Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

experiences in the affected communities is also key to connecting with one another, which can also support individual recovery and resilience in the long term. Research should also focus on evaluating the effectiveness of different technologies and policies used to inform future pandemics.

Supportive Role of Telemedicine

Telemedicine has been a critical part of communication during this pandemic, with patients being increasingly screened over the phone. Further use of telemedicine to specifically prevent or limit adverse health and mental impacts of social isolation in residents will be invaluable, especially for those with chronic conditions who ordinarily have frequent healthcare visits.

Conclusion

To become a stronger, more resilient society both during and after the outbreak, we must focus on rebuilding central social foundations for vulnerable individuals in an innovative way. Once this viral crisis is over, our hope is that we do not forget the lessons learned about the value of creating and sustaining meaningful relationships with our oldest members of the public.

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Heat Maps for Surveillance and Prevention of COVID-19 Spread in Nursing Homes and Assisted Living Facilities

COVID-19 has created unique challenges for societies and health care organizations globally. The pandemic has placed our older adults at a formidable risk, because age is the most significant risk factor for severe morbidity and mortality.[1–4] Consequently, some of the most challenging situations occur in nursing homes (NHs) and assisted living facilities considered hotspots for COVID-19.

In Israel, NHs and assisted living facilities were some of the hardest hit by COVID-19.[5] Henceforth, a national task force appointed by the Israeli Prime minister named "Shield of Fathers and Mothers" was appointed.

To aid the task force, we devised a novel, interactive, real-time, dashboard-based heat map tool based on COVID-19 outbreak analytic metrics as well as spatiotemporal data analytics (http://covid19maps.org/). We developed a novel platform, focused on assisted living facilities and NHs, providing the Israeli Ministry of Health policymakers with a national graphical representation of all institutes (passkey protected to secure privacy issues). A basic layer allows identification of all facilities with diagnosed cases (resident or staff) by rendering them as "warm" (red color) if a positive COVID-19 case was identified within an interactive last *n* days (eg, last 14 days as a default for the system) or "cold" (blue color), displayed in Figure 1A. Importantly, in addition to a basic layer that allows representation of the quantity of the diagnosed cases (displayed as circle-size in the current platform), a key novelty of the developed platform is the ability to follow and intuitively display the trajectories within the facilities where cases were identified. The trajectories can be followed by using a set of mathematical analytic algorithms of evaluating the local COVID-19 spread rates based on replication rate, the rate of spread, and the doubling time (Appendix).[6] NHs with rapidly escalating trajectories are represented by warm colors and those with stable trajectories are represented by cold colors.

The dashboard enables prevention of and acting on disease outbreaks in this susceptible population in the following ways:

- A picture at a glance to direct efforts: The task force is able to quickly assess the national picture in all of the various nursing and assisted living homes and direct its diagnostic and therapeutic efforts (Figure 1A).
- Outbreak linkage: Outbreaks in NHs and assisted living facilities can be catalyzed by the health care staff,[7] some of whom work in several proximal facilities. The heat map can assist the epidemiologic investigation by allowing an online display of nearby infected facilities, linking the outbreak in adjacent facilities to the staff (Figure 1B and 1C), thus speeding up the investigation.
- Tailoring of disease mitigation steps by heat map layering: Most of the sweeping public health measures endorsed by health policymakers lack in data and are nonselective. The resultant detrimental health implications on the older population in these facilities may be severe. The dashboard we developed monitors municipalities as well as the nursing and assisted living facilities. By layering over the 2 heat maps (Figure 1D), policymakers are able to quickly assess whether the facilities are located in "hot" or "cold" municipal zones and are able to make data-driven, precise mitigation steps in the

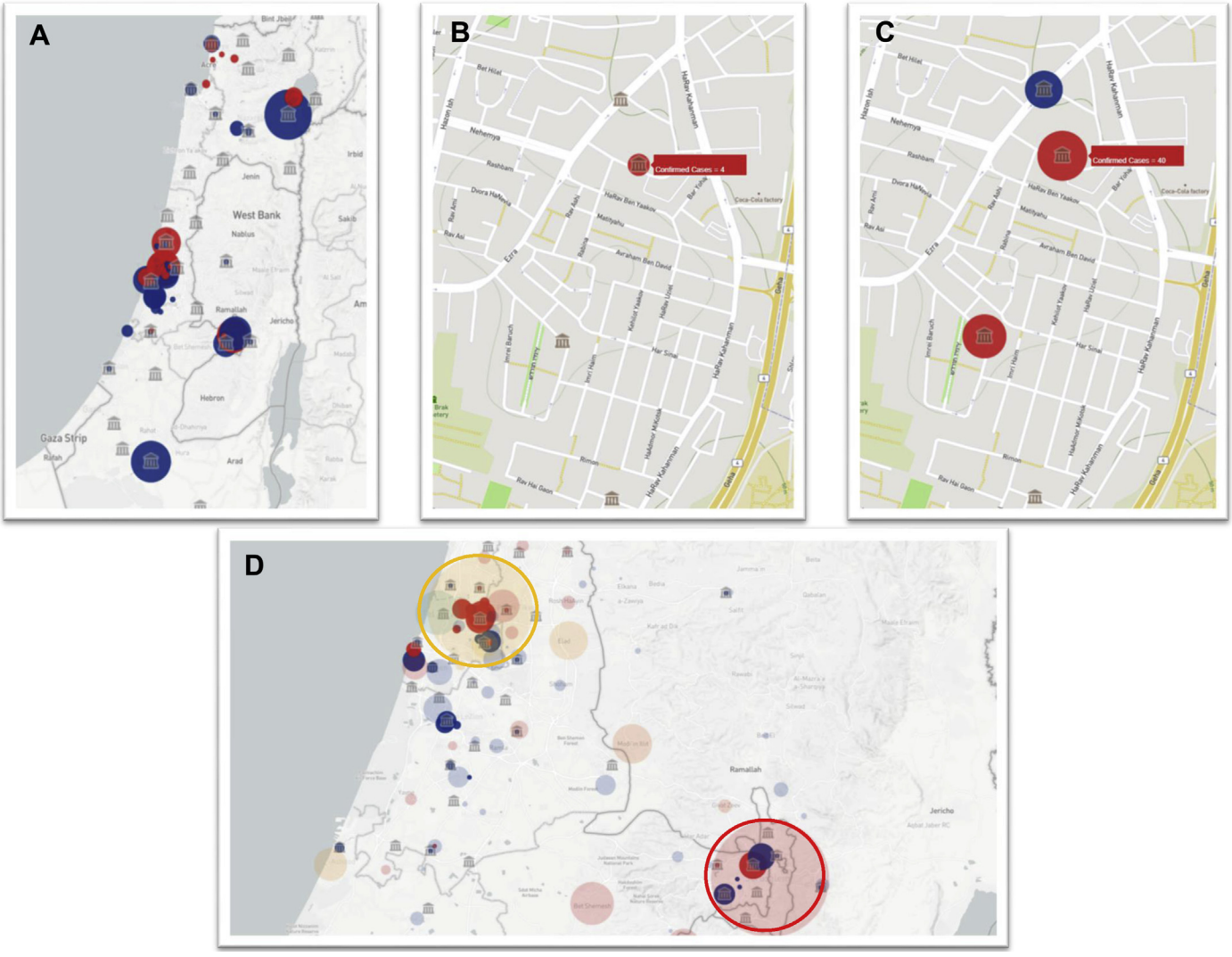

Fig. 1. The heat map display of COVID-19 spread in nursing and assisted living facilities in Israel. The heat map allows policymakers to make informed decisions by displaying vital information in an easily understandable fashion. (A) A national picture at a glance, where the red color indicates facilities with a diagnosed case in the past 2 weeks (blue color indicates the opposite). The circle size indicates the number of cumulative cases. As disease outbreaks in facilities has been linked to staff workers, monitoring facilities (staff, resident, or both) adjacent to hot spots assists in directing diagnostic efforts of residents and more importantly joint staff. In the city of Bnei Brak, an outbreak in 4 staff members was identified on the April 17 (B). On May 10, a widespread outbreak in residents in the index and 3 neighboring facilities was identified with a total of 94 diagnosed cases in residents and a total of 12 staff members (C). Moreover, as the nursing and assisted living facilities are a part of their municipalities (staff residence, visitation) layering the municipal heat map over the facilities display aids in a more comprehensive risk assessment. (D) The lighter shaded halos represent disease trajectories in the cities of Bnei Brak (upper) and Jerusalem, sites of major disease outbreaks in Israel. Layered over the municipal heat map are the nursing and assisted living facilities located within their boundaries.

facilities. Moreover, as staff may live in the municipalities around the facilities, this feature enables better risk assessment.

Patient Allocation

Some of the residents diagnosed with COVID-19 deteriorate, and their admission to a general hospital might be inevitable. The system enables policymakers to decide where to admit these often-complex patients based on the hospital burden for ventilated and nonventilated patients using the heat map layer displaying the hospital occupancy burden and trajectories. Optimizing patient allocation will enable the health care system to provide better care, as the older patients will be directed to hospitals with less burden, limiting health care contingency.

Channeling Messages to Leadership and the General Public

As some of the disease mitigation steps taken in these facilities are consequential for the older population,[8] the importance of channeling the decisions transparently is of utmost importance. The simple and intuitive heat map display helps deliver a clear reasoning for actions taken.

Policymakers as well as health care providers must contain the disease spread as tightly as possible in this susceptible population. We urge countries and health care organizations to adopt such tools for data-driven monitoring of outbreaks for the vulnerable population living in NHs. Analytical heat maps, beyond standard dashboard-based graphic data representation of COVID-19 case quantities, are essential for tracking COVID-19 pandemic dynamics, preventing institute-based outbreaks, and may be instrumental for devising diagnostic and therapeutic strategies in the high-risk population.

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Coronavirus Lockdown: Forced Inactivity for the Oldest Old?

To the Editor:

According to the WHO, as of March 15, a total of 153,517 patients have been diagnosed with coronavirus disease 2019 (COVID-19) worldwide—with a death toll of 5735 (https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200315-sitrep-55-covid-19.pdf?sfvrsn=33daa5cb_6). These heartbreaking figures have led the most affected countries (notably, Italy and Spain) to implement strict national lockdowns, ordering people to stay home—except for essential reasons such as going to work, medical appointments, or buying food—in order to reduce virus spread.

This exceptional situation is having important consequences for everyone in general but for the oldest old—those aged 85 years and older—in particular. This population segment is indeed very vulnerable, especially under stressful situations that challenge body functional reserve. On one hand, older adults present the greatest risk of mortality for COVID-19 (odds ratio per year increase of 1.10, 95% confidence interval 1.03 to 1.17),[1] and therefore require strict protection measures against the infection. On the other hand, prompting the oldest old to stay home might further increase sedentary behavior, a situation that is likely to contribute to aggravating sarcopenia, frailty, and age-related functional decline, and to increase the risk of all-cause mortality.[2]

Important lessons can be drawn from other confinement conditions in the oldest old such as mainly hospitalization, where they spend most of the time in bed, including those who are able to walk independently.[3] This scenario can lead to major negative health consequences even when the illness that prompted hospitalization is successfully treated. Ten days of bed rest suffices to result in marked impairments in muscle mass and strength, walking speed, and functional ability among individuals aged about 70 years.[4] Approximately one-third of older adults lose their ability to independently perform 1 or more activities of daily living from hospital admission to discharge,[5] which has important short- and midterm consequences—including a higher risk of nursing home admission, hospital admission, and mortality.[6]

There is growing evidence that the oldest old people can adapt to exercise just like younger individuals and deserve to benefit from it.[7] The incidence of functional decline during hospitalization has been inversely associated with the levels of physical activity.[8] A recent randomized controlled trial from our group showed that even a simple exercise intervention (doing uncomplicated exercises such as walking back and forward along a corridor and rising from a chair twice a day for ~20 minutes in total) was safe and significantly reduced functional decline (by 64%) in oldest old people (aged 88 years on average) who had been hospitalized for a median time of 7 days.[9] Furthermore, the intervention proved especially effective in those with a worse functional status at baseline.[10]

The situation for the oldest old is especially dramatic in light of the recent recommendations from the Italian Society of Anesthesiology and Intensive Care for "exceptional conditions of imbalance between needs and available resources" in intensive care unit admissions of this country (http://www.siaarti.it/SiteAssets/News/COVID19%20-%20documenti%20SIAARTI/SIAARTI%20-%20Covid19%20-%20Raccomandazioni%20di%20etica%20clinica.pdf). The considerations for potential triage during the ongoing COVID-19 outbreak in Italy include a patient's age and chance of survival. Under these circumstances, it is not surprising that some oldest old Italians are gripped with fear and stuck to immobility.

The need for avoiding virus infection should not overshadow the deleterious effects that disuse can impose in all individuals and particularly the oldest old. Public health efforts to promote physical activity and "break" sedentary behavior—which can be achieved with simple home exercises such as rising up from a chair several times a day and avoiding continuous sitting for long hours—during lockdown are to be recommended.

Methodology Appendix

The map displays real time COVID-19 disease spread metrics based on data derived from Johns Hopkins University and Israel Ministry of Health datasets.[1]

We assessed disease spread by 2 measures: the replication rate (RR) and the rate of spread (RoS).

RR was defined as the slope of the logarithmic curve of the natural logarithm of the number of cases diagnosed in each facility. We calculated the slope of a sliding window of size (dT), where we chose dT = 3. Let C_t be the number of validated cases of COVID-19 for each facility at day t.

$$Replication\ Rate = \frac{\ln(C_{t+dT}) - ln(C_t)}{dT}.$$

RoS was calculated to provide a long-term trajectory. It is calculated by running a linear regression of ln(Confirmed Cases) on time, and taking RoS to be the slope coefficient of the regression. We used a 7-day sliding window, as in Sajadi et al.[2]

$$(RoS)Rate\ of\ Spread\ (RoS)_{n+7} = slope\ of\ the\ linear\ regression\ on\ \ln(C_n), \ldots, \ln(C_{n+6})$$

The calculation of the RoS was conducted by using a window for regression that does not include any missing values. From the RoS, one can estimate the doubling time of cases[3]:

$$\text{Doubling Time} = \ln(2) * \frac{1}{RoS}.$$

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