of restrictions it was estimated that Rt could be reduced to 0.7 for two weeks, followed by 0.9 for two weeks following the opening of schools. Prior to the introduction of these restrictions, the value of Rt was 1.4 – 1.5.

3. The value of Rt is determined by the extent of contacts between individuals (number, proximity and duration) and the impact of any mitigations which are in place (hand hygiene, face coverings, ventilation and effectiveness of the TTP system). It is also likely to be influenced by seasonal factors. In the case of the TTP system, this includes the rapidity with which close contacts are advised to self-isolate and the degree of compliance with that advice.

4. Rt at the outset of the epidemic was approximately 2.8, and the impact of full lockdown with the degree of compliance seen at that time was to reduce Rt to approximately 0.7. There will only be a reduction in the number of cases and other aspects of the epidemic if Rt is reduced to less than 1, and the decrease in the epidemic will be greater the further Rt is below one and the longer that is maintained.

5. Modelling from a range of UK groups suggests that full lockdown as before with schools open would result in Rt a little less than 1. Full lockdown with schools closed and the hospitality sector open (and current mitigations) would also result in a value of Rt a little less than 1 or possibly greater than 1. It is not considered likely that Rt can be less than 1 with both schools and hospitality open.

6. Any relaxations compared with full lockdown will raise Rt a little, with society working fully as normal equating to an R0 value of 2.8.

Modelling:

7. It is necessary to define the key objective for the health care system in relation to epidemic control as this will define the context for modelling. The Executive has previously confirmed that controlling transmission and protecting healthcare capacity as guiding principles when considering specific restrictions as outlined in Northern Ireland Executive: *"Coronavirus Executive Approach to Decision-Making"*, 12th May 2020. For the purpose of this paper, the key objective identified is to maintain the number of COVID patients in general acute medical beds as less than 20% of capacity (320 hospital inpatients).

8. The impact of non-pharmaceutical interventions (NPIs) is not expected to be fully apparent for between 2-3 weeks after implementation, subject to adherence by the population. With a sustained increase in the number of confirmed infections and hospitalisations, to avoid the health service being overwhelmed actions in the form of additional NPIs are therefore required a minimum of 21 days before the HSC would otherwise reach that point. For the purposes of this paper, our definition of overwhelmed describes "a situation in which the rate of COVID-19 hospitalisations results in multiple Trusts having to operate beyond their contingency capacity for COVID, placing a significant burden on the well-being of staff, and affecting the treatment of other acute, non-COVID patients with the associated indirect health consequences in terms of delays in planned treatment as in the first wave.

9. Updated modelling has been conducted for a range of scenarios which are described below. In each case it is assumed that Rt is reduced to to 0.7 for 2 weeks and 0.9 for 2 weeks during the current 4 week period of restriction. After this period the following scenarios are considered:

    a) Rt 1.4 Nov, 1.6 Dec, 1.4 Jan – similar to the period before current restrictions (High)

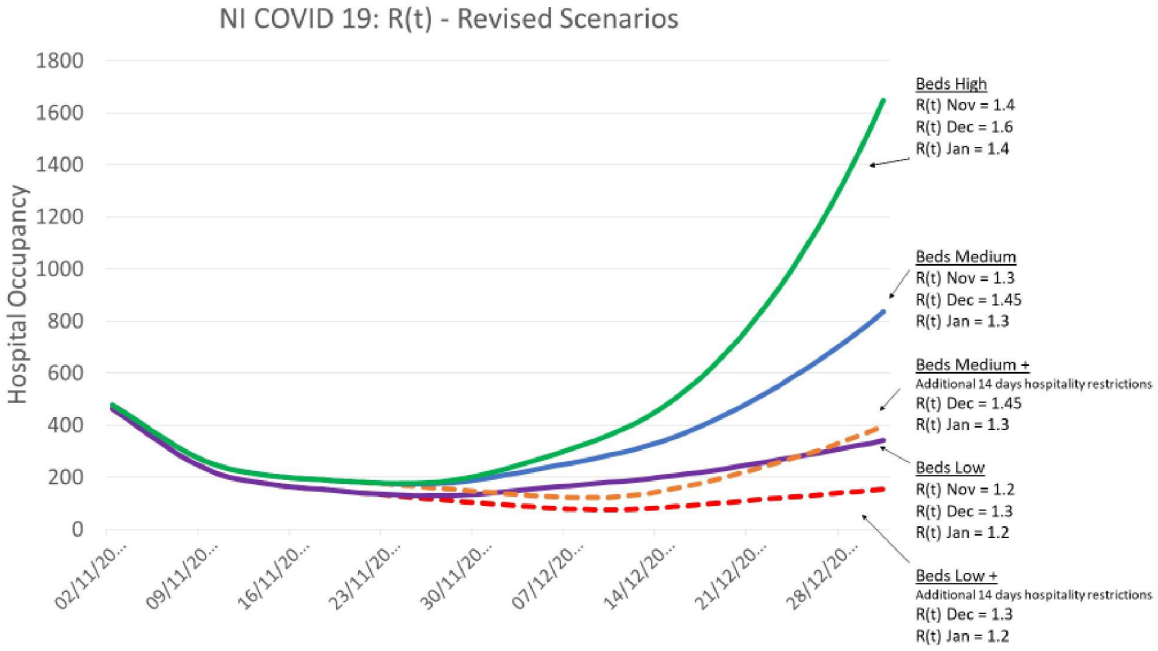
    b) Rt 1.3 Nov, 1.45 Dec, 1.3 Jan (Medium)

    c) Rt 1.2 Nov, 1.3 Dec, 1.2 Jan (Low)

    d) a two week extension to current restrictions after November 13th (Rt 0.9) followed by b)

    e) a two week extension to current restrictions after November 13th (Rt 0.9) followed by c)

10) The graph below shows the scenarios above, modelled to the end of 2020 for COVID +ve hospital bed occupancy (community acquired cases).



10. Scenario a) or b) above would require a further intervention in early – mid December to avoid the Health and Social Care system becoming overwhelmed.

11. Scenario c) or d) above would require a further intervention shortly before Christmas to avoid the Health and Social Care system becoming overwhelmed.

12. Scenario e) above would not require a further intervention to avoid the Health and Social Care system becoming overwhelmed until January .

13. It remains the case, as discussed previously, that a single intervention is unlikely to be sufficient to protect the hospital system through the winter. Under all of the models considered an additional intervention or interventions would be required early in 2021 at the latest.

14. When emerging from a period of intervention, it remains the case that significant restrictions will be required to ensure that Rt remains at 1.3 or less under these

scenarios. This implies more restrictions and/or significantly better compliance than before October 16th.

15. In all models, better compliance with restrictions may lead to better numbers than shown, whereas worse compliance would lead to worse numbers.

Alternative approaches:

16. Increased compliance with recommendations to socially distance, reduce contacts, wear a face covering etc has the potential to somewhat reduce Rt compared with early October, but is likely to be difficult to achieve and to have minor effects overall.

17. Previous SAGE modelling suggested that an effective TTP service (80% contacts reached within 48 hours of a positive test result, and 72 hours of a positive test request, and 80% isolating for the full required period) would reduce R by approximately 30%. The NI TTP service is currently achieving this so far as notifying contacts is concerned, but uncertainty remains about the extent of compliance with advice to self-isolate. Improvements in this area would reduce Rt somewhat, though will be difficult to achieve. If 80% of contacts self-isolated within 48 hrs of the onset of symptoms in a case, R might be reduced by as much as 60%. No Western country has succeeded in achieving this in the presence of significant community transmission.

18. Measures to increase hospital capacity would allow an increased epidemic level to be managed, but this would inevitably be associated with a greater number of deaths and might be limited by the need of staff to self-isolate if infected or contacts as a consequence of healthcare related outbreaks in hospitals or community acquired COVID. It is also the case that the associated levels of community transmission would inevitably result in a further significant increase in outbreaks in care homes among extremely vulnerable older people which would result in excess deaths in this population. Furthermore, even a significant increase in capacity (a doubling) is likely to enable no more than two additional weeks before restrictions are required.

19. Intensive efforts to ensure shielding of the elderly and extremely vulnerable with underlying health conditions could reduce pressures on the hospital system and may reduce mortality. However, this would require considerable sacrifice on the part of those shielding and those protecting them over at least a four month period with significant adverse impacts on their physical and mental health and well-being. A

combination of this approach with some restrictions would allow more relaxed behaviours on the part of the younger part of the population (under 60s) but to avoid risk would require no mixing with the older population which is not considered feasible in practical or behavioural terms, as discussed previously.

Recommendation

20. In light of the current status of the epidemic, the response to the restrictions of 16th October, the modelling above and the likely pressures on the Health and Social Care system before Christmas, as CMO and CSA we recommend that the current restrictions are extended for a further period of 2 weeks after the 16th November.

Dr Michael McBride, Chief Medical Officer

Professor Ian Young, Chief Scientific Advisor