Stay Local, Protect the NHS

Investigating the efficacy of local lockdowns in Wales in reducing pressure on the NHS

# Introduction

## 1.1 Background to COVID-19

Since its first detection in Wuhan, China, in December 2019, the novel coronavirus SARS-CoV-2 (COVID-19) has spread to more than 200 countries and territories, and infected more than fifty-eight million people, of whom 1.3 million have died (Worldometer, 2020).

The impact of COVID-19 on those it infects ranges from imperceptible (in asymptomatic cases) to deadly, or to long-term health issues known as “long COVID” (Iacobucci, 2020). Approximately 20-30% of cases result in hospitalisation (ECDC, 2020), with 17% of these hospitalised patients requiring intensive care (Docherty et al., 2020). With the median duration of hospital stay being estimated at between 4 and 53 days (Rees et al., 2020), the virus presents a significant challenge to health services, threatening to fill beds and overwhelm resources.

The struggle shared by many nations in 2020 has been to suppress the spread of the virus at least enough that their health services can provide adequate care and resources to the infected. Declaring the virus a pandemic in March of 2020, the World Health Organisation (WHO) urged countries to “detect, test, treat, isolate, trace, and mobilize their people” to prevent transmission (WHO, 2020).

Whilst not all nations responded in the same way to this call-to-action, many (including the UK) entered “lockdowns” in the spring of 2020, to reduce the spread of the virus (CITATION). Coming out of these lockdown periods in the summer, the economies of these countries were found to be severely impacted (Gopinath, 2020), and as a second wave of the virus approached in the autumn nations faced the challenge of protecting both their health services and their economies.

## 1.2 COVID-19 in Wales

Residents of Wales, along with the rest of the UK population, entered a national lockdown on the 23rd of March, during which the public were instructed not to leave their homes “without reasonable excuse” (The Health Protection (Coronavirus, Restrictions) (England) Regulations 2020). During this period Wales experienced a peak of 391 daily infections (UK Government, 2020). The Welsh Government gradually lifted the restrictions on movement, trade and activity in Wales during the summer of 2019, but by September it was clear that the virus was spreading quickly again, with daily report cases increasing tenfold between August and September (ibid).

The Welsh Government’s response to this second rise in infections was to implement a number of “local lockdowns” – at the county level – which, among other restrictions, required residents of affected counties to remain within those counties unless they had good reason to leave (Welsh Government, 2020a). Schools, shops and hospitality venues remained open during the periods of local lockdown, but residents were prevented from entering each other’s homes and required to wear face coverings in indoor public spaces (ibid). The leader of Caerphilly council, Philippa Marsden, spoke of a need to “break the cycle of infection” when the lockdown was introduced, over growing concern that increased hospitalisations would follow as the virus spread (Welsh Government, 2020b).

The challenge faced by the Welsh Government in handling the localised outbreaks of COVID-19 was to effectively reduce the pressure on the Welsh NHS whilst supporting the economy and maintaining enough public support for the restrictions that residents would actually follow them. Public Health Wales reported on 18th September that 91% of Welsh adults surveyed expressed support for the local lockdowns (Public Health Wales, 2020). This may have been because the lockdown measures were not especially strict (with schools and restaurants remaining open), but the leniency may also have limited the efficacy of the measures.

This investigation aimed to examine the efficacy of the series of local lockdowns implemented between 8th September and 23rd October in reducing the pressure on the Welsh NHS Service, by studying hospital admissions, hospitalisations and bed occupancy over time and across the nation.

## 1.3 Previous research

Previous research into the efficacy of lockdowns has found them to be effective in reducing the spread of COVID-19 (Alfano and Ercolano, 2020). Vinceti et al. found that when lockdown restrictions in Italian regions were tight enough to severely impact mobility, transmission was reduced almost immediately after the implementation of the restrictions (Vinceti et al., 2020). However, in a wider study of 202 countries, Alfano and Ercolano found that a reduction in daily reported cases is evident 10-17 days after a lockdown begins and continues for at least a further 20 days (Alfano and Ercolano, 2020). This suggests that, if the lockdowns in Wales were effective, the positive results may not appear until 10-20 days after their implementation.

Results of a simulation model suggested that localised lockdowns, managed in a co-ordinated approach, can be more effective than a single national lockdown as well as impacting fewer people (Karatayev, Anand, and Bauch, 2020). However, the local lockdowns modelled involved shop and school closures, unlike the lockdowns imposed in Wales.

Most research in this area targets the effect of lockdowns on transmission, rather than on hospitalisation, despite the reasoning behind lockdowns generally being to reduce pressure on health services. Davies *et al.* used modelling to assess the impact of a range of non-pharmaceutical interventions on intensive care admissions, finding that a combination of interventions including social distancing and “intense lockdown measures” over short periods could sufficiently suppress transmission enough for the NHS to support patients (Davies et al., 2020).

This investigation differs to those above as it directly compares a number of different health boards that implemented local lockdowns over a staggered time period, using hospital admissions, number of hospitalised patients, and bed capacity as indicators of the lockdowns’ success.

## 1.4 Investigating the efficacy of local lockdowns in Wales

Data from Stats Wales was investigated and visualised in order to examine the effect of these local lockdowns – if any – on the numbers of hospital admissions and hospitalised patients. “Protect the NHS” being one of the UK Government’s slogans throughout 2020 (Department of Health & Social Care, 2020), so the data was examined for signs that pressures posed to the NHS in Wales had been relieved by the localised interventions.

It was hypothesised that a drop in daily hospital admissions and number of hospitalised patients would be observed following the implementation of local lockdowns. Given that, on average, it takes 5 days for symptoms to manifest in an infected person (CITE), and a further 7 days for symptoms to progress (CITE) to a level at which hospitalisation is required – if at all – then a drop in daily hospital admissions was hypothesised to appear at least 12 days after the implementation of the local lockdowns for each health board. Considering that local lockdowns were implemented at the county level, whereas the available data was aggregated at the health board level, this delay in visible outcome was likely to be longer.

While daily hospital admissions were expected to decrease, or increase more slowly, following introduction of local lockdown measures, it was anticipated that little or no impact would be observed on bed occupancy for most health boards, given the duration of stay for a COVID-19 patient tends to be at least 4 days and most local lockdowns lasted only XX days. One health board – Aneurin Bevan – was affected by local lockdown measures for more than 40 days, so the bed occupancy in this health board was studied in detail to ascertain whether the local lockdowns had had an impact.

As well as examining the number of people admitted to and retained in hospital, the ratio of patient types (suspected, confirmed or recovering) was investigated to ascertain whether understanding and management of the virus had improved in Wales throughout the autumn.

# 2 Materials and Methods

# 3 Results

# 4 Discussion

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Findings

* There was no noticeable reduction in percentage of beds in use in any health board during the local lockdowns
* This supports other findings that lockdowns are effective only when strict (or something like that)
* However, the same can be said of the firebreak lockdown (admittedly much more recent)
* This could be because, while keeping bed occupancy low is a goal of lockdown measures, it is not a useful indicator of their efficacy because of the significant time lag between infection, hospitalisation, and death or recovery
* What is clear is that September – November was a period when intervention was needed. The lockdowns do seem to have been implemented at a time that anticipated increased pressure on the NHS, and the situation in Welsh hospitals could have been considerably worse without the interventions.
* Overview (animated bar chart) – while the outlook may look bleak from the change in hospitalisations, there is some good news. The ratio of suspected to confirmed patients has completely flipped, indicating that there are better testing mechanisms in place now than there were in September. The proportion of hospitalised COVID-19 patients who are recovering has also increased.

RESEARCH

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7288278/

As described in the Methods, we considered how the time from symptom onset to hospitalisation changed in the initial stages of the COVID-19 pandemic ([Figure 1](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7288278/figure/jcm-09-01297-f001/)B). The estimated mean value of this quantity changed from around 6.5 days in the period between 2 January and 14 January to a lower value of around 2 days by 22 January. Towards the end of the time period considered, the mean time from symptom onset to hospitalisation appeared to be reducing more slowly than earlier in the time period considered. This potentially indicates a limit to the ability of isolation measures to decrease the symptomatic infectious period.

<https://jamanetwork.com/journals/jama/fullarticle/2761044>

The median time from first symptom to dyspnea was 5.0 days, to hospital admission was 7.0 days, and to ARDS was 8.0 days.

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html>

The incubation period for COVID-19 is thought to extend to 14 days, with a median time of 4-5 days from exposure to symptoms onset.(1-3) One study reported that 97.5% of people with COVID-19 who have symptoms will do so within 11.5 days of SARS-CoV-2 infection.(3)

<https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-020-01726-3#:~:text=Median%20hospital%20LoS%20ranged%20from,4%20to%2019%20days%2C%20respectively>.

We identified 52 studies, the majority from China (46/52). Median hospital LoS ranged from 4 to 53 days within China, and 4 to 21 days outside of China, across 45 studies. ICU LoS was reported by eight studies—four each within and outside China—with median values ranging from 6 to 12 and 4 to 19 days, respectively. Our summary distributions have a median hospital LoS of 14 (IQR 10–19) days for China, compared with 5 (IQR 3–9) days outside of China. For ICU, the summary distributions are more similar (median (IQR) of 8 (5–13) days for China and 7 (4–11) days outside of China). There was a visible difference by discharge status, with patients who were discharged alive having longer LoS than those who died during their admission, but no trend associated with study date.

<https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(20)30201-7/fulltext>

“It appears that the less rigid lockdown led to an insufficient decrease in mobility to reverse an outbreak such as COVID-19. With a tighter lockdown, mobility decreased enough to bring down transmission promptly below the level needed to sustain the epidemic.”

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7432619/>

Measure lockdown effectiveness with R number / infection rate.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7268966/>

“Our results show that lockdown is effective in reducing the number of new cases in the countries that implement it, compared with those countries that do not. This is especially true around 10 days after the implementation of the policy. Its efficacy continues to grow up to 20 days after implementation.”

Median incubation + median time to hospitalisation + median time in hospital = 5 + 7 + 5 = 17

<https://www.color-blindness.com/coblis-color-blindness-simulator/>

Used to test colour scheme as produced at: <https://coolors.co/>