POLICY NOTE NO. 3 / 20 April 2020

Estimating Local Healthcare Capacity to Deal with COVID-19 Case Surge: Analysis and Recommendations

UP COVID-19 Pandemic Response Team

The Challenge: Estimated Severe and Critical Cases at Peak

The rising number of cases of COVID-19 infections on a daily basis is a serious concern as there are limits to hospital care capacity for patients with serious symptoms (e.g. difficulty in breathing). Should the number of infected people rapidly rise, there may come a time when the hospital care resources will be overwhelmed. The UP COVID-19 Pandemic Response Team, in its latest model run, estimates the number of confirmed COVID-19 cases to reach 9,000 to 44,000 by the end of April 2020. As of April 16 DOH reports a total of 5,660 confirmed cases.

Majority (around 81%) of Filipinos who contract COVID-19 will exhibit uncomplicated or mild illness. These patients do not require hospitalization, but isolation is necessary in order to prevent viral transmission. Approximately 14% will develop severe illness requiring oxygen therapy, while the remaining 5% will require intensive care unit (ICU) treatment. Estimates on the number of Filipino COVID-19 patients who will require hospitalization is shown in Table 1.

In a scenario at the peak of the COVID-19 crisis, where a COVID-positive person can infect two others (R0=2), our simulations show that about 51,933 Filipinos will need hospitalization, approximately 13,194 of whom will need ICU treatment. Outside of Metro Manila, the biggest bulk of severe and critical patients would come from Regions III (Central Luzon), IV-A (CALABARZON), VI (Western Visayas), and VII (Central Visayas).

Table 1. *Projected number of COVID-19 patients requiring hospitalization*

REGION	ESTIMATED NUMBER OF COVID PATIENTS REQUIRING HOSPITALIZATION AT PEAK (SEVERE + CRITICAL CASES)			ESTIMATED NUMBER OF CRITICAL CASES (REQUIRING ICU)		
	R0=2	R0=2.5	R0=3	R0=2	R0=2.5	R0=3
PHILIPPINES	51,933	62,312	69,231	13,194	15,831	17,588
National Capital Region (NCR)	38,916	46,699	51,888	9,887	11.864	13,182
Cordillera Administrative Region (CAR)	272	326	362	69	83	92
Region I – Ilocos	493	591	656	125	150	167
Region II - Cagayan Valley	98	117	130	25	30	33
Region III - Central Luzon	2,303	2,763	3,069	585	702	780
Region IV-A – CALABARZON	5,820	6,983	7,758	1,478	1,774	1,971
Region IV-B – MIMAROPA	60	72	80	15	18	20
Region V – Bicol	366	439	487	93	112	124
Region VI - Western Visayas	840	1,007	1,119	213	256	284
Region VII - Central Visayas	1,628	1,954	2,170	414	496	551
Region VIII - Eastern Visayas	147	175	194	37	44	49
Region IX - Zamboanga Peninsula	126	151	168	32	38	43
Region X - Northern Mindanao	237	285	316	60	72	80
Region XI – Davao	228	273	303	58	69	77
Region XII – SOCCSKSARGEN	218	261	290	55	66	74
Region XIII – Caraga	65	78	86	17	20	22
Bangsamoro Autonomous Region in Muslim Mindanao (BARMM)	117	140	155	30	36	39

Can Local Healthcare Systems Absorb the Surge?

There are 456 hospitals in the country classified either as Level 2 or 3. Altogether, excluding those classified as specialty hospitals, these hospitals combined will have a total bed capacity of 67,119. Approximately 41% of these beds are in government-owned hospitals while the remaining 59% are in private hospitals. Figure 1 shows the proportion of hospital beds according to ownership.

In this analysis, it is assumed that 80% of these beds would be used for treating people with other illnesses. In 2012, the average bed occupancy rate among Level 3 hospitals in Metro Manila was 77.2%. DOH-retained hospitals across the nation had an average bed occupancy rate of 105% in 2013. For the treatment of critical cases, there are a total of 2,335 critical care beds in 450 intensive care units in the Philippines. This corresponds to 3.1% of the total approved bed capacity of Level 2 and 3 hospitals in the country.

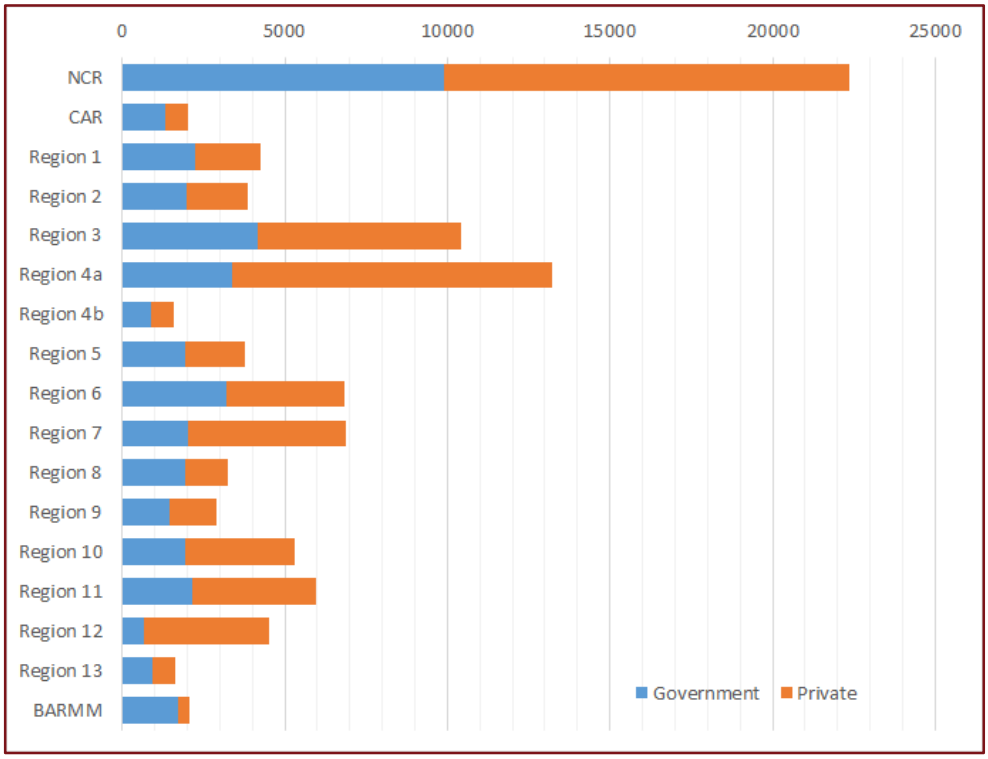
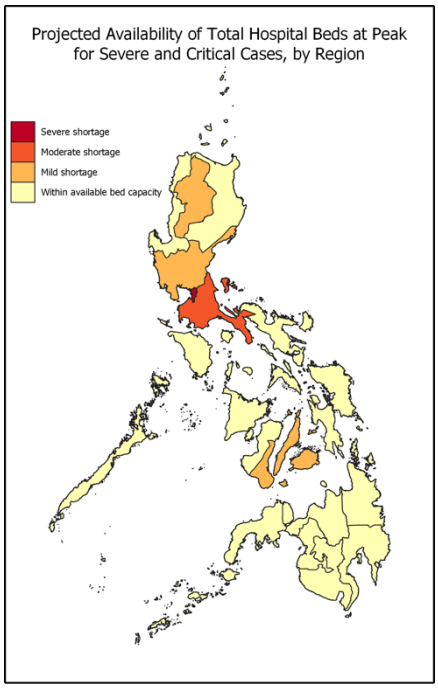


Figure 1. *Number of hospital beds according to ownership, per region*

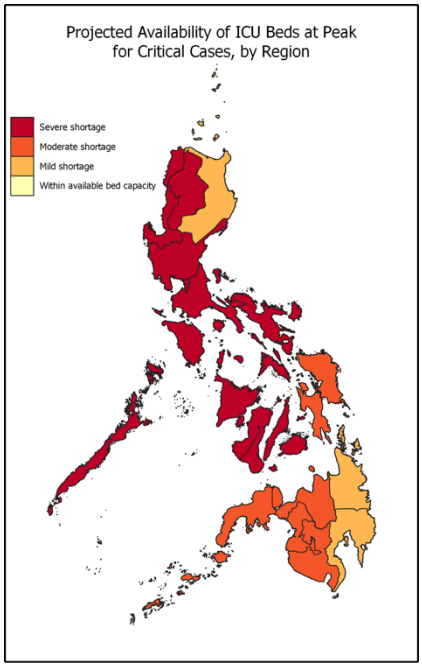
We estimate, based on our projections (Figure 2) and assuming a scenario with a reproductive rate (R0) of 2, that three provinces adjacent to NCR, namely, Bulacan, Cavite, and Rizal, may face a serious shortage of hospital beds for handling severe and critical cases. COVID-19-related patients alone would fill up the total bed capacities in these areas. We also identify 25 provinces and two cities in Metro Manila, namely, Malabon and Navotas, which do not have Level 2 or 3 hospitals within their geographic bounds. Thus, it is imperative to capacitate Level 1 hospitals in these areas to address the situation.

On the projected availability of ICU beds corresponding to critical COVID cases at the provincial and regional levels (Figure3), we estimate that it is beyond the capacity of most provinces to handle the surge of the COVID-19 crisis in the Philippines at its peak. There is a lack of available critical care beds because across the country, there are only a little over 2,000 ICU beds to cater to the projected 8,800 to 19,800 critical COVID-19 cases.



REGION	HOSPITAL BEDS (LEVEL 2&3)	SEVERE AND CRITICAL CASES AT PEAK AS PERCENTAGE OF TOTAL BED CAPACITY		
		R_0=2	R_0=2.5	R_0=3
PHILIPPINES	67,119	77%	93%	103%
National Capital Region (NCR)	18,932	206%	247%	274%
Cordillera Administrative Region (CAR)	1,214	22%	27%	30%
Region I - Ilocos	2,653	19%	22%	25%
Region II - Cagayan Valley	1,926	5%	6%	7%
Region III - Central Luzon	6,121	38%	45%	50%
Region IV-A - CALABARZON	8,309	70%	84%	93%
Region IV-B - MIMAROPA	307	20%	23%	26%
Region V - Bicol	2,124	17%	21%	23%
Region VI - Western Vlsayas	4,823	17%	21%	23%
Region VII - Central Visayas	5,286	31%	37%	41%
Region VIII - Eastern Visayas	1,371	11%	13%	14%
Region IX - Zamboanga Peninsula	1,462	9%	10%	11%
Region X - Northern Mindanao	3,270	7%	9%	10%
Region XI - Davao	4,747	5%	6%	6%
Region XII - SOCCSKSARGEN	2,277	10%	11%	13%
Region XIII - Caraga	1,085	6%	7%	8%
Bangsamoro Autonomous Region in Muslim Mindanao (BARMM)	1,212	10%	12%	13%

Figure 2. *Projected availability of hospital beds at the regional level during peak*



REGION	HOSPITAL BEDS (LEVEL 2&3)	CRITICAL CASES DURING PEAK AS PERCENTAGE OF ICU BED CAPACITY		
		R0=2	R0=2.5	R0=3
PHILIPPINES	2,081	634%	761%	845%
National Capital Region (NCR)	587	1685%	2022%	2246%
Cordillera Administrative Region (CAR)	38	184%	220%	244%
Region I - Ilocos	82	152%	182%	203%
Region II - Cagayan Valley	60	42%	50%	55%
Region III - Central Luzon	190	308%	370%	411%
Region IV-A - CALABARZON	258	574%	689%	765%
Region IV-B - MIMAROPA	10	161%	192%	213%
Region V - Bicol	66	141%	169%	188%
Region VI - Western Vlsayas	150	143%	171%	190%
Region VII - Central Visayas	164	252%	303%	336%
Region VIII - Eastern Visayas	43	88%	105%	116%
Region IX - Zamboanga Peninsula	45	71%	85%	94%
Region X - Northern Mindanao	101	60%	71%	79%
Region XI - Davao	147	39%	47%	52%
Region XII - SOCCSKSARGEN	71	78%	94%	104%
Region XIII - Caraga	34	49%	59%	65%
Bangsamoro Autonomous Region in Muslim Mindanao (BARMM)	38	79%	95%	105%

Figure 3. *Projected availability of Intensive Care Unit (ICU) beds at the regional level during peak of the Covid-19 crisis*

If we are not able to "flatten the curve" or significantly reduce the transmission of the COVID-19 virus in the Philippines through the enhanced community quarantine ECQ, the healthcare system will be overwhelmed way beyond their

capacity as clearly seen in the relatively low number of hospital and ICU beds. Approximately 35,000 additional beds are required to accommodate the peak number of cases in a scenario wherein the reproductive number (R0) is 2. Certain regions (I, III, IV, V, VI and VII) may need to stretch their capacities to accommodate the cases during the peak.

Health human resource is another key determinant to the capacity of the healthcare system to absorb the surge of patients. To handle critical patients, there should ideally be one attending physician for every two patients, and one-on-one nursing. Additionally, there should be one intensivist, one pulmonologist, and one infectious disease specialist for every five patients. At R0=2, this roughly corresponds to 14,500 doctors and 13,200 nurses. As of 2018, there are 40,775 doctors and 90,308 nurses in the country. Peak-time critical COVID-19 cases alone would require the attention of approximately 21% of our healthcare workers. Note that this is over and above the already heavy regular workload of our health human resource.

Table 2. *Healthcare workers and hospital bed statistics per 10,000 population*

REGION	DOCTORS	NURSES	MEDTECH	HOSPITAL BEDS
PHILIPPINES	**3.7**	**8.2**	**1.2**	**6.1**
National Capital Region (NCR)	10.0	12.0	3.0	13.5
Cordillera Administrative Region (CAR)	6.0	14.8	2.0	6.5
Region I – Ilocos	3.8	10.5	1.3	4.8
Region II - Cagayan Valley	3.2	11.4	1.3	5.1
Region III - Central Luzon	3.4	7.2	1.1	5.0
Region IV-A – CALABARZON	2.7	6.3	0.6	5.3
Region IV-B – MIMAROPA	1.8	5.5	0.5	1.0
Region V – Bicol	2.4	7.3	0.9	3.4
Region VI - Western Visayas	2.9	6.8	1.0	5.9
Region VII - Central Visayas	2.9	9.9	1.2	6.6
Region VIII - Eastern Visayas	2.5	6.6	1.3	2.8
Region IX - Zamboanga Peninsula	2.5	9.0	1.0	3.7
Region X - Northern Mindanao	2.7	8.8	0.9	6.4
Region XI – Davao	2.9	6.7	1.0	8.9
Region XII – SOCCSKSARGEN	2.3	7.8	1.1	4.9
Region XIII – Caraga	2.0	7.4	1.0	3.8
Bangsamoro Autonomous Region in Muslim Mindanao (BARMM)	0.8	3.8	0.3	2.7

There are, on the average, 3.7 doctors per 10,000 population in the Philippines. This is below the World Health Organization-prescribed ratio of 1 doctor for 1,000 persons (or 10 per 10,000). Moreover, there is a wide discrepancy across regions of the country. For instance, the ratio is 10 per 10,000 in NCR while it is 0.8 per 10,000 in BARMM. Furthermore, there are 8.2 nurses per 10,000 nationwide compared to the WHO-prescribed ratio of 1:1,000.

The enhanced community quarantine reduced the Reproductive Number, R, (Figure 4), which helped get the hospital care system to deliver services to those in need. We attribute this downward trend mainly to the ECQ. As of 19 April 2020, the Reproductive Number, R, for the Philippines is at 1.072. Should the ECQ be lifted on 30 April 2020, we expect the number of Covid19-related cases and the value of R to again rise. We should prepare early for this expected surge of Covid19 patients once the quarantine is lifted.

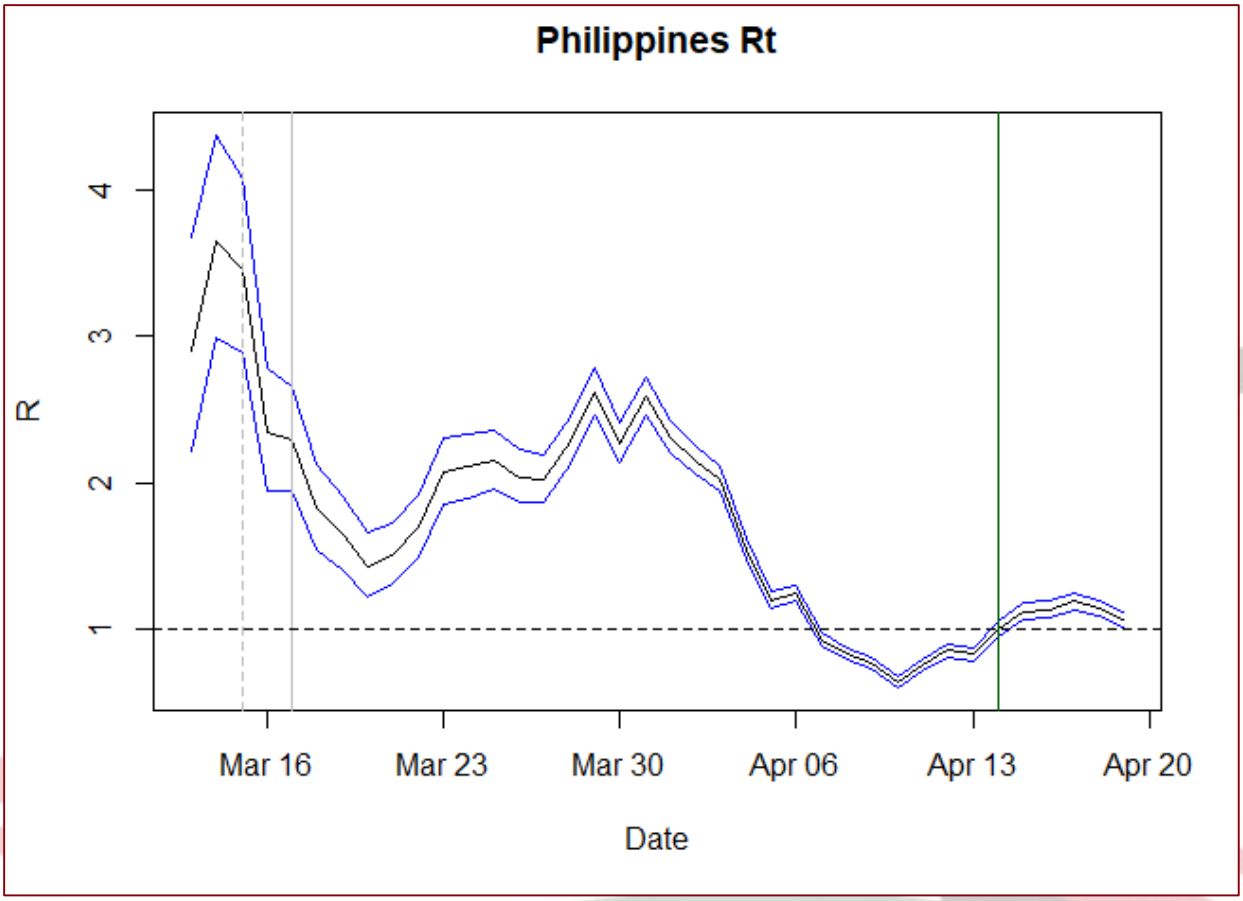


Figure 4. *Time series graph of Reproductive Number, R, for the Philippines*

The estimates provided in this document can be used as a guide for planning. These include: the number of hospital beds, ICU beds, and human resource availability. The number of medical equipment and supply of PPEs will also need real-time monitoring to guide administrators, decision-makers, and donors on the allocation of resources and triaging services.

Notes:

The outcome of the analysis is only as good as the quality of the available data. There is also a need for more refined information on the actual bed occupancies, critical care bed numbers, and number of healthcare workers.

For questions or clarifications related to the technical or other aspects of this policy note, please send an email to upri.covid19@up.edu.ph. Scientific reports related to this statement will be posted in the endcov.ph site.