Covid-19: Early curfews are not effective and may backfire

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Abstract

How effective are lockdowns in containing an epidemic? During the COVID-19 pandemic, some countries have enforced tight lockdown measures, including early curfews. Several studies try measure the effectiveness of such measures across different countries, but clear identification of effects is elusive. On the one hand countries differ in important characteristics that affect the performance of measures, but also the measurement of the pandemic itself: recorded cases are biased and since testing methods are not homogeneous across countries, the bias is heterogeneous (see Georganas, Velias & Vandoros, 2021a). On the other hand, the measures are not the same across countries, and seldom are enforced alone within a specific country; a bundle of measures is usually enacted on the same day complicating the isolation of single measure effects. In this paper we use a natural experiment in a single European country to clearly identify the effect of early curfews, using a difference in difference approach, comparing a region affected by the curfew to neighbouring regions. We find that early curfews hardly curb mobility, meaning that the actually *increase* congestion and possibly the number of daily contacts, lowering social distancing. While anecdotes of increased congestion abound, this is the first clear measurement of the effect. The result is important to show that curfews may backfire, but also more generally to show that strictness in lockdown procedures is not necessarily related to effectiveness. Instead of mechanistic approaches claiming that more (lockdown) is always better, interventions should be based on a thorough analysis of human behaviour, that anticipates substitution of activities.

Keywords: Covid-19; mobility; curfews; crowding; non-pharmaceutical interventions; substitution

1. Background

There is an ongoing debate about non-pharmaceutical interventions and what might work or not in an effort to tackle the Covid-19 pandemic (Brauner et al 2021). Such measures are most often introduced jointly, so disentangling the effects of individual

measures is challenging, while finding appropriate control groups is not always straightforward.

Restricting one human activity can lead to substitution by others, as humans seek alternatives. An increasing number of studies suggest that stringency of the lockdowns measures does not make a difference in infection prevalence or related deaths (Bonardi et al., 2020). Of course, such studies are often challenged by measurement and identification issues. Herby (2021) gives further examples of evidence that the 'signal (inducing voluntary behavior changes) is important in contrast to the actual regulation (mandated behavior changes)'. Conversely, the softest lockdown measures appear to work just as well as the hardest. At the same time, stricter lockdowns have been found to produce negative effects on citizens' welfare in the domains of domestic violence (Leslie and Wilson, 2020).

Why would stricter lockdowns either fail to achieve the desired greater reduction in virus spread or, even, backfire by contributing towards the spread? One straight-forward reason is that people do not fully reduce the activity proportionately to the strictness of measures – they reallocate part of it towards options that are still allowed. For example, mobile tracker data in the US shows a large reallocation of consumer activity from "nonessential" to "essential" businesses as well as from restaurants and bars toward groceries and other food sellers (Goolsbee and Syverson, 2021). Whilst these studies do not measure the resulting congestion in the essential businesses, we argue that it is likely to be high, resulting in greater risk of virus spread.

In our study, we took advantage of within-country heterogeneity in the timing of the introduction of an early evening curfew to evaluate this measure in tackling the Covid-19 pandemic. The advantage of our data is that we can cleanly identify the effect using a sudden, unanticipated and singular change in the lockdown rules.

While cross country studies are definitely also very useful, they suffer from several drawbacks absent in our method. On the one hand countries differ in important characteristics that affect the performance of measures (availability of ICUs, the state of the health system), but crucially they also differ in the way they measure the pandemic itself. Recorded cases are biased and since testing methods are not homogeneous across countries, the bias is heterogeneous, differing greatly across countries (see Georganas, Velias & Vandoros, 2021a). On the other hand, the measures are not the same across countries, and seldom are enacted alone within a specific country. Usually, a complicated bundle of measures is enacted on the same day (and some measures almost always come together, such as closing several levels of schooling along with other face to face activities) which greatly complicates isolating the effect of a single measure. In this paper we use a natural experiment in a single European country to clearly identify the effect of early curfews, using a difference in difference approach, comparing a region affected by the curfew to neighbouring regions.

2. Data and Methods

While a 9pm-5am curfew applied in Greece since November 2020, a 6pm-5am weekend curfew was introduced on 6 February 2021 in the Attica region (which includes the capital city of Athens) as a response to increasing Covid-19 cases. We studied the impact of the 6pm curfew on human activity using mobility data from Google Community Mobility Reports (2021). In particular, we focused on time spent at home, and time spent at groceries/pharmacies. Staying at home is considered a goal of lockdown measures, to limit the spread of the novel coronavirus; while it has been shown that indoor spaces such as supermarkets may facilitate transmission (Shao et al. 2021). Google mobility reports show how time spent in different places compares to the baseline, which was the "median

value for the corresponding day of the week, during the 5-week period Jan 3 – Feb 6, 2020" (Google Community Mobility Reports 2021), before the pandemic started in Greece.[1]

A simple before-after analysis to evaluate the impact of the policy on mobility may not be reliable as other factors affecting mobility may change, which is why we used the nearby Peloponnese Region (where the curfew remained at 9pm during the study period) as a control group. We studied the difference in the differences in mobility between these two areas in the two weeks before and the two weeks after the introduction of the 6pm curfew in Attica.

In Attica, there was a 6.50 percent increase in time spent in residential spaces compared to the baseline in the two weeks before the introduction of the 6pm curfew, and a 9 percent increase compared to the curfew after the new policy – constituting a 2.5 percentage point increase. The corresponding figures for Peloponnese were 7.75 before and 6.75 after – a 1 percentage point decrease. The difference in the differences between the two Regions was 3.5, indicating a relative increase in time spent at residential spaces in Attica after the introduction of the 9pm curfew by 3.5 percentage points (Table 1). Similarly, the relative decrease in time spent in groceries and pharmacies after the 9pm curfew was only 1.83 percentage points (Table 1).

Consequently, a reduction in the time when people were allowed to go outside by 3 hours (a 18.75% decrease) led to a 3.5 percentage point increase in time spent at home and a 1.83 percentage point decrease in time spent in groceries/pharmacies, in relative terms. As the change in activities is much smaller than the change in time, the early

[1] Apple mobility trends reports are also available. However, these only cover driving, walking and commuting, and captures the volume of requests, rather than actual mobility. Furthermore, Apple makes data available for Attica and Greece, so the control group would be contaminated by areas where the treatment applies. Despite these issues, any evidence we could get out of the Apple data points at exactly the same direction as the results using the Google data.

curfew led to greater crowding. To the extent that more people were present simultaneously in high-risk places such as supermarkets, the early curfew backfired, possibly leading to greater disease transmission. Finding the exact impact on crowding is not straightforward, as Google mobility data do not show what time of the day these activities took place, or the density of activities during the day.

Table 1 – Differences in google mobility trends (compared to baseline) in Attica (treatment group) and Peloponnese (control group)

	Before	After	Difference
Change compared to baseline: grocery & pharmacy			
Attica	8.17	-7.17	-15.33
Peloponnese	10.50	-3.00	-13.50
Diff-in-diff			**-1.83**
Change compared to baseline: residential			
Attica	6.50	9.00	2.50
Peloponnese	7.75	6.75	-1.00
Diff-in-diff			**3.50**

4. Conclusions

We found that the 6pm instead of 9pm curfew in Athens led to a 3.5 percentage point relative increase in time spent at home and a 1.83 percentage point relative decrease in time spent in groceries and pharmacies. Considering that this was a result of a 18.75% reduction in hours where people were allowed to leave home, it seems that the early evening curfew led to more crowding – which may facilitate the spread of disease. Our findings add to existing evidence from Toulouse (Dimeglio et al 2021), that suggests that a 6pm curfew backfired.

This study is subject to limitations. The outcome is mobility rather than infections. Although certain environments such as supermarkets have a higher likelihood of

spreading the disease (Shao et al. 2021), our data do not show the actual impact on Covid-19. However, such an effect would be extremely challenging to disentangle, even with clinical data for the following reasons: (a) Other factors such as variants that may be more transmissible may apply, distorting the effect on actual health outcomes; (b) there is dispersion in the time lag between infection and symptoms or hospitalisation or death; (c) the effect might show via second-hand transmission. For example, individuals who first contract SARS-CoV-2 due to more crowding may be younger people who are often asymptomatic (Kelvin and Halperin, 2020), and may pass the virus on to others with a longer lag. Furthermore, Google mobility data do not include a breakdown by time of day, so we cannot be sure how the distribution of mobility changes, and the extent to which crowding occurs. While accurately estimating the effect is not possible, the data show a clear direction towards more crowding in certain spaces.

Overall, lockdowns and other measures are needed to tackle Covid-19. However, it is important to design smart measures that do not lead to substitution by activities that contribute further to spreading the virus.

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