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Delivering on the Sustainable Development Goals 2016-2030



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Challenges for the World and Opportunities for India

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Abstract: The world is not delivering on the Sustainable Development Goals (SDGs) agenda – a set of promises that were agreed by all governments in 2015 to cover the years from 2016-2030. Progress is happening at less than one-fourth of the promised speed. On current trends, even disregarding the effects of the Covid pandemic in 2020-21, the world will reach its 2030 promises almost half a century too late in 2078. Lower-middle income countries will achieve the SDGs slightly earlier in 2068, while low- and high-income countries will each complete their promises only in the 22nd century. India stands out because, of all G20 countries, it has the fastest trend from 2015-19, and is moving faster than even lower-middle income countries. On current trends, India will achieve the SDG promises in 2059, three decades late.

Since the world and even India will not achieve the SDG promises on time, it is useful to consider which of the promises should be prioritised, to speed overall progress. Cost-benefit analysis can identify which policies generate the most socio-economic good for each extra rupee spent. Analysing more than one hundred relevant Indian policies, we identify 12 highly effective policies where extra resources would deliver astounding social, economic, and environmental returns on investment.

As India's economy grows at a rapid pace, public consumption in nominal terms increases annually more than ₹2 lakh crore. If just a small amount—say, 5% of India's annual, additional public resources (₹10,000 crore)—were to be spent on these 12 very effective policies, benefits could be generated worth possibly ₹5 lakh crore. That is equivalent to more than two percent of India's GDP, with a return of possibly ₹50 for every rupee spent.

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1. Current progress on the SDG agenda for the World and India

The Millennium Development Goals and other UN goals

The SDGs are just the most recent set of promises to emerge from a long tradition of goal setting at the United Nations (UN) (Lomborg 2014), covering a wide range of important policy areas.

Take for instance education. Universal education was promised in at least 12 UN sponsored declarations between 1950 and 2000 (UNMP 2005, 32), invoking language from promises made first in 1934 (Kenny and Sumner 2011). In 1961, the Addis Ababa Plan, for instance, promised that in Africa by 1980 “primary education shall be universal, compulsory and free.”ⁱ Unfortunately, in 1980, about half of all children of primary school age in Africa were still out of school.ⁱⁱ

However, in September, 2000 something remarkable happened, when what was then the largest gathering of world leaders in history – 100 heads of state and 47 heads of governmentⁱⁱⁱ – met at the UN Millennium Summit in New York. They made many promises ranging from the grandiose “just and lasting peace all over the world” to specifics like urging the passing of the Kyoto Protocol and arguing for better safety for UN personnel.^{iv} But they also made a number of very specific, concrete promises, which later ended up as the Millennium Development Goals (MDGs).

These goals were unique because they were short, specific and obvious development targets that everyone could relate to – and because they had a clear deadline of 2015. In short, world leaders staked out real and verifiable development promises, for the first time in history.

In reality, the MDGs were mostly developed by a small group of people around the Secretary General. The goals emerged almost fully formed in Secretary General Kofi Annan’s *Millennium Report* published in April 2000,^v and while they were formally adopted by all countries in September, they had been thrashed out in August 2001 in collaboration with the IMF, the World Bank and the OECD.^{vi} There was no long, public deliberation or much participation from individual governments.^{vii} This simplicity was likely one of the primary reasons that the end result was a simple, short list of 8 goals and 21 targets.^{viii}

Moreover, much of the MDG conversation disregarded 14 of these official targets, leaving a simple 7 promises, listed in Table 1. This was entirely sensible. A promise like “halve the proportion of people in poverty from 1990 to 2015” seems clear, important, achievable and relatable, and thus worthy of a global commitment and goal status. This is less true of the promise to “Address the special needs of landlocked developing countries and small island developing states (through the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly).” A promise to “achieve full and productive employment and decent work for all, including women and young people” is well-intentioned, but superfluous (which government would not strive towards higher employment?), impossible (a well-functioning labour market needs some unemployment to facilitate job changes), and possibly even counterproductive (job protection rules can lead to higher rates of youth unemployment and increase poverty^{ix}).

Goal	Promise by 2015	Improve- ment?	Faster progress?	Reached?
Poverty	Halve the proportion of poor	Y	N	Y
Hunger	Halve the proportion of hungry	Y	Y	N
Education	Full course of primary schooling	Y	Y	N
Gender	Gender equality in school	Y	N	Y
Child mortality	Reduce under-5 mortality by 2/3rds	Y	Y	N
Maternal mortality	Reduce maternal death by 3/4ths	Y	Y	N
Environment	Halve the proportion without clean drinking water	Y	N	Y

Table 1 The 7 crucial promises from the MDGs. 'Faster progress' measures whether at least one-fourth of low-income countries saw substantial acceleration in their rate of progress (UNDESA 2015; McArthur and Rasmussen 2018).

The official report of the MDGs showcased how each of these seven promises saw significant, global improvements (UNDESA 2015). Poverty rates much more than halved, from 47% in 1990 to just 14% in 2015, whereas hunger almost halved, from 23.3% in 1990 to 12.9% in 2015. A recent study shows that the MDGs accelerated the rate of progress for a majority of indicators, in total saving between 20.9 and 30.3 million additional lives (McArthur and Rasmussen 2018). The MDGs demonstrably made the world a better place.

2. The SDGs: Impossibly many promises

In 2014, as the MDGs were reaching their conclusion, the UN set up a process to identify a new set of global goals that could run from 2016 to 2030. These were the goals and targets that would eventually be named the Sustainable Development Goals.

Unlike the previous, simple process led by a small group around the Secretary General, the new process was long and inclusive.^x One working stream, called the Open Working Group, originated from the Rio+20 environment conference, and had 23 meetings over two years in more than 90 nations, often for a week at a time.^{xi} Another stream came from the development community through a UN System Task Team and a high-level panel co-chaired by the Presidents of Indonesia and Liberia, and the Prime Minister of the United Kingdom. Yet others came from national, global, regional and thematic consultations, as well as an independent research network called Sustainable Development Solutions Network led by Jeff Sachs, and businesses through the UN Global Compact.

At one point, an online tracker of all the proposed targets showed more than 1,400 different targets.^{xii} Towards the end of the process, some of the targets were eliminated, but most targets were concatenated. The next-to-final version of the SDGs contained 212 targets. Finally, during

negotiation, this number was slightly reduced to 169 targets. However, the wordcount was reduced by just 20 words, from 4,389 to 4,369.

This process is why many of the 169 targets read like long strings of thematically connected promises. For instance, poverty target 1.4 contains a plethora of promises: “By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.”

3. We are near half-time for the SDGs but nowhere near halfway

The promises in the SDGs run from 2016 to 2030, with the midpoint in mid-2023. We are approaching half-time for the SDGs. Therefore, it is worth taking stock to see how well the world is doing. Unfortunately, the short answer is that we have not progressed nearly as much as the SDGs promised.

It is very difficult to identify data to accurately measure SDG progress across all nations, across the many hundreds of promises and across time. Many of the indicators for the individual SDG targets have little or no data, and low and lower-middle income countries are typically under-represented, often with few or no repeat data points.

However, the Sustainable Development Report (Sachs et al. 2022) is a global academic attempt at an overall, consistent assessment of countries' progress towards achieving the SDGs. The report identifies all the data that is widely available and highly related to the individual goals, and attempts to fill in data for missing countries and years. The report develops SDG Index scores for individual goals and an overall SDG index for all nations across of 2000-22, along with typical country groupings and for the entire world. It explicitly scales these indices, which means that 0% means complete failure to achieve the goal, and 100% means full attainment:

“The global SDG Index score and scores by goal *can be interpreted as the percentage of achievement*. The difference between 100 and countries' scores is therefore the *distance in percentage that needs to be completed to achieving the SDGs* and goals. Sweden's overall Index score (85) suggest that the country is on average 85% of the way to the best possible outcome across the 17 SDGs” (Lafortune et al. 2018, italics added).

This means that we can show the SDG development for individual countries, for groupings like low-income countries, and for the world, over the 22 years from 2000 to 2021. (Unfortunately, but not surprisingly, the values for 2022, which is still not finished, are forecast and do not generally fit the historical values from 2000-21, which is why they are not utilised here.)

In Figure 1, we see the global data for the total SDG index or SDG fulfilment from 2000 to 2021. At the beginning of the period, the world had attained 59.4% of its SDGs, whereas from 2019 to 2021, it hovered around 66.0%, meaning that the period saw an increase of 6.6 percentage points. In general, the world has moved in the right direction of the SDGs, and it did so even before the SDGs were set and finalised in 2015.

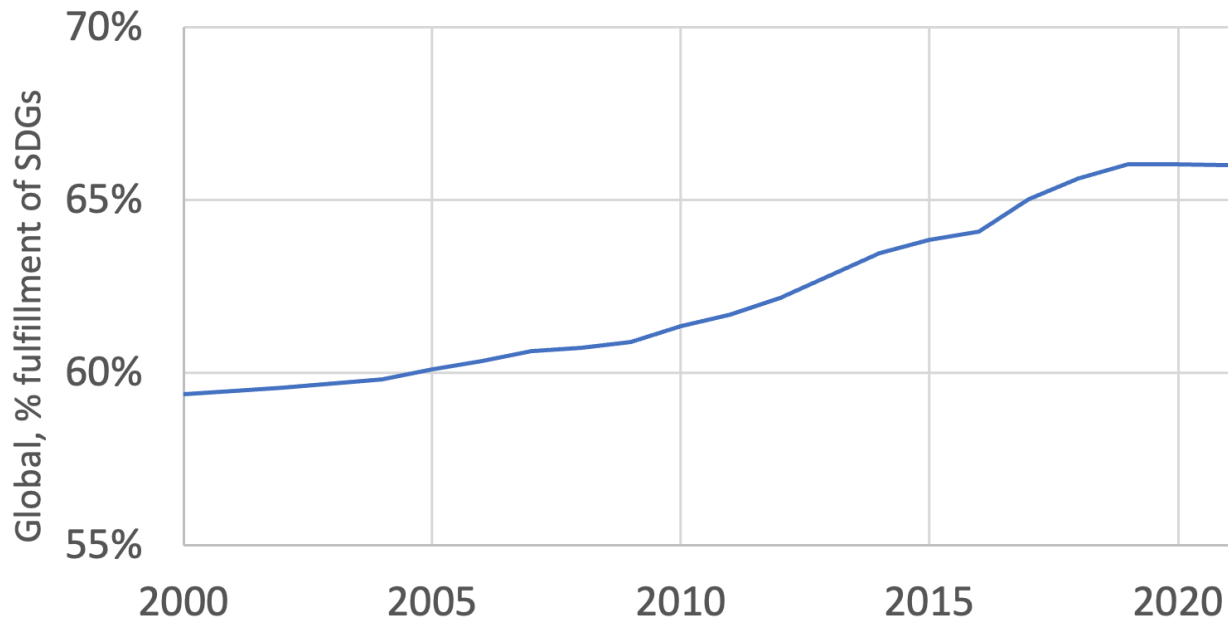


Figure 1 Global fulfilment of all SDGs, 2000-2021, (Sachs et al. 2022).

It is also clear that the world in 2020 and 2021 saw absolutely no SDG improvement, a stall caused by the Covid pandemic, which precipitated many shutdowns and economic hardship.

The 2000s (from 2000-09) saw a relatively low annual growth of 0.15 percentage points, whereas annual growth in the 2010s was much higher at 0.47 percentage points. However, there was little or no acceleration across the 2010s. The early 2010s (2010-14) saw an annual growth rate of 0.53 percentage points, almost as large as the 0.55 percentage points in the late 2010s (from 2015-19). The increase from 2015-19 (0.550) is the second-largest four-year increase, just behind 2013-17 (0.554), but these are all very small changes, likely caused by annual fluctuations.

Thus, it is hard to argue that the adoption of the SDGs has substantially increased the SDG fulfilment rate, since the rate of increase has remained almost constant over the 2010s. Rather, the SDGs could be said to be a codification of targets that were already seen to be important and worthwhile to fulfil in the early 2010s.

Figure 1 shows that the world has delivered on some SDG promises, at least up to the Covid epidemic. The years from 2015 to 2021 show an increase from 63.8% to 66.0%, an increase of 0.36 annual percentage points. But implicitly, Figure 1 also shows how far away the global improvement is from delivering on the SDG promises. By 2030, the SDG index should in principle reach 100%, which would mean “achieving the SDGs” (Lafortune et al. 2018). That would require an annual increase from 2015 of 2.4 percentage points, a speed of progress almost seven-times faster than what actually happened. If we disregard the Covid crisis over 2020-21, the growth rate from 2015-19 was 0.55, which is still more than four times slower than what was promised. The four-year progress from 2015 to 2019 of 2.2 percentage points is still a little less progress than what should have taken place in just the first year of the SDG period, from 2015-16.

We can more clearly visualise this missing performance in Figure 2. Here we still see the actual SDG index data from 2000-21. But it also shows the promise of 100% by 2030. In 2021, the world should have been at 78.3%, 12.3 percentage points above the actual 66%.

When estimating the development of the SDG index for the rest of this decade, we can look at the historical performance, as analysed above. For an optimistic estimate, we can use the increase from 2015-19, which was the almost-highest four-year increase. If we use the regression slope from 2015-19, the increase is even higher and the absolutely highest of all four-year regression slopes, at 0.59 percentage points per year.

Thus, a best-case empirical estimate, based on the trend from 2015-19, of the global SDG score in 2030 would be 71.3%, as seen in the dashed line for 2030 in Figure 2. This would be quite spectacularly below the 2030 promise, at 28.7 percentage points below 100%. The hatched area shows the unfulfilled part of the SDG promise.

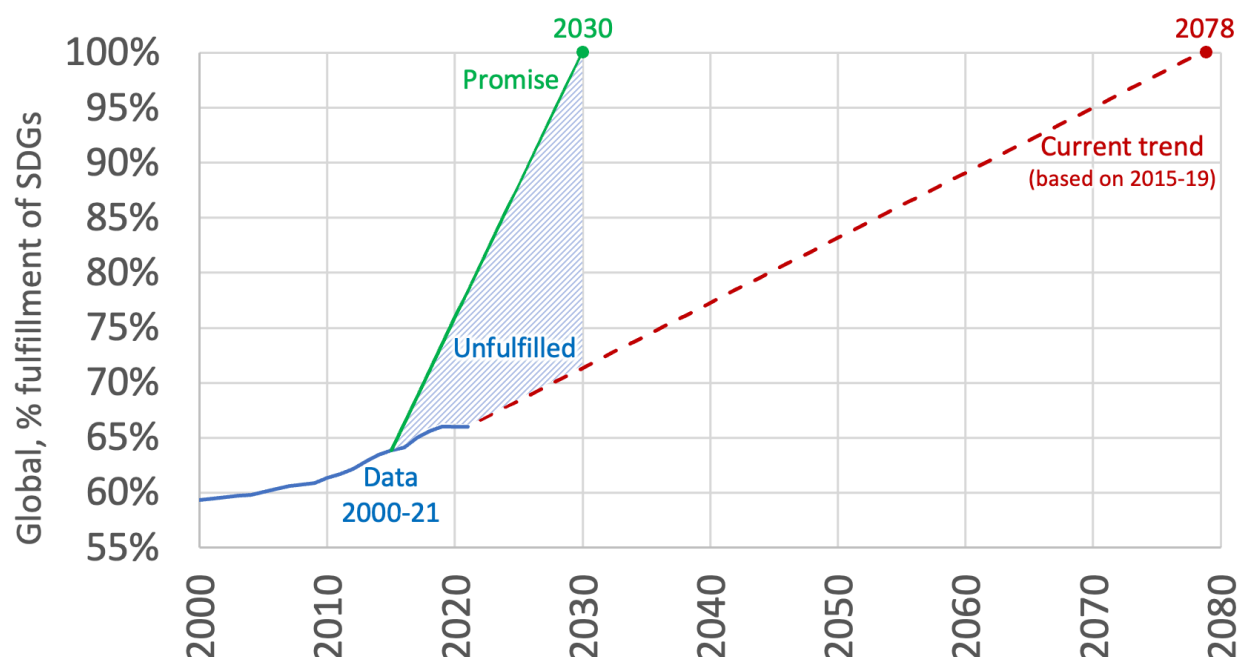


Figure 2 Global fulfilment of all SDGs, based on data 2000-2021, and trend from 2021, based on the linear regression increase from 2015-19, before the stall during the Covid years of 2020-21. On that trend, the global SDGs will be completed in 2078. Also shown is the promise of SDG completion (100%) by 2030. From a global score of 63.8% in 2015, the score should have been increased 14.5 percentage points in 2021, but the actual increase was 2.2 percentage points. The difference between promised and actual performance can be defined as the hatched area of unfulfilled promises. Based on the data from (Sachs et al. 2022).

Another way to describe the discrepancy between the 2030 promise and the empirical SDG index is to extrapolate the index to reach 100%, to see when that happens. Using the highest historical performance during 2015-19, and extrapolating from 2021, we see that on current trends the world will reach 100% a little after 2078, almost fifty years after the 2030 target. This is not an actual prediction, since it is very plausible that when countries get closer to 100% they will shift their emphasis and funding to other targets, not necessarily within the SDGs. Instead, it is a very

accessible way to describe the difference between the SDG promises for 2030 and the actual SDG performance.

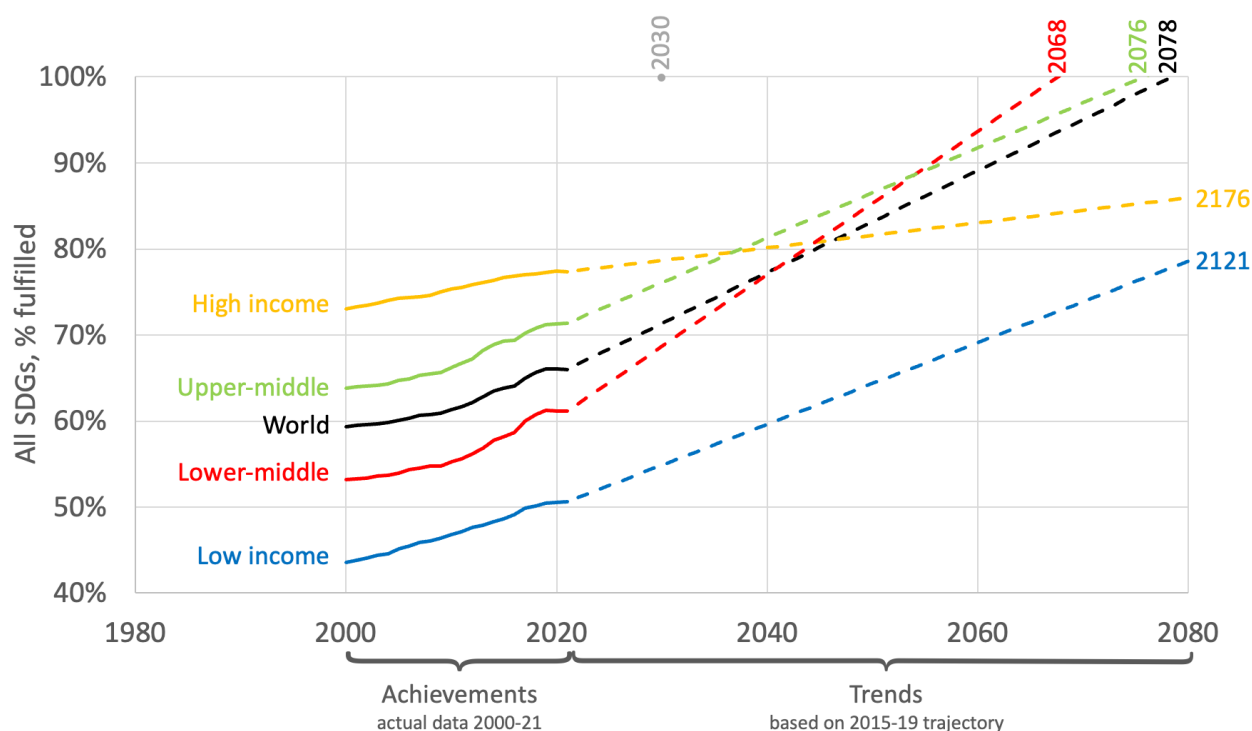


Figure 3 Fulfilment of all SDGs, for low, lower-middle, upper-middle, and high income countries, along with world. Based on data 2000-2021, and trend from 2021, using the linear regression increase from 2015-19 (ignoring the Covid impact of 2020-21). The years indicate the time to reach 100% on linear extrapolation. SDG fulfilment promise for 2030 marked in grey. Based on the data from (Sachs et al. 2022).

This allows us, in Figure 3, to show the empirical evolution from 2000-21 of the SDG index for the world, split into four income categories of countries. It also delineates their implicit long-term trends using the 2015-19 trajectory. Here it is clear that over the 2010s, the lower-middle income countries, which include India, have seen the fastest SDG increase, with a regression slope of 0.69 percentage points. The upper-middle income countries have seen the second-fastest increase at 0.56, with low-income countries at a more moderate 0.42 and the high-income countries at a very slow 0.22 percentage point increase per year.

Although the lower-middle income countries start fairly low at 53.2% in 2000 and even see a tiny decline during Covid to 61.2%, their progress over 2015-19 is so strong that on current trends they will reach 100% by 2068. Upper-middle income countries, although already at 71.4% in 2021, will on current trends complete the SDG journey in 2076, slightly ahead of the whole world. Low-income countries, starting very low, and not growing nearly as much, will on current trends only achieve all their SDGs by 2121. And despite high income countries starting out at the highest level of 77.4%, their growth is so tiny that on current, 2015-19 trends, they will only reach the SDG targets by 2176.

4. India: a success-story for SDGs

In Figure 4 we see India's SDG performance compared with the world and the four World Bank income groupings. While India starts out somewhat below its own lower-middle income group, it almost catches up, especially over the last four-year period before the Covid pandemic, 2015-19, where India spurts with a 4 percentage point growth, compared to 3.1 for lower-middle income countries in general.

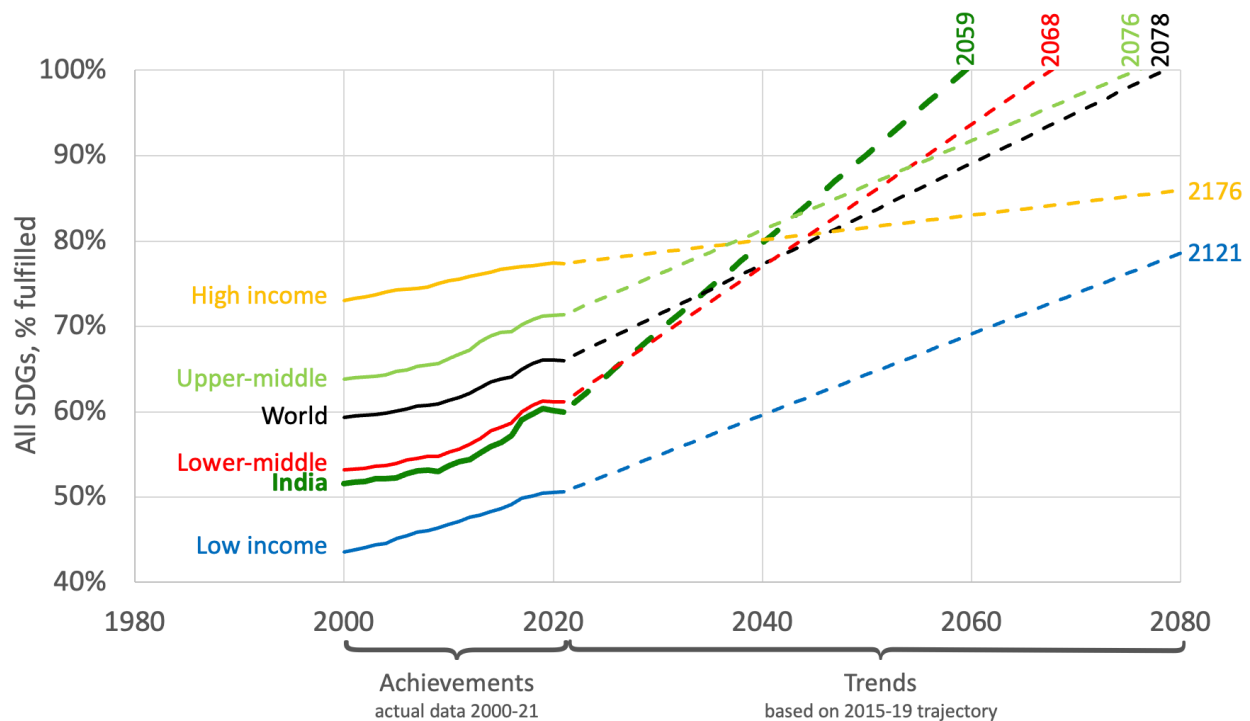


Figure 4 Fulfilment of all SDGs, similar to Figure 3, but including India's performance. Based on data 2000-2021, and trend from 2021, using the linear regression increase from 2015-19. The years indicate the time to reach 100% on linear extrapolation. SDG fulfilment promise for 2030 marked in grey. Based on the data from (Sachs et al. 2022).

On current 2015-19 trends, India is likely to overtake its lower-middle income country group before 2030. It is, on current trends, set to complete the SDGs around 2059. While this is still almost three-times slower than the promise of 2030 in the SDGs (44.5 years rather than 15 years), it is much better than the performance of any grouping of countries by income category, or indeed the world.

If we similarly compare progress over the first SDG period, 2015-19, before Covid, with the G20 nations, we find that India has performed better than any other nations, as can be seen in Table 2.

G20 Countries	SDG Index Increase 2015-19		SDG Index Increase 2015-19		SDG Index Increase 2015-19	
	India	4.0	South Africa	1.5	United Kingdom	0.5
	Saudi Arabia	3.6	Turkey	1.4	United States	0.4
	Indonesia	3.4	Japan	1.0	Argentina	0.4
	Mexico	3.0	Italy	0.8	Australia	0.4
	China	2.5	EU27	0.8	Germany	0.3
	Russia	2.5	Korea	0.6	Brazil	0.2
	France	1.6	Canada	0.5		
World	SDG Index Increase 2015-19					
	India	4.0				
	Lower middle	3.1				
	World	2.2				
	Upper middle	1.9				
	Low income	1.9				
	High income	0.6				

Table 2 SDG index increase 2015-19 for all countries in the G20 (left) and for India, the world and the four income groupings (right). Data from (Sachs et al. 2022).

Not surprisingly, high-income countries generally show the lowest increases, as was evident in Figure 4, whereas Saudi Arabia, Indonesia and Mexico have seen substantial increases, almost as good as India's 4 percentage points increase.

5. If we don't do everything, we should do the most effective policies first

Crucially, all country groups are far behind achieving their 2030 SDG promises. As is evident in Figure 4, neither the world, nor low, lower-middle, upper-middle or high-income countries are anywhere close to reaching their promises by 2030. Rich countries are moving so slowly that they will be almost one and a half century late, while even the quickest, lower-middle income group will still be almost four decades behind.

Similarly, all the G20 countries are far behind their SDG promises. While Indonesia has seen a slower growth from 2015-19 compared to India (Table 2), it starts out almost 9 percentage points higher in 2021 (68.9% against India's 60%). This is why Indonesia has the lowest completion time of the SDGs, reaching 100% on current 2015-19 trends by 2053. India is fourth after Indonesia, Saudi Arabia and Mexico, with China reaching it in 2063, Japan in 2095 and the EU27 in 2122. Both the US and Germany are last, reaching their promises by 2348. On average, the G20 nations will first finish their SDG journey in the mid-22nd century, some 120 years late.

While the world is nearing the halftime point of the SDGs, the world is nowhere near half-way toward achieving the SDG promises, even if we disregard the Covid disruption. On current trends, completing the SDG promises is set to take more than 63 years (2015-2078) globally, rather than the promised 15 years (2015-2030). Progress is more than four-times slower than promised.

One reason for the slowness is that some of the promises, like the elimination of war, poverty, climate change, hunger, and disease are simply impossibly ambitious. Another reason is that promising everything means it is hard to focus — having 169 targets is effectively equivalent to having no priorities (Lomborg 2018). Yet another reason is simply that most nations manifestly are unable or unwilling to set aside sufficient resources to achieve all their promises. Roughly, we can say that empirically, nations are only spending enough to go at one-fourth the promised speed.

But if the world has massively overpromised, and we can now see that there are not enough resources to achieve three-quarters of all promises, it is timely to consider if we can spend the SDG resources better. If we can't do it all, can we do better with what we have?

Some SDG targets will have more effective solutions than others — policies that will have a better chance of success, programmes that are cheaper, and outcomes that are more valuable than others. We should consider focusing on these solutions first. When this argument was first made at the outset of the SDGs, it was countered with the blind optimism of the new SDGs: 'We have promised everything and we should deliver everything.'

But now, as we are nearing halftime for the SDGs, and we are nowhere near halfway, this answer is no longer valid. If we continue in the next half of the SDG period as we have done up to now, we will achieve some good, but we will likely fail at all or most of our promises. The alternative is to acknowledge that since we are not doing everything and will likely fail to achieve most of the SDG promises, we should justify which things we *are* doing, and ask if we could do better.

Economic cost-benefit analysis can help identify policies where few resources can help a lot, and show where even very large resources achieve little. In the current SDG world, where we are not achieving everything, and any realistic prognosis would suggest that will remain true for the rest of the SDG period, we should allocate more resources to the policies that will deliver the most effective return for an extra rupee, dollar or shilling.

This analysis was conducted for the world in 2015 (Lomborg 2018) and is underway for the world again, at halftime. This paper will look at rough cost-benefit analyses that are relevant specifically for India to emphasise where Indian public money can be spent most effectively on SDG targets, essentially identifying the policies where India can achieve the most good first.

6. Best opportunities for India

Using cost-benefit analysis to identify best opportunities

Every society faces a multitude of challenges and has a wide range of possible policies that could mitigate these challenges. Unfortunately, no society — however rich — can afford to implement all policies and fix all challenges at the same time.

This is why every society ends up prioritising their efforts, typically through an annual budget, like India's Union Budget, State budgets, and local budgets. These budgets are an output of political haggling and institutional influences. The issues and policies that get more resources will often be those that receive more political attention and institutional sway, including issues that might make it easier to win elections or to argue for a track record in the media. The reason that more policies do not get more resources is simply that the relevant tax intake puts a natural budget constraint on the entirety of the endeavour.

But one crucial input into the political process of prioritisation is to put more effective policies first. This is where cost-benefit analysis can help. In principle, such an analysis will attempt to identify *all* the costs, including economic, social, and environmental. For instance, implementing vaccinations has an economic cost (for the vaccine, but also for health personnel) but also social costs, for instance in that a parent will have time costs from taking their child to be vaccinated. Similarly, constructing a new power plant will incur economic costs and also environmental costs from air and water pollution along with climate impacts. This analysis will use standard economic valuations to translate social costs like waiting time and environmental costs like CO₂ emissions to rupees or dollars, so that all costs can be added up.

Similarly, the analysis will attempt to identify *all* benefits. For vaccination, this would include the social cost of not dying or not becoming ill, as well as economic impacts like lower health care costs and avoided disease days. For a power plant, the benefits would be both economic, such as higher GDP, and environmental, as in avoided indoor air pollution from cookstoves.

Such a comprehensive analysis makes it possible to weigh all benefits against all costs, and suggest the benefit per rupee or dollar of cost. It allows us to rank all policies from very effective policies delivering perhaps ₹15 or more in total benefits for every rupee spent, to moderately effective policies delivering ₹1-5 of benefits per rupee spent, to bad policies that deliver less than one rupee for each rupee spent.

Of course, this effectiveness ranking is just one input to the political and ultimately democratic discussion on social priorities. Imagine deciding on what to order in a restaurant: most people have a budget constraint, and they will have preferences of some dishes over others. Information on prices and sizes, nutrition and calories of different dishes can help guide choices, but they won't be the only deciding factor. An analysis might perhaps show that the chana masala is the cheapest and most healthy dish on a menu, but if you don't like chickpeas, you will still decide against it.

Similarly, the programmes that will be highlighted in the next part of this paper all deliver excellent social returns on every rupee spent. But these are only informed suggestions for a democratic policy conversation that discusses where resources are best spent.

Global cost-benefit on the SDGs

During the UN's deliberations to choose the SDGs, the Copenhagen Consensus think tank asked more than 50 teams of economists to use cost-benefit to identify where spending extra resources would deliver the most good first (Lomborg 2018; 2015). This resulted in about 75 separate cost-benefit analyses (less than the number of targets because not all targets could reasonably be operationalised). Based on these analyses and further expert evaluation of the remaining targets, it was possible to rank all the targets from the ones that would deliver the least social good for each dollar up to the ones that would deliver the most. This is shown in Figure 5.

If we imagine spending an equal amount of resources across all 169 targets in the SDGs, we will spend some resources on very effective targets, but also many resources on targets that will do only little or moderate good.

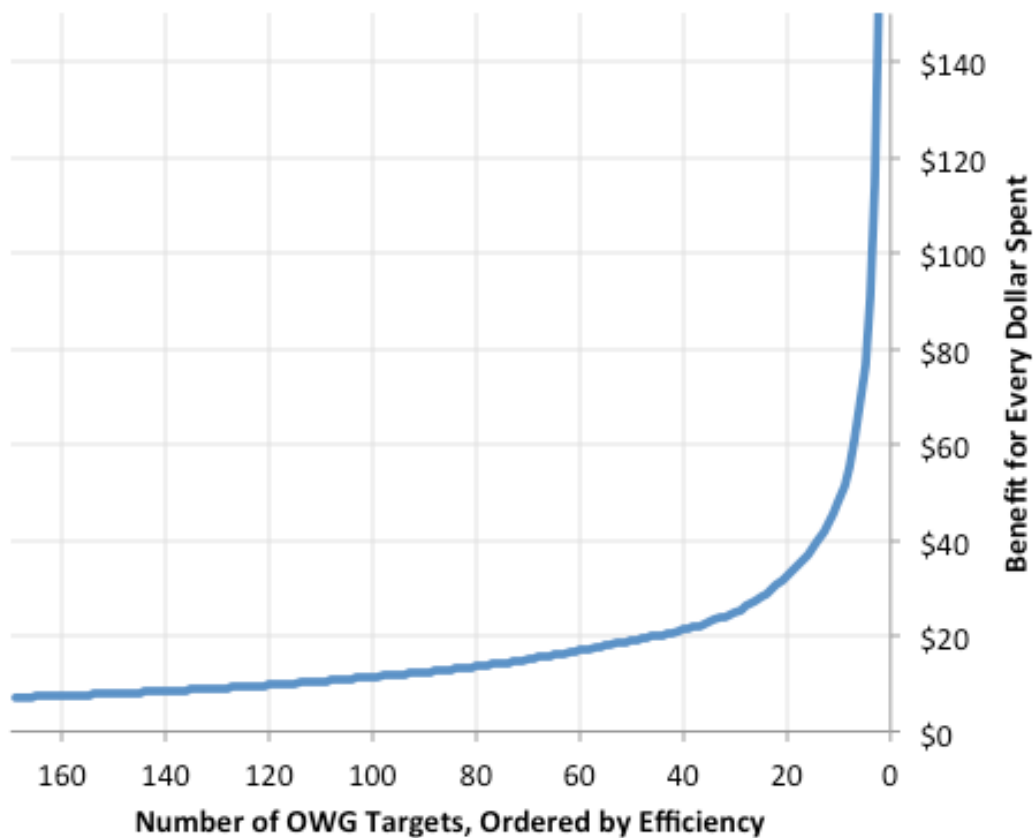


Figure 5 All 169 SDG targets, ranked according to their cost-benefit rate, with very low-return targets to the left, and more and more effective targets towards the right. The y-axis shows the average benefit per dollar or rupee spent for the cumulative best set of targets. For instance, 40 targets on the x-axis means spending resources equally across the best 40 targets, delivering on average \$21 of social benefits per dollar spent. (Lomborg 2015)

As can be seen in the very left edge of Figure 5, if we spend resources across all 169 targets, we will achieve \$7 of good. This is not bad, but remember, it is an average of some very good spending

and some very mediocre spending. With 169 targets, we will be spending a small fraction on a few, very, very effective targets and a large amount of money on much more feeble targets. If we reduce the number of targets to the 100 best targets, the average benefit per dollar will rise to \$12. This is because we have cut away some of the least effective targets. If we cut the number of targets to 50, we will be doing \$19 of good for each dollar spent. If we pick just the 40 most effective targets, each dollar will do \$21 of good. Picking just the 40 best targets means we will do *three-times as much good for every dollar spent* compared to choosing all 169 targets (\$21 versus just \$7).

This shows us two things. Picking the low-hanging fruit (meaning the very effective targets) first will deliver much more public good per rupee or dollar spent. But it also disproves a common intuition. Doing the *most* good doesn't mean trying to do all good things, but focusing on the best things first. If we want to help the world, the best approach is not making a long list of all the good things possible to do, but rather, to focus on the very, very best things to do first.

Promising everything to everyone gives us no direction. Having 169 priorities is like having none at all. Prioritisation is difficult but vital, which is the point Apple founder Steve Jobs emphasised:

“People think focus means saying yes to the thing you've got to focus on. But that's not what it means at all. It means saying no to the hundred other good ideas that there are. You have to pick carefully. I'm actually as proud of the things we haven't done as the things I have done. Innovation is saying no to 1,000 things”^{xiii}

In effect, we need to focus on a rather small subset of desirable targets. By implication, this means saying no to a lot of other, nice-sounding targets. How many targets we need to say no to, is a political decision. Clearly, we should not just make one or two global promises. But likewise, we ought not make 169. Cost-benefit analysis can help us identify the very best promises to make first.

Previous comprehensive cost-benefit analyses in India

In 2018, the India Priorities project, under the co-sponsorship of Tata Trusts and the Copenhagen Consensus, established two projects in Andhra Pradesh (Lomborg, Razvi, and Naidu 2020) and Rajasthan (Lomborg and Bakshi 2020), to discover which policies in these states would deliver the highest benefits per rupee invested.

Both of these research projects analysed more than 70 policies that were locally determined as some of the most promising policies in each state while also having economic evidence to establish their effectiveness. The policies are considered as marginal policies, meaning increases from today's funding (possibly from zero, if it is an entirely new policy). This means these are policies that could be implemented on top of current policies.

In the standard approach of the Copenhagen Consensus, policies are put into groups depending on how much benefit is obtained for each extra unit of cost. This is the benefit-cost ratio. The policies with the worst benefit-cost ratio (or BCR) are termed Poor, with a BCR below 1. This means that each rupee spent will deliver less than one rupee in social benefits. Such a policy actually makes society less well off.

Policies are said to be Fair when the BCR is between 1 and 5, denoting a fair return on social investment. Policies that return between 5 and 15 rupees of social good for every rupee spent are termed Good, and the very best policies, delivering more than 15 rupees on the rupee, are denoted Phenomenal.

Listing the 70+ analysed policies from Rajasthan from least to most effective, we get the picture in Figure 6. It shows how approximately 20% of all programmes are Phenomenal, 30% are Good and 50% are Fair or Poor.

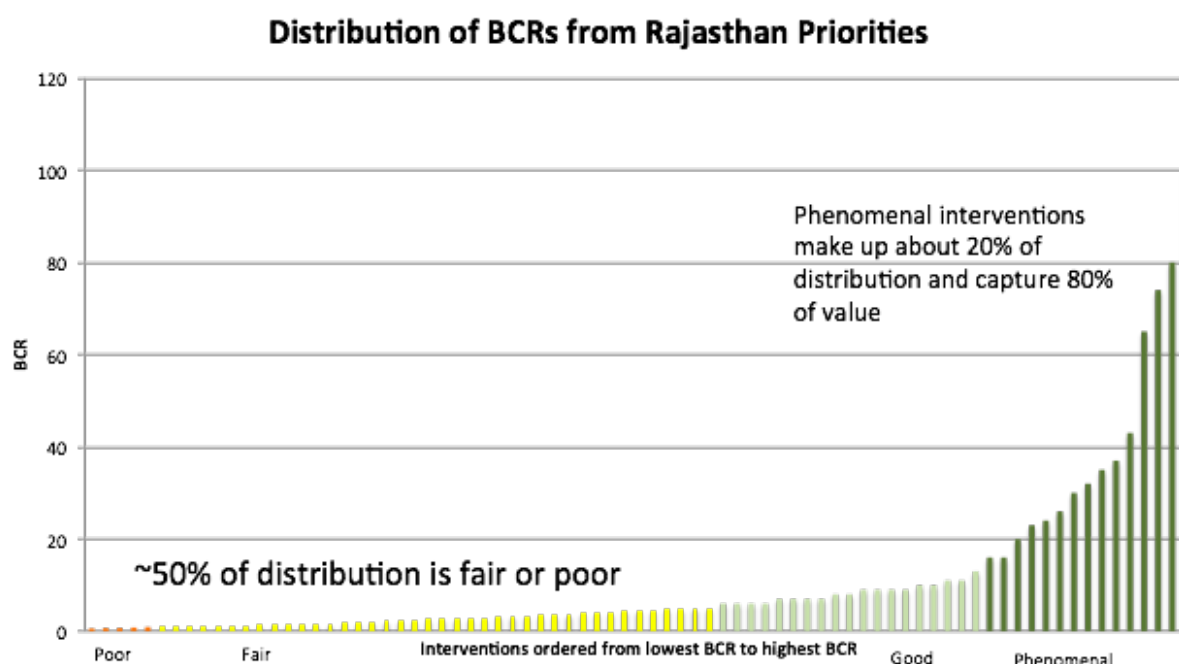


Figure 6 Distribution of analysed policies in the Rajasthan Priorities project (Lomborg and Bakshi 2020)

If one were to allocate an equal amount of money across all policies, 80% of the social benefit would be delivered by the Phenomenal policies. Moving money two levels – either from poor to good, or from fair to phenomenal – represents an order of magnitude increase in effectiveness. In other words, spending the same amount more smartly does ten times more social good.

While the individual policies that are Poor, Fair, Good, and Phenomenal differ from one state to another, and from one country to another, we have found this overall pattern to be true in every place we have undertaken this analysis. What this means is that if we focused spending on the Phenomenal policies in Rajasthan—or indeed, anywhere else—we would likely only pay one-fifth of the amount, but achieve almost all the benefits. Similar to the finding for the SDGs above, a restriction to funding just the very best policies could deliver four-times more benefits for the same investment.

The best SDG investments for India

Each year, as India's economy grows at a rapid pace, public consumption in nominal terms has increased tremendously. From 2016 to 2017, spending increased by ₹2.5 lakh crore, and from 2020 to 2021 it increased by ₹2.9 lakh crore as can be seen in Figure 7. Over the five past years, the increase has been an average of ₹2.2 lakh crore. That means over the past half decade, there has been more than ₹2 lakh crore of new money available to spend on dramatically increasing India's welfare.

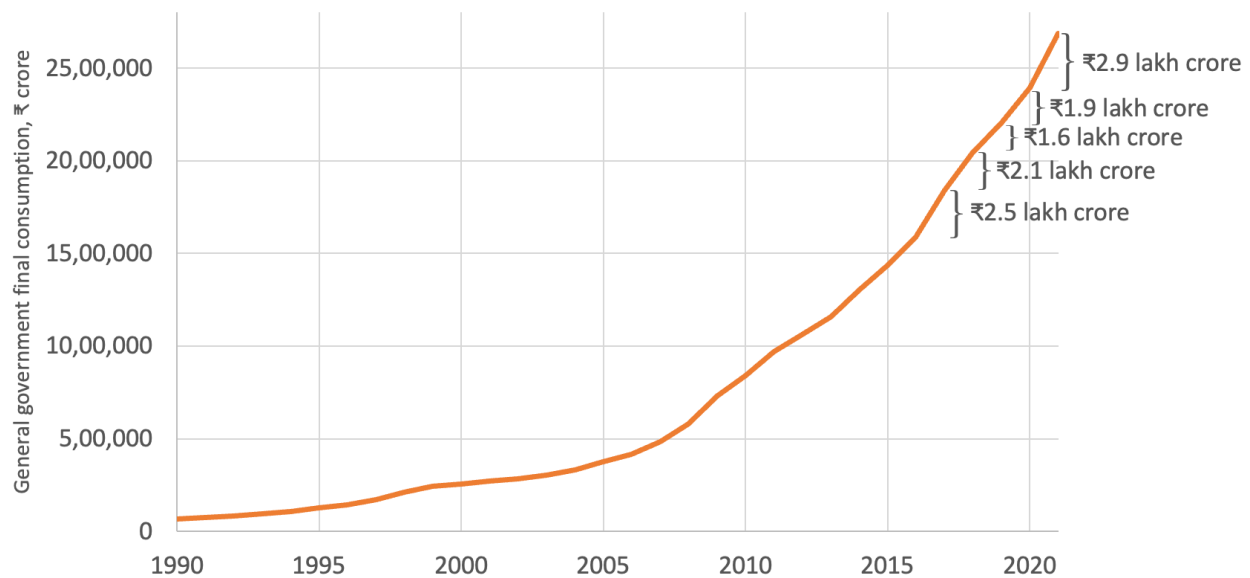


Figure 7 Public consumption in India across government, 1990-2021 (World Bank 2022).

Money spent equally across all the 70+ policies analysed in Rajasthan and Andhra Pradesh, as shown in Figure 6, would generate about ₹9 of social good for each rupee spent (a BCR of about 9). If just 5% of the additional public consumption next year — about ₹10,000 crore — was spent across policies in India with a similar profile to the policies in Rajasthan, this would generate a social benefit of ₹0.9 lakh crore.

However, if the extra ₹10,000 crore were to be spent just across the Phenomenal policies, each rupee would generate about ₹50 of social, economic and environmental benefits. With the same resources, it would be possible to deliver about ₹5 lakh crore of benefits (about 2% of GDP), or ₹4.1 lakh crore more good. This shows the power of focusing on the best programmes first.

For India, this report has investigated about one hundred programmes currently implemented by Union and State governments that are broadly consistent with the SDGs. These top programmes are also comparable to the findings of top outcomes in both Rajasthan and Andhra Pradesh. Here, we will identify the very best policies, meaning the policies with a Phenomenal BCR delivering more than ₹15 of social benefits for every rupee spent. In alignment with the previous findings in Andhra Pradesh and Rajasthan, it is likely that the average BCR is about 50.

Again, any decision to increase funding would be a political and democratic decision, but from a welfare economic point of view, these nine programmes are the first that should be considered for increased funding, given their high rate of return:

- Nutrition counselling under the ICDS / National Nutrition Mission
- Tuberculosis control and treatment under the Revised National Tuberculosis Programme
- Family planning services under the National Health Mission
- Routine immunization programme under the National Health Mission
- Home-based new born care under National Health Mission
- HIV prevention strategies under the National Aids Control Programme
- E-mandis rollout
- Agricultural R&D
- Certified seed production and distribution under RKVY and National Food Security Mission

Moreover, these three additional programmes should be considered for addition into their relevant programmes:

- Provision of calcium and multiple micronutrients to women during antenatal care visits
- Teaching at the right level pedagogical approaches
- Computer assisted learning at the right level

Given that these programmes are phenomenally effective, it is reasonable to assess that both the Union government and the State governments should invest more in these programmes first. The simply takeaway from this report is therefore quite simple: **more money should be spent on these very effective programmes first.**

The academic evidence shows that doing so would deliver four-times higher returns on social investment, and will deliver benefits much higher than ₹15 back on each rupee spent and likely as high as ₹50.

Evaluation of some of the best Indian policies

We will show how 12 Indian policies are great investments for India. These are likely not the only policies that are tremendously effective, but it is very likely that these 12 policies will deliver a phenomenal return on investment within the SDG framework. This means that there is a very strong, academic argument that both the Union government and the State governments should invest in these policies first.

These are first-draft cost-benefit analyses that roughly sketch out the evidence. If there is public and political interest in making substantial investments in one or more of these programmes, further and more in-depth cost-benefit analyses should be undertaken.

Here, we explore each of the 12 policies, with a short description of the relevant programme, a plain language summary, and an academic summary of the evidence.

At the end we conclude with some methodological considerations.

Invest more in Nutrition and health counselling

Launched on 2 October 1975, the Integrated Child Development Services (ICDS) Scheme is one of the flagship programmes of the Government of India, and represents one of the world's largest programmes for early childhood care and development. It is the foremost symbol of country's commitment to its children and nursing mothers, as a response to the challenge of providing pre-school, non-formal education, and breaking the vicious cycle of malnutrition, morbidity, reduced learning capacity and mortality.

The beneficiaries under the Scheme are children in the age group of 0-6 years, pregnant women, and lactating mothers. The ICDS Scheme offers a package of six services, namely supplementary nutrition, pre-school non-formal education, nutrition & health education, immunization, health check-up and referral services.

Provision of supplementary nutrition under the ICDS Scheme is primarily made to bridge the gap between the recommended dietary allowance and the average daily intake of children and pregnant and lactating women. The aim of nutrition and health counselling is to enhance the capability of the mother to look after the normal health and nutritional needs of herself and the child through proper nutrition and health education.

Why nutrition and health counselling is a phenomenal investment

As a behavioural change intervention, nutrition and health counselling has relatively low cost. In contrast, studies have demonstrated that the benefits can be large in terms of improved nutrition and health outcomes, making it a highly cost effective intervention. Two cost-benefit analyses of the intervention done for Andhra Pradesh and Rajasthan shows that a six-year campaign on nutrition counselling and hand washing returns ₹61 and ₹43 for every rupee spent in the respective states. The average unit cost, including cost of counselling sessions for each women, and time costs for the women, was estimated at ₹1177 and ₹1250 for Andhra Pradesh and Rajasthan respectively. Note that the programme does not provide food, but instead provides information to

the mother, making it more likely that the child will receive more and better food. Based on previous studies, it is estimated that counselling leads to a 12 percent reduction in stunting, which in turn leads to better cognitive skills among the children and higher earning capacity in the future. Quantifying these higher earning shows that the per unit benefit for Andhra Pradesh and Rajasthan comes to ₹71,500 and ₹54,000 or a BCR of 61 and 43 respectively, placing it comfortably in the phenomenal range.

These figures consider the well-known implementation challenges of nutrition counselling, because they are based on high quality studies implemented in real world environments across the developing world. In each of these countries, some of the counselling is thwarted by incompetence, corruption, and many other forms of implementation failure. The average results from these countries show that even with all such real-world implementation failures, the benefits are such that when applied to the Indian cost structure, they will result in benefits worth ₹61 and ₹41 per rupee spent.

However, it is a relevant question to consider whether India's implementation challenges are comparable to the average of the evidence from other developing countries. The short answer is that this is not clear. Of course, if India's implementation is better than average, it simply means that the benefits are even greater. But even if India's implementation problems are worse than the average, it is unlikely to make the BCRs less than phenomenal. Assuming that the average of the other developing countries experiences one-third implementation failure (meaning that one-third of all resources spent will result in no benefits), the ideal BCR for Andhra Pradesh would have been ₹91.5. If India sees two-thirds of its implementation going to waste, it will still see a phenomenal ₹30.5 of social benefits for each rupee spent. Moreover, as implementation failure increases, not all costs are incurred (e.g. there is no cost to mother's time if the programme never reaches her), meaning the real BCRs are reduced less than the implementation failure suggests.

Even with the very worst set of assumptions on implementation failure, it is hard to find a situation in which nutrition counselling proves less than phenomenal. If we – very unrealistically – assume that all other developing countries have no implementation failure, for Andhra Pradesh the implementation failure rate can reach as high as 82%, while for Rajasthan 74%, and the benefits would be still 15-times higher than costs. Given that studies have shown failure rates between 25%-85% for nutrition counselling across India, and these thresholds are towards the upper end of the range, a phenomenal rating is still warranted. With a more realistic assumption that failure in other countries is at least 25%, the phenomenal rating is true all the way to 85%.

The takeaway from this research is that nutrition counselling is in all likelihood a phenomenal intervention with today's implementation, even with very high levels of failure rates. Of course, poor implementation still makes the benefits lower than they could be, and consequently proposals for policies to improve implementation should also be welcomed.

Why nutrition and health counselling is a phenomenal investment: Academic evaluation

Nutrition and health counselling is an important and cost-effective intervention with a 'Phenomenal' BCR rating. The intervention through group and one-to-one counselling aims to enhance the knowledge and capacities of mother and community on basic health, nutrition, childcare and development. As per NFHS-4 (2015-16), 38 percent of children in India under five

years are stunted (low height for age) and 20 percent are wasted. Under-five mortality rate in the country is still high at 50 per 1000 live births and child undernutrition is strongly associated with higher risk of child mortality (Butta et al., 2013).

A recent study by India Consensus for Andhra Pradesh and Rajasthan shows that a six-year intervention (2016-2021), which includes counselling for breastfeeding, complementary feeding and hand washing, gives a BCR of 61 and 43 respectively (Joe et al., 2018a, 2018b). The cost of the campaign per beneficiary comes to ₹1177 and ₹1245 for Andhra Pradesh and Rajasthan respectively. Out of the total cost, around 35 percent is the value of caregiver time, and the rest is for other components of the programme. In terms of benefits, the main effect is improved linear growth, with studies estimating that nutrition counselling reduces stunting by 12% (Bhutta et al., 2013). Avoided stunting improves cognitive skills that would increase the productivity of children in adulthood. This would lead to consumption gains of 66% over the lifetime. Health benefits of the intervention include 0.99 deaths avoided and 0.67 years of illness avoided per 1000 children reached in Andhra Pradesh and 1.31 deaths avoided and 0.98 years of avoided illness (YLDs) per 1000 children reached in Rajasthan. Total benefits per beneficiary are therefore ₹71,500 in Andhra Pradesh and ₹54000 in Rajasthan, 85% of which are productivity benefits and the remainder are health benefits.

The studies of Joe et al. (2018a, 2018b), upon which the BCR categorisation rests, are based on effect sizes taken from meta-analyses of Black et al (2008) and Bhutta et al (2013). These meta-analyses include findings from randomised controlled trials conducted around the developing world. To the extent that India shares the same implementation challenges as the ‘average’ programmes used in the meta-analyses, the effect sizes should be applicable to India insofar as they incorporate such implementation failings. Nevertheless, it is possible that India’s implementation challenges are worse than the average nutrition programme from these meta-analyses.

Nutritional and health counselling is an effective intervention but has not been well implemented. An older evaluation study of the ICDS programme shows that only 19 per cent of the mothers reported that the AWC provides nutrition counselling to parents (Planning Commission, 2011). As per another study in urban slums in Delhi, only 14% of the target group (females in the age group of 15-45 years) were registered for nutrition health and education (NHED) but the counselling sessions were never organised (Meena et al., 2017). NHED counselling sessions were organised in 56% sample AWCs in Jammu (Dogra, 2017). Another evaluation study in Gujarat found that almost three-fourths (73.8%) of AWCs conducted at least one NHED meeting per quarter (Chudasama et al. 2016). These studies demonstrate the significant heterogeneity in implementation coverage of nutrition counselling across India with coverage gaps ranging from 26% to 86%.

How does this affect the proposed BCR rating? It is difficult to know for sure, since the extent to which India’s nutrition counselling shares the implementation failures from the meta-analyses is unknown. However, as a sensitivity check, we can identify the level of implementation failure that would render the BCR lower than 15, under the unrealistic assumption that the average study in the meta-analyses represent perfect implementation. For this, we assume that implementation failure would mean paying all programme costs but receiving none of the benefits. Additionally, the cost of a mother’s time, which accounts for 35% of the costs, is reduced in proportion to the implementation failure on the reasonable assumption that if a programme does not reach an individual then there is no time spent in accessing the services. On these figures, the BCR of

nutrition counselling would still be phenomenal with 82% implementation failure in Andhra Pradesh, and 74% implementation failure in Rajasthan. The fact that these are towards the upper end of the observed range, and the assumptions are deliberately pessimistic, suggests that BCR rating of phenomenal is still warranted.

The takeaway from this is that nutrition counselling is in all likelihood a phenomenal intervention with today's implementation, even with very high levels of failure rates. Of course, very poor implementation still makes the benefits lower than they could have been, and consequently proposals for policies to improve implementation should also be welcomed.

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Invest more in the Revised National Tuberculosis Programme

After a pilot in 1993, the Revised National Tuberculosis Control Programme (RNTCP) was launched in 1997 in India, with a plan to scale up in a phased manner. The programme adopted the internationally recommended Directly Observed Treatment Short-course (DOTS) strategy. Full nationwide coverage was achieved by the end of 2005. The goal of the Tuberculosis (TB) Control Programme in India is to reduce mortality and morbidity due to TB and cut transmission of infection until TB ceases to be a major public health problem.

The objectives of RNTCP were to achieve and maintain a cure rate of at least 85 per cent among new smear-positive cases initiated on treatment, and thereafter a case detection rate of at least 70 percent of such cases. Based on the positive results achieved, programme in the National Strategic Plan (NSP) during the Twelfth Five Year Plan (2012-17) a vision of a TB-free India was adopted. The goal of the NSP is to achieve universal access to quality TB diagnosis and treatment for all TB patients

Why the Revised National Tuberculosis Programme is a phenomenal investment

Treating TB is a very cost-effective intervention with numerous studies in India and abroad documenting BCRs around 100 or more. There are two reasons why TB treatment tends to produce such high BCRs. Firstly, the costs of treatment are generally cheap, at about ₹20,000 per patient treated, and the cure rate is 90%. In other words, spending relatively little resources can save a life. Secondly, and more importantly, because TB is a contagious disease, identifying and treating patients now reduces the number of onward infections resulting in either more lives saved, or less health expenditure in the future or both. This second effect is particularly important if it reduces drug-resistant TB, which is very costly to treat and much less curable. In India 4% of patients with TB have the drug resistant version, but treating them requires 40% of the TB budget.

A recent study from Rajasthan, which examined the costs and benefits of engaging private providers to better identify and treat TB along with actively searching for TB infections in urban slums, demonstrates the effective nature of control strategies. In the first year, it costs ₹11 crore to identify 1400 more people with TB, of which 1200 get treated, and 55 lives are saved. The costs rise substantially to ₹67 crore in the sixth year by which time 2,200 lives are saved. However, after that point the annual costs start to fall as the cost-saving impacts of reducing infection start to materialise.

After 10 years of the intervention, there are 15,000 fewer new infections of TB across the state including 1,900 fewer MDR-TB infections. Four thousand deaths are avoided. At the same time, costs are 41 crore, less than previous years due to significantly reduced costs of treating MDR-TB. After 30 years costs are only 36 crore for the intervention, but there are 24,000 fewer infections and 7,700 fewer deaths than would have been without the intervention. On average, about 5000 deaths are avoided per year for a cost of ₹24 crore per year though of course these averages mask the dynamic nature of TB control. The BCR of this intervention is calculated as 105.

Why the Revised National Tuberculosis Programme is a phenomenal investment: academic evaluation

The rating for RNTCP is phenomenal. Treating TB is widely considered a beneficial and very cost-effective public investment with multiple pieces of robust evidence from India and elsewhere. Goodchild et al (2011), using historical data, determined that the scale-up of TB control under the RNTCP generated a return of ₹115 per rupee spent between 1997 and 2006. The India Consensus studies in the states of Andhra Pradesh and Rajasthan reveal respective benefit-cost ratios of 118 and 179 for what is essentially the execution of the main features of the National Strategic Plan on TB (Pathy 2018a, 2018b). In Bangladesh, control of TB generated a BCR of 21 (Vassall, 2017)³. Globally, Laxminarayan et al. (2009) find that the benefit-cost ratio of a sustained Directly Observed Treatment Short Course Strategy is ₹92 per rupee in twenty-two high TB-burden countries worldwide. The Copenhagen Consensus arrived at the same conclusion in its Post-2015 study, scoring TB treatment as a phenomenal intervention, which would save lives and have impacts on society and the economy (Lomborg, 2015). The main costs identified in the above studies are the costs of diagnosis and treatment, while the most significant benefits are the reduction in lives lost due to the disease. Though long-running (6 months) in duration, the treatment for TB is cheap and effective with a 90%+ cure rate. It saves lives, and patients regain their strength, resulting in reductions in both mortality and morbidity and increased productivity and well-being. Early treatment also reduces the onwards infection of other people, with reduced knock-on costs of treatment, mortality, and morbidity. There is also the eventual reduction in public spending that will come with a decline in TB prevalence. Therefore, the underlying rationale for the rating is that TB control has a significant numerator and denominator effect in the BCR: it saves lives now for relatively little cost, and in addition, reduces transmission and public treatment costs in the future.

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³ This study used an approach that conservatively valued life years at one third of the value in recent India studies (Pathy 2018a, 2018b), suggesting that the BCR in Bangladesh could be as high as 63.

Invest more in family planning

The objectives, strategies and activities of the Family Planning component under National Health Mission includes: Target free approach, Voluntary adoption of Family Planning Methods, Based on felt need of the community, along with more emphasis on spacing methods, assuring quality of services and expanding contraceptive choices.

Why family planning is a phenomenal investment

Family planning has a phenomenal rating. The annual costs of family planning are small, estimated at around only ₹1200 per woman helped. The annual cost per person across the whole population is ₹36, because only 12% of women in the reproductive age has unmet needs.

In contrast, the benefits can be much larger. The three types of benefits associated with fewer unwanted children are demographic dividend, reduced infant mortality and reduced maternal mortality. The first of these, the demographic dividend, occurs when society benefits from having fewer dependents relative to working people, and can be particularly large and sustained. A recent study in Rajasthan estimates that meeting the entire need for family planning would lead to small increases in income initially of ₹97 per capita, growing to ₹6500 by 2066 or an increase of 0.6%. The study also estimates that the full provision of family planning would lead to 1100 fewer child deaths per year due to better birth spacing, along with a small reduction in maternal mortality. The present-day value of the benefits are about ₹20,000 per capita over 50 years. This contrasts with a present-day cost of ₹600 per capita over 50 years, leading to a BCR of 32. Studies from outside of India reinforce this finding, as they consistently show BCRs for family planning provision in the phenomenal range.

Why family planning is a phenomenal investment: Academic assessment

The rating of the family planning component of National Health Mission is phenomenal. Two recent studies in the Indian context have demonstrated BCRs of 32 in Rajasthan and 16 in Andhra Pradesh (Sodani et al., 2018a, 2018b). Family planning confers three types of benefits: demographic dividend, reduced infant mortality and reduced maternal mortality.

Ashraf et al. (2013) develop a model that accounts for several pathways in which reduced population can improve GDP per capita via demographic dividend. The model accounts for per capita increases in the available amount of resources such as land, capital and parental attention via reduced population, as well other effects of a demography where a greater proportion is of working age. The model indicates that a reduction in TFR of 0.5 leads to an 5.6% increase in GDP per capita over 20 years, and an increase of 11.9% in GDP per capita over 50 years. Using these findings, Sodani et al. (2018a, 2018b) estimate that completely meeting the unmet need for family planning in Rajasthan and Andhra Pradesh would lead to 0.57% and 0.11% higher incomes respectively by 2066. These figures appear small but are large relative to the small per capita costs of family planning. Considering health benefits, evidence indicates that appropriate birth spacing, one of the benefits from family planning, reduces the likelihood of child mortality (Guttmacher Institute, 2016). In the case of Rajasthan and Andhra Pradesh, Sodani et al. estimate this would lead to 1100 and 270 fewer child deaths per year, respectively. Maternal mortality would also

lower due to the effect of reducing the number of births, though the number of avoided deaths would be small in both states. These benefits of family planning collectively are estimated to total ₹6300 per capita-year in Andhra Pradesh, and ₹20,000 in Rajasthan. This is against a cost per capita-year only ₹400 in Andhra Pradesh and ₹600 in Rajasthan.

Since family planning is delivered under the National Health Mission, its implementation challenges mirror those of the broader scheme. A recent CAG report notes shortfalls in health facilities of up to 38%, shortfall in nurses at community health centres (CHCs) of 45% and shortfall in ability to perform sterilisations of 40% on average across Indian CHCs (Comptroller and Auditor General of India, 2017). It is unclear how this would affect the BCR - are costs incurred without services being provided, or is money simply not being spent at all? The former is obviously much more detrimental to an assessment of BCR, however the same report notes that much money allocated to the Rural Health Mission remains unspent hinting that it is likely to be the latter case.

In any case, as a pessimistic sensitivity test, we apply a 40% reduction in benefits based on the shortfalls noted above. To reiterate: this assumes that a shortfall implies all money is spent without any benefits, which seems overly pessimistic. For Andhra Pradesh this application leads to a BCR of 10, while for Rajasthan it is a BCR of 19. Given that Rajasthan has a much similar total fertility and unmet need to the average across India, it is the more appropriate comparator for the purposes of a rating assessment. Therefore even under this assumption the BCR is still phenomenal, though of course we note that the actual BCR will differ by geography.

Additional evidence from India and other global studies support a phenomenal rating for family planning. Stenberg et al. (2017) undertake a cost-benefit analysis of a suite of maternal and child health interventions which include family planning. Their analysis shows that the benefits of demographic dividend *alone* relative to the costs of *all* interventions in the MCH package yields a BCR of 21 for India. Clearly, including only the family planning costs in the denominator and also the health benefits from family planning in the numerator would lead to an even higher BCR. In the case of Haiti, Kohler (2017) estimates a BCR of 18. For Vanuatu and Solomon Islands, increasing family planning would cost \$8m by 2020 but lead to health and education savings worth \$112m. This by itself suggests a BCR of 14 - almost in the phenomenal range - without accounting for any health benefits or wider demographic dividends (Kennedy et al. 2013). In South Africa, a cost-effectiveness estimate indicates scaling up family planning would save one child's life for \$2400. Assuming the value of a life year at three-times GDP per capita, the BCR of family planning is 125 (Chola et al. 2015). This very high BCR is supported by Kohler and Behrman (2018) who show that the BCR of family planning across high fertility African countries is 120.

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Invest more in the Routine Immunization Programme

The Routine Immunization Programme is one of the key interventions for protecting children from preventable life-threatening conditions. It is one of the largest immunization programmes in the world and a major public health intervention in the country. The Immunization Programme in India was introduced in 1978 as the Expanded Programme of Immunization (EPI). The programme gained momentum in 1985 and was expanded as Universal Immunization Programme (UIP) to be implemented in phased manner to cover all districts in the country by 1989-90. UIP is currently one of the key areas under National Health Mission. Under the Universal Immunization Programme, Government of India is providing vaccination to prevent seven vaccine preventable diseases; Diphtheria, Pertussis, Tetanus, Polio, Measles, severe form of Childhood Tuberculosis and Hepatitis B, Haemophilus influenzae type b (Hib) and Diarrhoea (<http://www.nrhmhp.gov.in/content/immunisation>)

Why the routine immunization programme is a phenomenal investment

Immunization is one of the most effective and cost-efficient methods to save lives and avoid preventable disease at the early stage of life. Studies have shown that delivering six vaccinations (tuberculosis, diphtheria, tetanus, pertussis, measles and polio) can deliver one year of healthy life for only ₹650, which translates to a BCR around 50. For Hepatitis B, Hib and rotavirus vaccines, the cost to deliver one year of healthy life is between ₹400 to ₹26,00, for a BCR range of 14 to 75. It is clear that expanding India's immunization programme is very likely to be a phenomenal investment.

The BCRs reported above are for the expansion of coverage. However, it is also important to look at programmes that increase the demand for vaccines, since lack of demand is likely to be one constraint against wider vaccine coverage. While there is less evidence for demand-based strategies to support immunization, a recent cost-benefit analysis in Rajasthan suggests that a phenomenal rating is also warranted for these types of programmes. Adapting the findings from a randomized controlled study in the same state, the cost-benefit analysis suggests that rolling out immunization camps and incentivizing women with lentils and hot meals would lead to almost 68,000 more fully vaccinated children per year. The cost of this would be ₹3,600 per child, with roughly two thirds of the costs for the incentives, 20% of the cost for the medical expenses and the rest being the private costs for the women. This intervention would lead to 827 lives saved per year while also delivering the equivalent of 8,675 years of healthy life. Along with the incentives (which are a benefit as well as a cost), the total benefits of the intervention are around ₹108,000 per new child vaccinated, for a BCR of 30.

Why the routine immunization programme is a phenomenal investment: academic evaluation

The BCR categorization for the Routine Immunization Programme is phenomenal. Every year, five lakh children die in India due to vaccine preventable diseases and another 89 lakh remain at risk due to partial or no immunization (MoHFW, 2018). The latest data shows that only 62 percent

of children age 12-23 months were fully immunized (BCG, measles, and 3 doses each of polio and DPT) in the country (NFHS-4).

A recent review of the cost-effectiveness evidence for vaccinations demonstrate that little spending is required to save lives and avoid disease (Horton and Levin, 2016). The original EPI vaccines (tuberculosis, diphtheria, tetanus, pertussis, measles and polio), which form the bulk of India's immunization, programme avert one DALY for \$100. At conventional assumptions this would translate to a BCR around 50. Hepatitis B, Hib, and rotavirus vaccines - the remaining vaccines in the schedule - are also very cost-effective averting one DALY for \$60 to \$360 (Horton and Levin, 2016). For these vaccines, under the same assumptions, the BCR range is 14 to 75. These BCRs are confirmed by another study that shows that globally expenditure on immunization programmes gives a BCR of 60 (Jha et al., 2018).

These BCRs are for programmes which supply vaccines to the beneficiary population. While this is certainly relevant for India - where lack of coverage remains a problem - it is also worth examining demand-based programmes, since one constraint to further expansion of vaccinations is also likely to be lack of demand. While the evidence for demand generation is smaller, one randomized controlled trial and subsequent benefit-cost analyses suggests that demand-based programmes can also have a phenomenal BCR in India (Banerjee et al. 2010, Shariff and Sharma, 2018a, 2018b). Banerjee et al. (2010) show that an immunization camp programme which incentivized mothers with in-kind transfers was able to raise vaccination rates from 6pp to 39pp (more than 700% gain) in rural Rajasthan. Applying these findings, with some adjustments, to current Rajasthan and Andhra Pradesh, Shariff and Sharma (2018a, 2018b) showed that the BCRs of expanding a demand-based programme to all districts with lower-than-average vaccination rates would generate a BCR of 37 and 30 respectively. The costs included the wages of the immunizing staff, transport costs, opportunity cost of time spent to attend such clinics by the beneficiary household and the cost of vaccines. The costs also included an incentive in the form of lentils and a hot meal, and promotion efforts by local field workers to let villagers know about the immunization camps to improve the coverage (Shariff, 2018a, 2018b). Even accounting for some substitution from the existing health system, the paper estimates that the intervention would lead to 68,000 newly fully vaccinated children in Rajasthan and 23,000 in Andhra Pradesh, for a cost of ₹3,600 and ₹4,700 per new child fully vaccinated respectively. Using findings from McGovern and Canning (2015), the authors estimate this would avert 827 child deaths and 8,675 YLDs for Rajasthan annually. The equivalent figures for Andhra Pradesh were 219 child deaths and 5,964 YLDS averted per year. Overall, the BCRs are 30 and 37 respectively. Based on the success and cost effectiveness of such interventions, the government should consider including some demand side incentives to improve immunization coverage in the country.

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Invest more in home-based new-born care

Home Based New-born Care (HBNC), through ASHAs and ANMs, has been initiated to reduce neonatal mortality and morbidity through early detection and special care of preterm and low birth weight newborns, early identification of illness in the newborn and provision of appropriate care and referral and support the family for adoption of health practices and build confidence and skills of the mother to safeguard her health and that of the newborn.

Why home-based newborn care is a phenomenal investment

The rate of institutional births in the country has reached 79% (NFHS-4) but the neonatal mortality rate (death of newborn during first 28 days of life) at 29.2 per 1000 live births is still high. Around 60 percent of neonatal deaths occur after the mother and child are discharged from the health facility. The rate is twice in rural areas (34/1000 live births) when compared to urban areas (17/1000 live births). This makes home based new born care (HBNC) a critical intervention. Under this intervention community health workers (ASHAs) educate mothers and family members in neonatal care and treat the sick children at home. According to a five-year study from rural Maharashtra (includes 39 villages), home based care by community health workers reduced the incidence of infections among newborns from 62% to 27.5%. Care related sickness like asphyxia, hypothermia and feeding problems came down from 48% to 26% and low birth weight from 42% to 35%. Based on these effects, home based newborn care avoids 48 cases of severe illness and 5 related deaths per 1000 live births. The total cost of the intervention per newborn is ₹337 for 60% coverage of the target population and ₹368 if the coverage is scaled up to 90% (at 2013 prices). The findings show that government expenditure for the intervention amounts to \$380 per death averted. If we add the private cost of mother's time and assuming value of a life year of three-times GDP per capita, the intervention gives a BCR of 200.

This figure should account for the well-known implementation challenges of the HNBC program, since the benefits are based on relatively large real-world rollout of the programme in India and Bangladesh, which would also be susceptible to implementation failure, corruption and wastage. However, it is worth considering whether the implementation of the programme now might be worse than what was documented in the academic studies. Studies have shown that ASHA workers under HNBC are neither properly trained nor well equipped to provide such care. This has resulted in high levels of misdiagnosis. Moreover, it appears only 16% of the newborns received a home visit by ASHAs in 2013-14.

Nevertheless, even under very stringent assumptions, i.e. that the studies upon which the benefits are estimated represent perfect implementation, the intervention failure rate in real life is 85% and benefits for the successful visits are about a third less than expected, the BCR is still phenomenal. This is because the intervention itself has phenomenal fundamentals: newborn care via ASHAs is not very costly, rigorous studies have documented large benefits from the programme in India and abroad, and the rate of neonatal mortality represents a real and sizeable problem to tackle.

Why home-based newborn care is a phenomenal investment: academic evaluation

The BCR categorisation for home-based newborn care is phenomenal. Nandi et al. (2016) model the effects of two strategies to scale up HBNC: i) through existing ASHA workers which covered 60 percent of rural population and ii) expanding the ASHA network to cover 90% of the population. Both strategies were deemed highly cost-effective requiring around \$380 for each

death averted. This is based on a cost of around \$1911 in government expenditure and 5 deaths avoided per 1000 live births under the programme. Given a value of a life year of three-times GDP per capita used throughout this report, plus the cost of mother's time for the visits (5 visits of around 30 min each valued at ₹15 per hour), this implies a BCR around 200. This does not include benefits such as avoided morbidity or the money-value metric of insurance, though these are likely to be small relative to the avoided mortality benefit.

It should be noted that the benefits from Nandi et al. (2016) are based on a reasonably robust body of literature that documents significant neonatal mortality reductions from home-based newborn care conducted under experimental trials. The most seminal of these studies comes from a quasi-experimental trial across 39 intervention and 47 control villages in Maharashtra from 1993 to 1998, which documented a 62% reduction in neonatal deaths and a reduction in morbidity of 50% (Bang et al., 1999; Bang et al. 2005). Ten years later, another study from Karnataka estimated similarly high mortality reductions of 54% (Kumar et al. 2008). A larger study from Sylhet in Bangladesh documented a lower but still impressive reduction of 34% (LeFevre et al, 2013). The findings of Nandi et al. (2016) are based on the assumption the HBNC package would reduce the risk of neonatal morbidity by 50.4% (Bang et al., 2005) and neonatal mortality by 54% (Kumar et al., 2008)

However, there are well-known implementation issues with HBNC programme and ASHA-led activities generally. Neogi et al (2016) document some of these shortcomings: 70% of ASHA workers do not complete the four training modules (with greatest absenteeism at the last round), medical kits required for the service are not distributed and there is limited supervision of ASHA workers. One assessment of the programme in Uttar Pradesh documented that ASHA workers misdiagnosed 80% of illnesses and failed to follow proper protocol for breastfeeding and weight assessments for more than two-thirds of neonates (Das et al. 2014). Perhaps most tellingly, only 4,000,000 newborns received a home visit during 2013-2014, while approximately 25,000,000 children are born each year in India. This implies a coverage rate of only 16% (Neogi et al, 2016).

How does this affect the BCR? As noted previously (see summary on nutrition counselling), what matters is the extent to which implementation challenges differs between the studies where the effect sizes are drawn and real-world settings. In this case, the main studies of interest are from India, so on that account implementation differences may be modest. At the same time, one might argue that there are non-trivial differences between an experiment conducted under RCT settings and implementation at scale.⁴

Nevertheless, even if one assumes that the comparator studies represent perfect implementation (an unrealistic assumption that biases the BCR estimate downwards), very high levels of implementation failure - say 85% - would still lead to a BCR of 30. Applying even more conservative assumptions about benefits, say by using the finding of 34% neonatal reduction

⁴ One major difference between the study settings and current circumstances is the rate of home births. In Bang et al. (1999) and Kumar et al (2008) approximately 90% of women in the study zone gave birth at home. As per NHFS-4, rural rates of home birth are only 25% mostly due to the JSY programme. There is a chance that higher facility birth rates today might crowd out the benefits from a home-based newborn care intervention. However, we argue that this is unlikely to affect the effectiveness of the intervention since numerous studies have shown that facility births under JSY have not lead to a reduction in neonatal mortality (Lim et al. 2010, Mohanan et al. 2014, Powell-Jackson et al. 2015). Additionally, interaction with the facility is relatively short, at most a few days, while home-based newborn care spans the pre- and post-partum period.

(LeFevre, 2016) instead of 54% from Kumar et al (2008), would render the BCR around 19. The intervention itself has phenomenal fundamentals: newborn care via ASHAs is not very costly, rigorous studies have documented large benefits from the programme in India and abroad, and the rate of neonatal mortality represents a real and sizeable problem to tackle. The inherent BCR is so large that even under significant operational challenges worse than expected, the BCR could still credibly land in the phenomenal range.

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Invest more in HIV prevention strategies

The National AIDS Control Programme (NACP), launched in 1992, is being implemented as a comprehensive programme for prevention and control of HIV/AIDS in India. Over time, the focus has shifted from raising awareness to behaviour change, and from a national response to a more decentralized response, as well as an increase in involvement of NGOs and networks of PLHIV. The programme is now in its fourth phase and aims at reducing new infections by 50 percent (2007 Baseline of NACP III) and provide comprehensive care and support to all persons living with HIV/AIDS and treatment services for all those who require it (<http://naco.gov.in/nacp>).

NACP-IV Components include: Component 1: Intensifying and Consolidating Prevention services with a focus on HRG and vulnerable populations, Component 2: Expanding IEC services for (a) general population and (b) high risk groups with a focus on behaviour change and demand generation, Component 3: Comprehensive Care, Support and Treatment, Component which will include (i) anti-retroviral treatment (ART) including second line (ii) management of opportunistic infections and (iii) facilitating social protection through linkages with concerned Departments/Ministries 4: Strengthening institutional capacities and Component 5: Strategic Information Management Systems (SIMS). (<http://naco.gov.in/nacp-iv-components>)

Why HIV prevention strategies are phenomenal investments

Early initiation of antiretroviral treatment (where HIV patients are provided with medicines regardless of how depleted their white cell count is) has a BCR in the good range when compared to treatment only when white cell count drops below a defined level. There have been some studies from India, and two focusing on treatment of the general population suggest that around \$550 or ₹40,000 can deliver one year of healthy life. This translates to a BCR of 8 or 9.

Prevention is now a priority of the government under the National Strategic Plan with almost two-thirds of the budget allocated towards prevention strategies. In India, there are a handful of studies which indicate very high BCRs for prevention strategies focusing on men who have sex with men (MSM), and sex workers. These studies suggest that a year of healthy life could be provided for \$20 to \$50 or ₹1500 to ₹3500, suggesting BCRs in the hundreds. This is not to say that all prevention strategies would be as effective or even phenomenal. Studies across the world demonstrate that the effectiveness of prevention strategies depends critically on the target population and the mode of prevention. Nevertheless, a phenomenal rating is warranted for this part of the NACO programme.

Why HIV prevention strategies are phenomenal investments: academic evaluation

According to the National Strategic Plan for HIV / AIDS and STIs 2017-2024 (Ministry of Health and Family Welfare, 2017) the aim is to extend HIV treatment for all infected persons regardless of CD4 count, a strong endorsement of early initiation of ART treatment.⁵ This is an important point in the context of academic studies covering ART, which in recent years have focussed on

⁵ Early vs delayed initiation is defined by the extent of CD4 count in HIV-positive patients.

the difference between early vs delayed initiation of ART, as opposed to ART vs no ART which were the focus of first-generation studies in this field (see Holmes et al, 2017 for an overview). Madalli et al (2015) estimate the benefits of early initiation of ART in India and find a cost-effectiveness metric of \$530 / QALY (2014 USD), which translates into a BCR around 9. Walensky et al (2013) identify a cost per DALY of \$530 (2012 USD) for early initiation versus delayed ART in India, which translates into a BCR of 8. Addressing the same question, Eaton et al (2014) calculate a cost per DALY of \$131 to \$290 (2012 USD) which suggests BCRs in the phenomenal range, though their study focused on a concentrated epidemic setting.

Prevention has taken a greater share of the budget under the latest Strategic plan with 64% of the allocation towards prevention strategies⁶, including 17% for high-risk groups. A recent review by Jacobsen and Walensky (2016) showed that the cost effectiveness of prevention varies substantially and depends on the exact strategy, target group and country, although many would be classified in the phenomenal range. Condom promotion to men-who-have-sex-with-men (MSM) and female sex workers (FSW) in Vietnam had BCRs of 60 and 20 respectively ⁷ (Pham et al. 2015) while distribution to women in sub-Saharan Africa also had BCRs in the phenomenal range (Mvundura et al 2015). However, a similar strategy for serodiscordant couples in Nigeria was only in the good range (Mitchel et al 2015). Prevention of mother to child transmission had a BCR of 5 in Ghana (VanDeusen et al 2015), 40 in Zambia (Ishikawa et al 2014) and above 150 in South Africa (Yu et al. 2015). The effectiveness of HIV testing was mixed, with one study of home testing kits in South Africa demonstrating a BCR above 15 (Smith et al, 2015), another of mobile testing clinics in South Africa had BCR of 7 (Bassett et al 2014), while a study of HIV screening in China had a BCR around 2 (Owusu-Edusei et al 2015). For pre-exposure prophylaxis three studies had BCRs in the fair range, while two were in the phenomenal range (see Jacobsen and Walensky, 2016).

Three studies show that focusing on prevention in MSM and FSW have yielded very high BCRs in India with Vassall et al (2014a) documenting a cost per DALY of \$46 (2014 USD) for the Avahan programme. Vassall et al (2014b) estimate a cost per DALY of \$14 (2011 USD) for community mobilization and empowerment in the same program, while Prinja et al (2011), estimate that an intervention including peer-led counselling for behaviour change towards safer sexual practices, condom promotion and quarterly referral for health check-ups yields \$10.9 per DALY averted (2008 USD). All results imply BCRs in the hundreds, making this an extraordinarily phenomenal intervention.

Given this evidence, the rating for HIV prevention under NACO is assessed as phenomenal with the caveat that cost-effectiveness for HIV prevention can vary substantially due to different population risks across time and space, the confounding effects of other interventions, and the diversity of interventions classified as preventative (Garnett et al. 2017). Nevertheless, the evidence suggests very high returns to prevention, and a phenomenal rating is warranted albeit with medium certainty.

⁶ Prevention strategies include treatment to prevent mother-to-child transmission, condom promotion, information education and communication, safe needle exchange, improving transfusion safety and more (Ministry of Health and Family Welfare, 2017)

⁷ The papers reviewed by Jacobsen and Walensky (2016) only report cost per DALY avoided, not BCRs. We apply a value per DALY of 3x GDP per capita in the relevant year to estimate approximate BCRs.

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Invest more in Electronic mandis for the National Agriculture Market

National Agriculture Market (NAM) is a pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for agricultural commodities. The NAM Portal provides a single window service for all APMC related information and services. This includes commodity arrivals & prices, buy & sell trade offers, provision to respond to trade offers, among other services. While material flow (agriculture produce) continue to happen through mandis, an online market reduces transaction costs and information asymmetry.

Why e-mandis is a phenomenal investment

Reforming agricultural markets has been a long-standing issue for farmers, who would like to see better prices for their produce. Additionally, the government has made a major goal of doubling farmers' income by 2022. Electronic mandis can help achieve this goal. They do this by increasing the pool of buyers for farmers' produce, instead of dealing only with local traders in the farmers' mandi, a farmer can theoretically buy and sell with the entire country. This improves prices because farmers have more people to sell to and ensures that farmers get taken advantage of less by unscrupulous local traders because they can see all the prices across the electronic market. Electronic markets also benefit buyers too since it reduces the cost of searching for sellers.

One study from Rajasthan assesses that the cost of e-mandis is relatively modest at ₹34 lakh per mandi or ₹39 crore for the remaining 114 mandis yet to implement electronic markets. One key factor in this intervention is that it leverages the set-up of existing agricultural markets and so new costs are relatively small. Costs include cost of providing hardware, software and other peripherals and orientation programmes for farmers and traders. There are additional running costs and including the set-up costs, the equivalent annual cost of the intervention is ₹11 crore per year.

The major benefit of the intervention is that farmers receive better prices for their produce. Findings from Karnataka, which is considered to be the pioneer for this intervention, shows that farmers earned around 13 percent more for two years for a set of crops sold through the e-platform. In the study from Rajasthan, only half of this value was assessed as a benefit. The benefit estimation also requires an assumption about how much would be traded through the e-mandi platform. While electronic markets were highly successful in Karnataka subsequent uptake across the rest of the country under e-NAM has been muted. In Rajasthan for example, after two years of implementation only 2.5% of all produce by value was traded through e-mandis after 25 out of 139 were brought online. The Rajasthan study assumes a slow take up rate, with e-mandis capturing 2.5% of all trading initially and only reaching 13% after ten years before increasing sharply to 80% after twenty years. Under this profile the benefits of the programme are large, with an annualized value of ₹685 crore per year and the BCR is 65.

The intervention is still at a nascent stage in India with some implementation concerns. There have been reports that the necessary infrastructure to support e-mandis such as quality grading facilities and internet connectivity have also been lacking. However, these problems also affect Karnataka, where the estimated benefits are drawn, so already account for these issues. Even then, the BCR of 65 is based on 50% reduction of the benefits from the Karnataka experience. An assumed 88% reduction would still yield a phenomenal BCR.

The more important issue is the limited take up of e-markets by farmers and traders to date. However, e-mandis have a useful life of perhaps several decades. Over this extended time, the

value of agricultural produce will increase dramatically along with the potential for benefits. The BCR is dependent on the long-term success of e-mandis, which is inherently uncertain. However, even modest take-up rates - as low as 10% - would lead to BCRs in the phenomenal range. This is because the fundamental economic case for e-mandis is strong: limited spending can integrate disparate markets through which a lot of value is traded (and which will grow over time). Even reducing inefficiencies by small percentages leads to significant benefits, relative to costs. The Karnataka experience demonstrates that strong implementation is possible, and it is up to those implementing the e-NAM system to fully capture the potential benefits.

Why e-mandis is a phenomenal investment: academic evaluation

Establishing electronic agricultural markets (e-mandis) has the basis for a highly cost-effective intervention, and despite relatively low take-up rates thus far, there is evidence to suggest the programme has a phenomenal BCR, albeit with low confidence.

A recent study by India Consensus under the Rajasthan Priorities project shows that setting up of e-mandis in the state yields a BCR of 65 (Banik, 2018). However, instead of focusing too much on this point estimate, it is useful to examine the underlying economics of e-mandis.

E-mandis have a favourable cost profile - setting up the electronic platform is relatively modest and leverages the existing physical mandi structure which is already in operation. Banik (2018), drawing upon several state government budgets, estimated a set up cost of ₹3.4 lakh per e-mandi. This involves integration costs, customization of software and training. Running costs were assumed to be 10% of investment costs. For 114 markets that had yet to be e-mandi enabled the investment costs were ₹39 crore, with running costs for 20 years at ₹82 crore for total costs of ₹131 crore or ₹10.5 crore per year.

The benefits of the intervention arise from joining up disparate markets across the state into a single unified platform. This should lead to a number of benefits including liquidity pooling, reduced transactions costs, lower information asymmetry, less collusion among middle men and lower inventory holding costs - all of which should be reflected in the prices realized by farmers.⁸ Indeed, several studies have documented increases in farmer prices post electronic market implementation. For example, the average real price premium for a set of crops for the farmers selling through e-platform in Karnataka was 13 percent for two years (Chand, 2017). Another study showed that between 2007 and 2015, there was a 128 percent increase in the average price of groundnuts in e-markets compared to 88 percent increase in non-e-markets (Reddy, 2016). Lastly, coffee traded through electronic tendering fetched a 4 percent higher price over the price determined through physical auction in Karnataka (Banker and Mitra, 2007).

To estimate benefits, Banik (2018) applied 6.5% to the value traded through e-mandis which is half the 13% boost documented in Chand (2017) analysing the Karnataka experience. This was assumed to represent the Pareto efficiency gains from e-mandis, with the rest assumed as merely a transfer. The benefit estimation also required an assumption about how much would be traded through the e-mandi platform. While electronic markets were highly successful in Karnataka where it was initially implemented, uptake across the rest of the country under e-NAM has

⁸ The idea that higher liquidity leads to improved price discovery and lower transaction costs has been explored thoroughly in the literature on capital and commodity markets and is relatively uncontroversial.

subsequently been muted. In Rajasthan, for example, after two years of implementation only 2.5% of all produce by value was traded through e-mandis after 25 out of 139 were brought online. At the same time, the Karnataka experience shows that widespread adoption of e-markets is possible after only several years. In the study, Banik (2018) assumed that e-mandis initially start out trading 2.5% of value and after ten years commands only 13% of all value. It reaches a tipping point once 40% of value is trading through e-mandis after which the value rises sharply, reaching 80% twenty years after programme implementation. Under this profile the benefits of the programme are large, with an annualized value of ₹685 crore per year and the BCR is 65.

Implementation issues matter greatly and deserve further comment. There have been reports that the necessary infrastructure to support e-mandis such as quality grading facilities and internet connectivity have been lacking (Jha, 2018). However, it is important to recognize that Karnataka experiences the same types of infrastructural challenges as other mandis throughout India and therefore the effect size documented by Chand (2017) embeds these shortcomings. It is of course possible that Karnataka has better functioning mandi infrastructure than the average across India, though we note that the effect size documented in Banik (2018) is already based on a 50% discount. Further discounts up to 88% less than the effect size documented in Chand (2017) would reduce the BCR but keep it in the phenomenal range.

A more important issue is that the adoption of e-mandis has been limited. However, the useful life of e-mandi platform could potentially be decades, and the value of agricultural produce will grow significantly over this time, enlarging the potential benefits. The BCR of the programme hinges on one's long-term beliefs about the success of the platform in attracting interest and trading volume. Aside from Karnataka, there is limited evidence upon which to base any projected growth and there is significant uncertainty with any forecast. However, even modest take up assumptions leads to BCRs in the phenomenal range. For example, capping the uptake over 20 years at 25% of all agricultural produce generates a BCR of 36, and even a paltry 10% upper bound generates a BCR of 17. Is it likely that by 2037 India would see at least 10% of all agricultural volume traded through e-mandis? It is impossible to know for sure, but this does not seem unreasonable, and it is for this reason we rate the scheme as phenomenal albeit with low confidence.

The fundamental economics of e-mandis are strong: limited spending can integrate disparate markets through which a lot of value is traded, and which will grow over time. Even reducing inefficiencies by small percentages leads to significant benefits relative to costs. The Karnataka experience demonstrates that strong implementation is possible, and it is up to those implementing the e-NAM system to fully capture the potential benefits. Moreover, there may be additional post-harvest loss benefits from integrating remote farmers into the national supply chain via e-mandis. While so far there is limited information about this potential benefit, if they were found to be substantial, it would further support the phenomenal rating.

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Invest more in agricultural R&D and certified seed production (RKVY and NFSM)

Rashtriya Krishi Vikas Yojana: RKVY scheme was initiated in 2007 as an umbrella scheme for ensuring holistic development of agriculture and allied sectors by allowing states to choose their own agriculture and allied sector development activities as per the district/state agriculture plan. The scheme incentivizes States to increase public investment in agriculture & allied sectors. States have been provided flexibility and autonomy for selection, planning approval and execution of projects/programmes under the scheme as per their need, priorities and agro-climate requirements. In November 2017, the Cabinet approved the continuation of RKVY as Rashtriya Krishi Vikas Yojana- Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RKVY-RAFTAAR) for three years i.e. 2017-18 to 2019-20. Under RKVY-RAFTAAR, the major focus is on pre & post-harvest infrastructure, besides promoting agri-entrepreneurship and innovations (<http://rkvy.nic.in/#>). Focus areas under RKVY include: (i) Integrated development of major food crops such as wheat, paddy, coarse cereals, minor millets, pulses, oilseeds under which assistance can be given for making available certified/HYV seeds to farmers, production of certified seed etc., (ii) Assistance for agriculture mechanisation, (iii) Development of rainfed farming systems, as also Integrated development of watershed areas, wastelands, river valleys (iv) Training to farmers on pest management through Farm Field Schools (v) Assistance to agri- entrepreneurs / agri-graduates to set up agri-clinics / agri-business centres, etc. (vi) Strengthening of Infrastructure to promote Extension Services (<https://rkvy.nic.in/static/guidelines-areas-of-focus.html>)

National Food Security Mission: NFSM, a Centrally Sponsored Scheme, was launched in October 2007 to increase the production of rice, wheat and pulses in the country. The scheme met with an overwhelming success and continued with new targets of additional production of food grains of 25 million tonnes comprising 10 million tonnes rice, 8 million tonnes of wheat, 4 million tonnes of pulses and 3 million tonnes of coarse cereals by the end of 12th Five Year Plan (2017-18) and additional 13 million tonnes comprising 5 million tonnes of rice, 3 million tonnes of wheat, 3 million tonnes of pulses, and 2 million tonnes of coarse cereals by 2019-20

Why agricultural R&D and certified seed production is a phenomenal investment

RKVY and National Food Security Mission together include almost all the interventions that can be conceived to improve the performance of agriculture and allied sectors in the country. Some of the key areas under these programmes are agricultural R&D, farm mechanisation, input management, leveraging ICT to improve the performance of the sector and postharvest management. As with any sector, some interventions provide a higher return while others are not as cost effective. For example, agriculture R&D is highly cost-effective given the huge untapped potential of the sector. According to one study, an annual extra ₹39,000 crore in agricultural R&D in India will increase yields by an additional 0.4% for crops and 0.2% for livestock. This would benefit producers substantially, by providing them with a greater return on their farming activities, as well as consumers who would pay less for food. Every rupee spent would return ₹22, making it a phenomenal intervention. This finding is supported by many studies that have looked at the historical experience of agricultural research and development in India, which tend to find that the returns to agricultural R&D is in line with a phenomenal BCR.

Seed is an important input and investment in production and distribution of better, certified seeds is a simple yet highly cost effective intervention. A study focusing on Andhra Pradesh shows every rupee spent on production of high-quality seeds returns 15 rupees. The costs are ₹400 crore per

year, 95% of which are for the new seeds themselves with the remaining being the cost of seed promotion. The certified seeds help to increase productivity of major crops by around 10%, leading to gains state-wide of ₹6200 crore. While this BCR is just at the threshold for a phenomenal rating, another study in Rajasthan looking at the same intervention reports a BCR of 20. Additionally, there is broad consensus that providing more effective seeds can boost yields at low cost.

The Andhra Pradesh study shows that investing in setting up custom hiring centers can help small and marginal farmers in farm mechanisation. They can rent machines like tractors and other capital intensive implements instead of buying them individually. This can bring down the cost of seed and fertilizer by 15%, animal labour by 60% and human labour by 20%. The reduction in cost will boost overall farm household income. The BCR for this intervention is 1.9.

Extension is another intervention that can help farmers adopt better practices and bridge the existing knowledge gap. According to one study, the government spends around ₹489 per hectare in 2016 on such services. The information from extension services leads to 12% higher returns for the farm household amounting ₹2998 per hectare. This gives a BCR of 6. This area also has huge potential as currently only 40 percent of the farmers access information on modern agricultural practices.

Why agricultural R&D and certified seed production is a phenomenal investment: academic evaluation

RKVY was designed as a State Plan Scheme that provides flexibility and autonomy to states in planning and executing programmes for incentivizing investment in agriculture and allied sectors. Major focus of the scheme is investment in varied assets and infrastructure.

National Food Security Mission was launched in 2007 to increase the annual production of rice by 10 million tons, wheat by 8 million tons and pulses by 2 million tons by the end of the Eleventh Plan (2011-12). The scope of the mission was increased and during the 12th Five Year Plan (2012-17) coarse cereals and commercial crops were also included in the mission. The programmed interventions among others include the promotion and extension of improved technologies i.e., seed, Integrated Nutrient Management including micronutrients, soil amendments, integrated pest management (IPM), input use efficiency and resource conservation technologies along with capacity building of the farmers'/extension functionaries. Unlike RKVY, the programme is more specific in terms of target regions (districts) and crops. However, the means to achieve the objectives would be similar under the two programmes. BCR categorization for some of the interventions under these two key schemes is as follow:

Agricultural R&D: The BCR categorization for agricultural R&D is phenomenal. Agricultural R&D has played an important role in welfare improvement in the form of higher production and lower food prices to domestic population, improved nutrition, expansion in rural employment and other linkages with the rest of the economy (Ramamamy, 2013). One cost-benefit analysis estimates that annual marginal spending of around ₹39,000 crore per year on agricultural R&D in India can bring an annual improvement in yield of 0.4% for crops and 0.2% for livestock products (Rosegrant et al., 2015a). While this is a large investment, the returns are substantial. A greater amount of produce would benefit producers by providing them with more goods to sell, and consumers by lowering the price of foods. Using IFPRI's IMPACT model, the paper estimates that

this would lead to annual welfare gains of ₹7 lakh crore and ₹1.6 lakh crore respectively by 2050. Altogether, this would generate returns of ₹22 for every rupee spent.

This finding study is supported by retrospective analyses on Indian spending in agricultural R&D. Rada and Schimmelpfennig (2015) estimate the contribution of agricultural research and development (defined as all spending by the Indian Council of Agricultural Research and State Agricultural Universities) as well as other inputs, to total factor productivity in the agricultural sector over the period 1980 to 2008. They identify agricultural research and development as the most important, with a 1% increase in agricultural spending increasing total factor productivity by 0.15 percent. The authors report an internal rate of return of 85% and a BCR of 18.3 using a 10% discount rate. A 5% rate applied in this report would increase the BCR. The report also utilises output as the measure of benefits, which fails to account for consumer welfare gains when output increases and prices fall. Thus, 18 would appear to be an under-estimate. An older review of 28 studies in India (Pal and Byerlee, 2006) noted an average internal rate of return of 72% for agricultural R&D in India, similar to the 85% documented in Rada and Schimmelpfennig. This suggests that high returns are a consistent feature of agricultural research and development in India. A more recent case study showed that the BCR for investments in the rice and wheat cropping system in India is 17.3 (Punia, Anbukkani and Pal, 2017). Finally, a broader cost-benefit analysis for the entire developing world estimates that increased investment of \$8 billion per year would generate benefits 34 times the costs (Rosegrant et al., 2015b).

As with other ratings in this document, a phenomenal marker for agricultural R&D is not meant to imply that implementation of the intervention is perfectly efficient. Indeed, there is evidence of challenges in the current set-up, with diminishing efficiency in agricultural research institutions, lack of appropriate staff, mismatches between research focus and crops which have the highest production value, and stagnation in the amount of funds being spent as a percentage of GDP (IFPRI, 2016). Nevertheless, these challenges are to a large extent already embedded in the findings above, either because they are retrospective analyses or because they draw on evidence from developing countries that would experience similar challenges. The overall body of evidence suggests a phenomenal rating is warranted despite implementation challenges. Reducing the effect of these shortcomings would increase the BCR even more.

Certified Seed Production and Distribution: The BCR categorization for this intervention is phenomenal. There are huge yield gaps for various crops in India, and one of the reasons is the low seed replacement rate (SRR), which is defined as percentage of certified seeds in comparison to farm saved seeds that are sown in total crop area (National Seed Policy, 2002). Certification ensures availability of high-quality seeds of notified varieties which results in higher productivity of crops and also ensure genetic identity and purity. Research by India Consensus shows that certified seed production has a high return on investment with a BCR of 15 for Andhra Pradesh and 20 for Rajasthan (Mittal, 2018a, 2018b). The costs include two components. First is the cost of production of the additional seed required for all the major crops to achieve a higher SRR. The second is the cost of promotion to increase the adoption of the improved seeds. The promotion cost is around ₹186 per hectare (Birthal et.al, 2015). The main benefit from this intervention is increased yields because of the use of certified seed which is around 10% and based on findings of some other studies (GoAP, 2015; Singh and Singh, 2016; Abebe, 2017; Clayton 2009).

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Invest more in Provision of Calcium and Multiple Micronutrients for pregnant women at ANC visits

The National Rural Health Mission (NRHM) was launched in 2005 to improve healthcare services in rural areas. In 2013, NRHM was subsumed with National Urban Health Mission to form an overarching National Health Mission (NHM). Under NHM, support to States/UTs is provided for five key components:

- (i) Health Systems Strengthening including infrastructure, human resource, drugs & equipment, ambulances, MMUs, ASHAs etc under NRHM and NUHM.
- (ii) Reproductive, Maternal, Newborn, Child and Adolescent Health Services (RMNCH + A).
- (iii) Communicable Disease Control Programme
- (iv) Non-Communicable Diseases Control Programme interventions up to District Hospital level.
- (v) Infrastructure Maintenance to support salary of ANMs and LHV's etc.

Public Health being a State subject, support under NHM is provided to States/UTs based on requirements posed by the States in their Programme Implementation Plans (PIPs).

Additionally, National Guidelines for Calcium Supplementation During Pregnancy and Lactation has been drafted. And Policy Guidelines on Vitamin A, Zinc and Iron-Folic Acid supplementation is in place.

Why Provision of Calcium and Multiple Micronutrients for pregnant women at ANC visits is a phenomenal investment

The National Health mission provides iron and folic acid supplements to pregnant women during antenatal visits. However, the intervention discussed here is different, proposing calcium and multiple micronutrient supplements to pregnant women during antenatal visits. Studies have shown that deficiency of calcium and other key micronutrients can reduce the risk of various infections, leading to fewer premature births, low birth weight babies, maternal deaths and infant deaths.

Two studies from Andhra Pradesh and Rajasthan show that every rupee spent on provision of calcium and micronutrients during antenatal visits returns around ₹38. The intervention uses the existing network of health facilities, and does not assume anything beyond the normal demand for ANC visits already shown by women in recent years. The additional cost includes the cost for hiring additional health staff, training cost, and cost of supplements to be distributed among pregnant women. These come to ₹884 and 637 per beneficiary for Andhra Pradesh and Rajasthan respectively. For every 100,000 pregnant women reached, the intervention saves 11 maternal lives and avoids 134 premature-birth deaths in Andhra Pradesh, and 22 maternal lives and 97 premature-birth deaths in Rajasthan. It also leads to 10,700 averted cases of anaemia and avoids 2,550 cases of low birth weight in Andhra Pradesh, and 6,850 averted cases of anaemia and 2,400 cases of low birth weight in Rajasthan. Avoided low birth weight means that the healthy children would earn 5-10% in the future due to better physical and mental growth. Adding the health and productivity benefits, the total benefit per beneficiary amounts ₹34,500 and ₹23,500 for Andhra Pradesh and Rajasthan respectively giving a BCR of 39 and 37. While there are known implementation challenges with the healthcare system, because this analysis assumes the same number of ANC visits that mothers themselves report attending, it likely already captures most major

implementation problems such as absenteeism. Furthermore, even if 60% of doctors did not provide the necessary tablets the BCR would still be above 15. We therefore rate the intervention as phenomenal.

Why Provision of Calcium and Multiple Micronutrients for pregnant women at ANC visits is a phenomenal investment: academic evaluation

Under the current health mission provision of iron and folic acid and tetanus toxoid is standard procedure during antenatal visits. However, we do not undertake a cost-benefit assessment of these here, as the main constraint to further expansion is largely demand based, and another summary deals with an incentive scheme for ANC visits. Instead, we provide an assessment of a suggested expansion of the current ANC programme to include calcium and multiple micronutrients, which has a phenomenal rating.

Deficiency of micronutrients in the diet can increase vulnerability to infections. According to a study by Copenhagen Consensus Center for Andhra Pradesh and Rajasthan, the BCR for micronutrient supplementation for pregnant women during ANC visits is 39 and 37 respectively (Joe et al., 2018a, 2018b). The marginal cost for the intervention includes the cost of health workers, training of the workers and provision of the supplements. Cost for behavioural change communication for better compliance in a scaled-up model of the intervention is also included in the total cost. As per the analysis, the intervention would reach around 9.7 lakh and 16.2 lakh pregnant women in 2018 and the marginal cost per beneficiary reached is ₹884 and ₹637 for Andhra Pradesh and Rajasthan respectively. The estimated benefits from provision of micronutrients include reduction in preterm deaths, maternal and mortality and morbidity related to anaemia, low birth weight, pre-eclampsia and pre-term birth. Potential productivity gains due to averted low birth weight is also included as a benefit of the intervention. Adding the health and productivity gains, the total benefits per beneficiary is about ₹34,500 and ₹23,500 for Andhra Pradesh and Rajasthan respectively. Hence, the intervention returns around ₹38 to society for every rupee spent.

To increase the uptake, the model assumes that during each visit, a two-month supply of Calcium and Multi-micronutrients will be provided to the beneficiary. The intervention will use the existing platform of ANC visits and provides calcium and MMN in place of vitamin A and folic acid. Because the analysis is based on self-reported visits to ANCs by women (from NFHS-4), it already embeds a lot of implementation failures that one might expect e.g. shortage of doctors and other staff, absenteeism, lack of awareness among the target population. The only risk in the new intervention is that doctors do not give the new pills but instead continue giving the old pills, but it seems unlikely this would last for a long time if the government promotes the use of calcium and MMN (and stops giving doctors vitamin A and folic acid). In a worst-case scenario, even if 60% of doctors were not providing tablets in the long run, the BCR would still be above 15. Hence, the intervention is rated as ‘phenomenal’.

In another study, it was found that incremental cost effectiveness ratio (ICER) per DALY averted is USD 24 due to switching from routine prenatal supplementation of 60 mg iron and folate plus the usual timing (week 20) of daily food supplements to potentially superior multiple micronutrients plus an early invitation (week 9) to food supplementation (Svefors et al., 2018). This gives a BCR of around 149 using the 2015 per capita GDP of Bangladesh. Although the intervention is a combination of food supplements and micronutrients, the phenomenal

categorisation will not be affected even if the benefits are attributed separately, because the combined BCR is very high.

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Achieving better learning: Invest more in teaching at the right level and computer assisted learning at the right level

Many efforts and resources are focused on achieving better learning in school. However, much greater focus should be on two very cost-effective educational policies. Both approaches involve teaching students with material that is more tailored to their individual learning levels: i) teaching at the right level and ii) computer assisted learning at the right level.

The first intervention, introduced by many states at different times over the last decade through the organization Pratham, essentially groups children together by learning level rather than by age. In Andhra Pradesh, the study mentioned above indicates a cost per child of ₹1100-2300 for the intervention, consisting of materials and extra time of teachers and students. Studies have shown that this approach would improve student learning, leading to a wage boost of 3% generating lifetime benefits of ₹49,000. BCRs are 20-45, in the phenomenal range. The second intervention is a computer-based approach that dynamically adapts to student progress. This would cost ₹1333 per student per year, including costs for infrastructure, hardware, staffing and software development. The study from Andhra Pradesh estimates that this would lead to a wage boost of 5.1% and lifetime benefits of ₹83000 for a BCR of ~60.

Current education indicators for the SDGs focus primarily on inputs or quantity of students attending school. However, the research suggests that India instead should focus on ways to achieve learning at the right level either through innovative pedagogical approaches that group students according to learning levels (Banerjee et al. 2016) or via specific computer assisted learning that dynamically adapts to student progress (Muralidharan et al. 2017). Evidence suggests these would generate benefits far above ₹15 per rupee spent (Chakrabarti et al. 2018a, 2018b).

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Methodological considerations for the identified phenomenal policies

The recommendations for increased funding should be construed as impact of modest future expansions of the programme (or, if easily reversible, the negative effects of modest retraction). It does not estimate what would happen if the programme were to be rolled back significantly or scaled up to 100%. Partly, smaller changes are more relevant in a political consideration of where to allocate more resources and the models employed are more likely to be useful for marginal changes. When contemplating largescale increases or decreases in programmes, difficulties of reaching the last mile or losing economies of scale would come into play, and these are not assessed.

Efficiency of implementation matters greatly, but perhaps not entirely the way one would think. There is a tendency to assume that a well-implemented programme also is a very effective program, while a badly implemented programme is ineffective. However, consider a programme that if perfectly implemented delivers an incredible ₹200 back on the rupee. Even if this was extraordinarily ineffectively implemented, with 80% of all resources completely wasted, it would still deliver ₹40 of social good for every rupee spent (80 paise will be wasted, but the last 20 paise will deliver ₹200 per rupee or ₹40 per ₹0.20). In comparison, a programme that in an ideal setting delivers just ₹2 of social benefits for each rupee spent will, even if perfectly implemented, still only delivers ₹2 per rupee.

Poor implementation can make a programme less effective than its ideal outcome, but great implementation just makes it as effective as it can be. Thus, the policies selected here are not an assessment of how close the programme comes to meeting its objectives, nor the competency or skill of those overseeing or implementing the programmes. It is simply an assessment of their actual effectiveness in using rupees to produce social benefits.

It is relevant to note that some of the selected programmes to not reach much of the target population, do not materially affect the SDG indicator, or possibly see a significant amount of money is wasted either through leakage, or absenteeism or another type of implementation failure. One way of adjusting for these concerns is to place greater weight on high quality randomized controlled trial evidence to estimate the impact of programmes, since experimental data is better able to capture the failures and shortcomings of real-world implementation than non-experimental methods. The second approach is to make a formal upward adjustment to costs by assuming some level of leakage. Of course, both approaches are constrained by availability of applicable evidence and data. In the comments for each programme it is also clear that the split between variable and fixed costs matters. If a programme has limited reach, the effect on efficiency is very different for a programme with higher share of fixed costs, most of which would go to waste, versus a programme mostly driven by variable costs in which case limited implementation only has a modest effect on money spent. Ultimately, such concerns should simply be noted and fed into the democratic debate on Indian priorities. But they do not invalidate a basic point of this paper that some policies are much more effective than others.

It is important to be clear about the limitations of cost-benefit analysis. Accurate and comparative cost-benefit analyses rely on being able to identify all important costs and benefits. Some benefits, especially more intangible benefits like dignity or avoided shame are hard to measure. However, it is likely that this factor would be similar across all programmes and would not affect the ratings. Secondly, individuals might not agree on an assigned values for various outcomes, such as the value of health or time. Obviously, different assumptions about valuations for these impacts might

lead to different conclusions. The valuation assumptions used in this report are based on some of the best available evidence and meta-analyses, though we note that naturally there are competing views on the appropriate value for some of these metrics

Equity is clearly a chief concern of policymakers and of society at large. Cost-benefit analysis as typically conducted does not account well for the distribution of costs and benefits. Nevertheless, cost-benefit analysis should be seen as a complement to discussions about equity. If society wishes to pursue a given policy due to strong equity concerns, then cost-benefit analysis will let decision-makers know if pursuing that policy comes with a loss or gain of efficiency, and to what extent. Since many of the programmes are targeted at the poorest elements of society, questions of efficiency do have an important moral element since those beneficiaries would be better off, sometimes significantly more so, under the most efficient programmes.

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