2020

THE ECONOMIC COST OF POLICY ACTION AGAINST THE OUTBREAK SCENARIOS OF COVID-19 IN LEBANON

COSTING THE HEALTHCARE INTERVENTION

REPUBLIC OF LEBANON
MINISTRY OF FINANCE

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LIST OF ACRONYMS

GDP	Gross Domestic Product
ICU	Intensive Care Units
MoF	Ministry of Finance
MoPH	Ministry of Public Health
PPE	Personal Protective Equipment
SMEs	Small and Medium Enterprises
WHO	World Health Organization

EXECUTIVE SUMMARY

- The Lebanese Government faces a new set of critical challenges with the COVID-19 outbreak: countering the spread of the virus and responding to the ensuing socioeconomic challenges.
- Amidst a deepening economic and financial crisis, treatment costs would inevitably increase the financing gap: the average cost of testing per patient is estimated to be 90 USD [1][2], while the weighted average cost of hospitalization amounts to 373.34 USD per patient per day [3][4][5]. The weighted average cost of intensive care is estimated around 1,200 USD per patient per day [6][7], and the cost of personal protective equipment is of 133.34 USD for two weeks [8].
- Any hospitalized citizen would therefore cost an amount ranging from 5,937 USD to 26,203 USD for an average of 20-day stay; between 49 and 218 times the monthly income of people living on less than 4 USD a day, who constitute 1/3 of the Lebanese population [9].
- The healthcare response, including the treatment of confirmed cases and factoring in costs of a larger-scale intervention, will be central in preventing the escalation of the crisis, yet will inevitably add to the fiscal burden of the Ministry of Public Health (MoPH).
- With limited available data to assess the severity of the outbreak in Lebanon, this study investigates historical data of the Spanish flu pandemic in different US cities and identifies those with comparable response scenarios. It associates similar patterns of mortality rates to project two possible trajectories for the spread of the virus over a period of 24 weeks.
- Although final numbers could significantly deviate from the model, in the event of a second wave (scenario 1), the total number of infected people is expected to reach 9,000 cases over a period of 24 weeks. A more extreme scenario (scenario 2), also foreseen in this study, is less likely to happen given the strict non-pharmaceutical measures put in place by the Lebanese government.
- Scenario 1 follows a pattern showing two waves with flattened curves. In this scenario, the cumulative amount needed to treat COVID-19 confirmed cases over a period of 6 months is 43.01 million USD.
- Scenario 2 follows a pattern showing one wave with higher contamination and mortality rates. In this scenario, the cumulative amount needed to treat COVID-19 confirmed cases over 6 months is 57.64 million USD.
- In terms of public finances, the MoPH's estimated budget of 461 million USD in 2020 budget consequently requires an additional funding of at least 43.01 million USD (almost 10% of the current MoPH budget), while Lebanon's real GDP is projected to contract by 12.0% in 2020 alongside a budget deficit estimated at (-7.2%) of GDP.

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[1] Lebanese Ministry of Public Health, Health System Challenges to Respond to COVID-19, 2020.
[2] Emergency Unit, *Daily Situation Report, April 2020, available online:* http://drm.pcm.gov.lb/Media/News/Daily-situation-report-7-April.pdf.
[3] Syndicate of Hospitals, *Minister decision concerning hospital rates,* 2009, available online: https://www.syndicateofhospitals.org.lb/Content/uploads/Informations/9764_karar34009.pdf
[4] Nidaa Al Watan, *Hospitalization Cost of COVID-19,* 8th of April 2020, available online: https://www.nidaalwatan.com/article/18450
[5] The head of the syndicate of hospitals reported that the NSSF rates are not applicable to COVID-19 cases, as significant additional costs are incurred by the hospitals such as expensive professional personal protective equipment. He mentioned as an example the cost of one protective suit exceeding 30usd.
[6] Lebanese Ministry of Public Health, Health System Challenges to Respond to COVID-19, 2020.
[7] Nidaa Al Watan, *Hospitalization Cost of COVID-19,* 8th of April 2020, available online: https://www.nidaalwatan.com/article/18450
[8] World Health Organization, Rational use of personal protective equipment for coronavirus disease (COVID-19) and considerations during severe shortages, 2020, available online: https://apps.who.int/iris/bitstream/handle/10665/331695/WHO-2019-nCov-IPC_PPE_use-2020.3-eng.pdf
[9] Rebecca Anne Proctor, "Coronavirus: a Clear and Present Danger for Lebanon," *Arab News* (26 March 2020). Available online: https://www.arabnews.com/node/1645421/middle-east

LEBANON IN THE FACE OF THE COVID-19 OUTBREAK

The novel coronavirus outbreak has put most of the world's countries under mandatory lockdown, urging governments to put in place economic and social response plans along with stimulus packages amounting, in some cases, to trillion of US dollars.

Despite the serious efforts invested by the Lebanese government to contain its spread, the outbreak of the virus adds another layer of complexity to the socioeconomic crisis and threatens to increase the speed and the severity of the ensuing recession.

The Lebanese government's financial margin of maneuver is extremely limited, or quasi-inexistent, with a debt to GDP ratio surpassing 170%, and economic indicators pointing to a prolonged and sizable real GDP contraction of more than 12%. Unemployment and poverty are rising to unprecedented levels: 45% of the population is estimated to be living below the poverty line and to be facing the risks of the accelerating inflation (27%) that is coupled with an informal depreciation of more than 40% of the Lebanese pound on the parallel market.[1] SMEs, which constitute more than 90% of the Lebanese market, were severely hit by the strict informal capital control imposed by Lebanese banks since October 2019 and are now forced into lockdown, thereby being deprived of their only remaining source of income: the market.

Under such circumstances, the Lebanese government is faced with the unprecedented challenge of countering the heavy socioeconomic impact of the COVID-19 outbreak without further deteriorating its fiscal and monetary position. It is indeed a moment of truth. Will Lebanon effectively prioritize the poorest and most vulnerable amid the crisis that is being described as the worst in the country's history?

This paper aims at assessing and costing the healthcare response in relation to various outbreak scenarios. Healthcare responses require, among other interventions, the treatment of infected people over a long period of time. For the sake of simplicity, this paper will investigate the direct cost of treating confirmed cases, thus excluding other response options such as prevention policies, the acquisition of health machinery, consumables, and personal protective equipment for the medical corps, deep clean and disinfection measures, as well as staffing and training for healthcare professionals.

This paper will be complemented by two policy briefs assessing (i) social protection policy intervention and (ii) economic stimulus packages.

(i) Reaching out to vulnerable populations, including families living under the poverty line and daily wage earners severely hit by the lockdown, and ensuring their livelihood during the lockdown period, is essential to appease their hardship and contain popular discontent. This brief will assess the potential expansion of the poverty response scheme already in place. It will map out social response plans being implemented around the globe and will estimate the costing of compatible and suitable policy options.

(ii) SMEs are the backbone of the Lebanese economy. This brief will investigate which policy option could save what remains of the SMEs sector in Lebanon and help in its recovery in the course of the "post lockdown" period, particularly in light of current fiscal and monetary constraints.

[1] Lebanese Ministry of Finance, *Situation update for Lebanon's Creditors,* 2020, available online: http://www.finance.gov.lb/en-us/Finance/PublicDebt/Info%20for%20Creditors/Investor%20Presentation%2027%20March%202020_Final.pdf

HEALTHCARE INTERVENTION IN RESPONSE TO THE COVID-19 OUTBREAK

This chapter aims at estimating the number of COVID-19 cases over a **period of 6 months** and the cost related to their treatment. Estimated numbers are based on simplified models and assumptions. The purpose of this study is to provide the government with an indicative framework that could help assess the financing needs for such interventions.

The study will follow the below **methodological steps**:

(1) Identifying a comparable pandemic with available historical data.

(2) Verifying a comparable response plan scenario.

(3) Identifying the relevant curve and project death data for Lebanon.

(4) Converting the death count into confirmed cases data.

(5) Identifying treatment scenarios.

(6) Costing and estimating total financing needs.

(1) Can lessons learned from the Spanish Flu inform the COVID-19 response plan?

The COVID-19 outbreak has triggered urgent questions about the gravity of the pandemic. However, as the outbreak is still in its early stages in Lebanon, it seems impossible to rely solely on existing data to draw a comprehensive picture and assess the scale and characteristics of the spread.[2] Instead, we will examine the spread characteristics of a comparable pandemic.

How is the Spanish Flu of 1918 comparable to COVID-19?

The objective of this research is to forecast the total number of potential contaminations. Consequently, the spread characteristics of the pandemic will be examined rather than symptoms or severity. For this purpose, the **R naught** range of the pandemics will be compared.[3] A comparable R naught range means that the spread patterns of the two pandemics might be similar.

Table1: Spread characteristics of the pandemics

	Spanish Flu (1918)	*COVID-19 (2020)*
R naught range	1.4-2.8[4]	2-3[5]
Mortality rate (%)	2.5[6]	4.5
World population (billion)	1.8	7.8

REFERENCE: HEALTHLINE, ACCESSED ON THE 6TH OF APRIL 2020

NOTE: DURING THE FIRST OUTBREAK IN 1918, THE H1N1 (REFERRED TO AS THE SPANISH FLU) RECORDED A HIGHER R NAUGHT RANGE COMPARED TO THE SECOND OUTBREAK IN 2009 WHEN IT RECORDED A RANGE OF 1.4-1.6

[2] As China reported 0 death and 0 confirmed cases on March 19.

[3] R naught is a mathematical term that indicates how contagious an infectious disease is. It tells the average number of people who will catch a disease from one contagious person.

[4] Healthline, *What Is R0?: Gauging Contagious Infections*, 2016, available online on https://www.healthline.com/health/r-nought-reproduction-number#rsubsubvalues.

[5] Medspace, *How Scientists Predict How Many People Will Get COVID-19*, 2020, available online: https://www.medscape.com/viewarticle/927949.

[6] BMC, *A year of terror and a century of reflection: perspectives on the great influenza pandemic of 1918–1919,* 2019, available online: https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-019-3750-8.

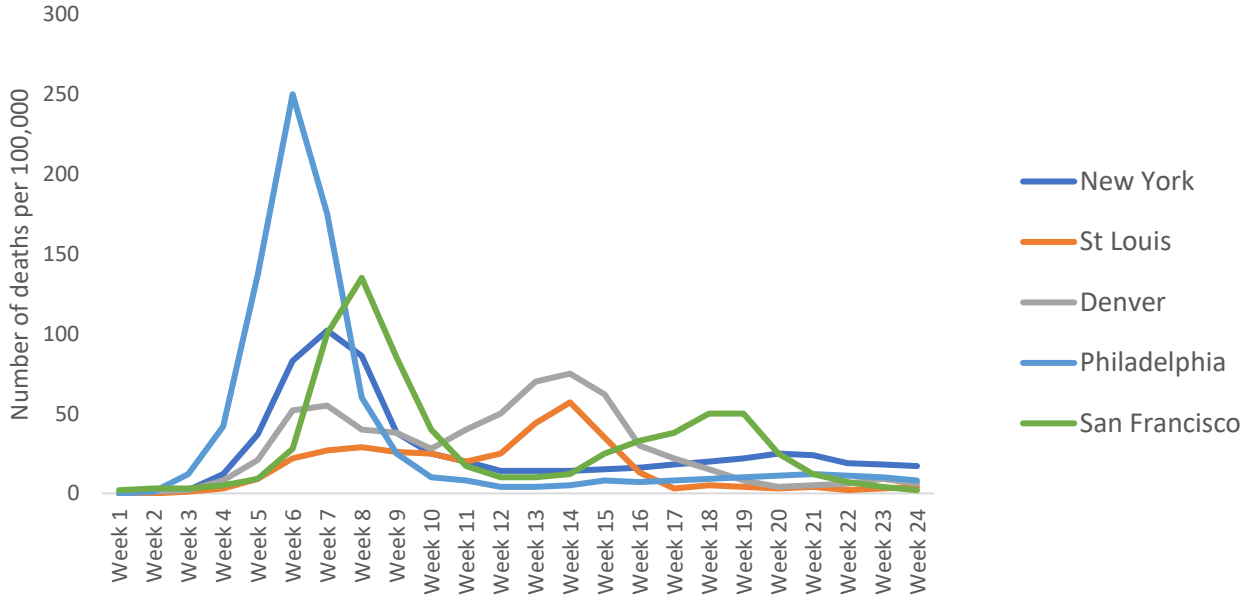
(2) What does historical data tell us about public health response plans?

Results from a study conducted by the *American Medical Association* over 43 US cities to examine the impact of non-pharmaceutical interventions in delaying the temporal effects of the Spanish Flu pandemic and reducing its severity,[7] show that cities that had adopted non-pharmaceutical interventions such as social distancing, school closures, public gatherings bans and isolation were able to significantly reduce the number of cumulative deaths and to delay the reach of a mortality peak. In other words, they were able to "flatten the curve". More details are available in Annex 1.

Table 2: Characteristics and outcomes of various interventions

	Public Health response time	*Intervention period*	*Loosening measures*	*Death rate*	*Occurrence of 2nd wave*
Philadelphia	Slow	Short	Yes	Very high	No
San Francisco	Slow	Short	Yes	Very high	Yes
St Louis	Fast	Long	Yes	Low	Yes
New York	Very Fast	Long	No	Low	No
Denver	Slow	Long	Yes	Low	Yes

Figure 1: Death curve in US cities during the Spanish Flu outbreak



REFERENCE: HOWARD & AL, 2007.

Cities with delayed interventions, such as Philadelphia, witnessed faster contamination rates and higher mortality while other cities that implemented fast distancing measures (such as New York and St Louis) were able to delay and flatten the death curve. Cities that lifted these measures early on witnessed a second wave.

[7] Howerd & Al, *Nonpharmaceutical Interventions Implemented by US Cities During the 1918-1919 Influenza Pandemic*, American Medical Association, 2007, available online: https://biotech.law.lsu.edu/blog/joc70085_644_654.pdf.

(3) What conclusions can we draw for Lebanon?

In the above sub-section, we examined a historical death count given the fact that data concerning confirmed cases was not available. We therefore assume the following:

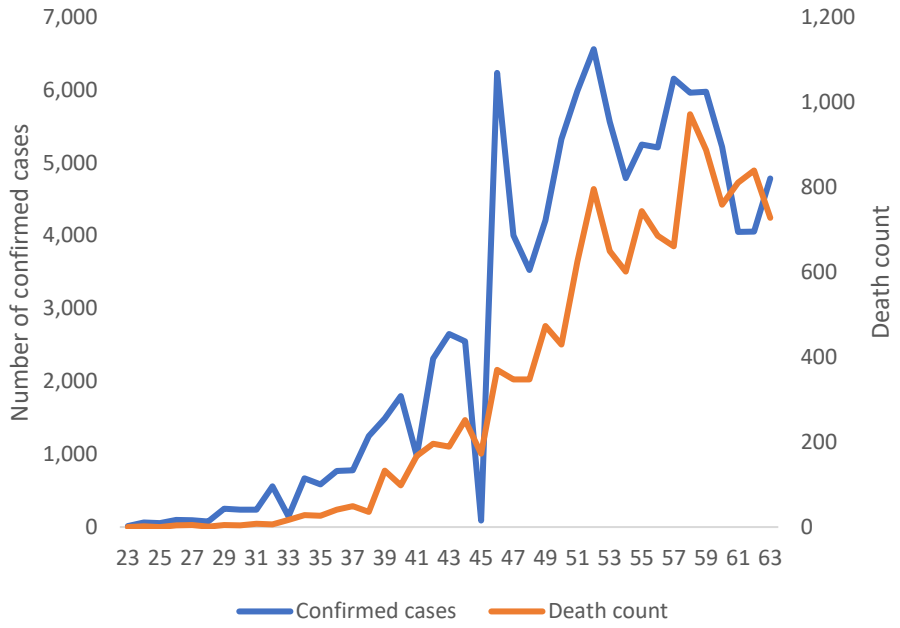
- The relation between death count and confirmed case count is linear and their respective curves follow the same pattern with a delay of few days.
- Projecting the mortality curve for COVID-19 will allow us to consequently predict a range of confirmed cases count.
- Consequently, and for the sake of simplification, the baseline assumption for projections is the pattern of the mortality curve of the Spanish flu in cities with comparable public health response plans.

Given the above assumption, this research seeks to offer an indicative, rather than an accurate model.

(A) The linear relation between death count and confirmed cases

The examination of daily data for China and Italy demonstrates a delayed synchronization of both curves:[8]

Figure 2: Confirmed cases and death count in Italy starting day 23

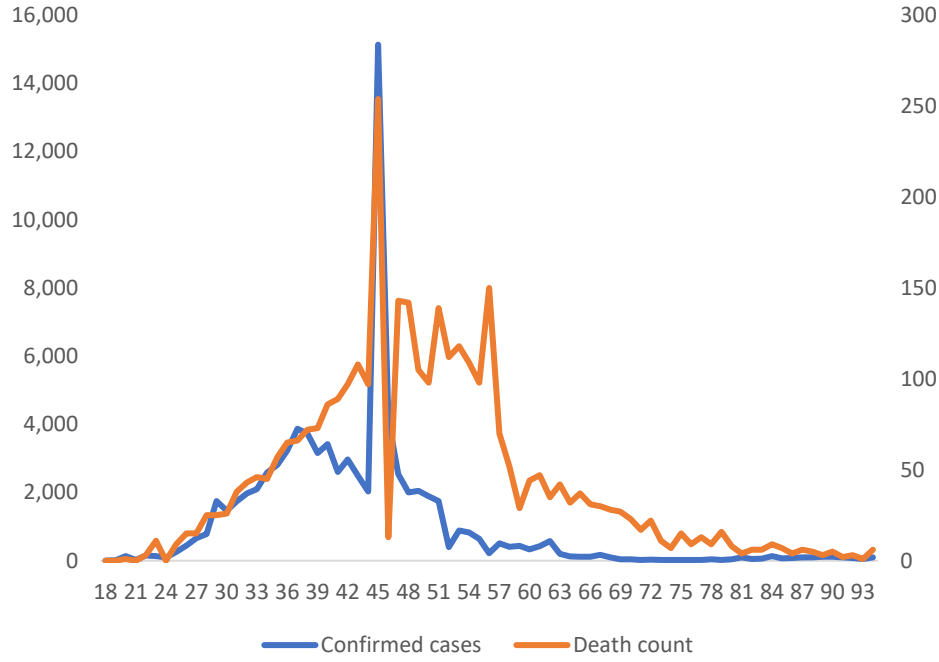


- **In Italy, the mortality rate** was of **11.9%** until 02/04/2020.
- The starting point is set as day 23, because previous data seems extremely under-reported with cumulative cases not exceeding 3.

REFERENCE: EU OPEN DATA PORTAL, 2020

[8] The two countries with largest data sample.

Figure 3: Confirmed cases and death count in China



- **In China, the mortality rate** was of 4% until 02/04/2020.
- The starting point is set as of day 18, because previous data seems extremely under-reported with cumulative cases not exceeding 59.

REFERENCE: EU OPEN DATA PORTAL, 2020

Despite differences in the count scale, and since the curves follow a similar pattern, analyzing the mortality rate will help convert projected death count into projected confirmed cases in the following section.

(B) What can a comparative analysis tell us about China and Italy?

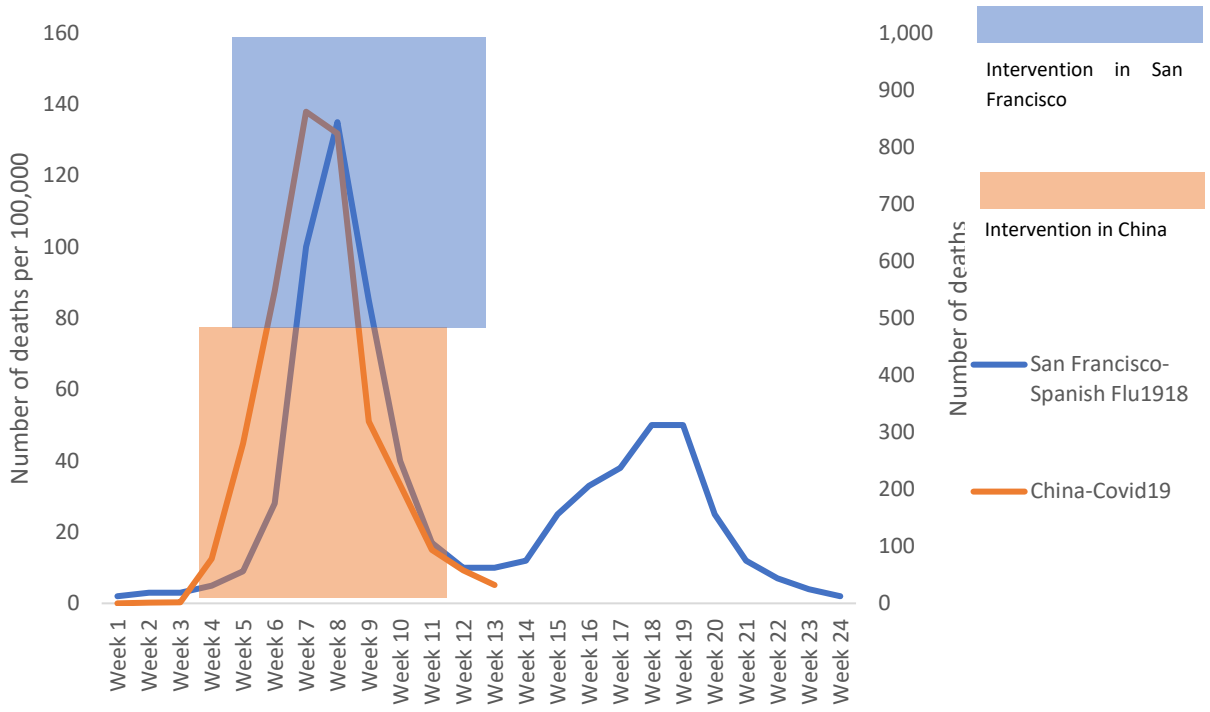
Assuming that the first wave has passed as the data show, China (Wuhan) can be compared to the 1st wave in San Francisco.

Table 3: Comparative analysis - China (Wuhan) vs San Francisco

	Mortality peak compared to highest peak	*Wave duration*	*Public health response time*	*Severity of measures*	*Duration of measures*
China [9] during COVID-19 – (Wuhan)	862 compared to 5652	10 weeks	8 days after mortality acceleration[10]	Total lockdown	9 weeks
San Francisco during 1918 Spanish flu	135 compared to 250	10 weeks	11 days after mortality acceleration	Total lockdown	9 weeks

[9] Mainly represented by the city of Wuhan. The latter being the epicenter of the disease.
[10] Defined as 2 × baseline death rate.

Figure 4: Deaths from COVID-19 in China compared to deaths from the Spanish Flu in San Francisco



REFERENCE: EU OPEN DATA PORTAL, 2020 AND HOWARD & AL, 2007.

Although it had started as the epicenter of the disease, the Chinese city of Wuhan was presumably able to contain the first wave of the outbreak with a total lockdown intervention that lasted 2 months. During the 1918 pandemic, San Francisco acted faster by imposing social distancing measures before the acceleration of the mortality rate. The impact clearly shows a delayed wave. Still, the intervention came late compared to other cities and led to a high mortality peak. It was not, however, the highest.

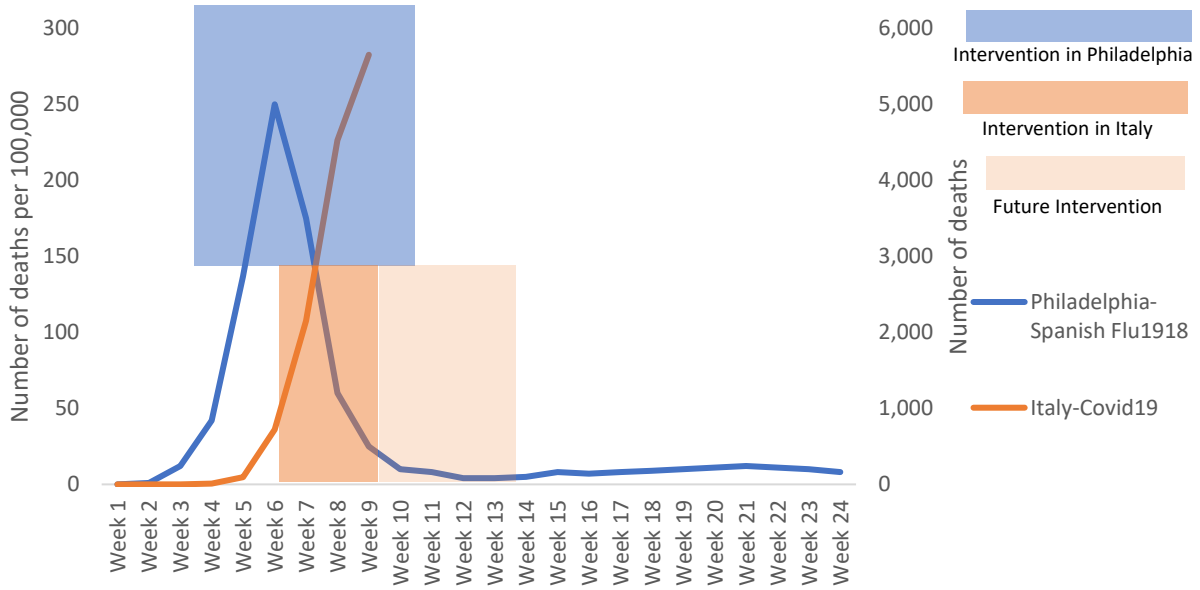
Italy can, however, be compared to Philadelphia: A late intervention coupled with the highest mortality peak and a sharp increase in mortality rates over a short period of time.

Table 4: Comparative analysis - Italy vs Philadelphia

	Mortality peak compared to highest peak	*Wave duration*	*Public health response time*	*Severity of measures*	*Duration of measures*
Italy during COVID-19	Highest peak	11 weeks so far	13 days after mortality acceleration	Total lock down	4 weeks so far[11]
Philadelphia during 1918 Spanish flu	Highest peak	5 weeks	8 days after mortality acceleration	Banning gatherings and closing schools	7.2 weeks

[11] The date of the expansion of the quarantine zone to cover the north of Italy.

Figure 5: Deaths from COVID-19 in Italy compared to death from Spanish Flu in Philadelphia



REFERENCE: EU OPEN DATA PORTAL, 2020 AND HOWARD & AL, 2007.

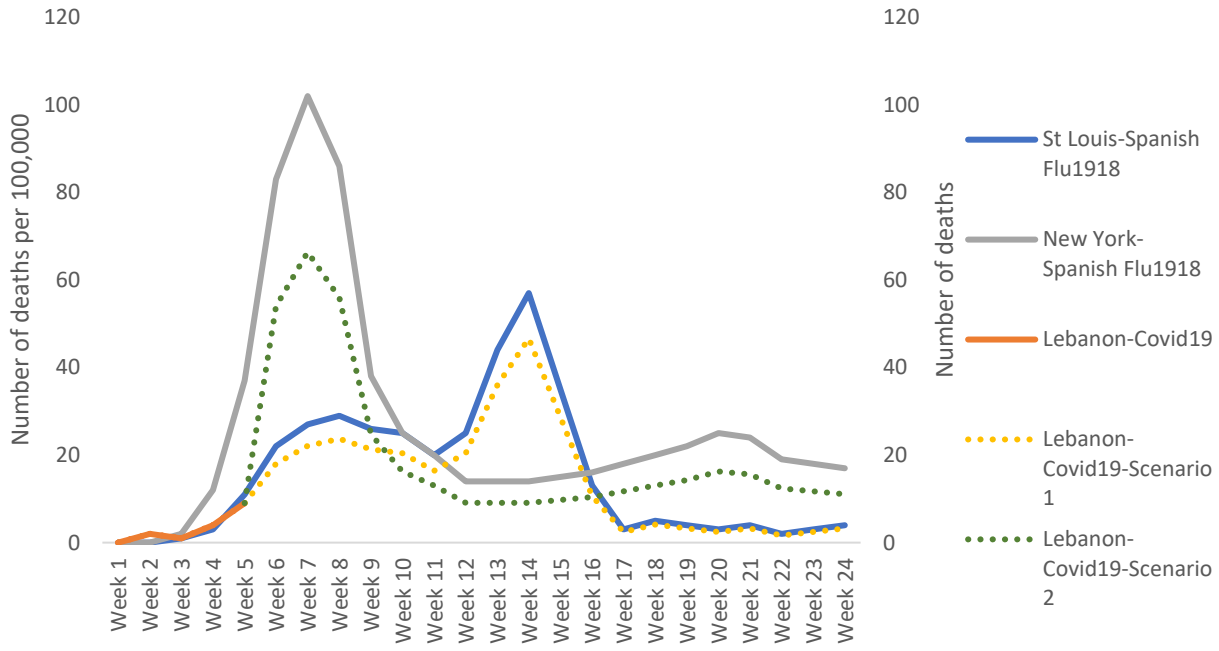
(C) Is Lebanon comparable to any of the five US cities?

As to Lebanon, available data does not provide much insight on the curve pattern. However, analyzing the intervention characteristics can help identifying two possible scenarios based on the historical data of US cities that have faced the 1918 Spanish flu. In fact, Lebanon took early on drastic measures (like St Louis and New York) and was able to relatively flatten the death rate curve. Now that we have comparable intervention measures, we can assume that the death rate curve can follow two different patterns. Projections were calculated based on weekly variation rates in the two benchmark cities of St Louis and New York.

Table 5: Comparative analysis - Lebanon v/s St Louis and New York

	Death peak compared to highest peak	*Wave duration*	*Public health response time*	*Severity of measures*	*Duration of measures*
Lebanon during COVID-19	Very low so far	N/A	1 day after mortality acceleration	Total lockdown	4 weeks so far
St Louis during 1918 Spanish flu	Very low	5 weeks (1st wave) 7 weeks (2nd wave)	1 day after mortality acceleration	Total lockdown	20 weeks
New York during 1918 Spanish flu	Low	9 weeks	11 days before mortality acceleration	Total lockdown	10 weeks

Figure 6: Deaths from COVID-19 in Lebanon compared to deaths from the Spanish Flu in St Louis and Philadelphia



REFERENCE: EU OPEN DATA PORTAL, 2020 AND HOWARD & AL, 2007.

The previous graph allows to visualize two different scenarios; however, a third scenario is possible and would consist of a combination of both. St Louis relaxed social distancing measures after the 5th week and witnessed the deadliest second wave. It therefore had to reinforce social distancing measures for another 7 weeks, whereas New York maintained strict measures over 9 consecutive weeks and avoided a second wave. The pattern of the projected curves in Lebanon will strongly depend on the final duration of social distancing measures.

For keeping the model simple, we will retain and investigate two scenarios only as baselines for the projection of possible confirmed cases.

(4) Estimation of confirmed cases

As explained, confirmed cases will be projected based on mortality rates applied to the projected death count over the upcoming weeks. At the date of data retrieval (02/04/2020), the mortality rates registered for various countries were as follow:

Figure 7: Mortality rates

Country	*Mortality rate (%)*
China	4.02
Italy	11.90
Lebanon	3.37[12]
Spain	8.86
France	7.08
World	5.05

REFERENCE: EU OPEN DATA PORTAL.

Lebanon's mortality rate seems to be below world average. The reasons behind this gap does not fall within the scope of this study. The mortality rate of 3.37% will be used as the base for projecting confirmed cases in the two scenarios.

Table 6: Projection of confirmed cases for Lebanon

Month count after 1st confirmed case	*Scenario 1*	*Scenario 2*
1st Month	411	411
2nd Month	2,010	5,348
3rd Month	2,331	1,873
4th Month	3,617	1,139
5th Month	364	1,641
6th Month	316	1,506
Total	9,049	11,918

[12] The mortality rate for Lebanon was calculated after adding the data of days 3/4/20, 4/4/20, 5/4/20.

(5) What are the treatment scenarios?

(A) What is the total estimate of needed hospital beds?

In Lebanon, 3 clinical diagnoses for COVID-19 are identified. Asymptomatic cases are sent automatically for home quarantine while critical cases are admitted to intensive care units. Mild/Moderate cases are either sent to home quarantine or admitted to hospital quarantine depending on the severity of the symptoms.

Table 7: Clinical presentation of COVID-19 cases in Lebanon and treatment scenarios

Clinical diagnosis	*Share of total cases (%)*	*Treatment scenarios*
Asymptomatic	22.65	Home quarantine
Mild/Moderate	68.94	Home and hospital quarantine
Severe/Critical	8.42	Intensive care

REFERENCE: LEBANESE MINISTRY OF PUBLIC HEALTH ON 07/04/2020

If we assume that around 55% of mild/moderate cases would need to be admitted to hospital quarantine, those would be the cases requiring hospitalization and not intensive care.[13]

Table 8: Total number of needed beds per scenario

Scenario	*Mild/Moderate*	*Severe/critical*	*Total*
Scenario 1	3,431	762	4,193
Scenario 2	4,519	1,003	5,522

(B) What is the total estimate of available and vacant hospital beds?

According to the data published by the Ministry of Public Health, the total estimate of available beds is 15,195 distributed as follows:[14]

Table 9: Total number of hospital beds – short stay in Lebanon (2016)

Sector	*Number*	*Share*
Public sector	2,446	13.9%
Private sector	12,749	86.1%
Total	15,195[15]	

REFERENCE: LEBANESE MINISTRY OF PUBLIC HEALTH, 2020

[13] World Health Organization, *Operational considerations for case management of COVID-19 in health facility and community*, 2020, available online: https://www.who.int/publications-detail/operational-considerations-for-case-management-of-covid-19-in-health-facility-and-community.
About 40% of patients have moderate disease that may require inpatient care; 15% of patients will have disease that requires oxygen therapy or other inpatient interventions. Other critical cases require mechanical ventilation.

[14] Emergency Unit, *Daily Situation Report, April 2020, available online:* http://drm.pcm.gov.lb/Media/News/Daily-situation-report-7-April.pdf.

[15] Of which 2,308 beds for intensive care units.

The Ministry of Public Health has developed a four-level response plan to accommodate COVID-19 patients:

Table 10: Available beds for COVID-19 patients according to the MoPH response scenarios

Level of preparedness[16]	*Public hospitals*	*Private hospital*
1st line - 12 Public Hospitals to be ready including RHUH, to designate specific sections/beds for corona patients	426	381
2nd line - to fully assign 12 Public Hospitals for the treatment of Coronavirus patients	1197	N/A
3rd line - to include another 17 Public Hospitals to the above	2057	N/A
4th line - All 29 public hospitals in addition to all private hospitals are classified as T1 (Tertiary Hospitals)	2215	N/A

REFERENCE: LEBANESE MINISTRY OF PUBLIC HEALTH, 2020

The following assumptions were added to our model:

- The shifting from one preparedness level to the next would come at an additional cost in terms of equipment, staffing and other.
- The overhaul of public hospitals to receive COVID-19 patients at full capacity is not likely to happen as it might compromise the health of other patients. Those suffering from critical illnesses and that are admitted as emergency cases are to be received in public hospitals located both in the capital and the regions.
- Public hospitals with limited capacities are less likely to receive COVID-19 patients, unless fully converted.
- We will assume that public hospitals will receive COVID-19 patients at 30% of their full capacity[17], excluding hospitals with very small capacities (bottom line 20 beds per hospital). The total number of beds available for COVID-19 patients in public hospitals is therefore estimated at 660 beds. Additional patients will be admitted to private hospitals or to community facilities (such as stadiums, hotels, etc.).
- According to the MoPH response scenario, 10 private hospitals can accommodate up to 381 COVID-19 patients under the 1st line preparedness scenario.
- We assume that only private hospitals with independent wings will receive COVID-19 patients (i.e. the 10 hospitals listed under the MoPH response scenarios)
- With an average capacity of 280 beds per hospital, the total number of available beds in private hospitals for COVID-10 patients drops to 2,800.
- Assuming a deployment rate of 30% (similar to the rate used for public hospitals), the total number of available beds for COVID-19 patients in private hospitals drops to 840.

Based on these assumptions, the total number of beds available for COVID-19 patients is estimated at 1,500.

[16] Lebanese Ministry of Public Health, Health System Challenges to Respond to COVID-19, 2020.
[17] The rate was calculated based on the 1st line preparedness response scenario

(C) What are the treatment options and policies?

Table 11: Treatment options and requirements

Treatment options	*Treatment requirements*
Home care	▪ Test. ▪ Provision of household members with ongoing support, education, and personal protective equipment.[18/19] Isolation period to be defined by the medical personnel. However, a period of two to three weeks is recommended. ▪ Double testing within 24 hours after symptoms resolving.
Hospital quarantine	▪ Test. ▪ Two weeks of hospital quarantine.[20] ▪ Provision of personal protective equipment. ▪ Double testing within 24 hours after symptoms resolving.
Intensive care	▪ Test. ▪ 20 days in intensive care units. ▪ 5 days in hospital quarantine.[21] ▪ Provision of personal protective equipment. ▪ Double testing within 24 hours after symptoms resolving.

In the event of reaching full hospital capacity, the authorities will have to deploy and equip community facilities (such as stadiums, gymnasiums and hotels, temporary hospitals, etc.) for isolating mild cases.

For this purpose, we will segregate the data by months and compare the total estimation of needed hospital beds to the full capacity and conclude on the additional number of beds needed. The latter will help identify total needs in terms of community facilities deployment.

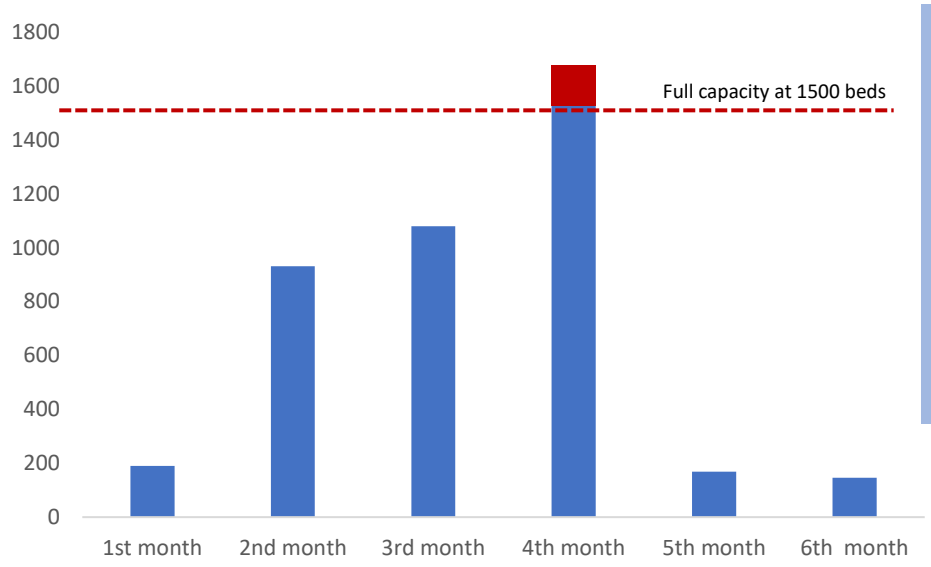
[18] World Health Organization, Home care for patients with COVID-19 presenting with mild symptoms and management of their contacts, 2020, available online: https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-(ncov)-infection-presenting-with-mild-symptoms-and-management-of-contacts

[19] World Health Organization, *Operational considerations for case management of COVID-19 in health facility and community*, 2020, available online: https://www.who.int/publications-detail/operational-considerations-for-case-management-of-covid-19-in-health-facility-and-community.

[20] World Health Organization, *Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19)*, available online: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf

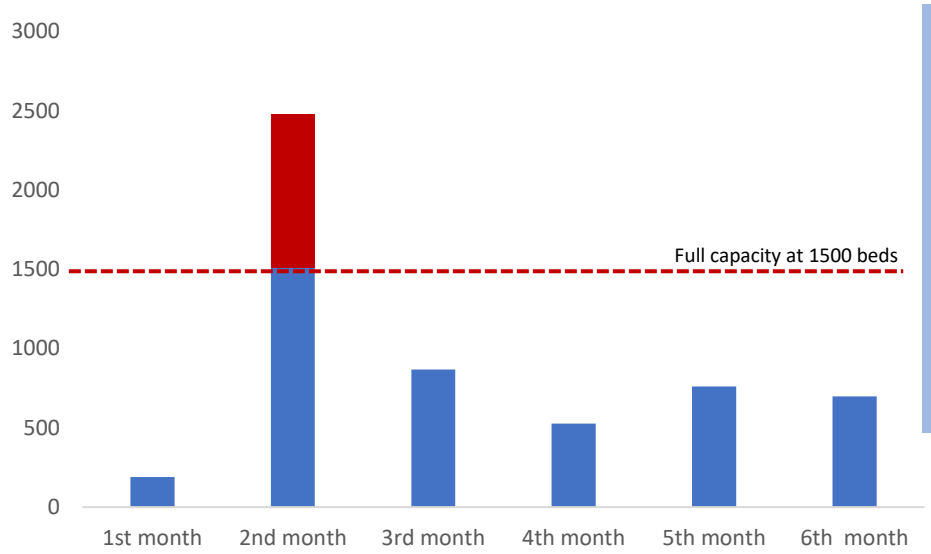
[21] Idem; 3 to 6 weeks for patients with severe or critical disease

Figure 8: Total number of needed hospital beds - Scenario 1



In the event of the 1st scenario, **full capacity** will be reached **during the 4th month of the pandemic**.
Additional 167 beds will be needed.
This would require the deployment of **2 to 3 community facilities**.

Figure 9: Total number of needed hospital beds - Scenario 2



In the event of the 2nd scenario, **full capacity** will be reached **during the 2nd month of the pandemic**.

Additional 978 beds will be needed.

This would require the deployment of **12 to 13 community facilities**.

(6) What are the total estimated costs and financing needs?

Testing kit

- The cost of testing in public hospitals as published in the MoPH response plan is approximately of USD 40 per person.[22]
- The cost of the test is set by the MoPH at USD 100 in private hospitals and laboratories.
- 3 of the 17 hospitals and laboratories that can officially conduct the testing are public hospitals.[23]
- Due to lack of data on testing capacity for each entity, we assume that all capacities are even and therefore calculate the average cost per person tested using the simple average method. The average cost of testing per patient is approximately of USD 90.

Regular hospital days

- Due to lack of data, we assume the cost of a regular hospital day to be equivalent to the official rate adopted by the National Social Security Fund, noting that this rate does not include personal protective equipment for medical personnel or for patients. The rate amounts to USD 46.67 per day.[24]
- According to the head of the syndicate of hospitals, as reported in the local press,[25] the average cost of a regular hospital day for Covid-19 patients varies between USD 600 and USD 666.67 depending on the hospital.[26]
- Assuming the public sector will accommodate 44% of the patients (reference section 5 of this study) against 56% in the private sector, the weighted average cost amounts to USD 373.34 per patient per day.

Intensive care units

- According to the MoPH response plan,[27] intensive care units cost on average USD 700 per patient per day in public hospitals.
- According to the head of the syndicate of hospitals,[28] as reported in the local press, the average cost of intensive care units per day varies between USD 1,483.34 and USD 1,666.67 depending on the hospital.
- Assuming the public sector will accommodate 44% of patients (reference section 5 of this study) against 56% in the private sector, the weighted average cost amounts to USD 1,200 per patient per day.

[22] Lebanese Ministry of Public Health, Health System Challenges to Respond to COVID-19, 2020.
[23] Emergency Unit, *Daily Situation Report, April 2020, available online:* http://drm.pcm.gov.lb/Media/News/Daily-situation-report-7-April.pdf.
[24] Syndicate of Hospitals, *Minister decision concerning hospital rates,* 2009, available online: https://www.syndicateofhospitals.org.lb/Content/uploads/Informations/9764_karar34009.pdf
[25] Nidaa Al Watan, *Hospitalization Cost of COVID-19,* 8th of April 2020, available online: https://www.nidaalwatan.com/article/18450
[26] The head of the syndicate of hospitals reported that the NSSF rates are not applicable to COVID-19 cases, as significant additional costs are incurred by the hospitals such as expensive professional personal protective equipment. He mentioned as an example the cost of one protective suit exceeding 30usd.
[27] Lebanese Ministry of Public Health, Health System Challenges to Respond to COVID-19, 2020.
[28] Nidaa Al Watan, *Hospitalization Cost of COVID-19,* 8th of April 2020, available online: https://www.nidaalwatan.com/article/18450

Personal protective equipment for 2 weeks

- Based on the WHO guidelines regarding PPEs rationalization during home care[29], personal protective equipment is estimated at USD 133.34.
- This includes gloves, medical masks, hand hygiene gel or and sanitizers, medical gown, eye protection. PPEs can include other recommended consumables such as tissues, plastic bags, medical digital thermometer etc.

Based on the above, the cost of treatment for the 3 different COVID-19 cases would be estimated as follows:

Table 12: Costing home care quarantine per case

Requirements	*Cost (USD)*
1st test	90
Provision of personal protective equipment for 2 weeks	133
Other costs related to awareness and ongoing support	100
2nd test	90
3rd test	90
Total	503

Table 13: Costing hospital quarantine per case

Requirements	*Cost (USD)*
1st test	90
15 hospital days (at 373.34 per day)	5,600
Provision of personal protective equipment for one additional week	67
2nd test	90
3rd test	90
Total	5,937

[29] World Health Organization, Rational use of personal protective equipment for coronavirus disease (COVID-19) and considerations during severe shortages, 2020, available online: https://apps.who.int/iris/bitstream/handle/10665/331695/WHO-2019-nCov-IPC_PPE_use-2020.3-eng.pdf

Table 14: Costing intensive care

Requirements	*Cost (USD)*
1st test	90
20 hospital days (at 1,200 per day)	24,000
5 regular hospital days (at 373.34 per day)	1,867
Provision of personal protective equipment for one additional week	67
2nd test	90
3rd test	90
Total	26,203

Table 15: Costing for the equipment of community facilities (cost per bed)

Requirements	*Cost (USD)*
1st test	90
Bed and related item equipping cost	1,333
15 hospital days (at 373.34 per day)	5,600
Provision of personal protective equipment for one additional week	67
2nd test	90
3rd test	90
Total	7,270

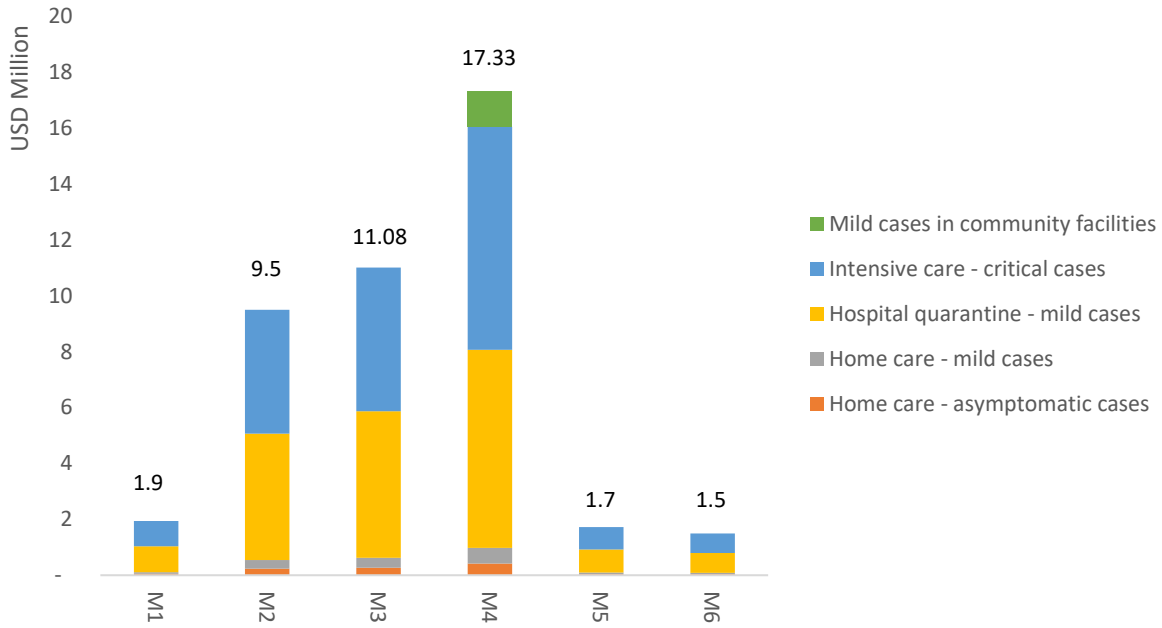
The above tables show the estimated unit cost per treatment scenario.[30] Having all the above assumptions at hand, the monthly estimated cost per scenario can be calculated, in addition to the total estimated cost over 6 months.

[30] The estimated costs are rough assumptions.

(A) Scenario 1

Scenario 1 follows a pattern showing two waves with flattened curves. The below figure displays the needed budget per month.

Figure 10: Monthly budget – scenario 1

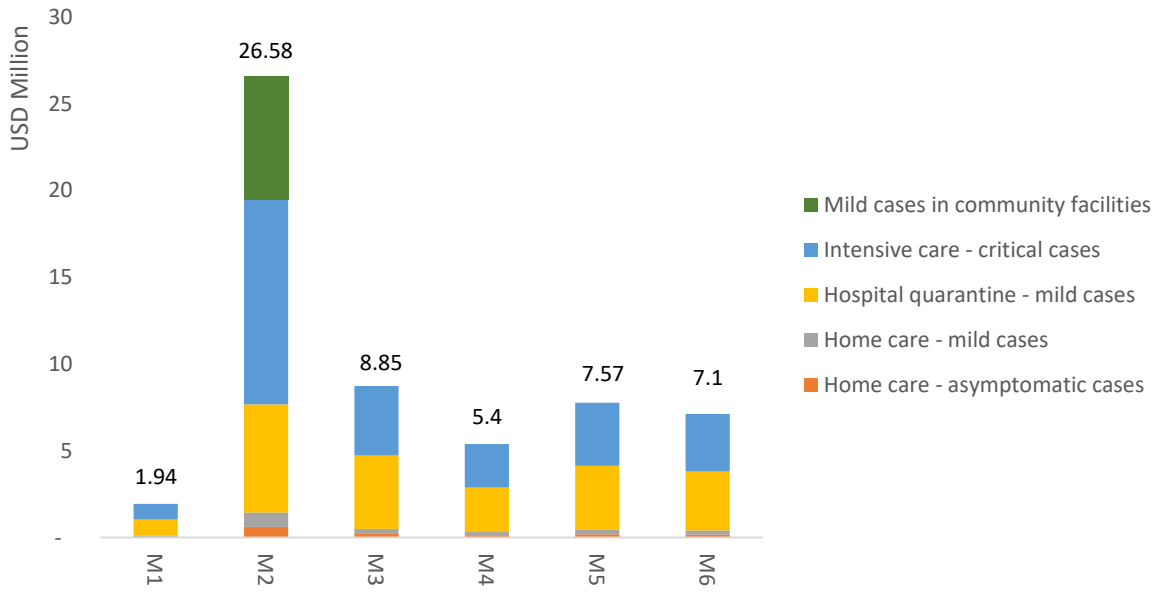


Assuming the curve pattern follows scenario 1, the **cumulative amount** needed to treat COVID-19 confirmed cases over a period of 6 months is **43.01 million USD.**

(B) Scenario 2

Scenario 2 follows a pattern showing one wave with higher contamination and mortality rate. The below figure displays the needed budget per month.

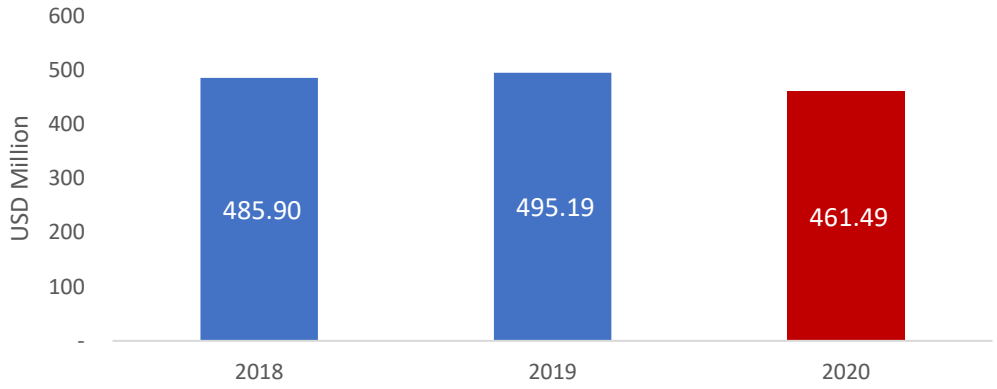
Figure 11: Monthly budget – scenario 2



Assuming the curve pattern follows scenario 2, the **cumulative amount** needed to treat confirmed COVID-19 cases over 6 months is **57.64 million USD.**

Under normal circumstances, the MoPH would have received a total amount of 461 million USD in 2020 budget, as shown in the below figure.

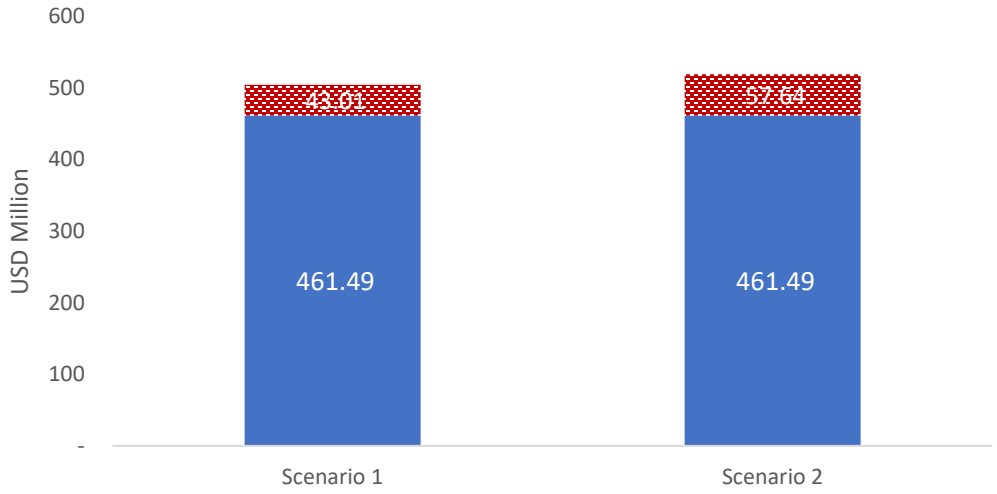
Figure 12: Budget appropriations allocated to the Ministry of Public Health



REFERENCE: BUDGET LAWS 2019 AND 2020

The MoPH consequently needs additional funding for the direct treatment of COVID-19 patients, excluding other health related costs (of which the acquisition of health machinery, consumables and personal protective equipment for the medical corps, deep clean and disinfection measures, staffing and training for all healthcare professionals and others), that varies between 43.01 million USD and 57.64 million USD.

Figure 13: Additional funding needed by the MoPH



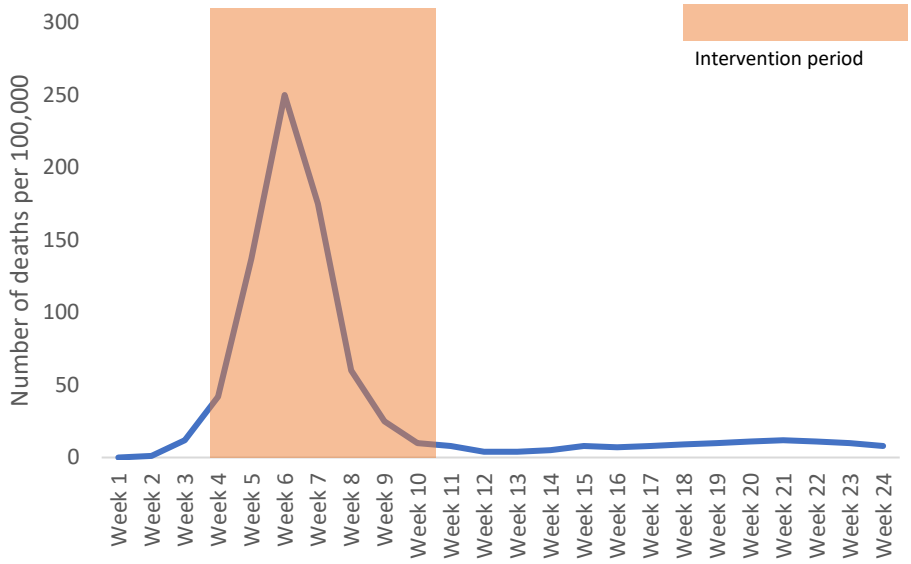
Knowing that real output is projected to contract by 12.0% in 2020 and that the budget deficit is estimated at (-7.2%) of GDP, It becomes imperative to consider alternative financing sources, in a country where almost 50% of the population is below the poverty line, and where a third of the population lives on 4 USD per day,[31] and certainly cannot afford expensive healthcare bills.

[31] Rebecca Anne Proctor, "Coronavirus: A Clear and Present Danger for Lebanon," *Arab News* (26 March 2020). Available online: https://www.arabnews.com/node/1645421/middle-east

ANNEXES

Annex 1 – Spanish Flue in US cities in 1918

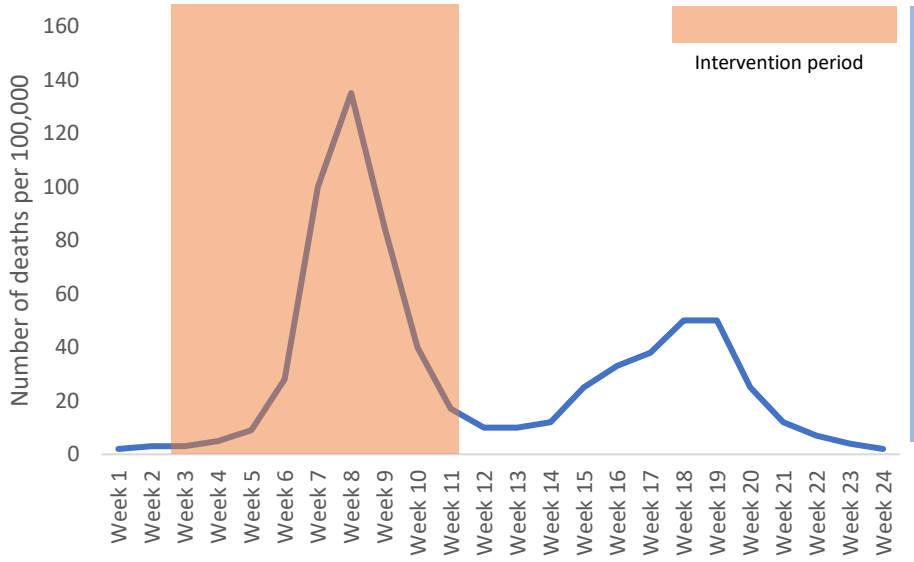
Figure 14: Number of casualties per 100,000 in Philadelphia



- Duration of social distancing measures: **51 days.**
- Delay in implementing social distancing measures: **8 days.**
- Outcome: highest death rate in US.

REFERENCE: HOWARD & AL, 2007.

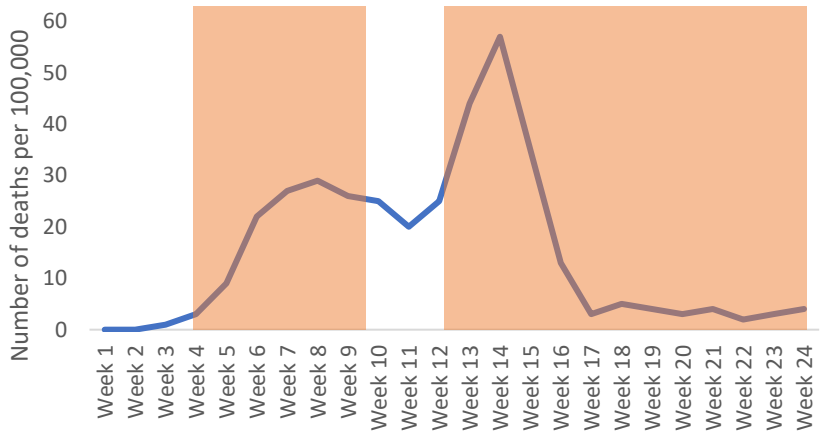
Figure 15: Number of casualties per 100,000 in San Francisco



- Duration of social distancing measures: **67 days.**
- Intervention after death acceleration: **11 days**.
- Outcome: High death rate and a **second wave** after relaxing the measures.

REFERENCE: HOWARD & AL, 2007.

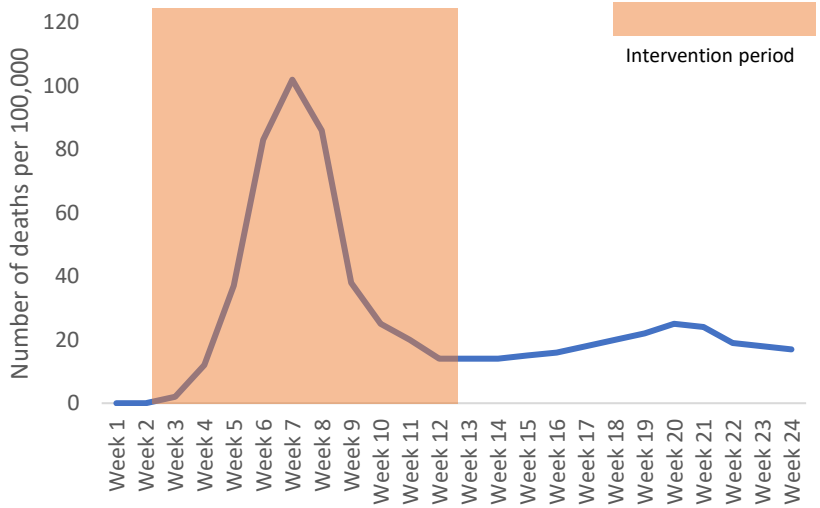
Figure 16: Number of casualties per 100,000 in St Louis



- Duration of social distancing measures: **143 days.**
- Intervention after death acceleration: **1 day.**
- Outcome: lower death rate and a **second wave** after relaxing the measures.

REFERENCE: HOWARD & AL, 2007.

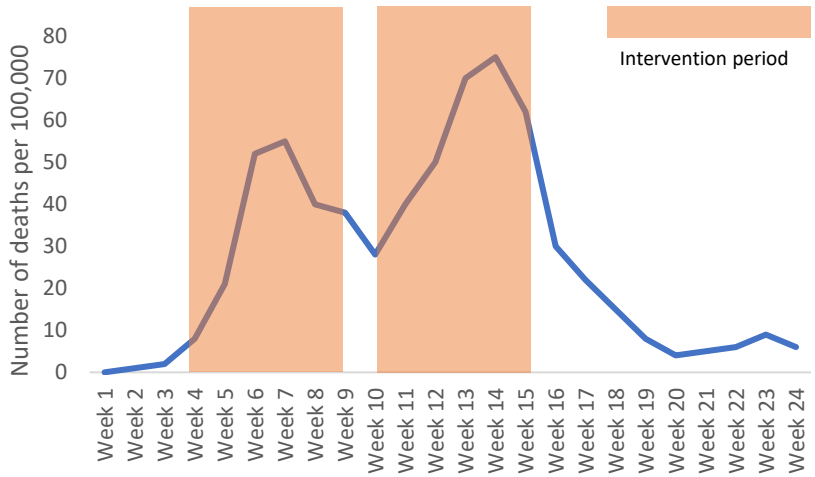
Figure 17: Number of casualties per 100,000 in New York



- Duration of social distancing measures: **73 days.**
- Intervention after death acceleration: **11 days before 1st casualty.**
- Outcome: lower death rate and a **second wave** after relaxing the measures.

REFERENCE: HOWARD & AL, 2007.

Figure 18: Number of casualties per 100,000 in Denver



- Duration of social distancing measures: **151 days.**
- Intervention after death acceleration: **9 days before 1st casualty.**
- Outcome: lower death rate and a **second wave** after relaxing the measures.

REFERENCE: HOWARD & AL, 2007.

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