University of Strathclyde Business School

DEPARTMENT OF MANAGEMENT SCIENCE

Brief notes for the NHS Lanarkshire CMT meeting, 14 April 2020
(Accompanies the updated report of 14/04/2020)

Immediate past activity

Table 1 below shows daily new COVID-19 cases (per 10,000 inhabitants) in England and Scotland (until 13 April). This demonstrates a peak in new cases across the UK (incl. Lanarkshire) last week. This suggests peak presentation of symptomatic cases for this wave has occurred. Given the bimodal clinical picture of COVID-19 infection presenting, our team predict NHSL will experience the greatest hospital activity over the next 7-10 days followed by a reasonably fast decline.
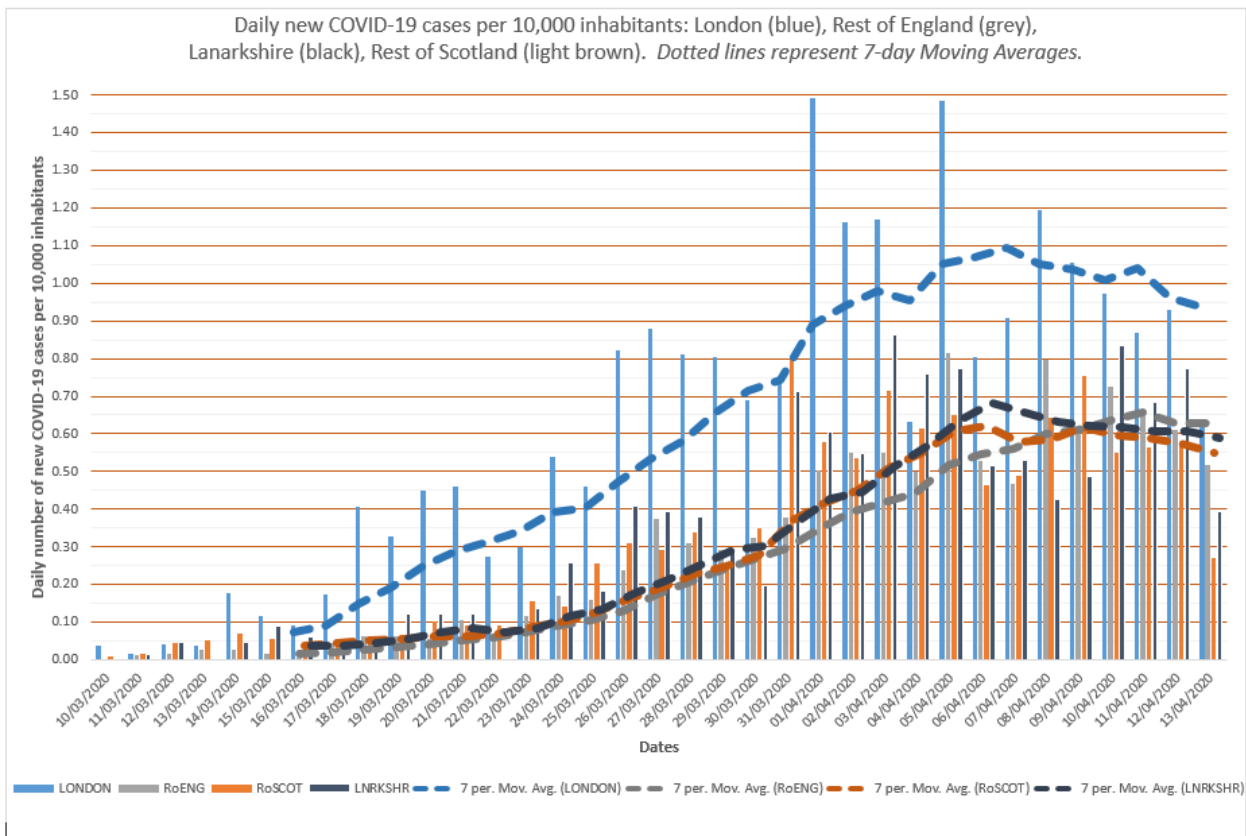
Table 1: Daily new COVID-19 cases reported in UK

Note: future new case numbers may be affected by NHS staff testing over the coming weeks. Therefore, a change in this trend – a slowing decline or even slight upward movement – should be interpreted with caution, as it may represent an increase in asymptomatic front-line worker testing.

Future activity as currently predicted

Running the model yields a range of key performance indicators, with variations in the utilisation of Level 3 beds of particular interest. Based on our planning assumptions, we currently predict that Level 3 bed utilisation is likely to reach a peak 11th – 24th April 2020 (given the stochastic nature of our model, all dates are approximate). We have presented two realistic scenarios which generate what we predict represents maximal bed utilisation (shown in comparison with activity seen so far Table 2):

1. 3% population infected over 10 weeks with 40% of people symptomatic (min. column of data)
2. 3.5% population infected over 10 weeks with 50% of people symptomatic (max column of data)

	Reported NHSL data		DES data modelling bed occupancy in real time			
STARTING WEEK 2 DUE TO POOR DATA ACCESS week beginning	Maximum number of General Ward beds occupied at one time during the week (midnight occupancy including AMU)	Maximum number of Level 3 beds occupied at one time during the week (INCLUDES HCU)	DES perdicted maximum number of General Ward COVID beds occupied at one time (including AMU/acute assessment)		DES predicted maximum number of Level 3 COVID beds occupied at one time	
week 1 insufficient data	insufficient data to compare week 1		MAX	MIN	MAX	MIN
3/27/2020	164	28	148	130	31	24
4/3/2020	248	39	329	274	50	32
4/10/2020	226	37	400	355	55	40
4/17/2020	0		400	355	53	33
4/24/2020	0		384	351	38	27

Table 2: Predicted COVID-19 resource utilisation in next 14 days

Level 3 beds: The stated number of Level 3 beds is sufficient to cope with demand, with an expected *maximum utilisation of less than 70% of the 80 available Level 3 surge beds*.

General Ward Beds: Allocation of 400 general ward beds to COVID-19 is likely to be sufficient but with 100% utilised in the highest demand. However, daily data tend to support enhanced admission avoidance in place across NHSL, making it more likely that general ward bed requirements will be below even our minimum predictions over the coming weeks if the trend of community care continues.

Acute Assessment Areas: AMU areas will undergo significant strain as all new admissions are moved through this area. *Our model predicts maximum resource needed during peak activity is **60-90 beds at any one time***. NHSL would be advised to ensure that Acute Assessment unit have sufficient capacity and staffing to deal with this, as patients are to remain in these assessment areas until test results known (mean LoS is 36hrs).

Comparison with the Scottish Government modelling outputs

We are aware that our Discrete Event Simulation (DES) modelled predictions are not fully consistent with the projection delivered to NHSL by the Scottish Government. Figure 1, below, is a graphical representation of these differences. As can be appreciated, predictions for the preceding and current week follow a similar trend, but largely diverge over the coming 7-10 days. The reasons why are summarised in Table 3 and explained in greater detail in our updated report of 14/04/2020.
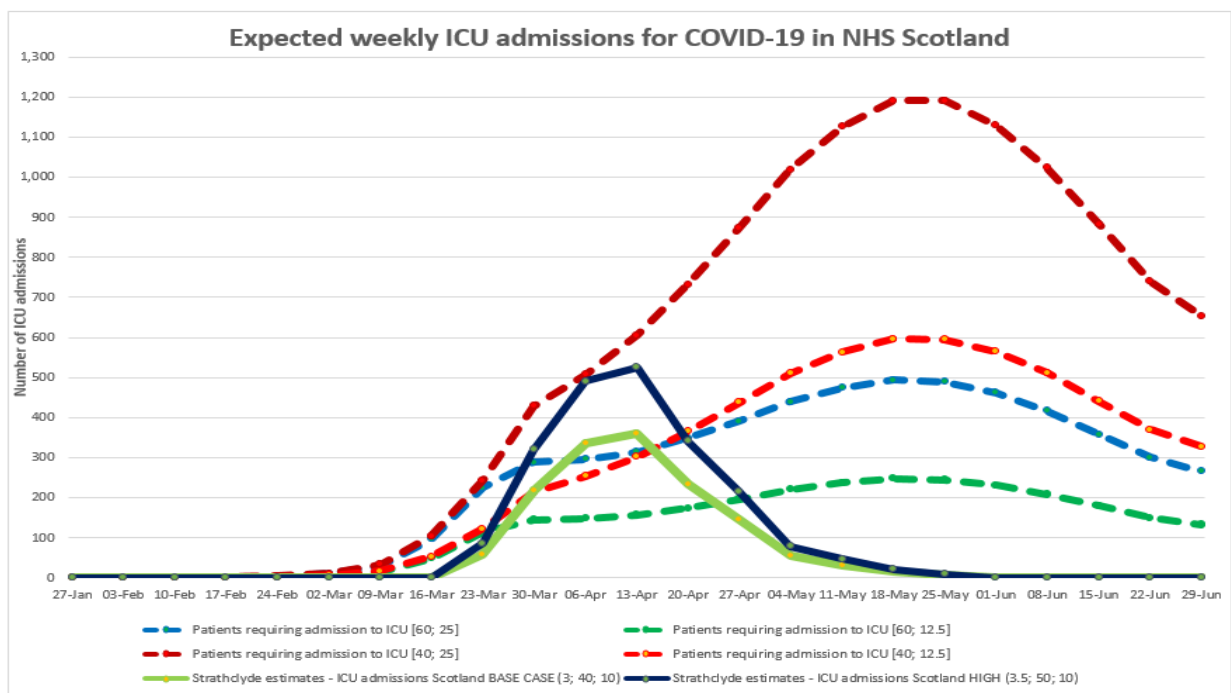
Figure 1: Predicted ICU admissions for COVID-19

Assumptions	Scottish Government	University of Strathclyde
Time horizon of current wave of infection	24 weeks	10 weeks
Population likely to be infected in first wave	Dependent on compliance with restrictions	3-3.5%
Population symptomatic	68%	40-50%
ED direct (self) presentations	Not clearly identified in data	Included in new patient data
Level 3 need	12.5% or 25%	Point estimates according to age & comorbidity
Suitability for hospitalisation	No assumptions stated	Adult, long-term care/nursing home care population removed from calculations
Suitability for Level 3 care	No assumptions stated	Proxy cohort of patients who will be deemed not suitable according to likely removed from Level 3 calculations

Table 3: Comparison of assumptions of Scottish Government & University of Strathclyde teams

Observations and recommendations

Under the current suppression policy, immediate plans will naturally focus on the current phase of the COVID-19 epidemic. Subsequent waves are likely to occur after the end of the first wave (predicted as less intense). What will happen after this first wave depends on a complex multitude of known and (as yet) unknown factors, and should be subject to a separate planning exercise.

In light of our predictions, there is an urgent need to begin planning for:

1. all non-COVID-19 related health and social care in the coming weeks (and beyond);
2. planning for continuing COVID-19 related health and social care, such as shielding, intensive testing and contact tracing;
3. planning capacity for potential further COVID-19 waves later this year.

Possible next steps

There are number of different ways in which we are developing our model to reflect the burden of assessment and testing in urgent care areas and the in-patient resource demand as the NHSL plans for the care provision of all patient groups, COVID-19 and non-COVID-19. Further developments will be tailored according to NHSL requirements.

The University of Strathclyde Business School health systems modelling team