# Project: Summarizing and Analyzing Research Papers

**Learner Name**: Aryan Namdev

**Learner Email**: namdevaryan044@gmail.com

**Topic**:

Toilet construction under the Swachh Bharat Mission and infant mortality in India.

**Research Paper**:

<https://www.nature.com/articles/s41598-024-71268-8?s=08#Abs1>

**Research Paper Download Link**:

<https://www.nature.com/articles/s41598-024-71268-8.pdf>

### Initial Prompt:

### [“summarize this research paper in about 100 words”]

**Description (50 words max):** [Describe your initial prompt]

My first prompt, “summarize this research paper in about 100 words,” was essentially an open-and-shut question. It is a directive prompt, giving ChatGPT a good base upon which to cut through everything else in this paper but the important elements. I also applied a constraint of 100 words on the output to fit it in the prescribed word limit.

**Generated Summary (100 words max)**: [Include the summary generated from the initial prompt]

The paper explores the effects of India’s Swachh Bharat Mission (SBM), a large-scale sanitation initiative, on reducing child mortality rates. Launched in 2014, SBM aimed to eliminate open defecation by constructing household toilets across the country. The researchers analyzed data from 640 districts over a decade to understand the program’s impact on infant and under-five mortality. Their findings reveal that regions with higher toilet access experienced significant improvements in child health, with noticeable declines in mortality rates. The study emphasizes that improved sanitation not only reduces exposure to fecal pathogens, which contribute to infections like diarrhea, but also improves overall health outcomes for children. The paper highlights the role of sanitation in public health, demonstrating that initiatives like SBM can have far-reaching impacts on child survival in developing countries. Moreover, the results show that scaling up sanitation programs can be an effective strategy in reducing preventable child deaths.

### Iteration 1:

### [“include some key figures or numbers in summary of this research paper in around 100 words”]

**Description (50 words max)**: [Describe your first iteration]

The prompt, **"Include some key figures or numbers in the summary in around 100 words"** is a iteration of the initial prompt given. The initial output lack numbers and figures so its first iteration seeks quantitative detail, enhancing specificity and focusing on data-driven insights within the research paper's summary.

**Generated Summary (100 words max)**: [Include the summary generated from the first iteration]

The research paper examines the impact of the Swachh Bharat Mission (SBM), a large-scale sanitation initiative launched in India in 2014, on reducing infant (IMR) and under-five mortality rates (U5MR). The study uses data from 640 districts across India from 2011 to 2020, applying a quasi-experimental design to analyze the association between toilet construction under SBM and child mortality. It finds that districts with over 30% toilet coverage experienced a reduction of 5.3 infant deaths and 6.8 under-five deaths per 1,000 live births. The paper estimates that SBM helped avert 60,000–70,000 infant deaths annually, with an inverse relationship between increased toilet access and child mortality. Placebo tests and robustness checks validate these findings. The study underscores the transformative role of improved sanitation in low- and middle-income countries, suggesting that large-scale public health initiatives like SBM can significantly improve population health outcomes, particularly by reducing deaths linked to poor sanitation.

### Iteration 2:

### [“summarize the research paper in 130 words including information about data collection and other metodologies used for this research”]

**Description (50 words max)**: [Describe your second iteration]

The second iterative prompt now narrows down to ask about the different methodologies, data collection, data sources and other important information regarding the research to include in the summary. The constraint is still applied otherwise the output may not have been in a desired format.

**Generated Summary (100 words max)**: [Include the summary generated from the second iteration]

The paper investigates the effect of the Swachh Bharat Mission (SBM) on child mortality in India using data from 640 districts between 2011 and 2020. Researchers employed a quasi-experimental design, analyzing infant (IMR) and under-five mortality rates (U5MR) in relation to toilet construction under SBM. They used district-level data from household surveys (DLHS, NFHS) and vital registration systems (VRS). SBM coverage data was sourced from the Ministry of Drinking Water and Sanitation. The study employed two-way fixed effects regression models, adjusting for socioeconomic, healthcare, and wealth-related factors. The findings show that districts with over 30% toilet coverage saw reductions of 5.3 infant and 6.8 under-five deaths per 1,000 live births, with an estimated 60,000–70,000 infant deaths averted annually, demonstrating the role of large-scale sanitation programs in improving public health.

### Final Prompt:

### [“Give a final summary about the research paper covering all the elements like objective, findings, applications, data and methodologies in around 100 words”]

**Description (50 words max)**: [Provide the final version of the prompt]

The final iteration of the prompt now narrows down to extract every possibly important information of the research paper. This includes the information that may not be a part of previous iterations like information about robustness, data sources, statistical methods, placebos, numbers and many more. Constraint of word limit and format is still there to ensure the desirable format of the output is delivered with all the other necessary requirements.

**Generated Summary (100 words max)**: [Include the best summary generated from the final prompt]

This research paper examines the impact of India’s Swachh Bharat Mission (SBM) on reducing child mortality, specifically infant mortality rates (IMR) and under-five mortality rates (U5MR). Launched in 2014, SBM aimed to improve sanitation by constructing over 100 million household toilets across the country. The study uses data from 640 districts spanning 2011 to 2020, collected through national household surveys (DLHS, NFHS) and vital registration systems (VRS). The primary methodology was a quasi-experimental design, utilizing two-way fixed effects regression models to analyze the relationship between toilet construction and child mortality, while controlling for socioeconomic and healthcare factors. The findings show that districts with over 30% toilet coverage under SBM experienced significant reductions in IMR (5.3 fewer deaths) and U5MR (6.8 fewer deaths) per 1,000 live births, potentially preventing 60,000–70,000 infant deaths annually. This highlights the critical role of large-scale sanitation initiatives in improving public health outcomes in developing nations. The study includes falsification and placebo tests to validate its findings, ensuring the observed effects were not due to chance or other confounding factors. Additionally, the researchers explored the interaction between SBM coverage and other public health interventions, such as vaccination rates, finding that SBM's impact was more pronounced in areas with lower healthcare access.

### Insights and Applications

**Key Insights (150 words max)**: [Describe the key insights extracted from the research paper]

The research offers valuable insights into the transformative impact of India’s Swachh Bharat Mission (SBM) on child health, particularly in reducing infant and under-five mortality. Launched in 2014, SBM aimed to combat open defecation by constructing over 100 million toilets nationwide, significantly improving sanitation access, especially in rural areas. The study establishes a strong inverse relationship between increased toilet coverage and reductions in infant mortality rates (IMR) and under-five mortality rates (U5MR). Districts with more than 30% toilet coverage saw significant decreases in mortality, with an estimated 60,000–70,000 infant deaths prevented annually. This underscores the vital role of improved sanitation in curbing diseases like diarrhea, often caused by exposure to fecal pathogens. The research methodology was rigorous, utilizing a quasi-experimental design with two-way fixed effects regression models. Data was drawn from multiple large-scale surveys, including the National Family Health Survey (NFHS) and District Level Household Survey (DLHS), ensuring comprehensive coverage. The study also incorporated placebo and falsification tests to validate its findings, highlighting that the impact was not driven by other confounding factors. Additionally, the research explored how SBM interacted with other public health interventions like vaccination coverage, noting the need for sustained behavioral change to ensure the long-term success. This study reinforces the importance of large-scale sanitation programs for public health improvement.

**Potential Applications (150 words max)**: [Suggest potential applications or implications of the research findings]

The findings of this research have wide-ranging potential applications in public health policy, particularly in low- and middle-income countries (LMICs). The demonstrated success of India’s Swachh Bharat Mission (SBM) in reducing infant and under-five mortality rates through large-scale sanitation improvements provides a compelling model for other nations grappling with high child mortality and poor sanitation. Policymakers in LMICs can use these insights to design and implement similar national sanitation programs, adapting SBM’s multi-pronged approach of toilet construction, public awareness campaigns, and community engagement. The research also highlights the importance of integrating sanitation programs with other public health interventions, such as vaccination and maternal healthcare, to maximize health outcomes. Furthermore, these findings can inform international organizations like the World Health Organization (WHO) and UNICEF in shaping global sanitation strategies under the Sustainable Development Goals (SDGs). At a local level, the study’s focus on the impact of sanitation access in rural and marginalized communities can guide targeted efforts to address inequities in health outcomes. Additionally, the robust methodology used in this research offers a framework for future studies evaluating the health impacts of large-scale public health interventions, ensuring that program effectiveness can be measured accurately across different regions and contexts

### Evaluation

**Clarity (50 words max)**: [Assess the clarity of the final summary and insights]

The final output summary gives a clear picture about what the research paper is all about. It gives clarity about almost all the important elements about the research including its objectives, findings, applications, data and methodologies. The summary highlights almost all the important facts and numbers considering the constraints imposed. There may be a few missing points that may not be as important but overall it gives the reader full clarity about what this research is all about, its objectives, its implications, its abstract. A point to be noted is that the research paper itself contains a section in the start itself with heading “Abstracts” that includes almost all the information that is show in final summary like number of potentially prevented deaths of infants, correlation between dip in IMR, U5MR and the construction of toilets under SBM. The key insights were also to the point but also look so generic and similar to summary. It could also have included the explanation about how toilet building is strongly co-related with decrease in infant mortality and U5MR. It is almost perfect but it would have been better if highlighting of second and third order effects of SBM were also included in the summary and the key insights.

**Accuracy (50 words max)**: [Assess the accuracy of the final summary and insights]

The accuracy of facts and numbers is very high and all the information included in the final summary and the key insights are true and correct with respect to the research paper. It highlights all the key and important information in an objective manner which is easy to understand and is written in simple language. The generative AI Chatbot (ChatGPT-4o) used exceled in this parameter of accuracy. It was very accurate highlighting the quasi-experimental methodology used and other statistical methods used. However the scope of numerical values and figures used in the summary and insights is limited due to the constraint of word limits, but it got all the general numbers and values that it includes right like potential prevention of 60,000-70,000 infants or decrease of 5.3 fewer IMR and 6.8 fewer U5MR linked to 30% increase in constructed toilets under SBM. Overall the parameter of accuracy is very high and highlights the reliability.

**Relevance (50 words max)**: [Assess the relevance of the insights and applications]

The insights and applications of the research paper about the toilet construction under SBM and Infant Mortality Rate effectively highlights the key findings of the research and the potential use cases and inspirations. They highlights the importance of basic amenity like proper sanitation infrastructure and its strong correlations with the health of the public. The insights emphasize on how the lack of basic sanitation facilities like toilet can lead to severe consequence in public health by causing harmful diseases like diarreha, cholera and many other harmful diseases caused by the fecal-oral disease causing bacteria. There are many applications of this research which are highlighted in potential applications section. This includes how the governments of LMICs (low- and middle- income countries) can draft and implement policy. The Swachh Bharat Mission (SBM) highlights the importance of basic hygiene on the health and well-being of the public especially from the LMICs. The potential applications could have also included the policy formulations in methodologies and process of its implementation. For example how the mobile-based applications were used for monitoring and tracking the on-ground progress of the policy and how new technologies like GPS based and photo based tracking of the progress can help to maintain the proper database and asses the results that we are getting. It also highlights how good policies can be drafted and implemented for the greater good to improve important socio-economic indicators like infant mortality rate. However, it would be better if it broadens the scope of hygiene by including more essential public infrastructure like sewage treatment and drinking water purification that may also lead to harmful diseases like hepatitis that can be fatal, but overall it is well balanced.

### Reflection

**(250 words max)**: [Write a brief reflection on your learning experience, challenges faced, and insights gained]

The overall learning experience was nice and good, and there were a lot of new things that I learned. The various masterclasses by experts organized for students were very helpful and helped us in exploring new things about the world of Generative AI, we learned many new things and the use-cases of AI to improve our productivity. The live-sessions and the LMS were really well-designed and perfectly organized that smoothened our learning experience. I learned many new things about AI, Machine Learning, how AI works, how AI models are trained and the potential risks and concerns that may arise during widespread adoption of AI. I also learned about new Terminologies like Generative Adversarial Networks (GANs), Varaitional Autoencoders (VAEs), Discriminative AI models, and many more that widen my knowledge about AI in general. I am very thankful to Skillible for this.

I have faced quite a few challenges while completing my tasks and projects, apart from my tight schedule, managing both regular college examinations and this course work was hard. I also faced many challenges while doing my final project work of summarizing a research paper using AI tools, rather I would say I faced dilemma that which domain to select. I first started working on a research by Université PSL, France about Nuclear Energy as the primary alternative non-conventional energy source for climate change but then stumbled upon this “Not So Glamorous Looking” research via a news article from ‘The Print’. The article showed how a very non-polarizing, non-controversial policy can have such a great impact. So I worked on this new research paper recently published by International Food Policy Research Institute, Washington, DC, USA about Toilet construction under the Swachh Bharat Mission and infant mortality in India.

While I was working on by final submission, I gained a lot of Insights not only about AI, prompting and importance of good sanitation but also about how good policy making can have a wonderful effect on public health. The research paper also helped me to understand the importance of such “Non-Glamorous” steps of toilet building and have such a positive impact on important socio-economic indicators like infant mortality rate, especially for a lower-middle-income developing economy like India. I also learned that we as a country also needs more of such steps to empower the lower starta of our society.

And at last I would like to thank Skillible for all of this. Just because of them, I was able to learn these wide range of things in a short duration of time.