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Impact of Per Capita Health Expenditure on Child Health Outcomes in Nepal

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Abstract

This paper explores the relationship between child health outcomes and per capita health investment in Nepal, using key indicators such as child mortality rate, stunting, skilled birth attendance, and appropriate treatment for acute respiratory infections. The study utilizes the data primarily from the World Bank and the Ministry of Finance in Nepal. The study adopts quantitative analysis techniques, including correlation and regression analysis, to assess the impact of health investment on child health outcomes. The results show that increased per capita health expenditure is positively correlated with improved child health outcomes which shows linear growth in different variables if compared with the per capita investment done in health. There is a negative correlation between per capita health expenditure and child mortality under 5 years of age and this is evidenced that increased per capita health expenditure reduces the child mortality among under 5 years of children. Thus, the study aims to highlight the importance of allocating resources in policy reforms, capacity building and allocating resources in the health sector. The study also incorporates relevant resources from scholarly articles and academic literature to provide a comprehensive understanding of the topic and support the analysis regarding the relationship between per capita health investment and child health outcomes.

Keywords: Child health, per capita health expenditure, outcomes, Nepal

Introduction

Child health is one of the human development priorities in developing countries. Usually, child health priority discussion is initiated with the incidents of child mortality. The adoption of the Millennium Development Goals (MDGs) by member countries of the United Nations (UN) signifies

the international acknowledgment and commitment to addressing child mortality as the biggest priority for human development. Within the MDGs framework, one specific goal was dedicated to reducing child mortality. This specific goal reflected the collective recognition by the global community that high child mortality rates hinder social progres, and economic development, and pose challenges in achieving sustainable development. By explicitly including child mortality reduction as a target, the MDGs aimed to mobilize resources, expertise, and policy efforts toward improving child health outcomes worldwide. Goal 4 of the Millennium Development Goals (MDGs) specifically aimed to achieve a reduction of child mortality by more than 60% between 1990 and 2015 (United Nations, 2000).

Similarly, the Sustainable Development Goals (SDGs), which succeeded the MDGs and launched in 2015, also emphasize the importance of reducing child mortality under Goal 3: Ensure healthy lives and promote well-being for all at all ages. SDGs enforcement on the child is very relevant because if a government gives priority to the health of children; it is likely to contribute to the future economic growth of the country. When children are healthy, they have a higher chance of achieving better educational outcomes and exhibiting higher labor productivity as adults (Belli et al., 2005).

There are several key indicators prioritized and measured under the child health condition of a nation. Malnutrition among children is one of the causes of child mortality. There are key measures for malnutrition; stunting (height for age) among under-five children, underweight (weight for age) and wasting (weight for height). Other indicators like Skill Birth Attendant (SBA) and appropriate treatment from Acute Respiratory Infection (ARI) can be taken as the key measures for child health outcomes. The paper explores the key indicators for child health outcomes comparing it with the per capita health investment in Nepal deriving the major source of data from the World Bank and Ministry of Finance (MoF) in Nepal. According to World Bank (2020) data, among South Asia countries, Pakistan has the highest child mortality rate of 6.52%. It has also been observed that the

country has the second lowest investment in the health sector after Bangladesh. The highest investment is made by Japan which also shows the lowest, 0.25% child mortality rate.

Methods and Materials

The objective of this research paper is to explore the key indicators for child health outcomes and examine their relationship with per capita health investment in Nepal. The study aims to analyze the major sources of data obtained from the World Bank and the Ministry of Finance (MoF) in Nepal to assess the impact of health investment on child health outcomes.

The methodology of the paper involves utilizing data from the World Bank and the Ministry of Finance in Nepal as the major sources of information. These sources will provide relevant data on per capita health investment and key indicators for child health outcomes in Nepal. The study employs quantitative analysis techniques which include a correlation analysis on per capita health investment and indicators such as child mortality rate, stunting, skilled birth attendance, and appropriate treatment for acute respiratory infection. Furthermore, the study will incorporate relevant references from scholarly articles and academic literature to provide a comprehensive understanding of the topic and support the analysis.

Result and Discussion

Research increasingly suggests that higher healthcare spending positively impacts health outcomes worldwide. Anyanwu and Erhijakpor (2007) found that between 1999 and 2004, in 47 African countries, every 1% increase in healthcare expenditure per person led to a 2.1% decrease in under-five mortality and a 2.2% decrease in infant mortality. A study by Rahman et al. (2018) from the SAARC-ASEAN region shows that healthcare spending, including both public and private sectors, significantly reduced infant mortality rates, with private health expenditure having a greater impact compared to public health expenditure. Moreover, private health expenditure played a significant role in diminishing the crude death

rate. Concurrently, the advancement of per capita income and the enhancement of sanitation facilities emerged as crucial contributors to the amelioration of population health within the region.

Child Mortality Rate

The under-five mortality rate refers to the probability a newborn would die before reaching exactly 5 years of age, expressed per 1,000 live births. Child mortality rates have decreased worldwide since World War II, but the extent of improvement varies from country to country. Significant improvements were observed in the global north, where the child mortality rates were already low, and have been reduced by five to eight times. In contrast, Portugal, a Southern European country, has seen a significant decline in child mortality, with rates now being about one-twenty-fifth of what they were in the 1950s (Monnier, 2001).

The 2000s marked a significant turning point in the efforts to reduce child mortality rates worldwide. During this decade, there was a notable acceleration in the progress made compared to the previous years. The global under-five mortality rate, which measures the number of deaths among children under the age of five per 1,000 live births, experienced a substantial increase in the annual rate of reduction, reaching 4.0% between 2000 and 2009. This positive trend indicated significant advancements in healthcare, access to essential services, and improved child survival strategies implemented during that period. However, in the subsequent period of 2010 to 2021, the annual rate of reduction in the global under-five mortality rate decreased slightly to 2.7%. While progress was still being made, the slower rate of reduction compared to the previous decade indicated potential challenges and the need for continued efforts to further reduce child mortality rates globally.

In the case of Nepal, the under-five mortality rate in 2021 was recorded at 27.2 per 1,000 live births (UNICEF, 2023). This figure represents the number of children under the age of five who die per 1,000 live births in the country. It is crucial to note that Nepal's government has set a target to

reduce the under-five mortality rate to 25 per 1,000 live births by 2030, aligning with the Sustainable Development Goals (SDG). The SDGs are a set of global goals adopted by the United Nations to address various global challenges, including improving child health and well-being. Achieving the target of reducing the under-five mortality rate to 25 per 1,000 live births by 2030 requires sustained efforts from the government, healthcare providers, and other stakeholders. This includes implementing effective healthcare policies and also increasing the per capita health expenditures.

Stunting among Children Under 5 Years of Age (Height for age)

The growth and development of a child during the first five years of life are closely linked to their nutritional status. Adequate nutrition plays a vital role in promoting optimal linear growth, cognitive development, and the prevention of chronic diseases later in life (Black et al. 2008). Stunting is a term used to describe a condition where a child is significantly shorter in height compared to what is expected for their age. It indicates a failure in both physical and cognitive growth and development. Stunting occurs as a consequence of chronic or recurrent malnutrition, where a child does not receive adequate nutrition over a prolonged period of time. The lack of essential nutrients and energy needed for proper growth and development leads to impaired physical and cognitive growth, resulting in the child being shorter than their peers. Stunting can have long-term consequences on the child's health, well-being, and overall development, including increased susceptibility to infections, delayed cognitive development, and increased risk of chronic diseases later in life.

Addressing the underlying causes of malnutrition and providing proper nutrition during the critical period of early childhood is crucial for preventing and reducing stunting and promoting optimal growth and development in children. Stunting is one of the measures for child malnutrition and contributes to the overall child's health. In Nepal, one in three children under five years of age (32%) are stunted. While children who come from poor households or whose mother/caretaker had no education are significantly more likely to be stunted (44% and 39%

respectively) than are children from wealthier or more educated households, 18% of children (nearly one in five) who come from rich households or who have a mother/caretaker with a higher education are stunted. These data indicate the pervasiveness of stunting in Nepal (MICS, 2019). Efforts aimed at preventing stunting are expected to yield benefits across various outcomes, such as cognitive development, academic performance, and adult earnings (Dewey, & Begum, 2011).

Skill Birth Attendants (SBA)

In Nepal, Skilled Birth Attendants (SBA), including doctors, nurses, and midwives, have been playing a crucial role in delivering skilled birth care and antenatal care since 2003. Over the course of nearly two decades, more than 7,000 trained SBAs have been actively working across the country, providing their valuable services to a population of approximately 30 million people. These skilled healthcare professionals, with their specialized training and expertise in maternal and newborn care, have been instrumental in ensuring safer and more effective childbirth experiences for women in Nepal. They are equipped to handle various aspects of pregnancy, labor, and delivery, offering essential medical interventions, monitoring, and support during the childbirth process. It helps reduce maternal mortality and improves neonatal care. Following the implementation of a federal government system, local governments now have the authority to oversee and enhance the quality of services delivered within their municipalities.

In Nepal, significant progress has been made in improving access to reproductive healthcare for women. However, moving forward, it is crucial to prioritize the provision of quality care by ensuring that service providers receive adequate training, their skills are regularly assessed, and necessary reinforcement is provided. While it is essential to allocate substantial funds and workforce from the government to address healthcare needs, it is equally important to focus on quality control measures and prioritize patient satisfaction. For the Fiscal year 2019–2020, the healthcare sector in Nepal received a designated allocation of 2% of the country's GDP. Within

this allocation, 5.4% was specifically designated for reproductive health and safe motherhood initiatives. Notably, a significant portion of 3.8% was dedicated to training and workshops, with a particular emphasis on the SBA training program. Generous funding was provided to support and enhance the skills of skilled birth attendants through these training programs (MoHP and UKaid/NHSSP, 2020).

Appropriate Treatment of Acute Respiratory Infection (ARI)

Children under five years of age are most vulnerable to various common but treatable diseases. Acute Respiratory Infection (ARI) which includes both upper respiratory tract infections (URTI) and lower respiratory tract infections (LRTI), accounts for up to 50% of hospital visits in children. URTI such as common cold, pharyngitis, tonsillitis, and otitis media also peak in this age. Pneumonia is the leading cause of mortality and morbidity in under-five children globally but its prevalence varies across the globe (Bhurtel et al., 2022).

There are several causes for ARI, among a few others anemia was found to be a significant risk factor for LRTI (Shakya, Singh, Lakhey, 2018). Respiratory infections constitute approximately 6% of the global disease burden, as reported by the World Health Organization (WHO). Every year, approximately 6.6 million children under the age of five die worldwide, with 95% of these deaths occurring in low-income countries. Acute respiratory infections (ARI) are responsible for one-third of these deaths. Bangladesh, India, Indonesia, and Nepal collectively account for 40% of global ARI-related mortality. Among children under the age of five. These statistics highlight the significant impact of ARI on child health and the healthcare system in low-income countries (Ghimire et.al, 2022).

According to the World Bank data, in 2017, the treatment rate for Acute Respiratory Infections (ARI) among children under the age of five in Nepal was 84.90%. This indicates that a significant majority of children with ARI sought medical assistance, which is a positive trend in terms of seeking appropriate care for respiratory infections. However, it is important to note

that despite the relatively high treatment rate, there is still a concerning proportion of children who do not receive the necessary treatment. More than 15% of children with ARI in Nepal do not receive appropriate treatment, which means that they are not accessing the healthcare system or receiving the required medical attention for their condition. The lack of appropriate treatment for a substantial portion of children with ARI raises concerns about the potential severity of their symptoms and the potential complications they may face.

Without timely and proper medical intervention, the symptoms of ARI can worsen, leading to more severe illness and potentially adverse outcomes. The historical data presented in the analysis below shows the significant progress made in ARI treatment rates over the past 21 years in Nepal. In 1996, the treatment rate was recorded at its lowest value of 18.00%, indicating a significant gap in access to healthcare for children with ARI during that time. However, the subsequent increase in the treatment rate to 84.90% in 2017 shows positive improvement in addressing the healthcare needs of children with ARI. While comparing the data in South Asia, Bangladesh has less than half of children with ARI taken to the hospital. This shows a comparatively better status for Nepal. Increased per capita health expenditure must have a positive contribution towards the increase in the percentage of children receiving the appropriate treatment, there is a need for continued efforts to improve access to healthcare and ensure that all children with ARI receive appropriate treatment, as untreated ARI can lead to worsening symptoms and potentially severe outcomes.

Statistical Inferences

It has been observed that when governments allocated a higher portion of their public expenditure towards the health sector in the Pacific Island Countries, it resulted in improved health outcomes. Specifically, indicators such as the infant mortality rate, under-five mortality rate, and crude death rate showed positive changes. This finding suggests that increased investments in the healthcare sector can contribute to better health outcomes for the population in these countries (Gani, 2008). However,

Filmer and Pritchett (1997), utilizing World Bank data discovered that variations in public health expenditure could only account for 0.15% of the disparities in health status among nations, specifically measured by Under 5 Mortality. Mortality was predominantly influenced by factors beyond variations in public health expenditure (Zakir, & Wunnava, 1999). These determinants encompass healthcare expenditure, poverty levels, income inequality, female education, and a spectrum of other socio-economic factors. Additionally, Musgrove (1996) and Kim and Moody (1992) argued that health spending exhibited a weak influence on the health of infants and children, which contrasts with other research findings.

Correlation between Per Capita Income and Child Health Outcomes

The data analysis is done by determining the correlation coefficient between the two variables. The study conducts the Pearson correlation coefficient approach to determine the linear relationship between the variables. The formula for calculating the correlation coefficient, denoted here as *"r"* between two variables X and Y can be calculated using the following formula:

$$r = (\Sigma [(X - \bar{X}) (Y - \bar{Y})]) / \sqrt{[(\Sigma(X - \bar{X})^2)(\Sigma(Y - \bar{Y})^2)]}$$

Where:

Σ represents the sum of a series of values.

X and Y are the individual data points of the two variables.

$\bar{X}$ and $\bar{Y}$ are the mean (average) values of X and Y, respectively.

The resulting correlation coefficient, "r," comes in the range from -1 to +1, where:

r = +1 indicates a perfect positive correlation (variables move in the same direction).

r = -1 indicates a perfect negative correlation (variables move in opposite directions).

r = 0 indicates that there is no correlation (no linear relationship between the variables).

By determining the correlation coefficient, the strength, direction and degree of linearity relationship between two variables are measured. The absolute value of the coefficient indicates the strength of the relationship between the variables. The closer the coefficient is to +1 or -1, the stronger the relationship. A value of 0 indicates no linear relationship. Similarly, the coefficient indicates the direction of the relationship. The positive (+) coefficient indicates a positive or direct relationship, meaning that as one variable increases, the other variable tends to increase as well. A negative (-) coefficient indicates a negative or inverse relationship, meaning that as one variable increases, the other variable tends to decrease.

Likewise, A higher absolute value of the coefficient indicates a higher level of predictability. If the correlation is strong, knowing the value of one variable helps predict the value of the other variable with greater accuracy, however, if a strong correlation exists between the variables, it does not necessarily mean that one variable causes the other to change. For this research analysis, various calculations have been taken into account, with the variables being considered as follows:

1. Per capita health expenditure from the government
2. Mortality rate of children under 5 years
3. Skilled Birth Attendance
4. Acute Respiratory Infection (ARI) treatment for under 5 years of children
5. Prevalence of stunting (Height for age) under 5 years of children

The data from the year 2000 to 2019 is collected as shown in Table 1 for analysis and determining the correlation coefficient is considered.

Table 1: Collection of data from the year 2000 to 2019

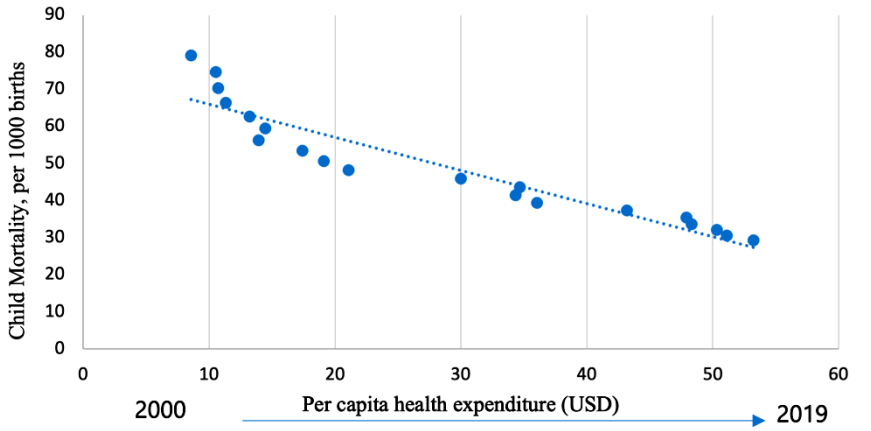
Year	Per Capita expenditure in Health (US $)	Mortality Rate of Children under 5 years (per 1000 live births)	Births attended by skilled health staff (% of total)	ARI treatment (% of children under 5 taken to a healthcare provider)	Prevalence of stunting, height for age (% of children under 5)
2000	8.5535	79.1	11.9	18	58
2001	10.5214	74.6	10.9	26	56.1
2002	10.7195	70.3	10.9	26	56.1
2003	11.3372	66.4	10.9	26	56.1
2004	13.2284	62.7	15.8	26	56.1
2005	14.4574	59.4	15.8	26	56.1
2006	13.9422	56.3	18.7	43	49.1
2007	17.4027	53.4	18.7	43	49.1
2008	19.0926	50.7	18.7	43	49.1
2009	21.0909	48.2	18.7	43	49.1
2010	29.9828	45.9	18.7	43	49.1
2011	34.6823	43.6	36	50	40.1
2012	34.3301	41.5	36	50	40.1
2013	36.0222	39.4	36	50	40.1
2014	43.1695	37.4	55.6	50.1	37.1
2015	47.8875	35.5	55.6	50.1	37.1
2016	48.3194	33.7	NA	84.9	36.1
2017	50.3108	32.1	NA	84.9	36.1
2018	51.1363	30.6	NA	NA	36.1
2019	53.2464	29.3	NA	NA	31.5

Source: World Bank and Ministry of Finance, 2000 to 2019

Under five Mortality Rate and Per Capita Health Expenditure

The mortality rate of children under 5 years (per 1000 live births) vs Per capita health expenditure in USD from the government is shown in Figure 1. This result shows that, as the government has increased the health care spending towards the population, the child mortality rate of children under the age of 5 has also decreased. It is evident that with the increase of health care investment of USD 8.55 USD in 2000 to 53.24 USD in 2019, the child mortality rate has decreased from 79.1 deaths per 1000 births to 29.3 deaths per 1000 births. With increased investment giving better healthcare facilities toward the wellbeing of the population, the child mortality rate tends to decrease.

Figure 1: U5 Mortality rate vs Per capita health expenditure, 2000-2019



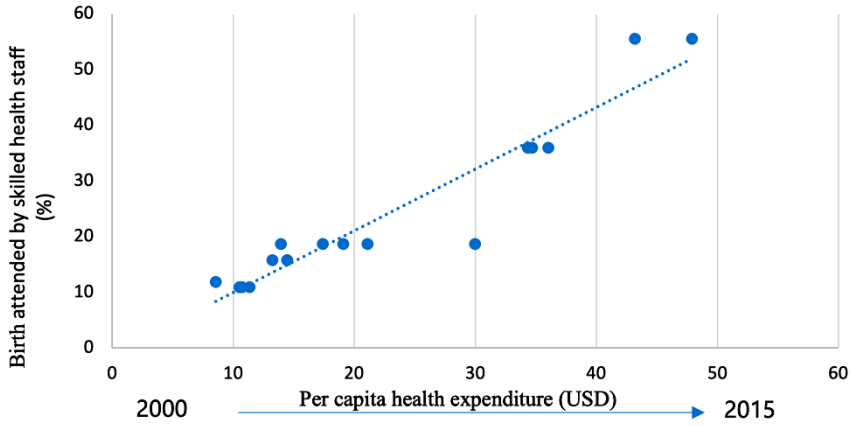
Source: World Bank and Ministry of Finance, 2000 to 2019

Note. *Per capita health expenditure in USD from the government is considered as X and Mortality rate of children under 5 years (per 1000 live births) is considered as Y. The correlation coefficient, r is determined to be -0.9427, which indicates that there is a negative correlation between health expenditure per capita and the mortality rate of children under 5 years and has a downward slope as seen in the graph.*

Per capita health expenditure and Births attended by skilled health staff

Per capita health expenditure in USD from the government is considered as X and Births attended by skilled health staff is considered as Y. The correlation coefficient, r is determined to be +0.9498, which indicates that there is a positive correlation between healthcare spending and the Births attended by skilled health staff. This denotes that the higher the per capita health investment, the higher the percentage of births attended by skilled human resources.

Figure 2: Birth attended by skilled health staff vs per capita expenditure, 2000-2015



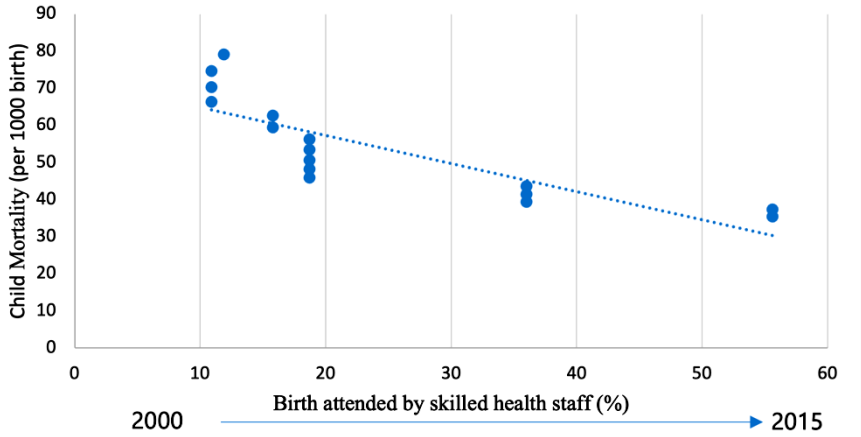
Source: World Bank and Ministry of Finance, 2000 to 2019

This result shows that, as the government has increased the health expenditure towards its people, the availability of a greater number of skilled health staff during birth has also increased. With the increased investment of USD 8.55 USD in 2000 to 53.24 USD in 2019, the birth taking place through the safe hands of skilled health staff also rose from 11.9% of total births to 55.6% of total births. This has ensured more safe birth resulting in the lower mortality rate of infants and maternal mortality.

Births attended by skilled health staff and mortality rate of children under 5 years

Births attended by skilled health staff are considered as X and the Mortality rate of children under 5 years is considered as Y. The correlation coefficient, r is determined to be -0.82989, which indicates that there is a negative correlation between Births attended by skilled health staff and mortality rate of children under 5 years.

Figure 3: Child Mortality vs Birth attended by skilled health staff, 2000-2015



Source: World Bank, 2000-2019

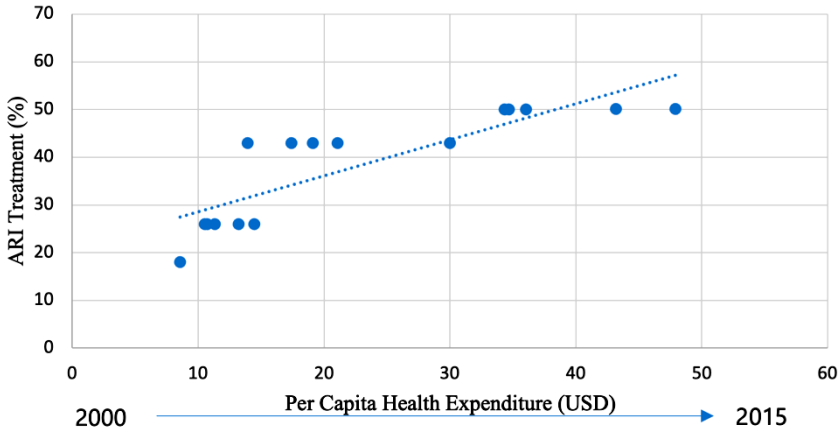
This result shows that, with the increase in the number of skilled health staff during birth, the mortality rate of children especially infants leads to have decrease.

Per capita health expenditure and ARI treatment

Per capita health expenditure is considered as X and ARI treatment for children is considered as Y. The correlation coefficient, r is determined to be +0.8434, which indicates that there is a positive correlation between per capita health spending and ARI treatment. The result shows that, as the

investment in health care from the government has been increased from the year 2000-2019, the treatment for Acute Respiratory Infection (ARI), which is the most common among children under 5, has significantly increased from 18 % to 50.1%. It may be due to increased health facilities, easy access to health centers and more skilled health workers providing quality health services.

Figure 4: ARI Treatment vs Per Capita Health Expenditure, 2000-2015



Source: World Bank, 2009-2019

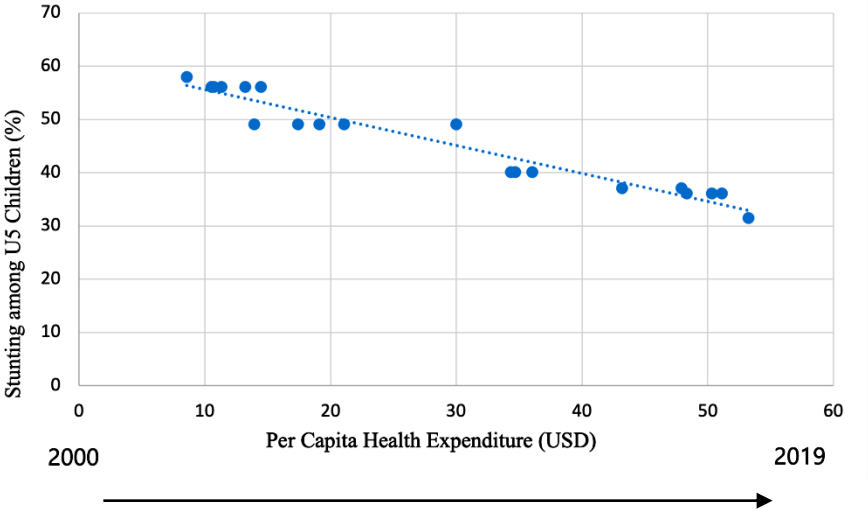
Per capita health expenditure and Prevalence of stunting among (under five)

Per capita health expenditure is considered as X and prevalence of stunting, and height for age (% of children under 5) is considered as Y. The correlation coefficient, r is determined to be -0.9674, which indicates that there is a negative correlation between Health Care spending per capita and prevalence of stunting, height for age (% of children under 5).

The result shows(Figure 5) that, as the investment in health care has increased, the stunting factor, i.e., a child's proper height at a certain age, for children below 5 years has also decreased, meaning the children's

height is increasing as per their age. The stunting among children under 5 has significantly decreased from 58% in 2000 to 31.5% in 2019.

Figure 5: Stunning vs Per Capita Health Expendture, 2000-2019



Source: World Bank, 2000-2019

Conclusions

From the analysis and results, it is evident that increasing government healthcare spending is associated with a decrease in child mortality rates. This underscores the significant positive impact of investing in healthcare on child health outcomes. Across all variables, increased spending consistently led to improved child health outcomes. The analysis also showed that healthcare spending on the population is associated with an increased likelihood of births being conducted by trained healthcare professionals. This is an important factor in ensuring safe deliveries and reducing maternal and infant mortality. Since the lack of treatment for a substantial portion of children with ARI raises concerns about the potential severity of their symptoms and the potential complications they may face, it is important to ensure that children receive appropriate treatment for

ARI, again increasing per capita health expenditure has positive correlation and therefore it is necessary to consider the aspect. The data analysis also suggests that higher healthcare spending is associated with a lower prevalence of stunting, which is an indicator of chronic malnutrition. This highlights the potential of healthcare investments in addressing nutrition-related challenges and promoting child growth and development.

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