Economic Analysis

Project Number: 54173-001
Loan Number: 3918
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Bangladesh: COVID-19 Response Emergency Assistance Project

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 19 April 2020)

Currency unit	–	Taka (Tk)
SDR1	=	$1.38
$1.00	=	Tk84.97

ABBREVIATIONS

ADB	–	Asian Development Bank
COVID-19	–	coronavirus disease 2019
DALY	–	Disability-Adjusted Life Years
GDP	–	gross domestic product
WHO	–	World Health Organization

NOTE

(i) The fiscal year (FY) of the Government of Bangladesh and its agencies ends on 30 June. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2019 ends on 30 June 2019.

(ii) In this report, “$” refers to United States dollars.

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A. Project Background

1. The COVID-19 Response Emergency Assistance Project will support the Government of Bangladesh (the government) in addressing immediate and urgent needs for financial, logistical, and systemic support to respond to the COVID-19 outbreak. The project has three outputs: (i) provide immediate and medium-term equipment needs for testing and managing COVID-19; (ii) deliver infrastructure and related equipment for supporting and sustaining prevention and management of COVID-19; and (iii) strengthen health system and community capacities in combatting COVID-19. These three outputs are aligned with GOB's current National Preparedness and Response Plan for COVID-19.[1]

B. Economic Rationale

2. Public investment in health is often justified because of the positive externalities of improved health outcomes such as increased human capital, higher productivity, increased earnings and economic growth. This project is likely to generate significant social benefits to a large number of beneficiaries through prevention and treatment of COVID-19, improved health risk management, and enhanced health awareness, and thereby contribute to curbing the negative economic impacts of the COVID-19 outbreak. Bangladesh could suffer significant economic losses due to COVID-19. The pandemic affects economic activity through various channels including a standstill in production and services, declines in domestic consumption, exports, investment and trade, and reduction in remittances. Asian Development Bank (ADB) estimates indicate that a significant domestic outbreak combined with longer containment periods and large demand shocks could contract real gross domestic product (GDP) by up to 4.9%.[2] As of April 2020, about $3.2 billion worth of export orders had already been canceled, affecting 2.3 million workers.[3] One million garment workers have already lost their jobs due to fall in global demand and almost a million of overseas workers have returned to Bangladesh due to outbreaks in their host countries.[4] In the short-term to medium-term, it is likely to lead to high unemployment and disruptions in schooling and thus, possible detrimental effects on long-term human capital growth. Equally important, COVID-19 will have debilitating effects on human capital through additional death and increased morbidities. Thus, the project outputs are expected to prevent loss of human capital and address short-term gaps in the health system.

C. Cost-Effectiveness Analysis

3. A cost-effectiveness analysis was conducted to assess the economic rationale for investing in the project, where the incremental impact of the project is compared to the baseline scenario without the project. The cost-effectiveness analysis compares the health impacts against the economic costs of the intervention against that for the "without project" baseline scenario. The incremental cost effectiveness ratio ($ICER$) is defined as follows:

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[1] Government of the People's Republic of Bangladesh. Ministry of Health and Family Welfare. 2020. *National Preparedness and Response Plan for COVID-19, Bangladesh Version 5*. Dhaka.

[2] Asian Development Bank. 2020. *Asian Development Outlook 2020: What Drives Innovation in Asia*. Manila.

[3] Bangladesh Garment Manufacturers and Exporters Association. 2020. https://www.bgmea.com.bd/.

[4] ADB. 2020. *Report and Recommendation of the President to the Board of Directors: Proposed Loans and Technical Assistance Grant—People's Republic of Bangladesh: COVID-19 Active Response and Expenditure Support (CARES) Program.* Manila.

Figure: Cost Effectiveness Indicator

$$ICER = \frac{C_{si} - C_b}{HI_{si} - HI_b}$$

Note:
1. C is the cost of the intervention scenario i.
2. HI is the health impact, expressed in terms of years of disability adjusted life years.
3. s_i refers to intervention scenario.
4. b refers to baseline scenario.

Source: Asian Development Bank. Guidelines to Economic Analysis of Health Sector Projects

4. In order to determine whether an intervention is cost-effective or not, we applied the following criteria recommended by the World Health Organization (WHO) and Commission on Macroeconomics and Health:[5]

- If cost per DALY > GDP per capita times 3, the intervention is not cost effective;
- If cost per DALY < GDP per capita times 3, the intervention is cost effective; and
- If cost per DALY < GDP per capita, the intervention is very cost effective

D. Health Impact

5. Health impact is measured by the number of Disability-Adjusted Life Years (DALYs) averted. The number of cases and deaths due to COVID-19 are converted into DALYs which is a composite indicator that combines both morbidity and mortality impacts into a single measure.[6] DALYs is the number of years lost due to ill-health, disability, or premature death. It is calculated as the sum of Years of Life Lost (YLL) and Years Lived with Disability (YLD).

$$\boldsymbol{DALY = YLL + YLD}$$

6. The YLL is estimated by multiplying the number of deaths due to COVID-19 among a given age-group with the standard life expectancy at the same age-group,

$$YLL = N \times L$$

where:
N= number of deaths by age
L= standard life expectancy at age of death in years

7. N is obtained by calculating the difference in the estimated number of infectious cases and mortality between two epidemiologic scenarios: (i) social distancing (baseline, without project, scenario); and (ii) suppression triggered at 1.6 deaths per 100,000 per week (with project scenario).[7] Standard life tables at age of death, L, was taken from WHO life tables.[8]

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[5] World Health Organization. 2001. Commission on Macroeconomics and Health & World Health Organization. (2001). Macroeconomics and Health: Investing in Health for Economic Development: Executive Summary/ Report of the Commission on Macroeconomics and Health. https://apps.who.int/iris/handle/10665/42463

[6] Another composite measure is called Quality Adjusted Life Year (QALY). While frequently used in developed countries, it has limited application in developing countries.

[7] Walker, et al. 2020. *Global Impact of COVID-19 and Strategies for Mitigation and Suppression*: PreventionWeb.

[8] https://www.who.int/quantifying_ehimpacts/publications/en/9241546204chap3.pdf

8. To measure YLD, the incident cases is multiplied by the average duration of the disease and a disability weight factor that reflects the severity of the disease on a scale from 0 indicating perfect health to 1 (dead).[9] The difference in the number of hospitalized cases between with and without project scenarios is multiplied by the average duration of the disease and the disability weight. Average duration of the disease is assumed to be 21 days.[10] The disability weight (DW) is proxied by the value for lower respiratory disease of 0.133.[11] Time discount rate of 3% is applied, consistent with the discounting rate for Commission on Macroeconomic on Health and WDR 1993. This implies that a year of life gained today will be valued more than a year of life gained next year. A discount rate of 6% which is the ADB hurdle rate for social sectors, was also applied.[12] This implies that a year of life gained today will be valued more than a year of life gained next year.

$$YLD = I \times DW \times L$$

where:
I = number of incident cases
DW= disability weight
L= average duration of the case until remission or death (years)

E. Economic Costs

9. The total capital investment costs (excluding price contingencies and taxes) are spread over the 4 years of implementation based on the disbursement schedule. Financial costs were converted to economic investment costs using the domestic price numeraire method by applying a shadow exchange rate factor of 1 on traded costs[13]; a standard conversion factor of 0.9 for non-traded and 1 for scarce labor;[14] and a shadow wage rate factor of 0.75 (footnote 14) for surplus labor. Recurrent and maintenance costs were assessed at 5% of major equipment costs (i.e., laboratory equipment, isolation and critical care equipment), and replacement of major equipment was assumed to be carried out every 10 years. An exchange rate of 1 USD to 85 Taka was assumed. The economic cost of the project was discounted at 3% and 6%, following ADB guidelines (footnote 12).

F. Results of the Economic Analysis

10. Cost-effectiveness analysis following ADB guidelines on economic analysis (footnote 12) shows that cost per DALY is less than the gross domestic product (GDP) per capita using the 3%

[9] In the burden of disease literature, the term disability is used broadly to refer to departures from good or ideal health (see footnote 8).
[10] Zhou, et al. 2020. *Clinical Course and Risk Factors for Mortality of Adult Inpatients with COVID-19 in Wuhan, China: A Retrospective Cohort Study*: The Lancet https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30566-3/fulltext. Given that not much is known about the longer-term impacts of COVID-19, for simplicity it is assumed that there will be no lingering impacts of COVID-19 to those who will recover from the disease. It should be noted that this assumption may most likely underestimate YLD.
[11] Global Burden of Disease Collaborative Network. 2018. *Global Burden of Disease Study 2017 (GBD 2017) Disability Weights*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME). http://ghdx.healthdata.org/record/ihme-data/gbd-2017-disability-weights
[12] ADB. 2017. *Guidelines for the Economic Analysis of Projects*. Manila.
[13] ADB. 2019. *Periodic Financing Request Report: People's Republic of Bangladesh: Skills for Employment Investment Program (Tranche 3)*. Manila.
[14] ADB. Forthcoming. Project Completion Report: Bangladesh - Third Primary Education Development Project. Manila (under preparation).

and 6% discount rate, making the intervention very cost effective (Table 1).[15] To be on the conservative side, it is assumed that the project contributes to only 5% of total DALYs averted. If a higher project attribution is assumed, ICER will be lower and therefore more cost-effective. Sensitivity analysis was conducted assuming higher costs (increased by 10%) and lower health benefits (decreased by 10%). Regardless of the reduction in assumed benefits and increase in costs or the discount rate used, the sensitivity analysis shows that the project is very cost-effective (Table 2).

Table 1. Results of Cost Effectiveness Analysis

Year	Project Costs	DALYS Averted
2020	37,455,586	40,133
2021	48,780,352	52,481
2022	9,143,672	9,261
2023	1,593,829	1,029
2024	650,098	257
2025	650,098	257
2026	650,098	257
2027	650,098	257
2028	650,098	257
2029	13,652,061	257
2030	650,098	257
2031	650,098	257
2032	650,098	257
2033	650,098	257
2034	650,098	257
2035	650,098	257
2036	650,098	257
2037	650,098	257
2038	650,098	257
2039	650,098	257
2040	650,098	257
PV at 3%	109,408,139	100,832
PV at 6%	100,344,836	95,296
ICER at 3%		1,085
ICER at 6%		1,053
GDP per capita		1,906
Three times GDP per capita		5,718

ICER = Incremental Cost effectiveness Ratio, DALY = Disability-Adjusted Life Years, GDP = gross domestic product, PV = present value.
Source: Asian Development Bank.

[15] World Health Organization. 2016. *Cost Effectiveness Thresholds: Pros and Cons*. Geneva. The project intervention will be deemed very effective if the cost per DALY is less than three times GDP per capita, cost effective if cost per DALY is less than GDP per capita, and not cost effective if cost per DALY exceed these levels.

Table 2. Sensitivity Analysis

	ICER at 3%	ICER at 6%
10% increase in cost	1,194	1,158
10% decrease in benefits	1,206	1,170
10% increase in cost and 10% decrease in benefits	1,326	1,287

ICER = cost effectiveness ratio.
Source: Asian Development Bank.