Conceptualising social returns to sanitation interventions: a case study on 3 states of India

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Abstract

Access to adequate sanitation facilities is essential for public health and sustainable development. In India, addressing the challenges of open defecation and associated health risks have been a government priority, leading to significant efforts in promoting toilet adoption. However, disparities in toilet availability and usage persist across different regions. One of the key challenges faced by policy makers and investors in the sanitation sector is the lack of robust evidence regarding the social and economic returns on investment. This study aims to assess the economic benefits and health outcomes derived from the availability and use of toilets in three states in India. By employing a comprehensive framework, we estimate the returns on investments in sanitation infrastructure by examining the reduced diarrhoea treatment costs and saved productive time due to the elimination of long-distance travel for open defecation. Our findings demonstrate significant positive savings when considering these crucial criteria. We also identify specific strategies, referred to as "nudges," that can be employed to further enhance the benefits and returns associated with owning a toilet. We acknowledge the need to expand the framework and calculation methods with further in-depth data and analysis to strengthen the evidence.

Keywords: *Social return on investment, WASH interventions, toilet availability*

Background

Access to adequate sanitation facilities is a fundamental aspect of public health. Open defecation not only poses serious health hazards, such as the spread of waterborne diseases, but also has far-reaching socio-economic consequences, particularly for marginalized communities. Over the years, the Indian government has undertaken various initiatives and campaigns to promote toilet adoption and improve sanitation infrastructure. These efforts have included the construction of millions of toilets, financial incentives for households to build toilets, and awareness programs to promote behavioural change. These initiatives are aimed at achieving the Sustainable Development Goal (SDG) 6, which targets universal access to sanitation facilities by 2030.

While significant progress has been made in promoting toilet adoption, there are still significant disparities in toilet availability and usage across different regions of India. Some states and communities continue to face challenges in terms of access to adequate sanitation facilities. This situation necessitates a deeper understanding of the economic benefits and health outcomes associated with the availability and use of toilets. This study seeks to fill the existing

research gap by assessing the economic benefits households derive from toilet availability and usage in three different states of India.

United Nations in its Sustainable development goal (SDG) 17 emphasise on "Partnership for the goals" to attain various developmental targets. The private sector investment in social sector to support the SDGs for India was around 70,000 crores as of 2018[1]. The primary implementors (besides governments) of projects driven towards SDGs and social sector upliftment are social enterprises and non-governmental organisations. The magnanimous amount of investments warrants the need to generate evidence on outcomes of these interventions and investments. However, gauging the impacts of these investments may face difficulties in 'unravelling performance' (Paton, 2003:5) due to complex and dynamic business models of the social enterprises across various sectors. The problem lies in identifying better methods to assess the impact of the intervention and then thereby gauging the benefits received from the efforts or costs invested to attain the development objectives. In this paper we have tried to address the issue of evaluating the returns from investment in sanitation infrastructure as a part of developmental initiatives.

Social enterprises and non-profit institutions can especially benefit from the above-mentioned returns to investment analysis due to what we may refer to as, 'CEE' (Kwizera et al., 2019). Where C represents Credibility, where returns on investment analysis facilitates non-profit to communicate its impact. The returns estimation of a social enterprise helps to generate Efficiency, as it helps to identify areas that needs to be or is efficient and learn from efficient systems identified through knowledge transfer. And finally returns on investment helps to present Evidences of intervention as the return's calculation model can provide tools to collect and analyse data and to interpret information for sustained functioning. Here Social return on investment (SRoI) is a performance measurement tool that helps to demonstrate the value generated in terms of both economic and social returns. Social Return on Investment (SRoI), is designed to understand, manage and report on the social, environmental and economic value created by an organization (New Economics Foundation, 2004). SRoI helps to assess if an intervention is worth the investment.

We have considered SRoI as the $Net\ Value\ of\ Benefits\ /\ Net\ Value\ of\ Investment$, that uses elements of cost-benefit analysis (Millar & Hall, 2013). The flexibility of the method, subjected to various contexts is the biggest benefit of this approach. In this study we use a simple framework that applies the logic of social returns from investment in sanitation facilities provision or toilet construction as a part of developmental efforts in rural Indian context. In this paper we would try to understand the impact of sanitation interventions by FINISH in India across different geographical context. We would estimate the benefits due to the interventions at household level and also estimate the returns from the interventions, annually. The broad research questions that we address are;

- *What are the social and economic benefits of toilet construction to a household?*
- *What are the enablers towards access of toilets and use?*

By estimating the returns on investments in sanitation infrastructure and related interventions, we sought to underscore the potential economic gains associated with improved access to toilets. Moreover, we aimed to shed light on the indirect benefits of toilet availability, particularly in terms of improved health outcomes and time savings. These indirect benefits can have a profound impact on household well-being and overall socioeconomic development. Furthermore, the identification of effective nudges, which can facilitate increased toilet

[1] https://sidbi.in/en/articles/optimismarticle-page/132.

ownership and utilization, emerged as a significant aspect of our study. By highlighting these nudges, we aim to provide actionable recommendations for policymakers, practitioners, and stakeholders in the WASH sector. These insights can foster evidence-based decision-making and facilitate the design of targeted interventions to enhance sanitation coverage and its associated economic benefits. Further, we present below a short study of literature on and around the importance of investment in WASH sector, role of NGOs and social enterprises in the improvement of WASH status in India.

This study is based on the data from FINISH Mondial programme in India running since 2010 and currently being implemented by Trust of People in India.

Literature Review

Looking into the annals of history, recurring epidemics have rocked the world and Indian subcontinent since the 18th century. Lack of adequate sanitation often led to the diseases and their spread caused most of these epidemics; as was substantiated by Edwin Chadwick's seminal work “Report on an inquiry into the sanitary condition of the labouring population of Great Britain” back in 1842. These epidemics were not only a concern for public health but also led to social unrest and confusion, calling for a prompt development of public health facilities and sanitation works[2] during early 20th century itself (Arnold, 1986). However, in India, historically since the colonial rule, the responsibility to provide health services, safe sanitation and drinking water, to tackle the burden of diseases, have been bestowed on the state or the government and over the past century, the scenario has improved as we entered the new millennium. However, taking into account, the complexity of the Indian society, the vastness of the population, its geographical peculiarities and lack of resources, more often it has been found that the government alone is not, capable of providing the facilities to control or tackle the burden of disease arising from the lack of provision of safe water and sanitation facilities.

The government’s health expenditure has remained at around 1% of GDP over the past decade, which puts India significantly behind the global average. These funds are also not efficiently utilised due to fragmented planning and vertical nature of the programmes. Moreover, India faces significant challenges in the provision of safe water, sanitation, hygiene and solid waste management and drainage, especially in rural areas. The inequality in access is acute, with more than 90% of urban residents accessing sanitation facilities compared to only 39% in rural India[3]. The diseases associated with poor sanitation correlated with poverty accounts for about 10% of the global burden of disease[4]. Hence, considering the resource crisis of the individual governments of these nations to deal with developmental issues (like provision of safe water and sanitation facilities) United Nations in its Sustainable Development Goal emphasised on “Partnership for the goals” to attain various developmental goals. The expectation was to encourage Governments, Non-Governmental Organisations (NGO), private and social enterprises to come together to attain the sustainable development targets. This was an extremely novel and timely effort by the UN, but is also very intricate process. For instance, (Ramani et al., 2017) in their study concerning the attainment of SDG goal to eradicate poverty, found that the involvement of the Multi-National Enterprises to eradicate poverty required extremely careful formulation of contracts on the part of the government,

[2] The efforts were ramped up by the then British Government in India and is enumerated in the Imperial gazetteer of India, Vol. IV, p. 469, circa 1909
[3] https://www.sruindia.org/hygiene-and-sanitation
[4] Van Minh H, Nguyen-Viet H. Economic aspects of sanitation in developing countries.

taking into account the significant effects of local dynamics shaping the outcome and other externalities affecting the desired outcome.

Hereafter we get into the core context of our study that is WASH interventions to reduce burden of disease, especially in the rural areas of India. There have been a growing and strong consensus that most of the burden of diarrhoeal diseases, under-nutrition and diseases due to contamination is attributable to inadequate WASH facilities. Added to that, it is increasingly being accepted that inadequate access to WASH can expose the women and girls to sexual violence. Studies have also found that the distribution of WASH-related mortality and morbidity is inequitable, and falls disproportionately on the poor, women and on children. Considering the above contexts, an increased investment, attention and effort by governments, NGOs and private players in the WASH sector to improve access to better WASH facilities have been undertaken. Nevertheless, recent studies have highlighted a rather slow progress and gaps at grassroot level. Hence, here we infer that, though all stakeholders accept the need for better access of WASH facilities and also an increasing effort targeted to improve the situation, *the problem also lies in identifying better methods to assess the impact of such interventions and the benefit received from the efforts / costs invested to attain the target.* And due to the limited evidences in measuring the effectiveness of social projects; misallocation, lack of required investment and inefficient utilisation plagues these efforts. Thus, *the objective of this study was to come up a simple tool to better assess the impacts of sanitation programs on social, and economic gains as well as on public health. We propose a method to measure Social Returns on Investment (SRoI) with focus on WASH interventions.*

Investment in any form, whether PPP or by private sectors, justifiably require a calculation of 'returns from investment' in terms of cost and benefit. Considering an investment whose outcome consists of a social change, 'Social Returns on Investment' could serve as a tool to help assess the developmental programs impact holistically. In the next section we move on towards defining SRoI.

Conceptual Framework

Through a long and momentous drive towards increasing provision and use of improved sanitation facilities, in India and globally, we have achieved successes at variable rates and levels. Several studies over time like Afework et al., (2022) have presented multiple observations showing positive correlation between improved health profile and availability of improved sanitation facilities. Studies have also pointed out the probable ills of open defecation in terms of, child health (Dutta et al., 2016; Megersa et al., 2019) loss of dignity (Saleem et al., 2019) productive time loss (Hickling & Hutton, 2014; Maliti, 2021) and other perils that can be encountered due to non-availability of toilets.

The benefits of investments in provision of sanitation facilities in most of the studies are perceived through the analysis of causal linkages between sanitation facility availability and improvement of health and other similar social indicators. It is, as we have elaborated earlier, difficult to express the benefits from toilet availability in absolute value. Moreover, the economic returns to an individual family from a unit of toilet, has also been difficult to measure. The problems of quantifying the benefit of investment in social sector arises from the multiple invisible benefits of the interventions. Considering the case of a safe sanitation facility as example, the benefits can range from improved health to reduction in gender-based violence to productive time gained. We can also use data to find a positive relationship between toilet

availability and reduction in gender-based violence (GBV). However, quantifying the benefits of reduced GBV or improved health requires moving a step ahead.

The problem of quantifying the benefits of an intervention lies in many factors including (but not limited to);

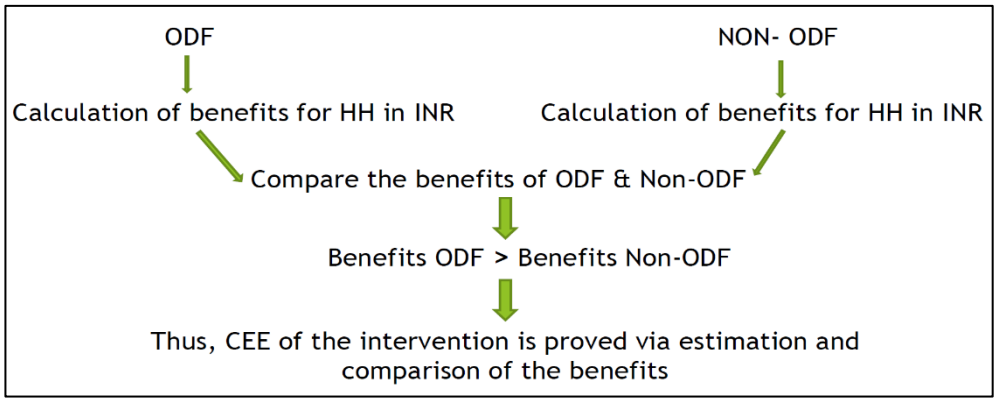
1. *Inclusion* of various in-tangible benefits like improved dignity and enhanced social status.
2. The *diversity* of the benefits depends on the location- demographics, geography, and social factors; In forest areas with wildlife, animal and reptile attacks can be prevented due to availability of toilets inside houses.
3. There might be multiple *externalities* that are not a direct result of sanitation intervention; like availability of toilets would increase the demand of construction agents in an area providing employment opportunities to masons.

Thus, we see that, considering a sanitation facility as an intervention investment, the benefits are layered and multiple. It would be a futile exercise to try and incorporate a fixed set of indicators to gauge the benefits of these interventions. Rather a list of indicators, that are local, strategic, and identifiable should be considered. This list of items that are identified as markers of benefits can be used in conjunction of a basic formula-based model to drive the benefits of an intervention. Moreover, the model, however designed, should be able to express the benefits in economic value terms and for the individuals.

In this study we have framed a stylised model and a formula that would help to express the estimated benefits from a sanitation system for individual household units. We would use the *availability of toilet* as our main input variable of interest that we would combine with the health and other outcomes using a generic formula to quantify the benefits and returns form an investment of one toilet unit. The household specific estimated benefits and returns are representative values that would enable us to not only have an idea of economic benefits generated but also try to contribute to the broader literature on quantifying returns from investments in social interventions.

We would first develop the model and quantify the benefits and returns for household with or without a toilet facility based on health benefits and productive time gained. The model would be stylised based on some initial findings from a primary data set and secondary information. The primary data is collected from three states of India, to be elaborated in the later sections. The model and the findings using the primary data and secondary information would be also used to identify possible linkages between benefits of toilet availability and related behavioural issues. Below is a brief conceptual framework that we use in this paper as an exercise to estimate benefits from toilet intervention in monetary terms.

Figure 1: The Conceptual Framework



The model

The idea behind conceptualisation of the empirical formula was to create an indicator that would help to understand the financial returns from investment in WASH intervention especially, the availability of toilet. The model is a highly stylised model and is intended to highlight a viable structure of calculation of SRoI and also to roughly estimate the benefits and returns. We intend to expand this formula and calculation mechanism with more research in future works.

The benefits from a household toilet, is a sum of savings due to the provision of toilet facility. In our case, it is the implicit cost that a household is able to save due to having a toilet. The model is based on two assumptions that is grounded in findings from the primary data, to be explained below. The *first* assumption is not having a toilet increases the risk of diarrhoea among children by more than 90%. The *second* assumption is having a household toilet saves a fixed amount of time daily that was lost due to time spent in open defecation. The productive time gained is equivalent of the economic value measured in terms of wage rate for a single household, to be explained in data section. Thus, from the first assumption we surmise that having a toilet saves at least one case per household of diarrhoea or its money equivalent medical expenditure, or otherwise. From the second assumption we surmise that having a toilet saves time that can be used to earn economic benefit of fixed amount for at least one member of a household. The stylised formula for benefit for the same is as below;

$$Annual\ benefit\ = Cost\ per\ case\ of\ diarrhhoea + [(Wage\ saved\ per\ day) * 300\ days]$$

It is to be noted that as explained earlier, we have incorporated only two aspects of the benefit from sanitation provision *(a) health benefit (b) productive time gained benefit*. There is scope to add more aspects in the same framework. The return is calculated as the ratio of benefit to cost of intervention at HH level. The return in this sense only considers one-time investment in toilet construction.

The rate of return is,

$$Return\ (\%) = (Annual\ benefit)/\ (Cost\ of\ construction\ of\ one\ unit\ of\ toilet)$$

The above formula is very much generic and can be modified to include or replace with other important variables that might reflect the returns from investment. Next, we discuss the calculations of the two benefits.

Cost per case of diarrhoea

On the health aspect, using the data we found that almost 95% of the HH without toilet had faced at least one case of diarrhoea. Therefore, it is safe to link that possession of toilet contribute to prevent diarrhoea and vice-versa. Further, having a toilet and prevention of Diarrhoea would save the cost of treatment for Diarrhoea. (Pradhan et al., 2020) in an elaborate study have presented detailed breakups of costs of treatment in diarrhoea cases. We have used the same findings to calculate the health benefit due to having a toilet.

Table 1: Cost of diarrhoea case per households (child)

IPD mild (40% of the samples)	Median INR	OPD Severe (60% of the samples)	Median INR
Direct		Direct	
Medicine	504.5	Medicine	1624
Diagnostic	0	Diagnostic	1120
Registration/doctor's	100	Bed	500
Other	20	Consultation	25
Total direct	**778.5**	Cost	0
Indirect		Other	120
Transport	230	***Total direct***	**3823**
Food	45	Indirect	
Income	0	Transport	350
Other non-medical	80	Food	1000
Total indirect	**407.5**	Income	0
Total IPD treatment	**1186**	Other	100
		Total indirect	**2237**
		Total OPD treatment	**6060**
Mild IPD INR	**1186**		
Severe OPD INR	**6060**		
Average cost of treatment per case (IPD & OPD) = INR 3623			

Source: (Pradhan et al., 2020)

Thus, from the above table we calculate the average cost of treatment per case is INR 3623.

Wage saved per day

On the other hand, using the primary data set, we find that on average, members of the households without toilet spend close to 20 mins or more each day to perform defecation activities. This time could have been invested in productive activities to gain economic returns or on caregiving and other home duties. We have taken into account this time loss and have incorporated the same in the model to calculate the value of yearly loss based on the daily wage rate.

The daily wage rate calculation is based on MNREGA workers regional wage rate of *INR 230*[5]. Also, we have hypothetically considered 300 working days in a year to calculate implicit wage lost. Next, we move on to the benefit due to time economising on defecation activities with

[5] https://indianexpress.com/article/india/nregs-wages-revised-less-than-5-per-cent-hike-in-21-states-union-territories-7843460/

toilet in house. Considering 8 hrs work per day and an average of INR 230 (calculation given below) of daily wage, the wage loss or otherwise is calculated.

Using our data, we find that, during the period of an entire day, an individual without toilet travels 20 mins or more on average for open defecation. In house toilet would save this time that has an implicit hourly value, as the population studied are daily wage earners and thus hourly wage is of high value to the workers. In this formula we incorporate the hourly wage times the 300 annual working days to calculate prospective benefit.

Table 2: Toilet and productive time lost

Where do you go for defecation (No toilet)	***Percent***
Open defecation (Less than 2 kms)	72.95
Open defecation (More than 2 kms)	26.14
Use neighbour's toilet	0.91

In case of the time that is spent to travel and perform the exercise of defecation in open, the productive time that is lost can be utilised to employ in economically gainful activity. Thus, we have considered the loss of time as a determinant in the benefit of availability of toilet. The table below illustrates that close to 26% of the households travel more than 2 km for OD and around 72% travels less than 2km. We have averaged out the time spent for various distance travelled to calculate the prospective time taken and concomitant economic loss.

We use the below formula to calculate productive time gained or the waste prevented due to having a toilet at house.

$$\textit{Productive time gained} = \left[\frac{Daily\ wage}{working\ hours * 60\ mins} * minutes\ waste/day) \ * total\ working\ days\right]$$

The calculation considers the household earning at least as much as a MNREGA worker in rural India. Following the calculation, we derive the value of productive time lost, or saved due to toilet availability.

Table 3: Estimated wage gained calculation

Categories	Wages	INR
Daily wage	230	230.00
Wage per minute considering 8 hours a day labour	230/ (8*60)	0.48
Minimum wage loss per day due to OD per day	((230/ (8*60)) *20)	9.58
Annual wage loss with 300 working days	((230/ (8*60)) *20) *300	2875.00

However, the saving is applicable only in case the household has a toilet and saves the Implicit money value. Thus, the benefit from health and wages add up to give the total benefit due to having a toilet. This total saving of HH divided by the cost of toilet is the returns percentage from the toilet intervention. The return is calculated for each individual HH and later aggregated at block, district, state of total level.

Benefits and returns on investment

In this section we elaborate the benefits that we have defined above. Benefits from preventing a case of diarrhoea on average is INR 3,623 and on the other hand, the household can save around INR 2,875 due to having a toilet in a year. Combining these, the total annual benefit comes to INR 6,498 per household.

Table 4: Benefits in INR – 3 cases

Annual return is	0	No toilet, no savings
Annual return is	2875	Has toilet, but suffered diarrhoea thus saved the wage but lost on the diarrhoea savings
Savings	6498	The maximum benefit due to toilet availability and no diarrhoea or works hours lost

We term the no benefits as B_0, the minimum benefit as B_{min} and the maximum benefit as B_{max}.

Using the formula of benefit, too, we find three levels of returns, say, in the first year of construction and access to toilets. Where annual return is = Annual benefit/ Cost of a toilet and the cost of toilet is taken as *INR 20,000 on average*. This is an observation validated across various project of Trust of People over past few years.

Table 5: Annual returns & cases scenarios

Annual return	Freq.	Cases
0	349	No toilet, no savings
14%	9	Has toilet, but suffered diarrhoea thus saved the wage but lost on the diarrhoea savings
32%	466	The maximum benefit due to toilet availability and no diarrhoea or works hours lost

*Thus, using our hypothecated stylised model, we see that, construction of a toilet can lead to a **minimum of 14% return in the first year itself**.*

Here after we would move on towards studying the variables that might have affected the above rates of returns and benefits, *in terms of having or not having a toilet* using primary data elaborated as below.

Data and Objectives

The idea behind sample design and collection was to run a comparative study of the effects of availability and non-availability of household toilets. As elaborated in the earlier sections, the idea in this paper is to express the benefits of sanitation interventions on the population in tangible terms. The major objective of this paper is not to perform a state level relative evaluation of benefits from sanitation facility. Hence rather than relative comparison of states, we would look into the benefits from toilet availability among the sample population dispersed among three distinct Indian states with diverse geography, economy and socio-political

scenarios. This diverse data set provides the empirical approach, the viability against local biases.

Summarising the main objectives of this paper

1. To develop a stylised framework to estimate financial benefits from having a toilet for an individual
2. To compare the financial gains with various factors that act as enablers

The data has been collected for 3 states of India, namely, Maharashtra, Bihar and Odisha. The choice of states was prompted by the idea to collect samples that are as much as possible free from exogenous biases linked to the state specific factors. The three states are distinct in terms of states gross domestic product per capita; in Maharashtra it is INR 225,073[6], in Bihar INR 50,555 and Odisha with INR 127,383. Moreover, Maharashtra and Bihar are the 2nd and 3rd most populous states of India whereas Odisha is relatively less populated at rank 11. In terms of population density of persons per square kilometre, Odisha has 270, Bihar has the highest at 1100 and Maharashtra at 370. In terms of literacy, Maharashtra has a relatively high literacy over 80%, Odisha has a moderate rate of literacy around 70% and Bihar has low rate of literacy relatively, around 60%. Hence, we see that samples distributed between three states are distinct in terms of state level characteristics.

Data collection & methodology

We have considered primary household level data from the rural areas of three states, Bihar Odisha and Maharashtra for estimating the benefit and returns from toilet availability. The data is segregated into two clusters for the purpose of mirroring an impact evaluation however applying cross-sectional data. The clusters can be categorised as a control group and a treatment group. The control group are the households without toilet access in the sample data set and the households with toilet access are considered as the treatment group. The samples were purposively selected to fit the two clusters; the villages, GPs and blocks have been chosen based on the existing situation of toilet availability in the areas. Separate villages were selected to cover sample households from both clusters with high and low sanitation density. Villages with high sanitation densities have been a part of FINISH interventions in past. The purpose of the sample selection for the clusters was to isolate the effects of toilet on health and other aspects of the rural life.

In the table below we have the distribution of samples within the three states.

Table 6: State wise distribution of samples

State	Freq.	Percent
Bihar	155	18.77
Maharashtra	369	44.67
Odisha	302	36.56
Total	826	100

[6]https://www.moneylife.in/article/maharashtra-recovers-set-to-grow-by-121-percentage-in-fy22-economic-survey/66615.html

The samples are distributed in one district from each state, and within one block of each district. The table below shows the state district and blocks list.

Table 7: States, districts and blocks

State	Odisha	Bihar	Maharashtra
District	Khordha	Darbhanga	Nandurbar
Block	Chilika	Keoti	Nandurbar

The table below shows the distribution of access to sanitation facility or otherwise in the total sample. The use of toilet as storage facility is quite small in the sample thus, we would consider that as having no toilet.

Table 8: Distribution of toilets in sample

Is toilet available	**Freq.**	**Percent**
No	329	39.83
Used as storage	20	2.42
Yes	477	57.75
Total	826	100

The sampling design is based on the idea of mapping linkages between the toilet availability clusters and social/ behavioural attributes.

Observations

The table below looks into the effects of educational backgrounds of the samples. We find that among the maximum benefit and returns recipients, the majority is graduate (53%) and moreover only 6% are illiterate, that might imply that educational level *at least above 10th standard* has a positive influence on investing in sanitation. Of the no returns, we find that majority of the no benefit earners (64%+9%) 73% are illiterate or have studied only till 10th standard.

Table 9: Education and difference in benefits

Benefit/ Education	**B_0**	**B_{min}**	**B_{max}**
Illiterate	***9%***	***0%***	***6%***
Till 10th	***64%***	***44%***	***41%***
Graduate and above	***27%***	***56%***	***53%***

Calculating separately, we also find that of all the Graduate and above 71% earns maximum benefit. Signifying a possible positive effect of education as *nudge* to improve sanitation usage. The majority of the samples are either soak pit with junction chamber and septic tank

with soak pit. We find that even low cost toilet designs such as one pit with junction chamber, can also generate the benefits of both health and time saving.

Table 10: benefits and toilet types

Benefit/ Education	Bmin	Bmax
A pit with a junction chamber	*25%*	*39%*
A pit without a junction chamber	*13%*	*13%*
Any other	*0%*	*1%*
No soak pit	*13%*	*0%*
Septic tank with soak pit	*0%*	*22%*
Septic tank without soak pit	*0%*	*2%*
Toilet is connected with drainage system	*0%*	*0%*
Twin leach pit with junction chamber	*13%*	*9%*
Twin leach pit without junction chamber	*38%*	*13%*
Total	**100%**	**100%**

The table below depicts probable nudges that can positively influence the use of toilet. We find that among the toilet available samples, the reason to possess a toilet is largely due to comfort and convenience (47%) and followed by around 20% being convinced of the health benefits of a toilet. However, also a significant portion, around 15% is attracted to the idea of toilet based on the social cause like honour and safety of women; as a starting point that might help, however, the focus needs to move more towards gender neutral approaches to toilet intervention nudges to equally target men for using toilets. The responses based on the household's perception highlights the nudges that is found in the section enjoying maximum financial benefits from having a toilet. The details of the nudges are as below;

Table 11: Benefits perceived and received: nudges

Category	B_{max}
Cleanliness	5.54
Comfort / convenience	47.34
Consolation for disabled or elderly	2.85
Health benefits	20.09
Honour / benefits for women	14.78
No benefits expressed	4.77
Privacy	5.32
Social status	4.85

Calculating separately the data on usage of toilet, we find that among the maximum benefit receivers, B_{max}, overwhelmingly 91.96% household also reported that everyone in the house uses the toilet. Interestingly while looking into the gender aspect and asking women the benefits of having a toilet, among the maximum benefitted households, women responded that 'feeling unsafe' was the biggest important factor in wanting a toilet; the nudge confirmed above also.

In the later versions of this study, we would include correlation regression models to ascertain the possible direction and magnitude of the causalities.

Conclusion

This study tries to address the critical issue of access to adequate sanitation facilities in India and the associated economic benefits and health outcomes. It contributes to the existing body of knowledge by assessing the economic benefits households derive from toilet availability and usage in three different states.

By employing a comprehensive framework, the study estimates the returns on investments in sanitation infrastructure. The findings highlight the significant positive savings associated with owning a toilet, particularly in terms of reduced costs of diarrhoea treatment and saved productive time. These economic benefits demonstrate the potential impact of improved sanitation on household well-being and productivity. In the stylised model incorporated considering the aspects of health and productive time gain, we find that the returns from investing in *a toilet can lead to a* minimum of 14% return in the first year itself. While attributing these gains purely due to access of a toilet is difficult, the findings indicate a positive return on investment in a toilet, and that investments in sanitation programs can lead to economic gains.

The findings of this study contribute to the broader understanding of the economic benefits and health outcomes associated with owning a toilet. The evidence generated from this research can inform policy makers, investors, and stakeholders in the Water, Sanitation, and Hygiene (WASH) sector, enabling them to make informed decisions and prioritize investments in sanitation infrastructure. We also tried to identify some nudges and factors that influenced the access of households' toilets. We find that higher level of education acts as a catalyst to invest and thereby receive the benefits from sanitation intervention. Comfort & convenience, perceived health benefits and honour of women turn out to be the primary nudges expressed by respondents who enjoyed most of the benefits due to toilet availability. For women of the households availing a toilet, 'feeling unsafe' while OD was the biggest concern expressed.

The study underscores the challenges arising from the lack of robust evidence on the social and economic returns on investment in sanitation. The limited availability and quality of data hinder the accurate assessment of the comprehensive benefits derived from improved sanitation infrastructure. This poses challenges for policy makers and investors in understanding the potential impacts of sanitation investments and justifying resource allocation. To address these challenges, it is crucial to prioritize further data collection and research efforts. Robust evidence is needed to inform evidence-based decision-making, support policy formulation, and facilitate effective resource allocation in the sanitation sector.

While challenges persist, the study highlights the significance of prioritizing investments in sanitation to address disparities in toilet availability and usage. By recognizing the economic benefits and health advantages associated with improved sanitation, policy makers and investors can work towards achieving the Sustainable Development Goal (SDG) 6 of universal access to sanitation facilities by 2030. This study serves as a valuable resource for evidence-based decision-making, policy formulation, and resource allocation, ultimately contributing to improved public health and sustainable development in India and beyond.

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