Should the attainment of Sustainable Development Goals be fast-tracked to build back better after the COVID Pandemic?

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2023

IEG Working Paper No. 457

सत्यमेव परमो धर्मः

May 2023

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Abstract

United Nations reports the COVID-19 pandemic to have delayed the attainment of Sustainable Development Goals (SDGs) as more resources were diverted to health and sanitation sectors. Scientific research attributes the COVID-19 pandemic to the loss of natural habitats of pathogens from unsustainable lifestyles that afflicted humans and puts their lives at risk. Should sustainable development or the attainment of SDGs be prioritized in post-pandemic developmental programs? Will such a policy undermine the pandemic management or the economic development of the countries? This paper examines this question by statistically analyzing the relation between SDG scores and COVID mortality in Indian states. COVID mortality is seen to be negatively related to the SDG score of the year 2020 as well as the rate of change of SDG scores between 2018 and 2020 and depicts an inverted U-shape association. This means states that fastened the attainment of SDGs in 2020 compared to 2018 witnessed fewer deaths, probably by managing the pandemic well, and states with the slow progress of SDGs witnessed more deaths. Globally, countries managing the pandemic well are seen to have suffered lower economic losses, and thus, high SDG scorer states can attain higher economic growth by better managing the pandemic. These results provide a reason to speed up the attainment of SDGs to rebuild the economy after the pandemic.

Keywords: COVID-19 Pandemic, COVID mortality, Sustainable Development Goals, SDG gap, Niti Aayog, India

JEL classification: I15, I18, Q01

1. Introduction

Building back the economy after the COVID pandemic and the associated setbacks is a vexing issue before world leaders. The outbreak of COVID-19 in late 2019 and its pandemic designation in March 2020 altered the investment priorities of governments from developmental activities towards research and development in the health and sanitation sectors.[1] As the COVID pandemic has been a super spreader (Trafton 2020), almost everyone was urged to invest in individual health along with community health. The pandemic has caused more than 4 million deaths so far and has impacted the economy, education, workforce, and much more, pointing to its significance for broader questions of sustainable development and societal well-being (Seshaiyer & McNeely 2020). It is estimated that global investment in recovering from COVID-19-related economic stress will equate to $20 trillion (Shulla et al. 2021). The choices surrounding how this money is invested will affect generations for decades to come and determine whether communities become more resilient to such future disruptions[2]. The UNDP advocates investing in green economies to restore the balance between people and the planet and help countries recover. *"The 2030 Agenda provides the blueprint we need, and its 17 Sustainable Development Goals (SDGs) identify ways in which the global community can collaborate to achieve the interconnected social, economic, and environmental challenges we now face. --- The best celebration of the fifth anniversary of the 2030 agenda will be to place it at the center of efforts to design sustainable solutions and build back better after the pandemic."*[3] In the words of UN Secretary-General António Guterres, had the implementation of the 2030 Agenda been further advanced, the world would have been more resilient and better prepared to respond to the challenges posed by the global health emergency.[4] Such arguments make a case for prioritising the attainment of SDGs in post-COVID building back strategies.

The 17 SGDs (see more discussion later), adopted by the United Nations in the year 2015, encompass different facets of well-being, and attainment of these goals is synonymous with a quality of life that ensures environmental, social, and economic sustainability. Though the

[1] https://www.who.int/docs/default-source/coronaviruse/covid-strategy-update-14april2020.pdf. Accessed on 20th January 2022

[2] https://www.unenvironment.org/news-and-stories/story/learning-green-recovery, Accessed on 20th January 2022

[3] https://sdg.iisd.org/commentary/guest-articles/the-2030-agenda-as-blueprint-for-a-post-covid-world/. Accessed on 20th January 2022

[4] https://sdg.iisd.org/commentary/guest-articles/the-2030-agenda-as-blueprint-for-a-post-covid-world/#_ftn3. Accessed on 20th January 2022

SDGs aimed to "leave no one behind," this objective has been threatened by the growing inequalities due to the pandemic. The multiplied global challenges, economic, and financial shocks associated with COVID-19 have made financing for sustainability more difficult (UN 2020). Work-related mobility and migration are heavily affected because of lockdowns and curfews with significant human and economic costs (Barbier 2020; Sirkeci and Murat 2020) and developing countries have become more vulnerable.[5] There are tremendous and widespread economic consequences affecting all areas of the economy, including capital flows, business operations, employment, and jobs (Djankov and Panizza 2020). Forceful digitalization of education has impacted over 1.2 billion learners in over 170 countries (72% of all learners) during the initial lockdown period (Mhlanga and Moloi 2020; UNESCO 2020). The decline in the global economy, especially the advanced economies, threatens the achievement of SDG 1. Despite some countries making progress in decreasing pre-pandemic income inequality, a global recession is expected to cause approximately 71 million additional people to live in poverty (UN 2021). The achievement of SDG 10 (reduced inequalities) is negatively impacted because the most vulnerable groups (women, youth, low-wage workers, small and medium enterprises, and the informal sector) have to cope with the most damaging impacts of COVID-19 and the current growing inequalities between countries (Berchin et al. 2020). The COVID-19 pandemic has underlined the already critical importance of SDG 3 (good health and well-being) for all as a global aspiration. Universal health coverage is posited as an aspiration for all countries, irrespective of their differences in resources and budget constraints, along with problems of low access to health services, low quality of health care, and high levels of financial risk (Hogan et al. 2018; Jamison et al. 2018; Ji & Chen 2016). Though the pandemic has derailed the attainment of some of the SDGs, it could probably be better managed with advancement toward SDGs due to the sustainable lifestyle that comes with higher SDGs, and the pandemic was attributed to an unsustainable lifestyle (Hu et al. 2021). In the Indian context, like other developing countries, a formidable investment challenge is resolving the trade-off between financing long-term Sustainable Development and the management of the pandemic and the uncertainties involved. Whether prioritizing SDGs in building back programs undermine or helps the pandemic management and the economic development of the country is a pertinent question. This paper examines this question in the context of the Indian economy and finds that higher levels of SDGs have complimented the

[5] https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/PB_81.pdf. Accessed on 16th Jan 2022

pandemic management in the country. The states, where SDGs attainment was prioritized between 2018 and 2020, witnessed lower COVID death rates. Moreover, there is evidence of an Environmental Kuznets Curve (inverted U-shape relation) between the COVID mortality rate and the rate of change of SDG scores between 2018 and 2020 that reinforces the argument to prioritize the fast attainment of SDGs in the Indian context.

First, the paper discusses the link between COVID-19 and unsustainable lifestyles to highlight the importance of sustainable development to manage the pandemic. This is then followed by a general discussion on SDGs and SDG scores of Indian states and then the empirical analysis, the discussion, and conclusions from the paper.

1.1 Unsustainable Development and COVID-19

The Genesis of the COVID-19 pandemic is being attributed to factors like rapid deforestation, habitat, and biodiversity loss, unhealthy unsustainable lifestyle, etc. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that caused the coronavirus pandemic is argued to have a zoonotic origin and COVID-19, a zoonotic disease caused by germs that spread between animals and people (Hu et al. 2021). Studies show that global changes in the mode and the intensity of land uses are creating expanding hazardous interfaces between people, livestock, and wildlife reservoirs of zoonotic disease (Gibb et al. 2020). Zoonotic viruses infect people directly when they handle live primates, bats, and other wildlife (or their meat) or indirectly from farm animals such as chickens and pigs (Donson et al. 2020). Globally, the most common form of land use changes is a conversion of natural habitats to agricultural or urban ecosystems and these are widely recognized to influence the risk and emergence of zoonotic disease in humans by causing changes in the local diversity and taxonomic composition of potential reservoir hosts (the animals that carry the pathogen and are the source of diseases but shows no sign of infection) (Myers et. al. 2013; Gottdenker et.al. 2014; Keesing et al. 2010). It is observed that pathogens and parasites comprise a greater proportion of local species richness (18–72% higher) and total abundance (21–144% higher) in sites under substantial human use (secondary, agricultural, and urban ecosystems) compared with nearby undisturbed habitats (Gibb et al. 2020). Governments are investing little toward preventing deforestation and regulating wildlife trade, despite well-researched plans that demonstrate a high return on their investment in limiting zoonoses and conferring many other benefits in the form of ecosystem services. Donson et al. (2020) argue to utilize the rising public funding in response to the COVID-19 pandemic for such purposes as the associated costs of the preventive efforts in the

form of protecting biodiversity and regulating wildlife trade would be substantially less than the economic and mortality costs of responding to these pathogens once they emerge as witnessed in the present context.

Natural as well as physical environments have been found to stimulate the infection rate. The role of environmental factors like temperature, humidity, wind speed, air, and water pollution, and physical features like unhygienic living, overcrowding, insects, inanimate surfaces, etc. in COVID infection have been studied, and supporting evidence found (Eslami and Jalili 2020; Kumar et al. 2021). A sustainable lifestyle is probably better able to withstand the pandemic and show a higher level of resistance to mortality and morbidity from infection. If so, the regions having a more sustainable lifestyle should have lower COVID-related deaths. This paper investigates if such evidence exists using data from India.

1.2 Sustainable Development Goals

The United Nations General Assembly adopted the 17 SGDs in the year 2015 with the mission statement "*A blueprint to achieve a better and more sustainable future for all people and the world by 2030*". These goals encompass different facets of well-being starting from poverty and hunger to peace, justice, and strong institutions. Attainment of these goals is synonymous with a good life that ensures the environmental, social, and economic sustainability of the lifestyle adopted by people. The 17 goals are described in Appendix 1.

These goals were born at the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012 to produce a set of universal goals that meet the urgent environmental, political, and economic challenges facing the world. The SDGs replaced the Millennium Development Goals (MDGs), adopted in 2000. For 15 years the MDCs made significant progress with some significant achievements like lifting I billion people out of extreme poverty (since 1990), HIV/AIDs infection dropping by almost 40%, etc.[6] SDGs are more encompassing by including climate change and sustainability components along with the poverty, health, and education goals. All 17 Goals are interconnected, meaning success in one will push for success for others. They deal with the threat of climate change impacts on how we manage our fragile natural resources, achieve gender equality or maintain better health and eradicate poverty, foster peace and inclusive societies to reduce inequalities, and help economies prosper. These goals are a global priority and developmental policies of

[6] https://www.undp.org/publications/millennium-development-goals-report-2015. Accessed on 16th of January 2022.

the governments are tuned to address the prerequisites so that the goal achievements are prioritized and hastened.

The 'take all together' ethos of the SDGs requires that the crisis should be used as an opportunity to strengthen the commitment to the 2030 Agenda and avoid risking the progress achieved to date on SDGs (Filho et al. 2020). By placing sustainable development at the core of recovery plans, a better response to future crises can be enabled, implying stronger health systems, fewer people living in extreme poverty, less gender inequality, a healthier natural environment, and more resilient societies (UN 2020). Balanced ecosystems are important for disease control (Macro 2020), which highlights the significance of understanding the interdependencies between people and ecosystems (Bodin et al. 2019) and prioritizing SDG attainment after the pandemic.

1.3 India and SDG scores

India is committed to implementing the SDGs based on the nationally defined indicators responding to national priorities and needs. The NITI Aayog has been assigned the overall implementation of the SDGs and the Ministry of Statistics and Program Implementation (MoSPI), Government of India develops the National Indicator Framework (NIF) on SDGs, in sync with the Global Indicator Framework (GIF), for monitoring the SDGs. The NIF handbook, released in 2019 describes the multiple indicators used and their sources of data to construct the index of each of the 17 SDGs and the composite SDG index for Indian states.[7] Except few, for which data periodicity is five years, annual data is used for the indicators to construct the annual SDG indexes. Once the indicator values are normalized, each of the goal scores is measured as the average value of the non-null indicators and then the composite index for a state is defined as the arithmetic average of the individual goal scores of the state.[8] The first NIF was developed in 2018 and SDG indicators were calculated and are being updated since then by NITI Aayog at the level of state and union territories and the district level by the respective state departments.[9] Between 2018 and 2020, Indian states and UTs improved their scores strongly and the range of SDG indexes changed from 42-69 in 2018-19 to 50-70 in 2019-20 and then to 52-79 in 2020-21. Table 1 puts the states into three groups as per their 2020-21 scores.

[7] https://www.mospi.gov.in/documents/213904/0/Report1.pdf/096f2315-8110-994a-417a-f5539f847f8d?t=1594731288973. Accessed on 16th January 2022.
[8] For detailed calculation, see NITI Aayog Report "SDG India: Index and Dashboard 2020-21", pages 41-42.
[9] https://www.mospi.gov.in/web/mospi/sustainable-development-goals-sdg

Table 1: Grouping of Indian states and Union Territories as per the SDG scores for the year 2020-21

Top scores (70-79)	Medium scorers (65-69)	Low scorers (52-64)
Chandigarh	Gujarat	Manipur
Kerala	Telangana	Madhya Pradesh
Himachal Pradesh	Delhi	West Bengal
Tamil Nadu	Lakshadweep	Chhattisgarh
Andhra Pradesh	Mizoram	Nagaland
Goa	Puducherry	Odisha
Karnataka	Punjab	Arunachal Pradesh
Uttarakhand	Andaman and Nicobar Islands	Meghalaya
Sikkim	Haryana	Rajasthan
Maharashtra	Jammu and Kashmir	Uttar Pradesh
	Ladakh	Assam
	Tripura	Jharkhand
		Bihar

There are 9 states and 1 union territory at the top place having scores between 70 and 79, 9 states and 3 union territories having medium scores between 65 and 69, and 13 states at the lowest level having scores between 52 and 64. One sees Chandigarh at the top and Bihar at the bottom of the SDG score ladder of India.

2. Analysis and Results

2.1 Data used

This study uses data from two sources. *Niti Aayog and United Nations publication 'SDG India: Index and Dashboard' for years 2018-19, 2019-20, and 2020-21* are used for SDG-related information and *COVID-19 Data Repository by the Centre for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU), USA*[10] for COVID mortality and infection information. Though the SDG scores for the three years differ with respect to the coverage of indicators and are not strictly comparable over time,[11] the present study makes a cross-section analysis and uses the aggregate score of states, not individual SDG scores. As indicators used to measure the SDG scores in a year were the same for all the states, comparison of the rate of change of average scores of states between years should not cause any bias in the

[10] "COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University": https://github.com/CSSEGISandData/COVID-19. Accessed on 28th August 2021

[11] See NITI Aayog Report "SDG India: Index and Dashboard 2020-21", page 60

results.[12] The mortality data were also cross-checked with mortality information from the *Arogya-Setu* App of the Government of India and no discrepancy was noticed. Reports and studies mention underreporting of COVID-related deaths in India (Jha et al. 2022; WHO 2022), whereas the Government of India has firmly refuted the underreporting and has stood by its data[13]. Moreover, the JHU database has been used widely by researchers globally. The estimated population of the states from the UDAI website (https://uidai.gov.in/), as reported for April of the year 2020, is used to make all average calculations,[14] and a few other pieces of information are taken from the statistical handbook of states. First, the SDG scores of Indian states and the COVID mortality cases are described, which is then followed by the econometric analysis. The paper does a state-level analysis. Though a district-level analysis would have been better for this subject, SDG scores were unavailable at the district level.

2.2 Comparison of SDG scores between 2018 and 2020

Though states show mixed performance between 2018 and 2019, almost every state performed better in 2020 compared to 2019 by attaining a higher SDG score as observed in Figure 1. Of course, in 2020, there are some high achievers like Chandigarh, Mizoram, Sikkim, Tamil Nadu, and Uttarakhand and some poor performers like Assam, Bihar, Odisha, and Rajasthan. Figure 2 shows the rate of change[15] in SDG scores of states between 2018 and 2020. Uttar Pradesh was the top achiever and Rajasthan, the least.

2.3 COVID mortality in India

India had been hit hard by COVID, especially during the second wave of the pandemic from April-May 2021. To analyse the impact of SDG scores on COVID mortality rates, this paper uses cumulative COVID-19 cases and cumulative mortalities in Indian states and union territories till the 27th of August 2021. As per the *JHU* database, the average cumulative COVID cases per '000 population was 38.27 in India with a wide discrepancy, like 5.81 for Bihar, 109.6 for Kerala, and 141 for Lakshadweep. The cumulative death rate per thousand

[12] The hypothesis is also tested using the scores only for the year 2020, in place of rate of change, to prove the robustness of results.
[13] https://pib.gov.in/PressReleasePage.aspx?PRID=1823012. Accessed on 31st May 2022.
[14] We avoid the present year population as these would be net of COVID deaths.
[15] The simple rate of change is defined as:

$$\frac{SDG(2020) - SDG(2018)}{SDG(2018)}$$

population was 0.5 for the country, again with a wide discrepancy of 0.08 (Bihar), 2.01 (Goa), and 1.28 (Pondicherry). The average mortality per '000 COVID cases was 13.0 for India with variations like 3.69 for Mizoram, 20.6 for Nagaland, and 27.3 for Punjab from the onset of the pandemic till the 27th of August 2021. The state-specific rates are shown in Figures 3 and 4.

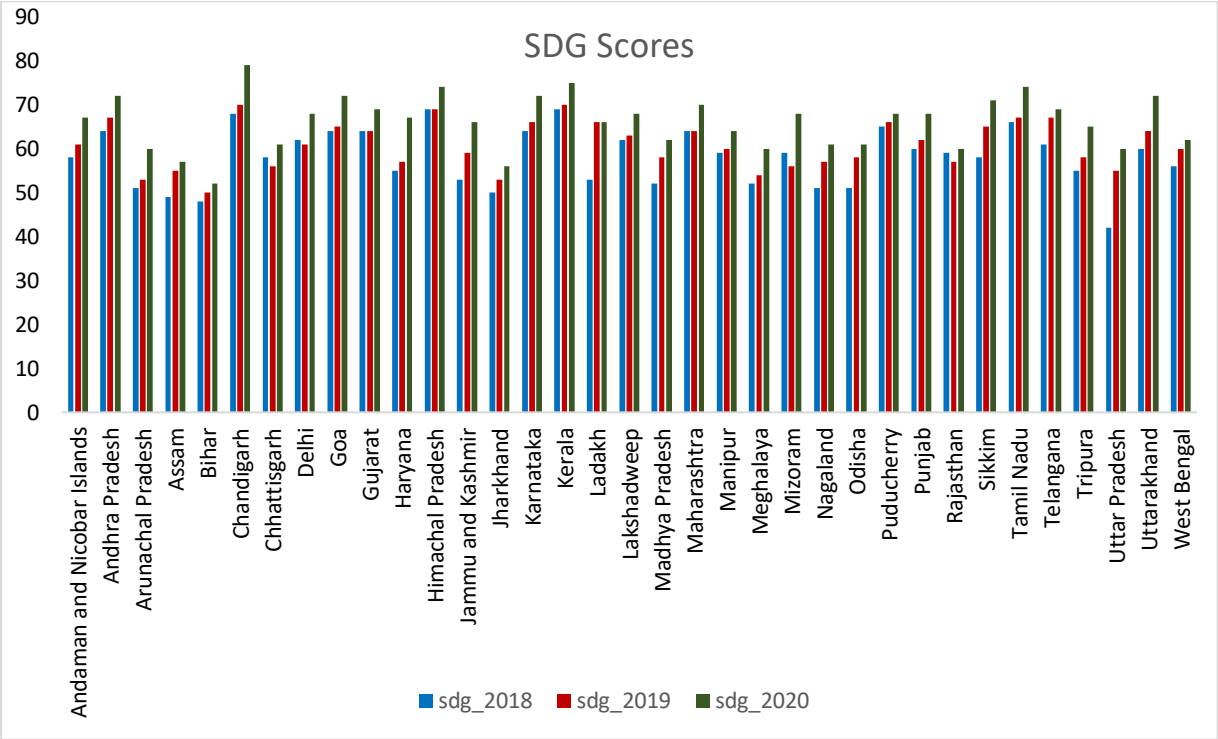


Figure 1: SDG scores of Indian States and UTs in 2018, 2019, and 2020 (Source: NITI Aayog)

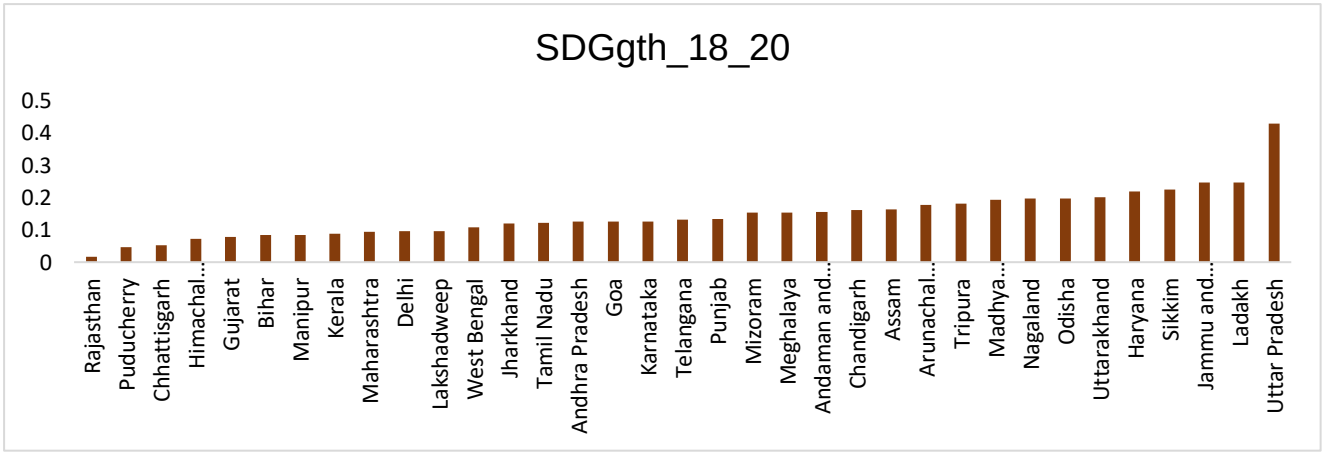


Figure 2: Rate of change of SDG scores of Indian states and UTs between 2018 and 2020.

Figure 3 shows the infection rates per thousand population and Figure 4 the mortality rates of states per thousand population and per thousand COVID cases.

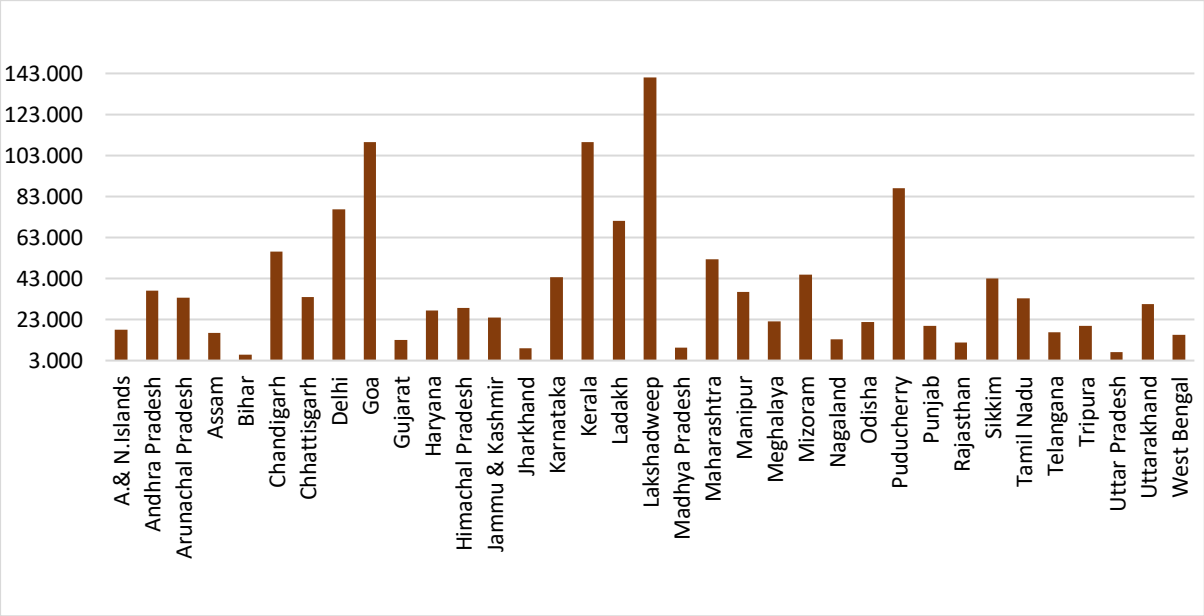


Figure 3: COVID cases of Indian states and UTs per '000 population

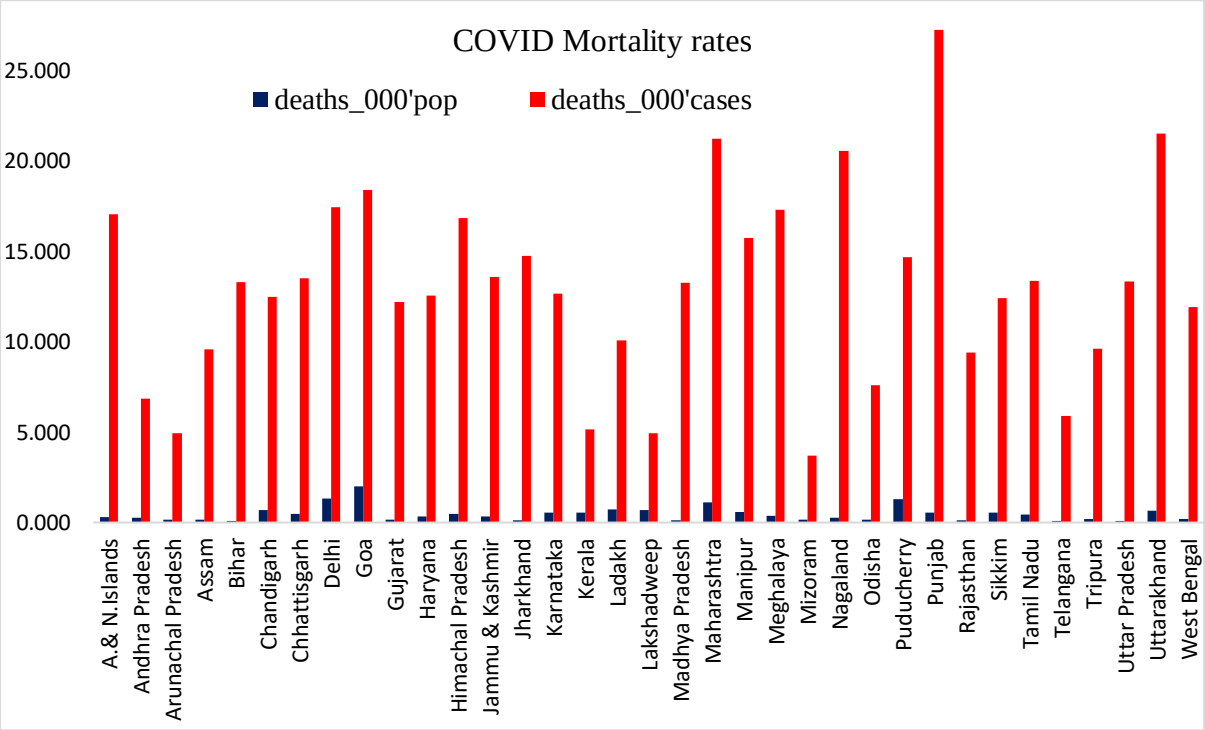


Figure 4: COVID mortality in Indian states and UTs per '000 population and '000 cases

Kerala and Lakshadweep, though had a very high infection rate (Fig 3), seemed to have managed the pandemic well with much lower death rates (Fig 4). States like Punjab, Uttarakhand, Goa, Maharashtra, Delhi, Pondicherry, and Nagaland witnessed high mortality per population and also high mortality per COVID cases (Fig 4). Goa had the highest mortality

per population whereas Punjab had the highest mortality per case. States like Mizoram, Lakshadweep, and Kerala seemed to have managed the pandemic well as they have the lower death rates per case, Mizoram has the lowest death rate in the country. Goa and Pondicherry have been some extreme cases with very high infection rates as well as high mortality rates in the country.

2.4 Relation between SDG scores and the COVID pandemic in India

First, the SDG scores[16] of different states and union territories for the year, 2020 are plotted with the mortality rates per '000 population after sorting the states in the ascending orders of their SDG scores as shown in Figure 5 and with scatter diagrams shown in figures 6.

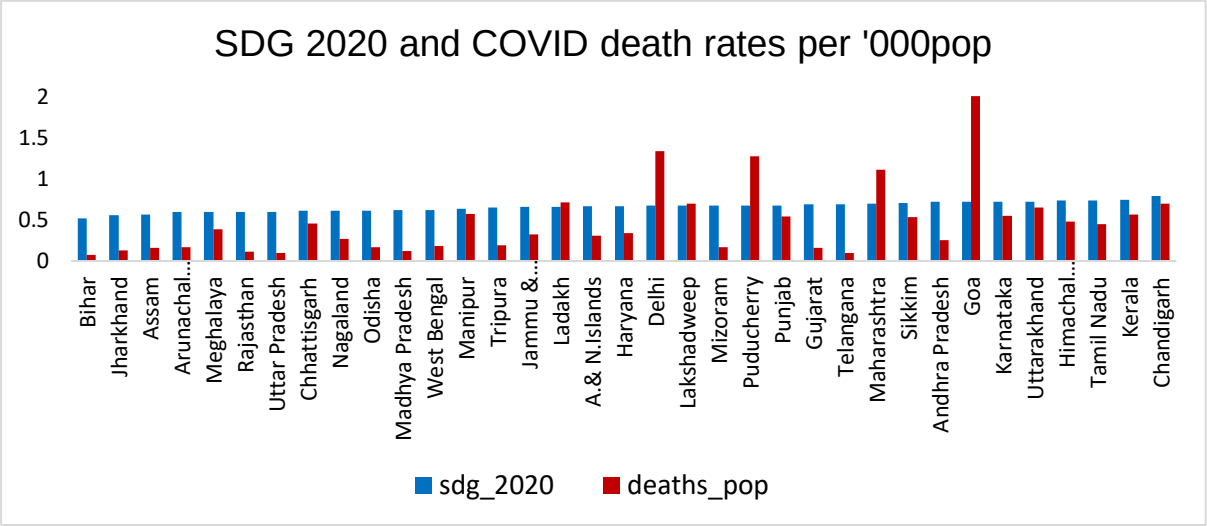
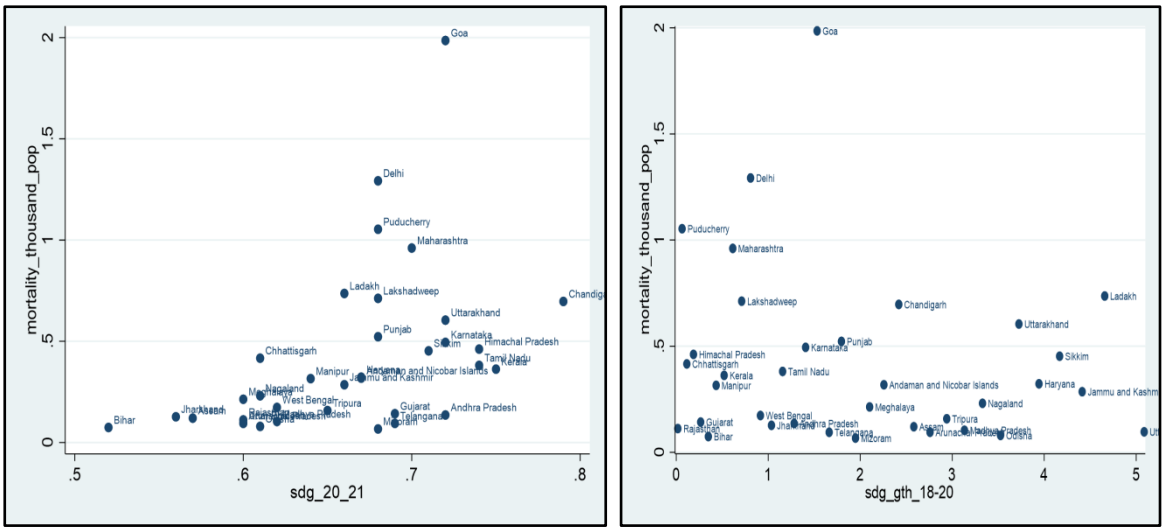


Figure 5: SDG score and mortality rates of Indian states and UTs

States with low SDG scores seemed to have witnessed low death rates and then death rates are increasing with an increase in scores and then tapering off with further increase. The histogram of Fig 5 and the scatters in Fig6 clearly shows it with high scorer states like Delhi, Goa, and Maharastra witnessing high deaths.

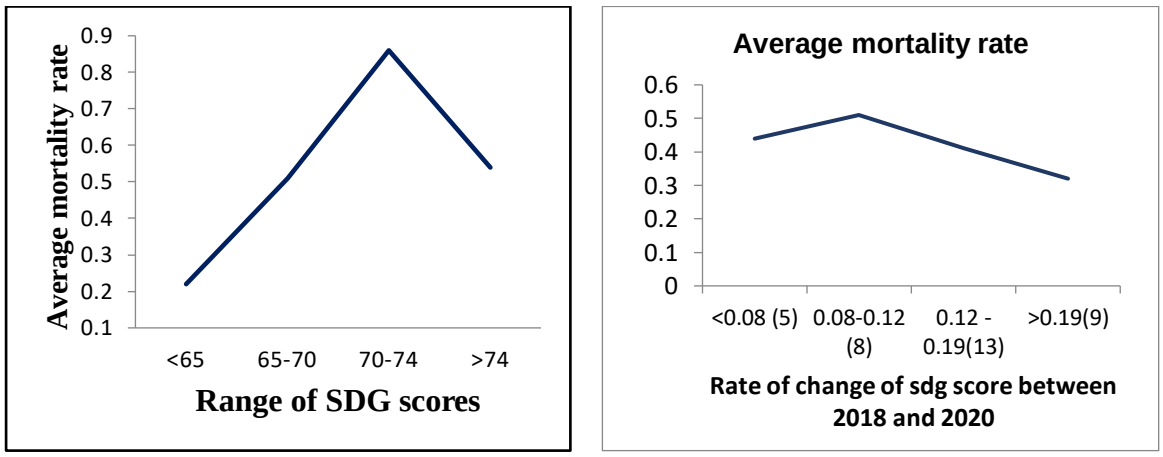
[16] The SDG scores are divided by 100 to make their values comparable to mortality rates which were in decimals.



(a) (b)

Figure 6: Scatter diagram of COVID mortality rate with (a) SDG score of states for year 2020-21 and (b) rate of change in SDG score of states between 2018 and2020.

This somewhat inverted U-shape Environmental Kuznets Curve (EKC) type relationship is clearly visible in Figures 7 when states are grouped into categories based on their SDG scores and score growth rates during 2018-2020, and average death is plotted against them. Such a relationship indicates the high scorer or high achiever states to better manage the pandemic, though the role of other confounding factors cannot be ruled out. Next, a regression analysis is used and quadratic equations are estimated to test for the existence of such an inverted U-shape relationship between the rate of change of SDG scores and death rate after controlling for confounders.



(a) (b)

Figure 6: Average COVID mortality over (a) different range of SDG scores and (b) rate of change of sdg scores. Bracketed figures in (b) are number of states.

3. Regression Results

Table 2 shows the summary statistics of the data used in regressions and Table 3, the regression results. SDG scores of different states for the year 2020 and the rates of change of SDG scores between 2018-19, 2019-20, and 2018-20 are used in the regression analysis to find out which one explains the death reductions better. The rates of change are better indicators of progress and the 2020 scores of states reflect the sustainable lifestyle status of states immediately before the onset of COVID, and thus, both are used in regression analysis. The other explanatory variables are COVID infection rate (control for severity of COVID), per capita income (control for the economic well-being of people), the share of consumption expenditure on health or the private health expenditure (control for the health consciousness of people), the share of population below poverty line (some control for the social vulnerability of the states), doctors per one lakh population (control for medical facilities available), arrivals from abroad in 2020 and 2021 (argued to be the main cause of the spread of the disease), and share of the population receiving COVID vaccinations (dose 1 and 2). The rate of change of the SDG scores during 2018-2019, 2019-2020, and 2018-2020 and their squares are used to examine the possibility of an inverted U-shape relation.

Table 2: Summary statistics of variables used in regression analysis (N=35)

Variable	Mean	Std. Dev.	Min	Max
COVID mortality per '000 population	0.41	0.41	0.07	1.99
COVID Infection rate per '000 population	38.27	32.35	5.81	141.12
Per capita income (US$)[§]	2619.8	1598.3	292	7029
Share of consumption expenditure on health (%)	12.26	3.36	6.6	18.6
Share of population below the poverty line (%)	17.88	11.16	1	39.93
Doctor per 1 lakh population	35.06	26.22	1	115
Share of population with COVID vaccine 1(%)	17.6	8.9	6.4	44.6
Share of population with COVID vaccine 2 (%)	4.5	2.9	1.4	13.6
Share of foreign arrivals in 2020 to the total population (%)	1.3	3.4	0	19.9
Share of foreign arrivals in 2021 to the total population (%)	0.02	0.04	0	1.7
SDG_gth_18_19	0.05	0.06	-0.05	0.24
SDG_gth_19_20	0.09	0.04	0	0.21
SDG_gth_18_20	0.15	0.08	0.02	0.43
SDG_gth_18_20_sq	0.03	0.03	0	0.18
SDG_gth_18_19_sq	0.01	0.01	0.00	0.06
SDG_gth_19_20_sq	0.01	0.01	0.00	0.05
sdg_2020/100	0.66	0.06	0.52	0.79
sdg_2020/100_sq	0.44	0.08	0.27	0.62

sdg_2020_category	2.03	1.01	1.00	4.00
sdg_2020_category_dummy1	0.37	0.49	0.00	1.00
sdg_2020_category_dummy2	0.34	0.48	0.00	1.00
sdg_2020_category_dummy3	0.17	0.38	0.00	1.00
sdg_2020_category_dummy4	0.11	0.32	0.00	1.00

§ *As reported by the Ministry of Statistics and Program Implementation on 31st March 2021*

As per Table 2, the average COVID mortality till August 2021 has been 0.41 per thousand population, though the infection rate was 38.27 per thousand persons during the same period. The average per capita income of the states was US$2619.8 during 2020-21, whereas it varied between US$292 and 7029 among the states and union territories. By the time of this analysis, nearly 18 percent of people have had the first dose of the COVID vaccine, whereas only 4.5 percent had taken the second dose. On average, the SDG scores of states increased by 15% during 2018 and 2020, though the average growth during 2018-2019 and 2019-2020 was 5 and 9 percent respectively. The square terms are used to explore the possible existence of any EKC-type relation between progress in SDG attainment and COVID management.

Five models are estimated using different combinations of variables of interest and Ordinary Least Square estimates with clustered standard errors are derived. The results are shown in Table 3. Model 1 tests for the existence of (if any) EKC-type relation between mortality and change of SDG score between 2018 and 2020, whereas model 2 tests it for the rate of change between 2018 and 2019 and model 3 for 2019 and 2020. One finds the rate of change and its square to have the expected sign and significance only in model 1 (growth rate during 2018-20 with a positive sign and its square term with a negative sign) indicating the possibility of an EKC-type relation between COVID death rate and SDG growth rate between 2018 and 2020. Such a relation is not found for the rate of change of scores between 2018-2019 or 2019-2020. The existence of such a relationship is also confirmed in Models 4 and 5 between the SDG score of the year 2020 and the mortality rate. However, the level of significance is low and the results are not very robust to the addition or drop of variables.

Other significant results are that states with high infection rates, more tourist arrival in 2021, and high per capita income have witnessed more mortality (more well-off states are not necessarily healthier ones) and states with a higher number of doctors per one lakh population have witnessed lowered deaths. These results depict the importance of health facilities in COVID management. The Coefficients of other variables are insignificant, but many of them have the expected sign.

Table 3: Ordinary Least Square (OLS) Regression results with clustered standard errors

Explanatory VARIABLES	(1)	(2)	(3)	(4)	(5)
	Dep. Var. = mortality per thousand population				
Infection rate per '000 population	6.042*	7.748*	7.580*	8.966***	7.316**
	(3.151)	(3.962)	(4.183)	(3.234)	(2.946)
Per capita GDP (US$)	0.000135**	0.000106	8.54e-05	0.000101	0.000116
	(6.39e-05)	(7.97e-05)	(7.65e-05)	(9.65e-05)	(0.000107)
Doctor per 1lakh population	-0.00629***	-0.00550**	-0.00485*	-0.00442**	-0.00410***
	(0.00209)	(0.00263)	(0.00241)	(0.00183)	(0.00145)
Share of the population below the poverty line	-0.00723*	-0.00606	-0.00491	0.000634	-0.000298
	(0.00406)	(0.00407)	(0.00364)	(0.00492)	(0.00474)
Share of health & consumption expenditure	0.0255	0.00574	0.000815	-0.00366	-0.00241
	(0.0194)	(0.0143)	(0.0113)	(0.0110)	(0.0121)
Share of population with COVID vaccine 1(%)	-0.711	-0.179	0.630	0.455	1.095
	(1.045)	(1.300)	(0.862)	(0.922)	(0.852)
Share of population with COVID vaccine 2	-1.435	-0.681	-1.504	-1.170	-1.360
	(2.041)	(2.064)	(1.508)	(2.767)	(2.570)
Share of foreign arrivals in 2020 to the total population	1.899	0.814	0.968	-0.736	-1.757
	(2.006)	(2.417)	(2.522)	(2.807)	(2.935)
Share of foreign arrivals in 2021 to the total population	15.68	28.67**	27.40**	46.02***	52.86***
	(12.20)	(11.61)	(11.84)	(16.50)	(17.84)
sdg_roc_18_19	-92.20**	3.060	-5.196	----	----
	(43.32)	(9.317)	(5.337)	----	----
sdg_roc_19_20	-79.49**	3.023	-4.355	----	----
	(36.89)	(9.423)	(5.723)	----	----
sdg_roc_18_20	**89.84****	-4.779	3.580	----	----
	(42.54)	(9.362)	(3.685)	----	----
sdg_roc_18_20_sq	**-50.64****	----	----	----	----
	(24.54)	----	----	----	----
sdg_roc_18_19_sq	----	14.82	----	----	----
	----	(17.65)	----	----	----
sdg_roc_19_20_sq	----	----	-4.785	----	----
	----	----	(6.730)	0.240*	----
sdg_20_category	----	----	----	(0.132)	----
	----	----	----	----	----
sdg_20_cat2(65<score<70)	----	----	----	----	0.140
	----	----	----	----	(0.137)
sdg_20_cat3(70<score<74)	----	----	----	----	0.569**
	----	----	----	----	(0.270)
sdg_20_cat4 (score>74)	----	----	----	----	0.664*
	----	----	----	----	(0.374)
sdg_2020	----	----	----	**30.95***	**30.27***
	----	----	----	**(15.17)**	**(15.63)**
sdg_2020_sq	----	----	----	**-26.74****	**-26.43***
	----	----	----	**(12.87)**	**(13.17)**
Constant	-0.354	0.336	0.264	-9.198*	-8.715*
	(0.448)	(0.239)	(0.263)	(4.732)	(4.884)
Observations	30	30	30	30	30

R-squared	0.920	0.892	0.888	0.897	0.909

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.1 Are there other policy variables more effective in controlling COVID mortality?

To examine the above question, a two-way 95% confidence interval polynomial plotting is done between the COVID mortality rate and a few state-level policy-relevant variables, including SDG growth rates. These confidence interval plots are independent of the regression results shown in Table-3. Figure 8 shows these intervals for some policy variables: (i) SDG growth rates 2018-2020, (ii) SDG score for the year 2020, (iii) having more doctors per 1lakh population, (iv) increase in health expenditure as a share of consumption expenditure, (v) more people getting MGNREGA jobs and (vi) increase in health insurance coverage. In addition to variables (i) to (iv), which are used in regression analysis for reasons given in section 3, variable (v) was taken up as studies show MGNREGA reduced the negative effects of reverse migration and thus, could have improved the COVID situation in rural areas (Vasudevan et al. 2020). Similarly, the insurance coverage provided to health workers could also have resulted in better COVID management (Adams and Walls 2020) or could be capturing the risk-averse precautionary attitude of people.

SDG growth rates bring the sharpest decline (Fig 8 (a)) in predicted COVID mortality followed by an increase in health insurance (Fig 8 (f)) and health expenditure (Fig 8 (d)). Surprisingly, an increase in SDG score, though decreasing predicted mortality, does not seem to result in that sharp a decline in mortality as witnessed in the case of score growth rates. This means better management of the pandemic happens when the low SDG scorer states attain higher scores rather than the high scorers attaining further high scores. This result adds credence to the statement that investing in SDGs after the pandemic will lead to better building back of the economies as it helps better and quicker control of the pandemic through sustainable development.

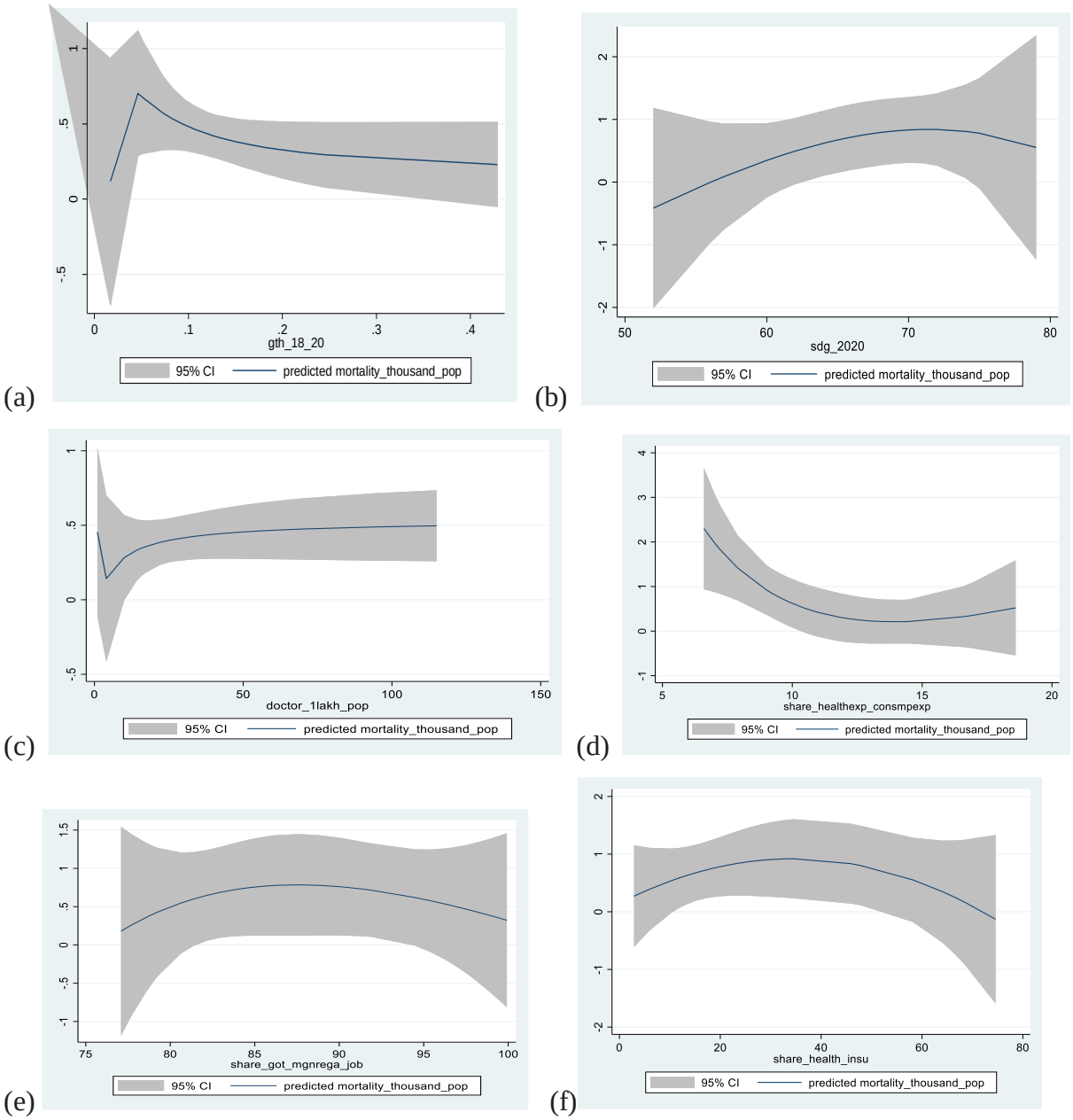


Figure 8: Confidence Interval (95%) of predicted COVID Mortality for an increase in (a) SDG growth rate, (b) SDG score of 2020, (c) doctors per 1 lakh population, (d) share of health expenditure, (e) more getting MGNREGA job and (f) more having health insurance.

Globally, better control of the pandemic has resulted in better economic returns and vice versa. Comparing the decline in per capita Gross Domestic Product in the year 2020 (almost every country suffered a decline due to pandemic-related lockdowns, etc.), it was observed that the decrease varied from 5 to11 percent for red or amber[17] countries, the higher being for countries that transited from amber to red or green to amber, whereas the green or countries transiting to

[17] See https://www.gov.uk/guidance/red-amber-and-green-list-rules-for-entering-england, for definitions.

green witnessed only a 2 to 3 percent of decrease (see Appendix 2 for more details). This example reinforces the argument that investing in measures that control the pandemic faster is better for building back the economy and investing in faster attainment of SDGs can be one such measure in India to put the economy back on a faster and more sustainable recovery path.

4. Discussions and Conclusions

This study examines the association between the Sustainable Development Goal scores of Indian states and their COVID pandemic management and finds evidence that states with high SDG scores in 2020-21 have better managed the pandemic with lower mortality rates, especially those states and union territories, where the goal achievement was fast-tracked. Mortality has been higher for states having high infection rates and also for ones with a high per capita income, which means the richer states are not necessarily the healthier ones.[18] The result on per capita income is counterintuitive but probably points a finger towards an unhealthy lifestyle or living conditions of high-income states. The mortality rate was lower for ones having more doctors per population and having a high rate of growth of SDG scores between 2018 and 2020. Better healthcare facilities and investments in sustainable lifestyles seemed to have resulted in better COVID management and lower mortality.

The COVID mortality rate was low in states having low SDG score growth (less than 8 percent), high in states having score growth between 8 to 12 percent, and again, low for states witnessing more than 12 percent rise in SDG scores (Fig.7). This inverted U-shape relation was also supported by regression analysis confirming that the states with fast-growing SDGs better-managed COVID compared to the ones with slow-growing SDGs. Low death rates from states with low SGD scores are a puzzle and poor reporting or lack of records due to low health infrastructure could be a possible reason. However, there is no conclusive evidence to prove such a hypothesis. The COVID mortality data has remained controversial and studies reveal that India's cumulative COVID deaths by September 2021 were six to seven times higher than reported officially (Jha et al. 2022; WHO 2022). The Government of India has also argued strongly against the WHO's report that supported the under-reporting of deaths in India.[19] With arguments and counterarguments like under-reporting of deaths, low deaths due to the joint family system, long exposure to bad air making it easy for people to face the coronavirus,

[18] The coefficient of correlation between per capita income and the mortality rate was 0.62 ($p<0.01$).
[19] https://www.thehindu.com/news/national/whos-covid-19-death-count-flawed-bid-to-tarnish-india-say-state-health-ministers/article65391002.ece. Accessed on 31st May 2022

exposure to multiple microbes, the hot climate, the demography, high compliance to mask-wearing, etc. (Cohen 2021; Kumar and Chander 2020; Laxminarayan et al. 2020), a more rigorous interdisciplinary study is needed to answer this question. This paper is based on government data, and the low mortality in poorer states may be because of some of the factors mentioned above. A two-way confidence interval plotting also showed the predicted mortality curve to have the sharpest decline with an increase in SDG score growth compared to an increase in many other policy-oriented developmental variables reinforcing the argument that prioritizing the faster achievement of SDGs or following a green path can be a better growth paradigm for the Indian economy to build back better. This study also examined the link between COVID mortality and individual SDG indexes (1 to 6) and did not find any significant relationship as observed for overall SDG scores. This means COVID management is multidimensional and states emphasizing overall sustainable development managed the pandemic well.

Green pathways refer to rebuilding after the COVID-19 crisis in a way that tackles climate change and aligns with the SDGs. Every country will have its way of undertaking green recovery as measures will depend on factors such as macroeconomic conditions, fiscal budget, pre-existing stimulus packages, capacity and ambition to address the climate crisis, and level of commitment to other policy objectives (Barbier and Bugess 2020). Country-level actions will depend on their existing or built-up capacity towards green recovery and undertaking such capacity building will be a win-win situation as green economies are inclusive and equitable, can generate poverty reduction and growth, create new jobs, and encourage stakeholders to act environmentally responsible (UNCC 2020). There is a wider commitment to certain global challenges in SDGs (e.g. climate change, poverty, water, peace), and these encompassing nature enables them to address the values of multiple groups and, in consequence, provide a better and sustainable life to all groups in a country.

There are multiple reports highlighting the benefits of going green. The New Climate Economy report cites transitioning to more sustainable systems as a way of increasing employment in low-carbon sectors by 65 million people by 2030.[20] When considering the jobs lost during the transition, the net gain is 37 million jobs. The International Labour Organization (ILO) has estimated that capping global temperature increases at 2 °C would create approximately 24 million jobs by 2030 (ILO 2021; Shulla et al. 2021). The Ellen MacArthur Foundation has

[20] https://newclimateeconomy.report/2018/executive-summary/. Accessed on 4th September 2021

calculated that transitioning to a circular economy has the potential to create 700,000 jobs by 2040, reduce greenhouse gas emissions by 25% and save US$200 billion per year (Wegge 2020). A circular economy would also be more resilient to global disruptions such as pandemics as it addresses pollution and climate change while creating jobs. There are multiple cautions, however, due to the availability of data as transitions to a green economy are lacking in number (Barbier 2020).

This paper has many caveats as it is based on limited cross-section data and analyses aggregate variables at the level of the states. There are issues with mortality and infection data, calculation of SDG scores, comparability, etc. Thus, the results, though interesting, should be interpreted to depict associations and indicative, rather than explain causality. More rigorous research with finer data, at least at the district level, needs to be undertaken to shed more light on the causal relationship between SDG scores and COVID mortality rates. There is also a need for developing and using other indexes in the analysis and making some cross-country comparisons keeping the global nature of SDGs in mind.

References

Adams J G, R M Walls (2020): "Supporting the Health Care Workforce during the COVID-19 Global Epidemic". *JAMA.* 323 (15):1439–1440. doi:10.1001/jama.2020.3972

Barbier E (2020): "Greening the post-pandemic recovery in the G20", *Environment and Resource Economics*, 76: 685 – 703.

Barbier E and Bugess J (2020): "Sustainability and development after COVID-19", *World Development*, 135, 105082, https://doi.org/10.1016/j.worlddev.2020.105082

Berchin Issa I and Guerra José Baltazar Salgueirinho Osório de Andrade (2020): "GAIA 3.0: Effects of the Coronavirus Disease 2019 (COVID-19) outbreak on sustainable development and future perspectives", *Research in Globalization,* 2, 100014. https://doi.org/10.1016/j.resglo.2020.100014

Bodin Ö, Alexander S M, Baggio J, et al. (2019): "Improving network approaches to the study of complex social–ecological interdependencies", *Nature Sustainability*. 2: 551–9.

Cohen, J (2021): "Is India's coronavirus death 'paradox' vanishing?", *SCIENCE*, Vol. 372, Issue 6542, pp.552-553. DOI: 10.1126/science.372.6542.552

Djankov S, Panizza U (2020): "Developing economies after COVID-19: an introduction", Vox eBook Chapters. In: Djankov S, Panizza U (ed.). *COVID-19 in developing economies*, vol. 1. 1st ed. Centre for Economic Policy Research, pp. 8–23.

Eslami H and Jalili M (2020): "The role of environmental factors to transmission of SARS-CoV-2 (COVID-19)", *AMB Express*. 15; 10 (1):92. DOI: 10.1186/s13568-020-01028-0.

Filho L, et al. (2020): "Reviewing the role of ecosystems services in the sustainability of the urban environment: a multi-country analysis", *Journal of Clean Production*, 262, 121338. https://doi.org/10.1016/j.jclepro.2020.121338.

Gibb R, Redding D W, Chin K Q, *et al.* (2020): "Zoonotic host diversity increases in human-dominated ecosystems", *Nature*, **584,** 398–402. https://doi.org/10.1038/s41586-020-2562-8

Gottdenker N L, Streicker D G, Faust C L and Carroll C R (2014): "Anthropogenic land use change and infectious diseases: a review of the evidence", *Ecology and Health*, **11**, 619–632, https://doi.org/10.1007/s10640-020-00437-w.

Hogan D R, Stevens G A, Hosseinpoor A R, et al. (2018): "Monitoring universal health coverage within the Sustainable Development Goals: development and baseline data for an index of essential health services", *Lancet Global Health*, 6: e152-68.

Hu B, Guo H, Zhou P, et al. (2021): "Characteristics of SARS-CoV-2 and COVID-19", *Nature Review Microbiology*, **19,** 141–154. https://doi.org/10.1038/s41579-020-00459-7

International Labour Organization (ILO) (2021): "COVID-19 and the world of work. Seventh edition Updated estimates and analysis", *ILO Monitor*, https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/briefingnote/wcms_767028.pdf

Jamison D T, Gelband H, Horton S, Jha P, Laxminarayan R, Mock C N and Nugent R (eds.) (2018): *Disease Control Priorities: Improving Health and Reducing Poverty*, Washington, DC: World Bank.

Ji J S and Chen L (2016): "UHC Presents Universal Challenges", *Health Systems and Reform*, 2 (1), 11–4

Jha P, Deshmukh Y, Tumbe C, Suraweera W, Bhowmick A, Sharma S, Novosad P, Fu S H, et.al. (2022): "COVID mortality in India: National survey data and health facility deaths", *SCIENCE*, Vol. 375, Issue 6581, pp.667-671. DOI: 10.1126/science.abm5154

Keesing F, et al. (2010): "Impacts of biodiversity on the emergence and transmission of infectious diseases", *Nature*, **468**, 647–652.

Kumar S, Singh R, Kumari N, *et al.* (2021): "Current understanding of the influence of environmental factors on SARS-CoV-2 transmission, persistence, and infectivity", *Environmental Science and Pollution Research*, **28,** 6267–6288. https://doi.org/10.1007/s11356-020-12165-1

Kumar P and Chander B (2020): "COVID-19 mortality: Probable role of microbiome to explain disparity", *Med Hypotheses*, 144:110209. doi:10.1016/j.mehy.2020.110209

Laxminarayan R, Wahl B, Dudala S R, Gopal K, Mohan B C, Neelima S, Reddy K S J, Radhakrishnan J and Lewnard J A (2020): "Epidemiology and transmission dynamics of COVID-19 in two Indian states, *Science*, Vol. 370, 691–697.

Mhlanga D and Moloi T (2020): "COVID-19 and the digital transformation of education: what are we learning on 4IR in South Africa?", *Education Sciences,* 10: 180. https://doi.org/10.20944/preprints202004.0195.v1.

Myers S S, Graffikin L, Golden C D, et al. (2013): 'Human health impacts of ecosystem alteration", *Proceedings of National Academy of Sciences USA,* **110**, 18753–18760.

Shulla K, Voigt B F, Cibian S, *et al.* (2021): "Effects of COVID-19 on the Sustainable Development Goals (SDGs)", *Discover Sustainability* **2,** 15. https://doi.org/10.1007/s43621-021-00026-x

Seshaiyer P and McNeely C L (2020): "Challenges and Opportunities From COVID-19 for Global Sustainable Development", *World Medical and Health Policy*, https://doi.org/10.1002/wmh3.380

Sirkeci I and Murat Y (2020): "Coronavirus and migration: analysis of human mobility and the spread of COVID-19", *Migration Letters*, 17 (2): 379 – 98. https://doi.org/10.33182/ml.v17i2.935.

Trafton A (2020): "Covid -19 'Super-Spreading' Events Play Outsized Role in Overall Disease Transmission", MIT News, November 2 [Online]. https://news.mit.edu/2020/super-spreading-covid-transmission-1102. Accessed June 12, 2021

UN (United Nations) (2021): Research roadmap for the COVID-19 recovery. https://www.un.org/en/coronavirus/communication-resources/un-research-roadmap-covid-19-recovery.

UN (United Nations) (2020): Inter-agency task force on financing for development.

https://developmentfinance.un.org/2020-financing-sustainable-development-report-preparatory-materials. Accessed 10 August 2021

UNCC (2020): E-Learning for a green recovery. https://www.uncclearn.org/learning-for-a-green-recovery/. Accessed 24 July 2021.

UNESCO (2020): Education: From School Closure to Recovery. https://en.unesco.org/covid19/educationresponse. Assessed o 31st May 2022

Vasudevan G, Singh S, Gupta G, *et al.* (2020): "MGNREGA in the Times of COVID-19 and Beyond: Can India do More with Less?", *Indian Journal of Labour Economics,* **63,** 799–814. https://doi.org/10.1007/s41027-020-00247-0

Wegge S (2020): "Creating resilient supply chains after COVID-19 with circular economy. Business & Industry", *Sustainable Packaging,* https://www.businessandindustry.co.uk/sustainable-packaging/creating-resilient-supply-chains-after-COVID-19-with-circular-economy/#. Accessed 10 August 2021.

WHO (World Health Organization) (2022): "14.9 million excess deaths associated with the COVID-19 pandemic in 2020 and 2021", Available at: https://www.who.int/news/item/05-05-2022-14.9-million-excess-deaths-were-associated-with-the-covid-19-pandemic-in-2020-and-2021. Accessed on 31st May 2022

APPENDIX

Appendix 1: Sustainable Development Goals

Appendix 2: Why is faster control of COVID building back better?

COVID Pandemic has slammed the world economy in 2019-20 and 2020-21 and governments have reacted with some of the globally adopted common measures like lockdowns, economic activity closures, social distancing, etc., which have resulted in severe economic losses. However, all countries have not suffered *uniformly*. Using World Bank data[21] on Per capita Gross Domestic Product (GDP per capita, PPP (current international $) for years 2017 to 2020, and COVID Control status of countries as whether green, amber, or red from the UK travel advisory[22], 169 countries were put into six groups and their yearly per capita income growth was compared. The groups were red, moving from amber to red, amber, moving from green to amber, green, and moving from amber to green and these statuses were as per the situation prevailing in these countries by the 30th of August 2021. Whereas being red or going back to previous categories (amber to red and green to amber) reflect bad management of COVID,

[21] https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD. Accessed on 2nd September 2021
[22] https://www.gov.uk/guidance/red-amber-and-green-list-rules-for-entering-england. Accessed on 2nd September 2021

being green or moving to the next category (amber to green) is recognized as better management of COVID.

Figure 1 shows the yearly percentage change in per capita GDP of a group of these countries over the previous year and we see both in 2018 and 2019, per capita income increased whereas all groups witnessed a decrease in per capita in 2020. The COVID pandemic was the cause. One important observation is that both in 2018 and 2019, the increase in per capita was marginally different for different groups, but the decrease in 2020 is widely different for different groups. It is pertinent to observe that the decrease varied from 5 to11 percent for red or amber countries, the higher being for countries that transited from amber to red or green to amber, whereas the green or countries transiting to green witnessed only 2 to 3 percent decrease in income. The countries controlling the pandemic faster (amber to green) had the lowest decrease in per capita GDP, just 2 percent. This example reinforces the argument that investing in measures that control the pandemic faster is better for building back the economy and investing in faster attainment of SDGs can be one such measure in India to put the economy back on a faster recovery path.

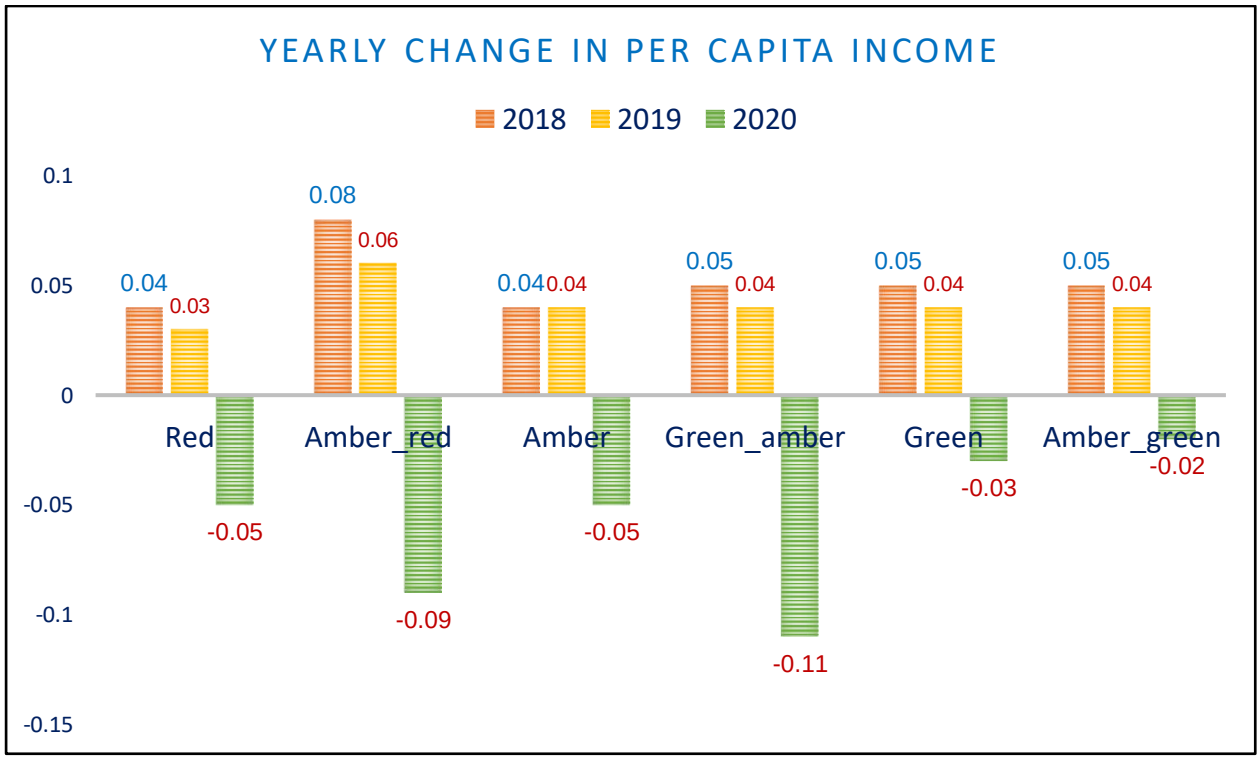


Figure A2: Percentage change in Global Per capita income for countries grouped based on their control over the COVID Pandemic

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