

The impact of curfew on mobility in Île-de-France

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INTRODUCTION

A curfew has been in effect in Île-de-France (IDF) since October 18, 2020, restricting circulation each night from 21h to 6h. This report analyzes the impact of curfew on mobility up to October 23, 2020. Using mobile phone data provided by Orange [1], we characterize reductions in mobility caused by the curfew, disentangle the concurrent effect of school holidays, and compare the curfew to past mobility restrictions (lockdown), and seasonal effects (summer holidays). Internal traffic within the region shrank by 12% in the first week of curfew, with respect to the week prior to curfew. Reduction was more marked in the first two hours into curfew (21h – 23h), with a 34% reduction on mobility. Daily mobility reduction in the first week of curfew was comparable to the one caused by summer holidays in mid-August, but significantly lower than the reduction generated by lockdown (March 17 – May 11). Curfew seems to have little effect on traffic leaving IDF. No anomalous increase in mobility is registered in the hours preceding daily curfew enforcement, all but excluding compensation effects.

METHODS

Data. Mobility data were provided by the Orange Business Service Flux Vision in the form of displacement matrices. The data contained travel flows among 1436 geographic areas of mainland France (2018 EPCI, Établissements Publics de Coopération Intercommunale). For each pair of locations and any given day, data were provided stratified by age class, and time of day. More details are available in Ref. [1]. Internal mobility in Île-de-France (IDF) was defined as the number of trips starting and ending in any geographic areas in IDF. Outgoing mobility was defined as the number of trips starting in a geographic area in IDF, and ending in a geographic area of metropolitan France outside IDF. When focusing on the week before curfew and the first week into curfew (Fig. 1, 2), we consider only weekdays (Monday to Friday). Week 42 in 2020 is October 12 through October 16; in 2019 it is October 14 through October 20. Week 43 in 2020 is October 19 through October 23; in 2019 it is October 21 through October 27. When exploring

daily mobility during 2020 (Fig. 3, 4), values are normalized to mobility in week 6 (Feb 3 – Feb 9, 2020), i.e. pre-pandemic conditions.

RESULTS AND DISCUSSION

Figure 1 reports the variation in internal and outgoing mobility of week 43 (first week into curfew) compared to its preceding week (week 42, the week before curfew). Week 43 marks also the start of school holidays. Internal mobility shrank by 12%, outgoing mobility increased by 4%. These variations are likely the combined effect of curfew and school holidays. To disentangle the effect of curfew we compare these figures with mobility variations of week 43 of 2019 compared to week 42 of 2019. Week 43 marked the start of school holidays in 2019, too. In 2019, both internal mobility (+1.4%) and outgoing mobility (+7%) increased.

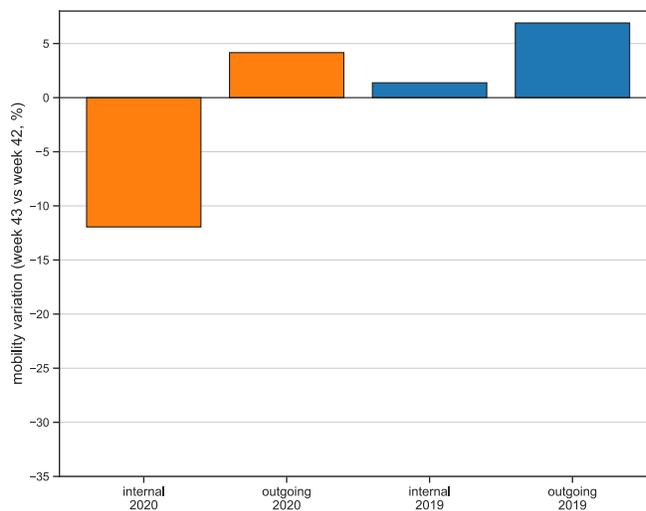


Figure 1. Variation in mobility from week 42 to week 43. Internal mobility is the number of trips whose starting point and endpoint are in Île-de-France (IDF). Outgoing mobility is the number of trips whose starting point is in IDF, and whose endpoint is in metropolitan France, outside IDF. Orange bars refer to 2020; blue bars refer to 2019 (for reference). Only weekdays are considered (Monday through Friday). Week 42 in 2020 is October 12 through October 16; in 2019 is October 14 through October 20. Week 43 in 2020 is October 19 through October 23; in 2019 is October 21 through October 27.

In Fig. 2 we focused on internal mobility in the two hours preceding, and following, the daily start of curfew (21h). Mobility from 19h to 21h decreased in week 43 with respect to week 42 by 7%. Mobility from 21h to 23h decreased by 34%. The same analysis in 2019 showed a reduction of 4.1% in both time windows. This shows two things:

- 1) The effect of curfew after 21h remains marked after accounting for mobility reductions caused by school holidays (-34% vs -4.1%);
- 2) No anomalous increase in mobility is visible right before lockdown, showing no evidence of compensatory effects.

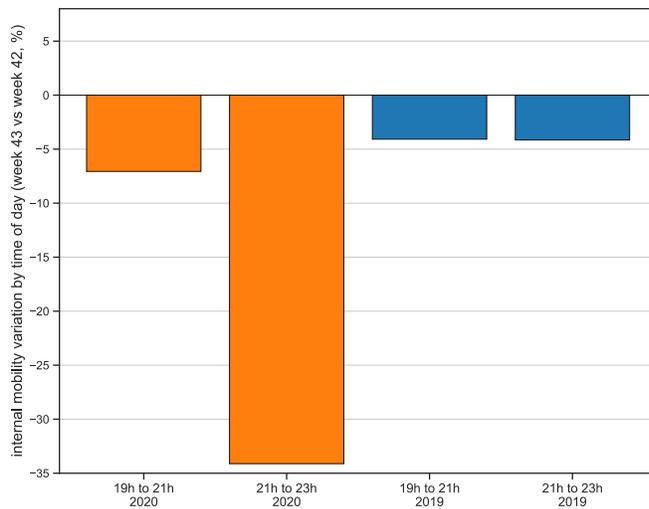


Figure 2. Variation in mobility from week 42 to week 43 in the two hours before, and into, curfew. Same as Fig. 1, but focusing on 2-hour time ranges right before and after daily curfew start.

Figure 3 shows daily internal mobility from Jan 6, to Oct 23, 2020, and reveals the effect of the current curfew in curbing overall mobility in IDF. The combined effect of curfew and school holidays are bringing mobility to 80% its benchmark value, a value much higher than lockdown, which brought it to less than 40%, and even summer holidays: in mid-August internal mobility was as low as 50% its benchmark value. As expected, curfew performs better when restricting the analysis to time ranges affected by the measure. Internal mobility between 21h and 23h is stabilizing at 50% its benchmark value, a value that is compatible with mid-August, but still higher than lockdown. Lockdown performed better in suppressing internal mobility even when considering time ranges that are under curfew. Furthermore, lockdown efficiently suppressed outgoing mobility, too. Curfew seems instead to have little effect on it, and in particular it is not suppressing the Friday night peak likely due to people leaving IDF for the weekend.

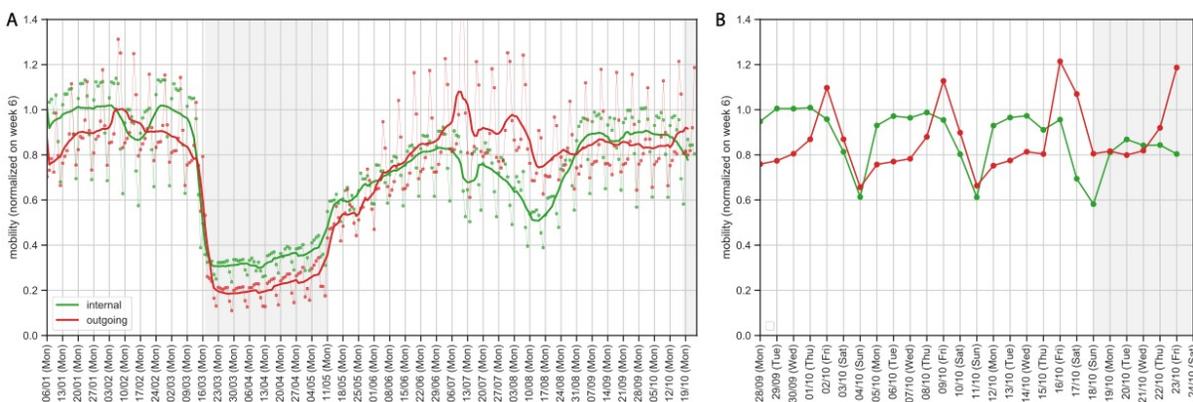


Figure 3. Daily internal and outgoing mobility in IDF in 2020. Dotted lines represent daily values; solid thick lines represent 7-day rolling averages. The gray shaded areas indicate lockdown (March 17-May 11), and curfew. Mobility is normalized to be on average =1 during week 6 of 2020. Panel B is a zoom of panel A on the latest four weeks.

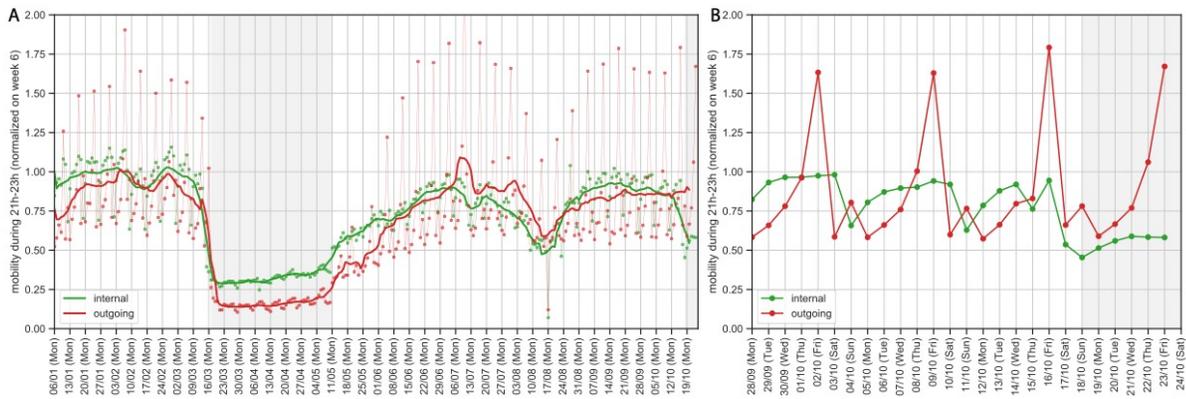


Figure 4. Daily internal and outgoing mobility between 21h and 23h in IDF in 2020. Dotted lines represent daily values; solid thick lines represent 7-day rolling averages. The gray shaded areas indicates lockdown (March 17-May 11), and curfew. Mobility is normalized to be on average =1 during week 6 of 2020. Panel B is a zoom of panel A on the latest four weeks.

ACKNOWLEDGMENTS

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REFERENCES

[1] G Pullano, E Valdano, N Scarpa, S Rubrichi, V Colizza, [Evaluating the impact of demographic factors, socioeconomic factors, and risk aversion on mobility during COVID-19 epidemic in France under lockdown: a population-based study](#), *The Lancet Digital Health* 2020, [https://doi.org/10.1016/S2589-7500\(20\)30243-0](https://doi.org/10.1016/S2589-7500(20)30243-0).