# Social distancing in Pakistan: Estimates for lives it can save under different scenarios and dollar value of the saved lives

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## Abstract

This study used age specific Infection Fatality Rate (IFR) from China to make projections of possible deaths for Pakistan with and without social distancing. The difference between deaths with and without social distancing is the number of lives saved by the social distancing. Further, the study calculated the dollar value of saved lives using the Value of Statistical Life (VSL) method. Estimates show that the number of deaths in Pakistan without social distancing, including lockdown, would reach to 856528. Moderate lockdown, as practiced in Pakistan, may have saved 428264 lives. However, still, more than four hundred thousand lives can be at risk. The dollar value of saved lives can be somewhere between US$ 37.89 billion to US$ 129.81 billion for moderate social distancing and between US$ 68.21 billion to US$ 233.66 billion for strict lockdown depending upon the different VSL. We, therefore, recommend provincial governments in general and federal government in particular to take measures to ensure higher degree of social distancing immediately, otherwise the spread of infection and fatalities may increase exponentially.


## Contents



## 1. Introduction

Since its imposition on 23rd March by the Federal Government, the term "Lockdown" in Pakistan's case has become politically controversial. Even after the announcement, the levels and strategies of lifting the lockdown continue to vary across provinces. Citing challenges to lives and livelihoods simultaneously, Pakistan finally lifted lockdown from 9th May despite a trend of daily increase in the number of coronavirus cases in the country. Easing of the lockdown is likely to further inflate the infection rate. For a total of 30, 941 cases, the number of deaths is 667, which is 2.15%[1]. In this study, the importance of social distancing has been emphasized[2], be it voluntarily or under strict lockdown[3].

This policy review contributes to debate on social distancing in its varying forms in Pakistan. First, it estimates the number of deaths social distancing avoided against the no social distancing benchmark. The estimates are based on age cohort-specific Infection Fatality Rate (IFR) analysis of a subset of cases from China and are segregated for a different level of social distancing (Verity et al. 2020).

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[1] As per Covid-19 Dash Board of Government of Pakistan, Retrieved from http://covid.gov.pk/ on 11th May, 9:40 a.m.

[2] Merriam Webster dictionary define social distancing as *"the practice of maintaining a greater than usual physical distance (such as six feet or more) from other people or of avoiding direct contact with people or objects in public places during the outbreak of a contagious disease in order to minimize exposure and reduce the transmission of infection"*

[3] Merriam Webster dictionary define lockdown as *"a temporary condition imposed by governmental authorities (as during the outbreak of an epidemic disease) in which people are required to stay in their homes and refrain from or limit activities outside the home involving public contact (such as dining out or attending large gatherings)"*

The difference between the number of deaths with and without social distancing mitigation policy is lives saved by the social distancing. Data from China has been used purposefully. It is the only country so far which has completed the cycle of COVID-19 epidemic and where reliable age specific IFR is available. The IFRs for the countries having control over the disease are subject to change. Second, in this study, the dollar value of the saved lives is calculated using the Value of Statistical Life (VSL) method. The product of VSL and the total number of lives saved equal the dollar value of gains from social distancing.

After being declared a pandemic by the World Health Organization (WHO), the COVID-19 is considered the greatest public health threat since the 1918 Influenza Pandemic that infected one-third of the world's population and killed at least 50 million people. COVID-19 cases and fatalities are growing exponentially (see worldometer.info) and there is much uncertainty about its ultimate impacts globally. "Social Distancing", either voluntarily or under strict government vigilance, has emerged as the most effective policy to prevent the spread of the virus in the absence of vaccines.

The degree of social distancing varies across the countries, i.e. from voluntary precautions to forced confinement of people to their homes through lockdowns and curfews. The policies adopted to ensure social distancing, such as lockdown, however, come with heavy economic costs. The businesses are closed. Workers are being laid off. Governments are running into deficits as a result of the provision of stimulus, required to protect people from the fallout of lockdown. The industries, including but not limited to, air travel, tourism, manufacturing, and SMEs are fighting for survival.

Moreover, closure of borders is having a heavy toll on international trade. It is in this context that the economic costs of social distancing and lockdown are getting attention. Economists are trying to quantify costs with and without policy measures implemented by the world governments, which is already clear from the data released by Italy, Spain, USA, etc.

The lockdown in China and social distancing with intensive testing in South Korea, Singapore, and Germany demonstrated the benefits of proactive policy measures with varying degrees of economic costs. Whereas South Korea and Singapore adopted more and more testing combined with voluntary social distancing, China imposed absolute lockdown. The sharp and large economic costs in either case naturally raise critical questions about whether social distancing is worth it (Hilsenrath & Armour 2020; Greenstone & Nigam 2020).

So is the case in Pakistan where social distancing, and the lockdown, have raised concerns about economic costs. The opponents argue that the country, already having poor economic fundamentals, may not be able to bear the economic burden of lockdown. The proponents maintain that costs will be higher otherwise as leaving the pandemic unattended and not imposing the lockdown may have heavy social, human, and economic costs. The debate seems unsettling as estimates of the gains from a lockdown are not available.

This policy review provides first estimates for lives saved by social distancing and corresponding dollar value using the Value of Statistical Life (VSL) method. We argue that in "lockdown" or "no-lockdown", precious lives can be saved through observing strict social distancing. That is why, it is important for the government to highlight the importance of voluntary social distancing and revert to lockdown if the people don't obey the standard operating procedures for social distancing.

It is noted at the very onset that the estimates and conclusions may suffer some limitations. We use the IFR based on the studies conducted for China as there is no reliable IFR data available for Pakistan due to i) (fortunately) few deaths yet by COVID-19 and ii) uncompleted cycle of the pandemic. At the early stages of a growing epidemic, the true case fatality rate shows underestimated numbers as when the final clinical outcome of most of the reported cases is typically unknown. Similarly, detecting clinically severe cases is biased especially in a country like Pakistan where diagnostic capacity is low. Further, the standard limitations of VSL apply.

The estimates of the underlying infection fatality ratio of this virus will inform assessments of health effects likely to be experienced in different countries, and thus decisions around appropriate mitigation policies to be adopted. Our estimates of the number of deaths with and without social distancing suggest that social distancing has saved around 428,000 lives so far, but an equal number may be at risk.

Pakistan must go for strict social distancing to save lives. VSL estimates show that the value of the saved lives varies between US$ 22.74 billion to US$ 77.89 billion for moderate social distancing and between US$ 68.21 billion to US$ 233.66 billion in case of complete lockdown depending on the VSL.

## 2. What is the Value of Statistical Life (VSL)?

The VSL is a tool from the economic theory which is an important ingredient in the cost-benefit analyses of policy interventions. It's not a measure of the economic productivity that a person provides, but rather how society as a whole assigns value to saving a life. In this study, the VSL measures how much the average (Pakistani) citizen, is willing to pay for a reduction in the probability of death. It is used to undertake benefit-cost analysis to evaluate the efficiency of government policies designed to reduce risk.

For instance, an average Pakistani is willing to pay Rs 10,000 to avoid a 0.1% chance of death, then the VSL is equal to 10,000/0.001 lives saved or Rs 10 million per statistical life saved. So, a policy that is expected to save one life has the social benefit of Rs 10 million. Statistical life here denotes one saved life. The total gains are then equal to the product of total lives saved by policy and the value of statistical life.

The literature on VSL for Pakistan is almost non-existing and only a few studies are available. Rafiq (2011) finds that Pakistan VSL varies between US$ 321813 to US$755193 while according to Viscusi (2017), VSL varies between US$ 248000 to US$ 640000 in Pakistan. Particularly, there is no study available calculating VSL for different age cohorts. We need VSL by age cohort to estimate the dollar value of gains - lives saved - lockdown as the pandemic has different mortality rates for different age groups.

We use Robinson et al. (2018) for overall VSL for Pakistan which we adjust for different age cohorts and life expectancy. Robinson et al. (2018) calculate VSL for Pakistan using Gross National Income (GNI) by three different methods i) multiplying GNI per capita with 160, ii) multiplying GNI per capita with 1004, and iii) using income elasticity of age (with respect to target population) =1.5. These three methods give VSL of US$ 849600, 51300, and 261067 respectively.5 In other words, VSL for Pakistan varies between 261067 and 849600.

All these estimates of VSL have some caveats. First, none of the available studies for Pakistan estimates VSL for the different age cohorts. Evidence suggests that VSL varies with age as any inverted-U-shaped relationships exist between VSL and age Murphy & Topel 2006; Aldy & Viscusi 2008). Second, the VSL estimates are not adjusted for life expectancy as each country has different life expectancies. We remove these caveats and use VSL by age cohort which is then adjusted for life expectancy. As no estimates for VSL are available for Pakistan by age, we adjust available VSL by age cohort and for life expectancy in Pakistan.

[4] Comparing these estimates to gross national income (GNI) per capita (expressed in international dollars for the same year and same population as each estimate) results in a VSL to GNI per capita ratio of 155 to 172 for the US estimates and a ratio of 98 for the OECD estimate. The substantial difference in these ratios is attributable at least in part to the use of divergent approaches to develop these estimates, not solely differences in the incomes and preferences of these populations.

[5] As we know that country like Pakistan has a large income differences when comparisons between populations often find that VSL is more than proportional to income which states that income elasticity would be greater than one (the ratio of VSL to GNI per capita is smaller among lower income population than in higher income populations). It means lower income individuals must devote a larger share of their incomes to more necessary or urgent expenses.

## 3. Calculating the dollar value of effective social distancing

Calculation of dollar values of health intervention, like social distancing, requires the estimates for VSL and total lives saved. Total lives saved means the difference between expected deaths without effective social distancing and the number of deaths with effective social distancing. As the observed sample is some portion of the population, the ratio of deaths avoided by effective social distancing is adjusted for the size of the population in different age cohorts. We use age cohorts for which the fatality rate of COVID-19 is reported. Finally, death avoided by adopting social distancing is counted as lives saved. The total number of saved lives is then multiplied by VSL to get the dollar value of benefits from effective social distancing as given below.

$$\text{Dollar Value Saved Lives} = VSL_i * \sum_i (D_i^{direct} * Pop_i + D_i^{Overflow} * Pop_i)$$

Here, i denotes the age group, $D_i^{direct}$ is the reduction in the direct death rate by implementing the different social distancing scenarios, relative to the no policy scenario, while $D_i^{Overflow}$ is the Intensive Care Unit (ICU) overflow deaths rate estimate under no policy and mitigation scenarios, as well as their difference which is the number of fatalities averted through COVID-related social distancing. The deaths of COVID-19 patients who are unable to receive ICU care because of pandemic related overcrowding in hospitals where health system can collapse in extreme case.

## 4. Projections of deaths for Pakistan at various degrees of social distancing

When a country implements social distancing, just the closure of all schools, colleges, and universities does not guarantee that all students would comply with the policy. One caveat is that household contacts rate for students' families and the communities may increase leading to a higher spread of the virus in the country, which the European countries did at the early stages of the virus spread. Keeping this in mind, we presented four different policy options that would be benefited for the government of Pakistan and based on that we also calculate the monetary benefits of these policy options.[6]

1. **Low Case Scenario (Low):** Case isolation in the home - Symptomatic cases stay at home for 7 days, reducing non-household contacts by 70% for this period. Household contacts remain unchanged. Assume 30% of household comply with the policy.
2. **Moderate Case Scenario (Moderate):** Voluntary home quarantine - Following identification of asymptomatic cases in the household, all household members remain at home for 14 days. Household contact rates double during this quarantine period, contacts in the community reduce by 75%. Assume 50% of household comply with the policy.
3. **High Case Scenario (High):** Social distancing of those over 70 years of age - Reduce contacts by 70% at workplaces, increase household contacts by 30% and reduce other contacts by 75%. Assume 70% compliance with the policy.
4. **Completely Lockdown (CLD):** Social distancing of the entire population - All households reduce contact outside household, school, or workplace by 100%. Assume 90 % of the population compliance with the policy.

[6] These policy options are based on study conducted by Ferguson et al. (2020)

**Table 1:** Direct deaths from COVID-19 with and without social distancing in Pakistan

| Age Groups | Total pop (Million) | IFR - Direct Deaths (%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No Social Distancing | Social Distancing | | | | Lives Saved (the difference between deaths with and without Social Distancing Policy) | | | |
| | | | Low | Moderate | High | CLD | Low | Moderate | High | CLD |
| 0-9 | 60.48 | 0.0010 | 0.0007 | 0.0005 | 0.0003 | 0.0001 | 0.0003 | 0.0005 | 0.0007 | 0.0009 |
| 10-19 | 49.10 | 0.0040 | 0.0028 | 0.0020 | 0.0012 | 0.0004 | 0.0012 | 0.0020 | 0.0028 | 0.0036 |
| 20-29 | 34.33 | 0.0200 | 0.0140 | 0.0100 | 0.0060 | 0.0020 | 0.0060 | 0.0100 | 0.0140 | 0.0180 |
| 30-39 | 25.79 | 0.0520 | 0.0364 | 0.0260 | 0.0156 | 0.0052 | 0.0156 | 0.0260 | 0.0364 | 0.0468 |
| 40-49 | 18.96 | 0.0980 | 0.0686 | 0.0490 | 0.0294 | 0.0098 | 0.0294 | 0.0490 | 0.0686 | 0.0882 |
| 50-59 | 12.71 | 0.9130 | 0.6391 | 0.4565 | 0.2739 | 0.0913 | 0.2739 | 0.4565 | 0.6391 | 0.8217 |
| 60-64 | 4.38 | 2.3910 | 1.6737 | 1.1955 | 0.7173 | 0.2391 | 0.7173 | 1.1955 | 1.6737 | 2.1519 |
| 65+ | 7.07 | 4.6970 | 3.2879 | 2.3485 | 1.4091 | 0.4697 | 1.4091 | 2.3485 | 3.2879 | 4.2273 |
| **Total** | **212.82** | | | | | | | | | |

**Note:** *Low indicates the social distancing policy implemented partially, Mode refers to a situation where 50 percent of the population complies with the social distancing policy while High indicates the 70 percent population comply with the government guidelines and CLD means complete lockdown policy implemented in the country and every one by force follows the social distancing policy. IFR represents Infection Fatality Rate which states that the proportion of all the infected COVID-19 patients that will eventually die.*

**Table 2:** Overflow deaths from COVID-19 with and without social distancing in Pakistan

| Age Groups | Total pop (Million) | IFR - Overflow Deaths (%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No Social Distancing | Social Distancing | | | | Lives Saved (the difference between deaths with and without Social Distancing Policy) | | | |
| | | | Low | Moderate | High | CLD | Low | Moderate | High | CLD |
| 0-9 | 60.48 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 |
| 10-19 | 49.10 | 0.002 | 0.001 | 0.001 | 0.001 | 0.000 | 0.001 | 0.001 | 0.001 | 0.002 |
| 20-29 | 34.33 | 0.009 | 0.006 | 0.005 | 0.003 | 0.001 | 0.003 | 0.005 | 0.006 | 0.008 |
| 30-39 | 25.79 | 0.023 | 0.016 | 0.012 | 0.007 | 0.002 | 0.007 | 0.012 | 0.016 | 0.021 |
| 40-49 | 18.96 | 0.045 | 0.032 | 0.023 | 0.014 | 0.005 | 0.014 | 0.023 | 0.032 | 0.041 |
| 50-59 | 12.71 | 0.418 | 0.293 | 0.209 | 0.125 | 0.042 | 0.125 | 0.209 | 0.293 | 0.376 |
| 60-64 | 4.38 | 1.085 | 0.760 | 0.543 | 0.326 | 0.109 | 0.326 | 0.543 | 0.760 | 0.977 |
| 65+ | 7.07 | 2.018 | 1.413 | 1.009 | 0.605 | 0.202 | 0.605 | 1.009 | 1.413 | 1.816 |
| **Total** | **212.82** | | | | | | | | | |

Tables 1 and 2 presents estimates for direct and overflow deaths, with and without social distancing against these four scenarios. We, however, maintain that Pakistan was able to implement a low or moderate case scenario. The challenge in estimating overflow deaths is that the death rate changes as a function of the number of patients, a standard model that takes COVID-19 death rates at an input will not directly capture this phenomenon.

In contrast, empirical comparisons between overwhelmed and calmer hospital systems (ex: Wuhan vs. rest of China) are challenging because distancing policies are most severely implemented in overwhelmed areas, confounding comparisons. Pakistan is already facing the shortage of hospital beds and ventilators and this number is just approximately 3500 out of which 2000 are in the private hospitals, which are far below in case of emergency. [7]

[7] See more details in Tsai et al. (2020)

## 4.1. Total number of Lives Saved

**Table 3**: Lives Saved with social distancing in Pakistan (COVID-19)

| Age Groups | Total pop (Million) | Direct Count (Lives Saved) | | | | | Overflow Count (Lives Saved) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No Social Distancing | Low | Mode | High | CLD | No Social Distancing | Low | Mode | High | CLD |
| 0-9 | 60.48 | 605 | 181 | 302 | 423 | 544 | 605 | 181 | 302 | 423 | 544 |
| 10-19 | 49.10 | 1964 | 589 | 982 | 1375 | 1768 | 982 | 295 | 491 | 687 | 884 |
| 20-29 | 34.33 | 6866 | 2060 | 3433 | 4806 | 6179 | 3090 | 927 | 1545 | 2163 | 2781 |
| 30-39 | 25.79 | 13413 | 4024 | 6706 | 9389 | 12071 | 5933 | 1780 | 2966 | 4153 | 5339 |
| 40-49 | 18.96 | 18583 | 5575 | 9292 | 13008 | 16725 | 8533 | 2560 | 4267 | 5973 | 7680 |
| 50-59 | 12.71 | 116000 | 34800 | 58000 | 81200 | 104400 | 53108 | 15933 | 26554 | 37176 | 47798 |
| 60-64 | 4.38 | 104824 | 31447 | 52412 | 73377 | 94341 | 47567 | 14270 | 23784 | 33297 | 42811 |
| 65+ | 7.07 | 331872 | 99562 | 165936 | 232311 | 298685 | 142584 | 42775 | 71292 | 99809 | 128326 |
| **Total** | **212.82** | **594126** | **178238** | **297063** | **415888** | **534713** | **262402** | **78721** | **131201** | **183681** | **236162** |

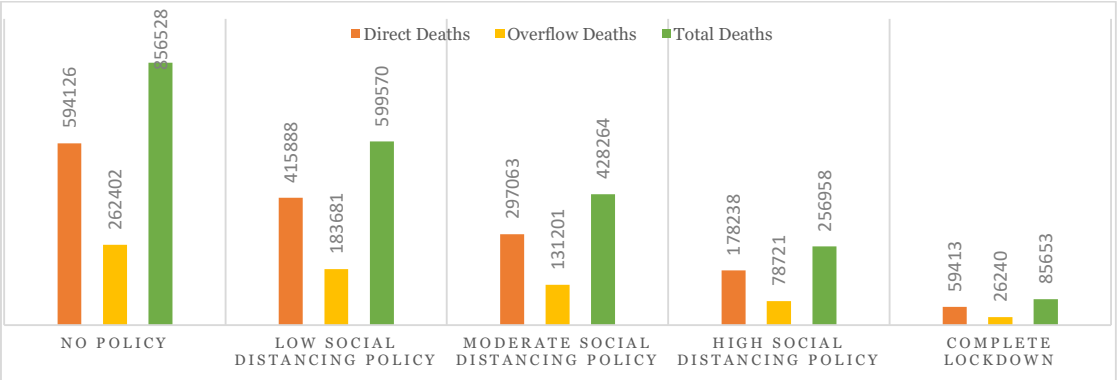
**Table 4:** Total lives (direct + overflow) saved with social distancing policy in Pakistan (COVID-19)

| Age Groups | Total pop (Million) | Total Deaths | Total Lives Saved | | | |
|---|---|---|---|---|---|---|
| | | No Policy | Low | Moderate | High | CLD |
| 0-9 | 60.48 | 1210 | 363 | 605 | 847 | 1089 |
| 10-19 | 49.10 | 2946 | 884 | 1473 | 2062 | 2651 |
| 20-29 | 34.33 | 9955 | 2987 | 4978 | 6969 | 8960 |
| 30-39 | 25.79 | 19345 | 5804 | 9673 | 13542 | 17411 |
| 40-49 | 18.96 | 27116 | 8135 | 13558 | 18981 | 24404 |
| 50-59 | 12.71 | 169108 | 50732 | 84554 | 118376 | 152197 |
| 60-64 | 4.38 | 152391 | 45717 | 76196 | 106674 | 137152 |
| 65+ | 7.07 | 474457 | 142337 | 237228 | 332120 | 427011 |
| **Total** | **212.82** | **856528** | **256958** | **428264** | **599570** | **770875** |

Table 4 summarizes the key results of Table 1, Table 2, and Table 3. Column 1 report on each of the 8 age categories and the population in each age group for Pakistan is reported in column 2. Columns (3) facts the projected deaths (856,528) with no social distancing policy implemented in the country. It is noted that almost 93% of lives are saved from the age group 50 and over and only 7 % from below the 50 years of age. In other words, these are the deaths avoided for these age groups when implementing a social distancing policy in the country.

Most importantly, the social distancing in Pakistan is potentially likely to save 256,958 lives with a low case scenario, 428,264 lives with a moderate case scenario, 599570 lives with a high case scenario, and 770,875 lives when a complete lockdown is forced with 90% population observing social distancing. It means complete lockdown in the country would reduce the total number of deaths to 85,653 (Chart 1) of which 59413 are direct deaths while the remaining (26240) are overflow deaths.

**Chart 1:** Number of deaths under different social distancing scenarios




The number of projected deaths under different scenarios may appear on a higher side in absolute terms. However, reading these numbers as a ratio of population suggests that deaths without any social distancing are 0.40% of the population of Pakistan. According to Barnett-Howell and Mobarak (2020), practicing low social distancing and complete lockdown decrease the ratio to 0.28% and 0.04% respectively.[8] The projected mortality rate is similar to earlier studies conducted for a major pandemic outbreak around the world.[9] Most importantly, Bommer & Vollmer (2020) calculate IFR for Pakistan to be 0.29% which is equal to what we have calculated for moderate social distancing in Pakistan (0.28%).

## 4.2. Dollar values of benefits from social distancing- Statistical Value of Saved Lives

Table 5 presents the VSL for Pakistan by different age groups after adjusting for life expectancy. All values are reported in Table 5 in a million USD. We observed that the VSL for Pakistan varies by age groups and older age groups (ages 60 and over) have less VSL as compared to the younger age groups.

**Table 5:** Value of a Statistical Life (VSL) in Pakistan by age cohort

| Age Groups | Value of a Statistical Life (Million USD) | | | | | | |
|---|---|---|---|---|---|---|---|
| | VSL1 | VSL2 | VSL3 | VSL4 | VSL5 | VSL6 | VSL7 |
| 0-9 | 0.3590 | 0.4734 | 0.9415 | 1.1404 | 1.2499 | 0.7812 | 0.3841 |
| 10-19 | 0.3777 | 0.4982 | 0.9908 | 1.2001 | 1.3152 | 0.8220 | 0.4042 |
| 20-29 | 0.3707 | 0.4889 | 0.9723 | 1.1777 | 1.2907 | 0.8067 | 0.3967 |
| 30-39 | 0.3238 | 0.4270 | 0.8492 | 1.0286 | 1.1274 | 0.7046 | 0.3465 |
| 40-49 | 0.2417 | 0.3187 | 0.6338 | 0.7677 | 0.8414 | 0.5259 | 0.2586 |
| 50-59 | 0.1572 | 0.2073 | 0.4123 | 0.4994 | 0.5473 | 0.3421 | 0.1682 |
| 60-64 | 0.0868 | 0.1145 | 0.2277 | 0.2758 | 0.3023 | 0.1889 | 0.0929 |
| 65+ | 0.0352 | 0.0464 | 0.0923 | 0.1118 | 0.1225 | 0.0766 | 0.0377 |
| **Total (all ages)** | **0.2440** | **0.3218** | **0.6400** | **0.7752** | **0.8496** | **0.5310** | **0.2611** |

**Note:** *VSL1=0.2440, VSL2=0.3218, VSL3=0.6400, VSL4=0.7752, VSL5=0.8496, VSL6=0.5310 and VSL7=0.2611*

[8] Countries and regions with younger populations, such as Bangladesh, Pakistan and Sub-Saharan Africa, face much lower risk, with the unmitigated spread of COVID-19 leading to predicted mortality rates of 0.39% and 0.21%, respectively.
[9] For context, the H1N1 Spanish influenza of 1918 is estimated to have killed between 50 to 100 million people, somewhere between .95% and 5.4% of the world population at the time.

**Table 6:** Total benefits (of lives saved) by social distancing under different VSL

(B=benefit=VSL*number of lives saved)

| Age Groups | Social Benefits (Billion USD) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **B1** | **B2** | **B3** | **B4** | **B5** | **B6** | **B7** |
| | **Low Social Distancing** | | | | | | |
| 0-9 | 0.13 | 0.17 | 0.34 | 0.41 | 0.45 | 0.28 | 0.14 |
| 10-19 | 0.34 | 0.44 | 0.88 | 1.06 | 1.16 | 0.73 | 0.36 |
| 20-29 | 1.13 | 1.46 | 2.90 | 3.52 | 3.85 | 2.41 | 1.18 |
| 30-39 | 1.91 | 2.48 | 4.93 | 5.97 | 6.54 | 4.09 | 2.01 |
| 40-49 | 2.00 | 2.59 | 5.16 | 6.25 | 6.84 | 4.28 | 2.10 |
| 50-59 | 8.11 | 10.52 | 20.92 | 25.34 | 27.77 | 17.35 | 8.53 |
| 60-64 | 4.03 | 5.23 | 10.41 | 12.61 | 13.82 | 8.64 | 4.25 |
| 65+ | 5.09 | 6.61 | 13.14 | 15.91 | 17.44 | 10.90 | 5.36 |
| **Total** | **22.74** | **29.50** | **58.67** | **71.07** | **77.89** | **48.68** | **23.94** |
| **Age Groups** | **Moderate Social Distancing** | | | | | | |
| 0-9 | 0.22 | 0.29 | 0.57 | 0.69 | 0.76 | 0.47 | 0.23 |
| 10-19 | 0.57 | 0.73 | 1.46 | 1.77 | 1.94 | 1.21 | 0.60 |
| 20-29 | 1.88 | 2.43 | 4.84 | 5.86 | 6.42 | 4.02 | 1.97 |
| 30-39 | 3.18 | 4.13 | 8.21 | 9.95 | 10.90 | 6.82 | 3.35 |
| 40-49 | 3.33 | 4.32 | 8.59 | 10.41 | 11.41 | 7.13 | 3.51 |
| 50-59 | 13.51 | 17.53 | 34.86 | 42.23 | 46.28 | 28.92 | 14.22 |
| 60-64 | 6.72 | 8.72 | 17.35 | 21.01 | 23.03 | 14.39 | 7.08 |
| 65+ | 8.49 | 11.01 | 21.90 | 26.52 | 29.07 | 18.17 | 8.93 |
| **Total** | **37.89** | **49.17** | **97.79** | **118.44** | **129.81** | **81.13** | **39.89** |
| **Age Groups** | **High Social Distancing** | | | | | | |
| 0-9 | 0.31 | 0.40 | 0.80 | 0.97 | 1.06 | 0.66 | 0.33 |
| 10-19 | 0.79 | 1.03 | 2.04 | 2.47 | 2.71 | 1.70 | 0.83 |
| 20-29 | 2.63 | 3.41 | 6.78 | 8.21 | 8.99 | 5.62 | 2.76 |
| 30-39 | 4.46 | 5.78 | 11.50 | 13.93 | 15.27 | 9.54 | 4.69 |
| 40-49 | 4.66 | 6.05 | 12.03 | 14.57 | 15.97 | 9.98 | 4.91 |
| 50-59 | 18.91 | 24.54 | 48.81 | 59.12 | 64.79 | 40.49 | 19.91 |
| 60-64 | 9.41 | 12.21 | 24.29 | 29.42 | 32.24 | 20.15 | 9.91 |
| 65+ | 11.88 | 15.41 | 30.66 | 37.13 | 40.70 | 25.44 | 12.51 |
| **Total** | **53.05** | **68.84** | **136.90** | **165.82** | **181.74** | **113.58** | **55.85** |
| **Age Groups** | **Complete Lockdown** | | | | | | |
| 0-9 | 0.40 | 0.52 | 1.03 | 1.24 | 1.36 | 0.85 | 0.42 |
| 10-19 | 1.02 | 1.32 | 2.63 | 3.18 | 3.49 | 2.18 | 1.07 |
| 20-29 | 3.38 | 4.38 | 8.71 | 10.55 | 11.56 | 7.23 | 3.55 |
| 30-39 | 5.73 | 7.43 | 14.79 | 17.91 | 19.63 | 12.27 | 6.03 |
| 40-49 | 5.99 | 7.78 | 15.47 | 18.74 | 20.53 | 12.83 | 6.31 |
| 50-59 | 24.32 | 31.55 | 62.75 | 76.01 | 83.30 | 52.06 | 25.60 |
| 60-64 | 12.10 | 15.70 | 31.23 | 37.83 | 41.46 | 25.91 | 12.74 |
| 65+ | 15.27 | 19.82 | 39.42 | 47.74 | 52.33 | 32.70 | 16.08 |
| **Total** | **68.21** | **88.50** | **176.01** | **213.20** | **233.66** | **146.04** | **71.81** |

**Note:** *B1= (VSL1*Lives saved), B2= (VSL2*Lives saved), B3= (VSL3*Lives saved), B4= (VSL4*Lives saved), B5= (VSL5*Lives saved), B6= (VSL6*Lives saved) and B7= (VSL7*Lives saved).*

Table 6 summarizes the main findings of the study. All social benefits adopting different distancing policy options are presented separately by panels. In the top panel, a low case scenario of social distancing is presented by using different VSL by age groups, and for the total population of Pakistan, benefits are varying between US$ 22.74 billion to US$77.89 billion while in bottom panel completely lockdown scenario is represented, and the benefits vary between US$68.21 billion to US$ 233.66 billion for Pakistan.

**Chart 2:** Benefits from moderate social distancing by age Group in Pakistan (Billion USD)

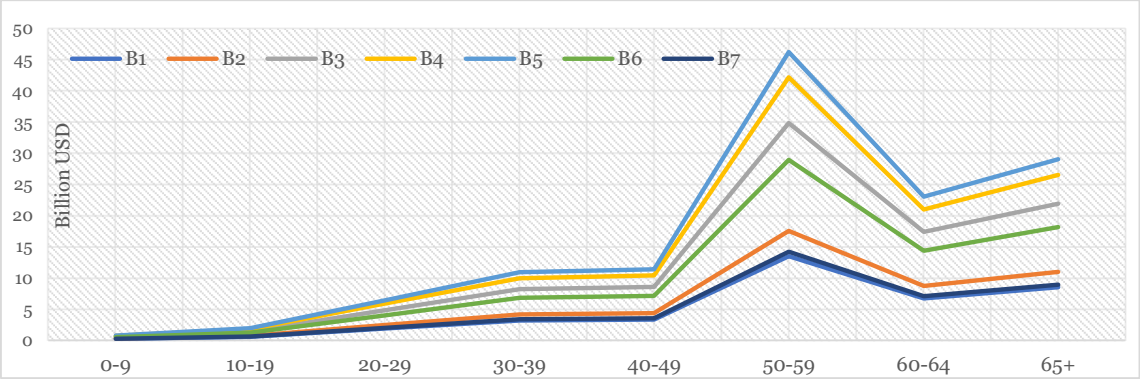



Chart 2 illustrates that the impacts are strikingly heterogeneous across age categories. Although about three-fourths of the averted deaths come from people older than 60, they account for only 40% of the monetary benefits because the VSL declines at older ages, reflecting their lower remaining life expectancies. It is also striking that the benefits of reduced mortality rates for people under the age of 50 are US$ 9.2 billion or just 24.2% of the total benefits, although they account for 88% of the population; this finding is not surprising as only 6500 deaths come from people under the age of 50. COVID-19's risks and the benefits of social distancing are disproportionately concentrated among the older age categories.

**Chart 3:** Total benefits from social distancing in Pakistan under different scenarios (Billion USD) (based on table 6)

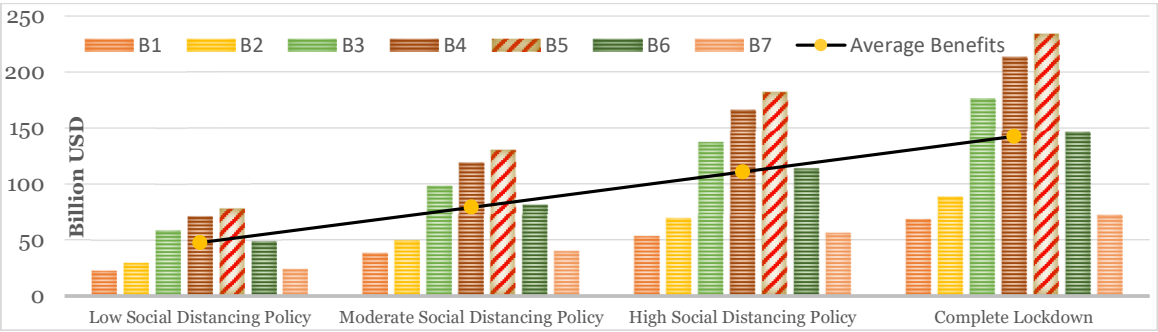



Chart 3 presents the benefits of social distancing under different mitigation measures. As noted from the red bar in chart 3 that Pakistan can save a maximum of US$ 233.66 billion while adopting a complete lockdown scenario while on average US$ 142.5 billion can be saved under this scenario. Pakistan can save US$ 77.89 billion under the low case scenario while on average US$ 47.5 billion can be saved under this scenario. All in all, the dollar value of lives saved ranges between US$ 47.5 billion to US$ 142.5 billion under different mitigation scenarios.

## 5. Conclusion

Replicating the IFR trends from China, we estimate that the number of deaths without any social distancing in Pakistan would reach to 856,528. With moderate social distancing policy, like the

present lose lockdown, Pakistan is likely to have saved 428264 lives. But, an equal number of lives can be still at risk. The present estimates for the deaths and benefits vary if we use the actual IFR for Pakistan when available or we recommend a random sampling to find out the actual IFR for Pakistan.

The dollar value of saved lives can be somewhere between US$ 37.89 billion to US$ 129.81 billion for moderate social distancing and between US$ 68.21 billion to US$ 233.66 billion for strict lockdown depending upon the different VSL. Overall, average benefits (VSL*lives saved) increase as we move from low social distancing to higher level of social distancing (chart 3).

As clinical knowledge of this new disease increases, the estimates may improve. However, if we have to err, we would prefer to err on the side of caution, therefore, we recommend respective governments to go for a higher level of social distancing immediately, including strict lockdown in the regions where the incidence of disease is high. Otherwise, the spread of infection and fatalities may increase exponentially

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