Evaluating the timing of stay-at-home mandates during the early COVID-19 pandemic

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Background

- Following the advent of COVID-19, WHO declared a "public health emergency of international concern" on 1/30/20, and ultimately a global pandemic on 3/11/21 [1]
- There is growing evidence to suggest that non-pharmaceutical interventions (NPIs) have a protective effect on controlling the spread of COVID-19 [2,3,4]
- The many economic, psychological, and social consequences of pandemics and social distancing measures create an urgent need to determine the efficacy of NPIs, especially those that are considered most stringent i.e. stay-at-home mandates.
- Objective: to evaluate the relationship between the timing of stay-at-home orders and the spread of COVID-19, both for countries and US states

Study Design

- Observational analysis from April-May 2020 including countries and US states with stay-at-home mandates.
- Date of implementation for stay-at home orders were collected online from select English-language Ministry of Health and local news websites
- Case and death counts for US states were collected online from official public health department websites. Case and death counts for countries were collected online from WHO daily COVID-19 situation reports as well as worldometer.com
- Primary exposure: the time between the first reported case of COVID-19 to an implemented stay-at-home mandate.
- Primary outcomes: the time from the first reported case of COVID-19 to the highest number of daily cases and daily deaths.
- Simple linear regression analyses were conducted, controlling for regional case rates at the time of mandate.

Results

Distribution: Number of Days Between First Reported Case and Stay-at-Home Mandate per US State (n=43)

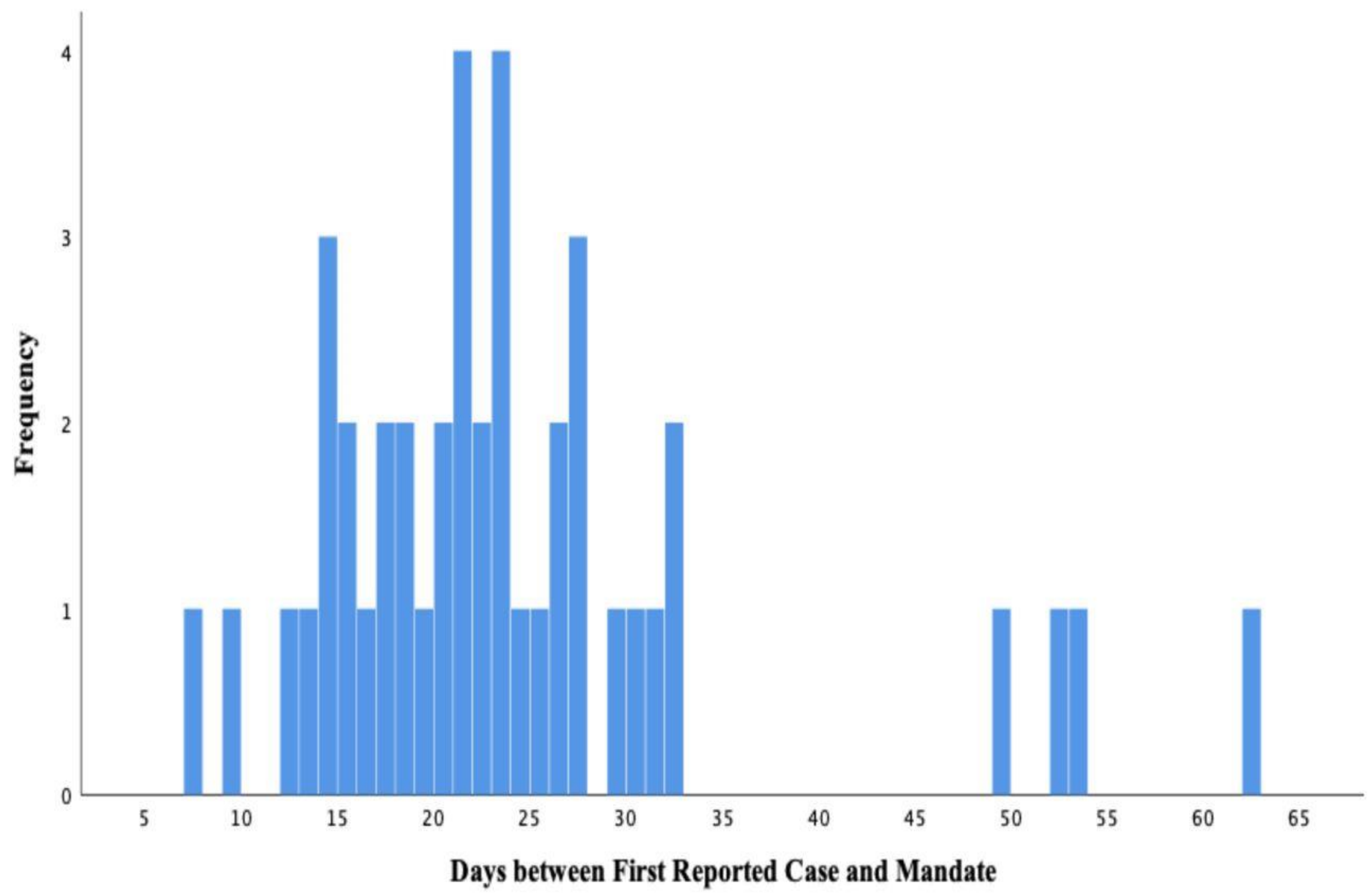

***Table 1a*: Linear Regression Models Predicting Number of Days to Highest Case and Death Count for State-level Analysis (n=43)**

Method of Classifying Exposure Variable (Number of Days Between 1st Reported Case and Mandate)	Coefficient	95% CI	P-value
*Measured Effect on Peak A: Number of Days from First Reported Case to Highest Number of Daily New Deaths ***			
Continuous Variable	1.1	.65, 1.5	***.000****
Categorical Terciles: Early, middle, late	13.1	6.9, 19.3	***.000****
Early vs. middle/late	-24.1	-34.5, -13.8	***.000****
Middle vs. early/late	8.5	-3.8, 20.8	*.17*
Late vs. early/middle	14.8	2.9, 26.6	***.016***
Categorical: *Earliest 10%*	-18.5	-38.4, 1.3	*.067*
Categorical: *Latest 10%*	35.3	18.1, 52.5	***.000****
*Measured Effect on Peak B: Number of Days from First Reported Case to Highest Number of Daily New Deaths ***			
Continuous Variable	1.0	0.7, 1.4	***.000****
Categorical Terciles: Early, middle, late	10.7	4.7, 16.8	***.001****
Early vs. middle/late	-15.5	-26.4, -4.2	***.007****
Middle vs. early/late	-1.2	-12.9, 10.5	*.843*
Late vs. early/middle	16.3	5.6, 26.9	***.004***
Categorical: *Earliest 10%*	-11.3	-30.2, 7.6	*.234*
Categorical: *Latest 10%*	38.3	23.6, 53.0	***.000****

*Significant results at p<0.05

**Models controlled for case rates per region, defined as number of new daily cases per 100,000 persons on the date of the implemented mandate

Distribution: Number of Days Between First Reported Case and Stay-at-Home Mandate per Country (n=41)

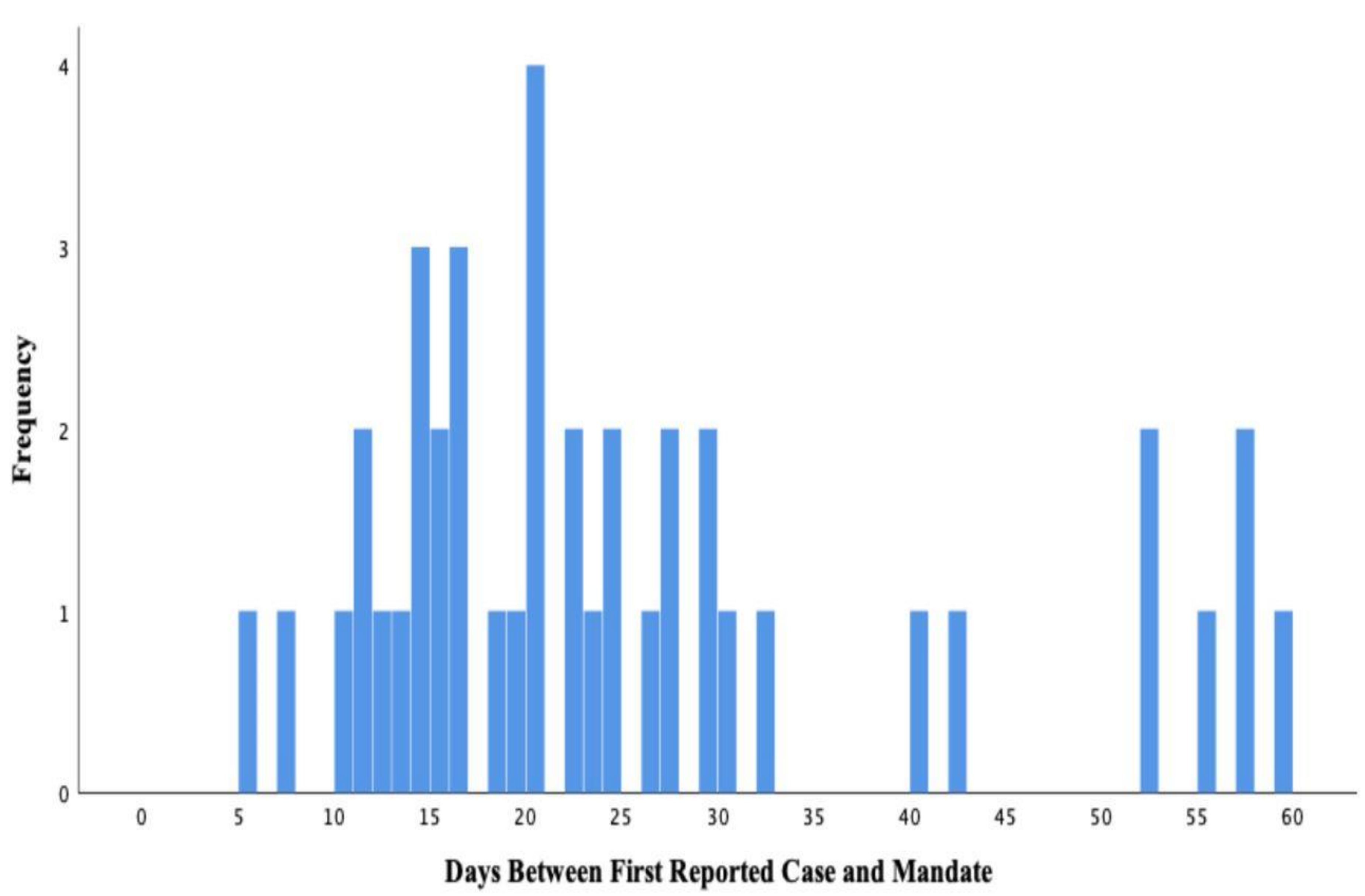

Table 1b: Linear Regression Models Predicting Number of Days to Highest Case and Death Count for Country-level Analysis (n=41)

Method of Classifying Exposure Variable (Number of Days Between 1st Reported Case and Mandate)	Coefficient	95% CI	P-value
*Measured Effect on Peak A: Number of Days from First Reported Case to Highest Number of Daily New Cases ***			
Continuous Variable	0.7	0.2, 1.1	***.000****
Categorical Terciles: Early, middle, late	10.2	1.6, 18.8	***.021****
Early vs. middle/late	-13.1	-28.5, 2.3	*.093*
Middle vs. early/late	-4.2	-19.9, 11.5	*.592*
Late vs. early/middle	17.4	2.5, 32.3	***.023****
Categorical: *Earliest 10%*	-7.6	-32.8, 17.5	*.543*
Categorical: *Latest 10%*	30.0	6.9, 53.2	***.012****
*Measured Effect on Peak B: Number of Days from First Reported Case to Highest Number of Daily New Deaths ***			
Continuous Variable	.5	0.2, 0.9	***.002****
Categorical Terciles: Early, middle, late	6.1	-0.5, 12.6	*.068*
Early vs. middle/late	-7.4	-18.9, 4.1	*.201*
Middle vs. early/late	-3.2	-14.8, 8.4	*.582*
Late vs. early/middle	10.6	-0.6, 21.9	*.063*
Categorical: *Earliest 10%*	-4.7	-23.3, 8.5	*.609*
Categorical: *Latest 10%*	26.3	9.9, 42.7	***.002****

*Significant results at p<0.05

**Models controlled for case rates per region, defined as number of new daily cases per 100,000 persons on the date of the implemented mandate

Conclusions

- A longer duration between the first reported case of COVID-19 to a stay-at-home mandate was associated with a longer duration to peak daily case and death counts.
- The largest effect was observed among regions classified as the latest 10% to implement a mandate, which in the US, predicted an additional 35.3 days to the peak number of cases (95 % CI: 18.2, 52.5), and 38.3 days to the peak number of deaths (95 % CI: 23.6, 53.0).
- This study supports a protective effect of implementing early stay-at-home mandates, both globally and within the US. Our study builds on the recent emerging epidemiological data supporting the efficacy of NPIs in the control of the COVID-19 pandemic.

Limitations:

- Exclusion of other NPIs (i.e. school closures, public gathering restrictions)
- This study did not account for the fidelity of and adherence to implemented mandates
- This study did not account for differences in testing capacity within each respective region

References

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