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TACKLING THE EMERGENCY. THE SCALING UP OF PRODUCTIVE CAPACITY IN THE ITALIAN HEALTH SYSTEM: PROGRESS OVERVIEW

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This note reviews the progress of the National Health System (Servizio Sanitario Nazionale or SSN) in strengthening productive capacity to respond to the Covid-19 epidemics over the period March 1 – April 14, 2020. The resources and the productive capacity of the SSN were not designed to face a large-scale epidemic. In particular, shortages of intensive care units (ICU) proved to be a material problem in regions where the epidemic hit hardest. The Italian system reacted quickly, even though unevenly across regions. Swift actions to close gaps on the availability of (1) ICU beds, (2) medical personnel, and (3) personal protective equipment (PPE) and swabs came from both the central and the regional governments. Both ICU beds and medical personnel working in publicly owned hospitals and establishments have increased significantly so far, by almost 65 percent and 3.5 percent respectively. The increase has been stronger in the Northern regions, reflecting the deepest impact of the epidemic. Similarly, supplies of PPE and swabs from the Civil Protection agency have been larger towards the Northern regions. As could be expected correlation between the volumes supplied across different protective equipment types was observed.

The strategy for increasing productive capacity

Tackling the emergency required balancing demand and supply of healthcare. While demand for healthcare was contained by means of lockdown and social distancing measures (key to reduce the speed of contagion and the spread of the disease), healthcare supply was expanded by scaling up of the productive capacity of the health system (in particular in terms of ICU beds).

Expanding capacity is typically very challenging over the short term. It requires identifying appropriate physical spaces (or building/adapting them), purchasing equipment and materials and hiring additional (specialized/technical) personnel. The latter, in particular as regards anesthesiologists, remains the most delicate and demanding challenge, since – while some of the tasks

[1] Banca d'Italia. The opinions expressed are personal and do not necessarily reflect those of the Bank of Italy.
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can be demanded to medical doctors specialized in other disciplines – there are a number of tasks that only trained anesthesiologists can perform. In emergency scenarios, the effort to expand capacity is typically accompanied by strategies to re-direct capacity from non-urgent activities (i.e. elective surgeries) towards urgent treatments and services, and by increasing the intensity in the use of existing resources (as for example increasing the number of working hours and shift durations of existing staff and use of reserve medical supplies). The need for rapid adaptation of health systems during emergencies can also highlight tensions or weaknesses in their governance frameworks, which will need to be addressed as well after the emergency. These latter aspects will not be analyzed in what follows. The note will also not cover all the efforts to expand productive capacity. Based on available information and data, it will focus on the adjustment of three critical dimensions in the fight against the Covid-19 epidemic during the emergency phase: i) ICU availability; ii) SSN personnel; and iii) personal protective material and swabs.

The documented actions reflect measures by both regional governments and the central government, including the March 17 Government decree which increased resources for SSN spending and, among other things, allowed the hiring of new staff. [2]

ICU

Before the Covid-19 crisis, the total number of ICU beds available to the SSN was about 5,300.[3] During the crisis and to respond to surging needs, about 3,360 beds have been added (almost a 65 percent increase) and a further increase by almost 2,400 beds is still planned (an increase of about 30 percent with respect to the current actual endowment) which if completed would more than double the overall capacity. While this is a substantial increase in all regions, its geographic distribution is uneven, reflecting heterogeneity in the initial endowment and differences in the severity of and response to the epidemic (Figure 1).

Prior to the epidemic, the number of ICU beds ranged on average from 7 to 10 per 100,000 inhabitants, with outliers being Liguria (12 beds every 100,000 inhabitants) and Trentino-Alto Adige (6.7 beds every 100,000 inhabitants). Because of the measures implemented to respond to the emergency, these differences increased substantially. Many regions (in particular in the Center-North) doubled the incidence of beds, and Trentino-Alto Adige almost tripled it (to 17.6 from 6.7). Currently, Emilia-Romagna has the highest incidence of ICU beds (21.6), followed by Toscana, Lazio and Trentino-Alto Adige (19.4, 18 and 17.6 respectively). In Lombardia and Veneto, the core of the epidemic spread for many weeks, ICU beds incidence is currently around 16.5 per 100,000 inhabitants. In many of the Southern regions, the capacity increase has been more limited, mirroring also the lower diffusion of the disease. Planned further expansion shows that regions are still building capacity to react, should the situation require (even though over the last week the number of ICU hospitalizations has consistently decreased, according to the data regularly released by the Civil Protection agency). However, even including planned expansions, ICU beds incidence would remain significantly more limited in the South.

According to the last available comparable cross-country data,[4] in 2012 Italy was ranking tenth among European countries in terms of ICU beds per capita, well below Germany (at the top of the list with roughly 30 ICU beds per 100,000 inhabitants), but above countries of comparable size, such as France and Spain. With the current endowment of less than 20 ICU beds per 100,000 inhabitants, Italy would have jumped at the fourth place of that ranking, if the other countries had not adjusted

[2] A discussion of the so called 'Decreto Cura Italia' is available on Banca d'Italia's website here.

[3] The latest available official data of the Ministry of Health refer to the end of 2018. Information on the recent evolution of ICU beds has been collected by the Bank of Italy regional branches.

[4] See Rhodes, A., P. Ferdinande, H. Flaatten, B. Guidet, P. G. Metnitz and R. P. Moreno (2012), *"The Variability of Critical Care Bed Numbers in Europe"*, *Intensive Care Medicine*. 38 (10): 1647–1653.

their ICU capacity as well. The unavailability of updated information for all countries does not allow a more precise comparison.

SSN Staff

Before the start of the Covid-19 crisis, the number of medical staff on open-ended contracts working for publicly owned hospitals and establishments was about 572,000. This is inclusive of 115,500 medical doctors and 344,100 nurses. Anaesthesiologists, both on open-ended and temporary contracts were about 12,000. The incidence of medical staff in Italy was about 95 workers every 10,000 inhabitants (57 nurses, 19 medical doctors and 19 other technical personnel every 10,000 inhabitants). Similarly to ICU beds, a significant regional heterogeneity could be observed (Figure 2). In particular, the regions with a smaller healthcare workforce were those subject to adjustment plans, which imposed severe limitations on new hires (Abruzzo, Campania, Calabria, Lazio, Molise, Puglia, Sicilia). This stands out with more clarity when data on nurses are considered, while the relative endowment of medical doctors displays a slightly lower range of variation. It should also be noted that in some cases, such as in Lombardia and Lazio, the apparently low endowment of medical staff is due to the fact that private units operating within the framework of the SSN (so called *privati accreditati*) are not taken into account in these figures.

Because of the sudden surge in needs, the Government allocated new resources to the SSN to allow about 20,000 new hires, which would represent a 3.5 percent increase of the medical workforce.[5] All the new planned hires have been completed, and they include more than 4,300 additional doctors (mostly anesthesiologists), almost 9,700 nurses, and 6,000 mainly technical personnel. The increase in staff (mainly through fixed-term contracts) is significant, considering that the public healthcare workforce has decreased by more than 2 percent in the last five years, with a marginal increase only in 2018.[6] The increase in medical staff is positively correlated with the number of new ICU beds created in each region. The correlation is slightly more pronounced if we consider doctors only.

Personal protective equipment (PPE) and swabs

Protective gear is an essential element to enable an effective response from medical personnel. Starting from March 1, the Civil Protection agency distributed numerous supplies, including machineries, personal protective equipment and swabs to the Italian regions.

Based on the information regularly issued by the Civil Protection agency, this note focuses on three widely used PPE items (masks, gloves and suits) and on swabs. It is worth emphasizing that these data can provide only a partial view of the response, because regions and local administrations have been sourcing these materials also through other means (e.g. direct purchases). Given the magnitude of the Civil Protection supplies, this overview remains nevertheless informative.

Figure 3 displays the cumulative number of tested swabs in different regions, normalized by population size.[7] On March 1 the regions that had performed the highest number of tests were Veneto (6.6 swabs every 1,000 inhabitants), Lombardia (4 swabs every 1,000 inhabitants) and Friuli-Venezia Giulia (2.8 swabs every 1,000 inhabitants). In the following weeks, dramatic increases were observed in Trentino-Alto Adige and Valle d'Aosta, but the overall ranking remained broadly stable over time with increases observed everywhere (even though at different rates). The Civil Protection agency has

[5] On top of new hires, the "Cura Italia" Decree introduced the possibility to work even beyond the retirement age for workers in the medical sector, and simplified the procedures to access the health profession.

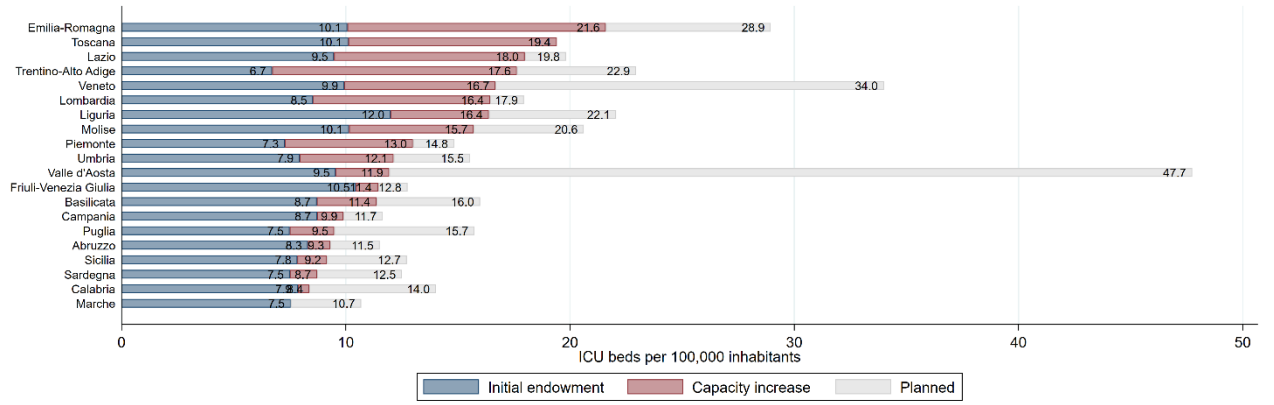
[6] Most but not all of new hires involve anesthesiologists. Unfortunately, the number of anesthesiologists by region is not available in 2018. If we considered anesthesiologists only, the percentage increase would be much higher.

[7] Tested swabs include both those distributed by the Civil Protection and those that Regional Health Systems purchased autonomously.

contributed to making tests possible by providing swabs to the regions. The distribution of these supplies reflected among other things the intensity of the emergency: roughly 50 percent of the swabs delivered by April 14 where provided to four of the most severely hit regions (Lombardia, Emilia-Romagna, Piemonte and Veneto).

The Civil Protection agency was also actively involved in the distribution of PPEs. Data normalized by population size are reported at three points in time: March 15, April 1 and April 14. Overall, the number of distributed PPEs has been steeply increasing over time. While masks and gloves were distributed from March 1, protective suits lagged behind, and started to be distributed only later. As for swabs, regions in the North received the highest number of PPE supplies, compared to regions in the South. The rankings among regions and for different PPEs are quite stable over time and a certain degree of complementarity across PPEs is observed, as the supplies of different PPEs are positively correlated across regions.

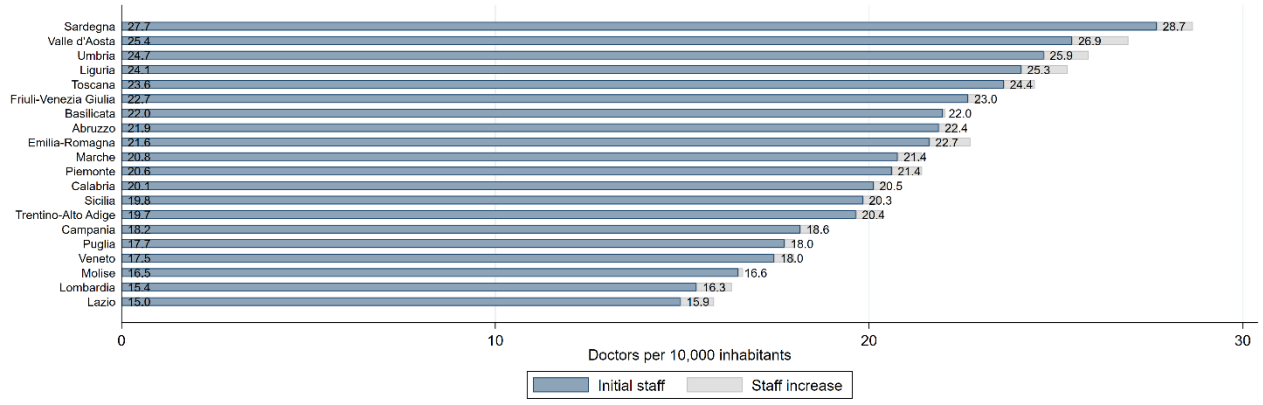
Figure 1: Availability of beds in ICUs across regions



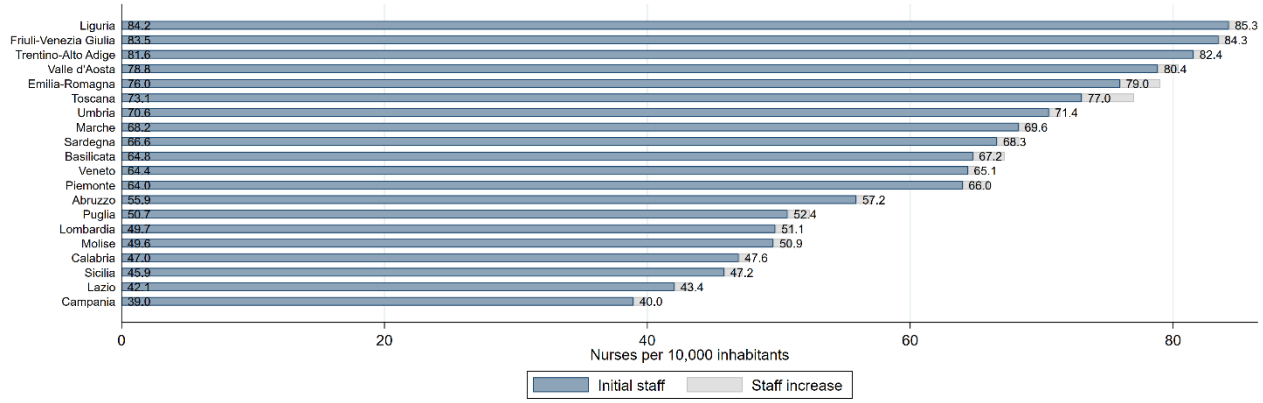
Source: Ministry of Health, Istat and data collected by Bank of Italy regional branches.

Figure 2: Availability of medical staff across regions

(a) medical doctors

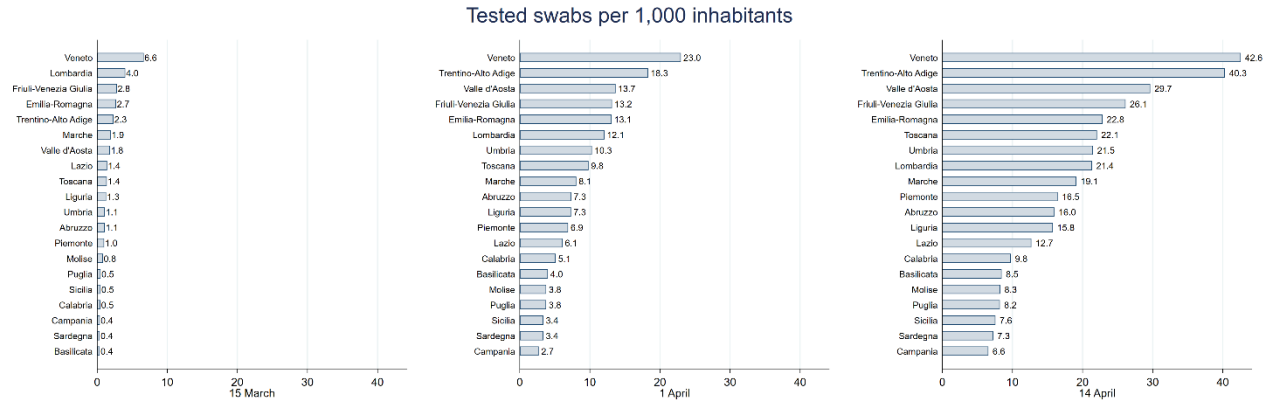


(b) nurses



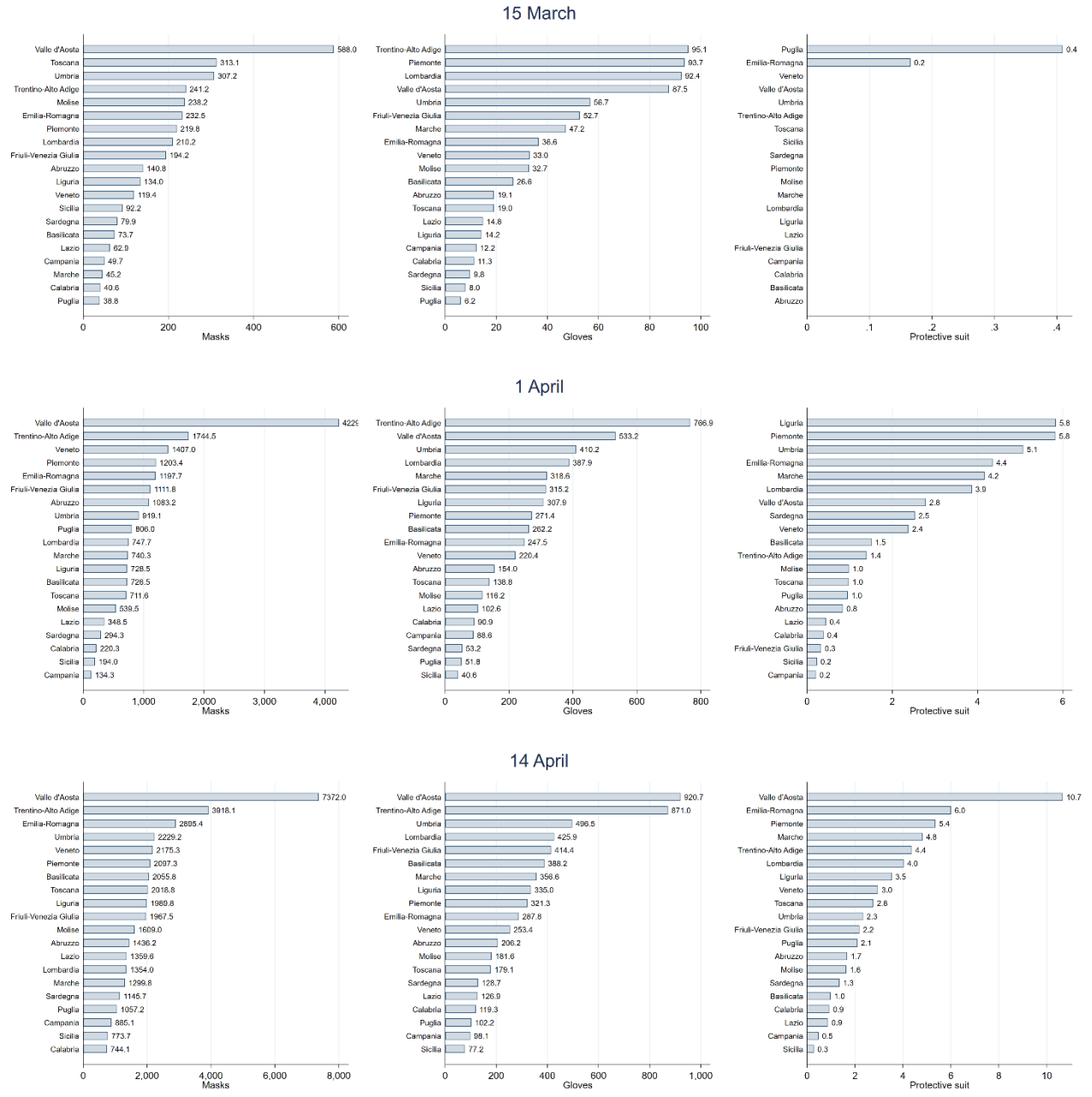
Source: Ministry of Health, Istat and data collected by Bank of Italy regional branches.

Figure 3: Tested swabs across regions



Source: Civil Protection agency and Istat.

Figure 4: Distribution of PPEs from the Civil Protection agency to regions



Source: Civil Protection agency, "Analisi Distribuzione Aiuti" (ADA).

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