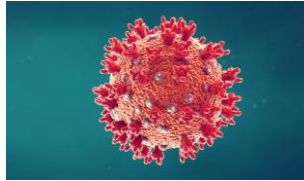


Nursing Home Staff Networks and COVID-19



Judith Chevalier
Yale SOM

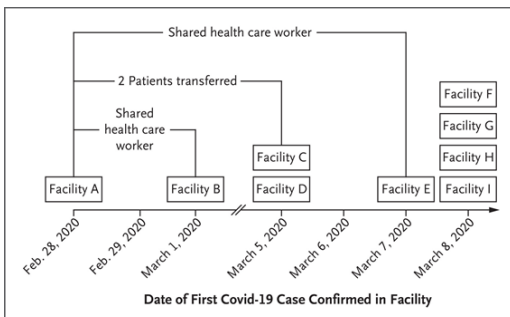
Keith Chen
UCLA Anderson

Elisa Long
UCLA Anderson

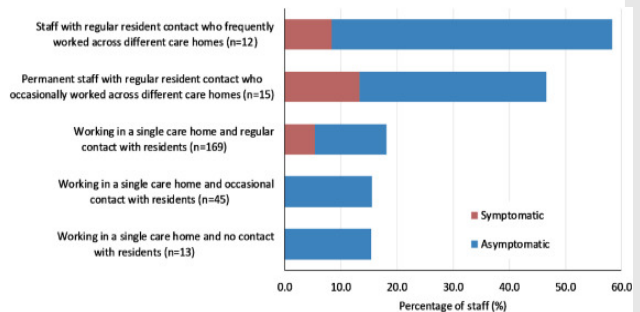
1

Staff/contractors working in multiple nursing homes

It has been understood since early on that some SARS-CoV2 transmission has moved from facility to facility via shared workers/contractors



Source: McMichael, et.al. *NEJM* May 21 2020



Source: Ladhani et. al. *Journal of Infection*, July 28 2020.

Despite what we know

- CMS-recommended testing strategies are not related to worker movement.
- CMS has no guidance around measuring worker movement and using it for contact tracing.
- Nursing home leaders/public health officials express frustration over their incomplete window on staff movements.

Our project

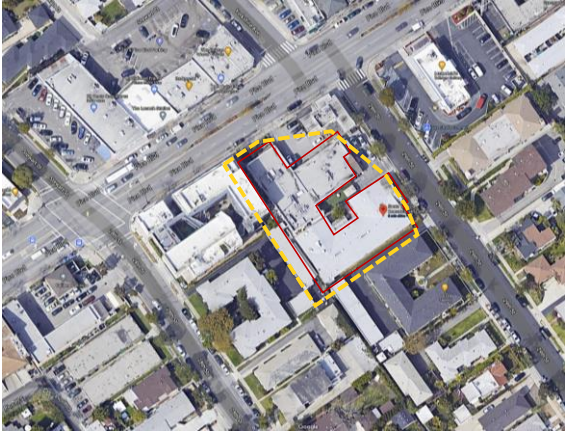
- Obtained a measure of cross-movement across homes
- Measured the association between cross-movement and cases
- Worked with public health authorities in LAC and with the MSCA on an early warning strategy and informing testing strategies.

Challenge: Identifying nursing home cross-traffic

- Smartphone location data from Veraset
 - 50M+ smartphones (US), 300M+ smartphones (worldwide)
 - 5 billion observations per day
 - Widely commercially available and used
- A “ping” reports:
 - Unique smartphone ID
 - Operating system of smartphone (IOS or Android)
 - Time (in seconds)
 - Latitude and Longitude
 - Accuracy measure of location (mean of 24m)



Processing rooftop data



Data period

- 11 weeks (March 13-May 28, 2020)

Filters for a day-visit

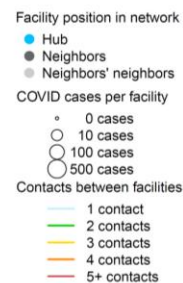
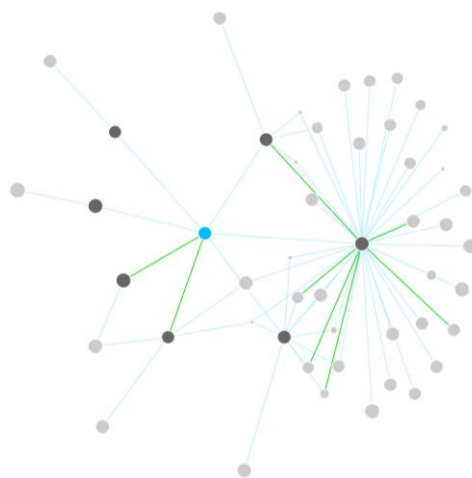
- Create convex hull of rooftop polygon
- Smartphone spends at least 1 hour inside

Final sample

- 501,503 smartphones
- If a home is visited, the smartphone returns on 16 different days, on average
- 5.1% of smartphones visit more than 1 facility

A network

Degree = 7
Strength = 9



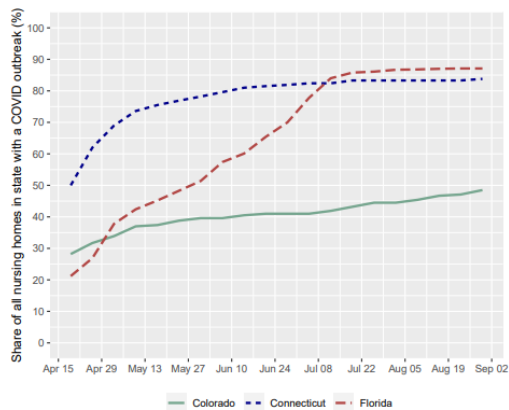
Degree = 38
Strength = 44

Degree distribution of nursing homes/ Cases as of May 31

	Without COVID	With COVID	
Average Degree	5.6	7.8	$p < 0.0001$
Average Strength	7.5	9.7	$p < 0.0001$

Our study: COVID cases over time in CT, FL, CO

Fig. S1: Fraction of state nursing homes with a reported COVID-19 outbreak over time.





Our study

- We show that a nursing home's first outbreak at week t predicts outbreaks at connected facilities in week $t+2$, relative to other homes in the same county-week.
- This finding motivates our “early warning system” assistance to LAC and the MSCA



Our study

- Undertake a large statistical study using hand-collected data from 22 states and CMS data as of May 31.
- Covariates of high cases relative to other homes in the same state.
 - For-profit status (+), high share Black (+), urban location(+), connections to other nursing homes (+)
 - CMS regulatory measures, share on Medicaid – not particularly predictive
 - **Connectedness**
- Setting connections to zero, holding other factors fixed, predicts **49%** reduction in cases among nursing homes residents



Solutions/Possibilities

- MSCA/LAC- helped with an early warning-communication system. What facilities should be informed when a facility has an outbreak?
- LAC- helped with a testing regime. If testing above CMS minimum can be undertaken, drive some allocation to highly connected homes.
- Advocacy for more federal assistance.