

PREVALENCE OF MALNUTRITION IN CHILDREN: ECONOMIC PERSPECTIVE AND POLICY ANALYSIS

Muhammad Abdullah Asrar Mirza and Amena Urooj¹

Abstract

Prevalence of malnutrition in children (under 05) is not just a public health issue but also has long-term economic implications that have been emphasized in the study. The adverse impact of child malnutrition on the GDP of the country has been estimated alongside projecting losses due to economic inconsistency because of loss in the future workforce. The “Consequence Model” has been used to obtain the empirical results for effective and data-driven policy recommendations. Further, online interviews with relevant stakeholders were conducted for detailed policy analysis and better outcomes. The total economic losses to GDP are estimated to be 0.0125%, while the annual losses to the economy due to loss in the future workforce is resulted in \$1.82 Billion/year. Based on the policy analysis, the study concludes that preventive health measures such as growth monitoring, immunization, maternal health, and education can play a vital role in controlling the rates of prevalence and will have a high impact at a low cost. However, challenges, like ‘institutional environment’ and ‘costing’, require to be organized for existing programs and policies first before the implementation of newer strategies, procedures, and policies.

Keywords: Malnutrition, Consequence model, economic inconsistency, preventive measures, costing, implementation

JEL classification: H5, H75, I15, I18, P46

1. Introduction

Child malnutrition refers to stunting, wasting, and being overweight that restrict the growth cycle physically and mentally as compared to children with a normal growth cycle. This abnormality impacts their lives and makes them prone to serious challenges like poverty and the adoption of non-communicable diseases. Malnutrition is caused by one or a combination of factors. The immediate determinants of child nutritional status are poor dietary intake (i.e., energy, protein, and micronutrients) and disease; these factors are interdependent. For instance, a child with inadequate dietary intake is more susceptible to disease, which in turn depresses appetite, inhibits the absorption of food nutrients, and competes for a child’s energy (Adeyemi, Ijaiya, Ijaiya, & Ijaiya, 2009).

¹ Authors are respectively M.Phil graduate and Assistant professor at Pakistan Institute of Development Economics, Islamabad. (Email of corresponding author: amna@pide.org.pk)

Dietary intake must be adequate in both quantity and quality, and nutrients must be appropriately consumed in the right combinations for adequate absorption. The immediate determinants of child malnutrition are influenced by three underlying determinants, which are food security, adequate care for mothers and children, and a proper health environment, including access to health services (Engle, Menon, & Haddad, 1999). Finally, the underlying determinants are influenced by the basic determinants: the potential resources available to a country or community, and a host of political, cultural, and social factors that affect their utilization (Ijarotimi, 2013). This study focuses on the economic perspective of malnutrition in children instead of debating on its nutritional side, which has already been carried out in several prior studies, however, very limited studies linked child malnutrition with economic aspect.

Child malnutrition is not just a public health problem, but it is also a threat leading to poverty trap, reduced productivity, and economic growth. The statistics show that in 2020, 149 million children appeared stunted, 45 million marked wasted and 38.9 million were overweight. The global trend shows that about 45% of children (less than 05 years) deaths are associated with undernutrition, out of that a large portion comprises low and middle-income countries (WHO, 2021). The main cause of stunting in children is inadequate dietary intake during early childhood which makes them incapable of utilizing their full potential due to compromised cognitive development consequentially because of learning difficulties at school. While wasting in children exists as a consequence of disease or poor nutrient intake weakening the immunity causing long-term age-related developmental delays and often leading to death in case of severe wasting. Furthermore, overweight-related malnutrition in children exposes them to non-communicable diseases or obesity, it is preventable but globally the estimates are not much progressed (UNICEF, 2021).

All these forms of malnutrition impose a direct and indirect cost on households and at the national level, which is a vigorous obstruction towards the fulfillment of SDGs, 2030. According to an estimate, the burden of malnutrition overall (including child malnutrition) on the global economy could be approximately US \$3.5 trillion per annum and US \$500 per individual (Adesina, 2016). These massive costs limit economic growth in one or many ways, i.e., early childhood mortality and morbidity associated with non-communicable and diet-related diseases or loss in human capital investments. The estimates reflect that there is a need to invest in child malnutrition to advance food

systems or dietary and nutritional evolvement, by implementing cost-effective measures. Region-wise examination of malnutrition indicates that all three forms of malnutrition are highly prevalent, especially in Asia and Africa. Stunting has observed a declining trend in all regions except Africa (61.4 million), while wasting shares the highest prevalence rate in Southern Asia (31.9 million) as compared to any other sub-region. Moreover, all the regions observed a steadily rising trend for overweight, however, Northern Africa (3.8 million) and South-eastern Asia (4.2 million) witnessed a substantial increase in overweight overtime since 2000 (UNICEF, 2021). Asia faces a 'triple burden' of malnutrition, a condition in which children either bear micronutrient deficiencies, or hunger and deal with obesity or overweight (APIYCNA, 2020). Out of 155 million children categorized as stunted, 62 million belong to South Asia. India and Bangladesh have observed a drop of 1 percent in stunting; however, Sri Lanka and Pakistan didn't experience a decline due to the unaffordability of people to buy nutritious food and lack of knowledge about smart dietary choices (RAJU, 2018). According to a UN report, pre-COVID-19 about 1.9 billion people in Asia and the Pacific were incapable and had no access to a healthy diet that is still prevalent due to economic downfall harming households (SEARO, 2021).

Moreover, Pakistan has been reported to have one of the highest levels of prevalence of child malnutrition compared to other developing countries (Di Cesare et al., 2015). According to the (UNICEF, 2018) among malnourished children under 05, 40.2% were stunted, 17.7% wasted and 28.9% reported being underweight. It has been found that malnutrition starts at an early age and remains persistent at later stages. According to a UNICEF report, due to pandemic outbreak, the nutritional services experienced a 30 percent reduction during the early days of lockdown and Pakistan also missed the campaign for supplementation of vitamin-A due in April 2020 affecting the 36 million children. An immediate cost of \$2.4 billion was projected to protect the nutritional status among maternal and child health, specifically in most exposed countries (UNICEF, 2020). Most of the researchers employed the anthropometric technique i.e., wasting (weight-for-height), stunting (height-for-age), and underweight (weight-for-age) by the NCHS/WHO for the assessment of child nutritional status (Asim & Nawaz, 2018). The present study emphasizes on the economic consequences of child malnutrition later reflecting on the policy analysis in framework of Pakistan. The main argument in this study is that child malnutrition is not just a public health problem but is an economic

challenge as well that has been explored as an objective one. To address this challenge “consequence model” is used to estimate economic burden of child malnutrition on GDP because to signify the importance; it is necessary to first diminish the current prevalence rates. Consequently, the second objective of the study is concerned with policy analysis in which PMNS is critically reviewed before suggesting need-based interventions.

The layout of the study is as follows. Section 2 presents a review of previous literature on the issue. Section 3 discusses the data description, variable construction, and methodology. Section 4 presents the empirical model and estimation results. In section 5 we will provide policy implication analysis and lastly, section six concludes the study.

2. Review of Literature

In the context of Pakistan, the main determinants of malnutrition in children are their nutritional status, illness, nutritional status of their mothers, and environmental and community factors then poverty (Arif et al., 2012). Considering the nature of determinates and trends of child malnutrition in Pakistan, the government had developed a policy framework named “Pakistan Multi-Nutritional Strategy (PMNS) 2018-2025 to deal with this emerging public health issue. The PMNS (2018-2025) aims to “Significantly and sustainably reduce the burden of malnutrition in the country with focus on most marginalized and disadvantage segments of the populations”.

The nutritional status and associated risk factors in children less than 05 years, with focus on the coexistence of malnutrition (over and under) in comparatively poor areas of China was investigated by Zhang et al., (2018). The study relied on primary data and to obtain the prevalence of malnutrition (stunted, overweight, wasted, overweight) 6570 children were sampled from 26 counties (poor areas of China). To obtain estimates for overweight two indicators were used; weight for height Z score (WHZ) and BMI for age Z score (BAZ) and later results were compared. The results revealed that the total prevalence of malnutrition was 19.2% while the estimates of stunting and overweight were 8.4% and 8.8% respectively. It also showed that children older than 12 months of age were stunted and significantly associated with primary education level (caregiver) in “multilevel regression models” while children younger than 24 months were significantly associated with overweight. Therefore, the study concluded that caregivers should be guided (with children at high risk or more prone to malnutrition) for improved and healthy

feeding practices.

The determinants of severe acute malnutrition among children less than 5 years of age is examined by Sand et al., (2018). The study was hospital-based (initiated in a hospital located at Tharparkar-Sindh, Punjab) and developed a survey therefore semi-structured questionnaire was developed to interview mothers of children admitted to the hospital, the sample size of children was 105 for which WHO guidelines for height and weight measurements were implemented to obtain and record the data. The results revealed that 48% of children admitted to hospitals were classified with severe acute malnutrition among that 55% were males and 45% were females. The study also exposed the factors contributing to child malnutrition, income, size of the family, infections frequency, breastfeeding practices, and immunization status. Therefore, the study suggested improvements and betterment in the said factors; it also emphasized the sector-wise monitoring of these factors to address the issue of malnutrition.

Asim and Nawaz (2018) evaluated a detailed qualitative study exploring the literature to examine the status of child nutrition in Pakistan. The secondary objective of the study was to review the methodological framework used in published studies to identify the gap and undressed areas in this subject matter. The authors employed various databases and search engines to gather relevant information and mainly cited articles published between 2000-2016. This narrative review eventually selected 28 articles to reflect and examine methodologies, the researchers found it evident that all studies used almost homogenous methodologies; a large segment piloted “cross-sectional quantitative and descriptive studies” implemented thorough structured interviews, and only one study used a mix-method approach. The malnutrition in children was assessed following WHO standards or protocols. The authors stressed that there is a dire need of understanding the qualitative and mixed methodologies for further in-depth analysis to have a better solution to diminish malnutrition in children.

To obtain the economic effects of the double burden of malnutrition which not only increases the medical expenses but also restricts the households and individuals to be productive in their daily lives, Nugent, et al., (2020) initiated a study. This study included the double burden of malnutrition to emphasize nutrition concentrating on overweight, obesity, and stunting that leads to compromised childhood development and more prone to infectious diseases and other non-communicable and communicable diseases as well. The study does not undertake the associated economic costs with the said conditions, but

it explored the prevailing approaches that are used for modeling the economic effects of the double burden of malnutrition and to identify the shortcomings in these methodologies. The study suggested that rather than relying on DBM for nutritional interventions, the economic evaluation analysis could be more suitable that perceives both stunting and overweight simultaneously, the authors experimented with this using cost-benefit analysis (economic evaluation) in children of age 4 and above by providing the improved quality meal at schools. Therefore, the result revealed that “Double-duty interventions” are more cost-effective and efficient as compared to “Single-duty interventions”.

In summary, considering the literature review or after analyzing the available research work executed on the subject matter, it is clearly identified that the present study focuses on the economic implications of child malnutrition (objective 01) later reflecting on the policy analysis (objective 02), while in past most of the work has been accomplished addressing the determinants of malnutrition in children that restricted the subject matter as public health problem but the present study has addressed its economic aspect. Therefore, the research gap in the study is defined by emphasizing the evidence based fact that child malnutrition is not just a public health issue but it also requires to be addressed from economic perspective (in context of Pakistan), using “consequence model” that allows projecting the economic impact of child malnutrition by applying the global coefficients from the scientific literature to this national health, demographic, labor, and economic data and by projecting the magnitude of annual loss (WFP, 2017) though determinants of child malnutrition suggests medical interventions to prevent it, the economic aspect suggests need based policy interventions to diminish the prevalence rates.

The economic impact of prevalence of malnutrition in children on aggregate economic activity or GDP is inevitable and deliberately emphasized in the study. The subject of child malnutrition is not just limited to the public health concern but it also has long term economic implications, at one side it projects the disease related huge program costs to control prevalence and incidence rates, on the other hand, it restricts the optimal economic growth due to lost in future workforce as result of childhood morbidities, therefore it appears as double burden on the economy.

3. Data Description

The study is based on a mixed methodology (qualitative and quantitative) to meet the

objectives and therefore divided into two parts.

a) Quantitative Analysis: The “Consequence Model” is used for economic analysis to project annual economic losses to GDP and loss in the workforce due to malnutrition in children under five years of age.

b) Qualitative Analysis: The “Structured Interviews” of relevant focal persons/stakeholders were conducted for better and more effective policy analysis.

For first objective, Secondary data is employed where the “Consequence Model” is acquired to draw the economic implications of child malnutrition after organizing and arrangement the data into Ms. Excel, later converting the data into a useful form, descriptive analysis is performed to obtain the results. The data is extracted from PDHS-2017-2018 and NNS-2018 while for some economic indicators and statistics; ‘The Economic Survey of Pakistan, PBS, and WDI have been sourced. The “Consequence model” is adopted from the report “Economic consequences of Undernutrition” published in 2017 by Planning commission, Pakistan in collaboration with WFP and SUN movement.

Subsequently, for second objective, a questionnaire was developed using the deductive approach based on 13 questions, and afterward using the CAPI method “Structured Interviews” of 05 relevant stakeholders were conducted using ‘purposive sampling’, comprising of; 01 consultant nutritionist, 01 Asst. Professor, 01 foreign and 02 national policymakers, belonging to; Nutritional International, Scaling Up Nutrition, PNDS, and NUMS. All the participants secure a demonstrated working history in the field of malnutrition in children. The responses were then longlisted in Ms. Excel and interpreted using bar graphs.

3.1 Quantitative Analysis

As stated, child malnutrition is not just a public health problem but also has implications for the national economy. To project the annual economic losses, the economy, the “consequence model” has been used.

3.1.1 The Consequence Model

The “consequence model” allows projecting the economic impact of child malnutrition in Pakistan by applying the global coefficients from the scientific literature to this national health, demographic, labor, and economic data and by projecting the magnitude of annual loss. Figure. 01 reveals the general presentation of the “Consequence model” (WFP, 2017). Since it has been assumed that child malnutrition is a public health issue

while children are considered as the future resource for country. In this way, children those affected from any type of malnutrition (stunting, wasting and underweight) have impact on GDP in the long run due to economic inconsistency, the coordinates of ‘consequence model’ that are discussed below separately i.e. number affected, average earning, labor force participation, coefficient risk deficit and average earnings allows to use these micro variable to calculate the aggregate losses to the economy in a macro perspective.

Figure 1: Consequence Model

Consequence Model and Parameters to Project Economic Losses from Individual Indicators							
Number Affected		Average Earnings	Labor Force Participation	Coefficient Risk-Deficit	Average Work-Life	Net Present Value (NPV)	Losses to Economy
Prevalence	X	National	National	RR or %	50 Yrs	Formula	NPV \$/yr.
X		\$1410/y	55%	Deficit	Work	@ 3%	
Risk Group			Male 83%	From	life		
			Female 22%	Scientific			
				Literature			

3.1.1.1 Number Affected

The values for the prevalence of all forms of child malnutrition are extracted from the NNS 2018 and the PDHS 2017-18 (NIPS, 2017-2018). “The government official published reports: National Nutritional Survey, 2018 and Pakistan Demographic and Health Survey, 2018 have been used to fetch estimates for stunting, wasting and underweight.

Risk ratio or relative risk (RR) is the percentage chance of occurring a disease, mortality, or any other related outcome in an exposed group compared to the non- exposed group (“The Economic Consequences of Undernutrition in Pakistan: An Assessment of Losses”, 2017), it can be calculated from the formula.

$$(Prevalence*(RR-1))/(1+(Prev*(RR-1)))$$

The numbers for affected children from all forms of malnutrition (stunting, wasting, and underweight) are derived from the total population of children under 05 projected by the World Bank (2020).

3.1.1.2 Average Earnings

The average wage rate has been determined from the World Bank (World Bank,2019) ~ \$1410 USD. World bank has been considered as a reliable source for using economic indicators although there are other available sources to obtain average earnings/wage indicator such as ILO and WDI, but the methodology of world bank is based on “GNI in U.S dollars (Atlas method).

3.1.1.3 Labor Force Participation

To calculate the rate of labor force participation, the following formula is being used:

$$\text{Labor force / Total working-age population}$$

and for the working-age population, the people from age 15 to 64 are perceived. Further, the indicator is adjusted down considering the age group, which is measured as a percentage of each age group (OECD).

The statistics for labor participation in this assessment are reported by the World Bank and the International Labour Organization (ILO) as 55 percent of the total population, with 83 percent for males and 22.3 percent for females respectively.

3.1.1.4 Coefficient Risk-Deficit

The scientific literature suggests that, in the course of any specific disease among a population, the chances to develop negative outcomes extensively increase, such as; mortality, morbidity, and compromised productivity work due to mental or physical breakdown (WFP, 2017). For instance, due to the prevalence of malnutrition in children under five, there are chances of these mentioned negative outcomes that may adversely affect the children.

To assess the chance of developing these negative outcomes, relative risk (RR) is used. The relative risk compares the probability of dying for a certain population group in contradiction to the risk of death for all other population groups (Services, 2004). E.g. The mortality rate in children under five suffering from malnutrition versus the possibility of death among all other non-malnourished children. i.e., formula:

$$\text{RR} = \text{Risk in One group (Group A) / Risk in all other groups}$$

3.1.1.5 Average Work-Life

To determine the value of lifetime future productivity amidst loss to childhood malnutrition is difficult to obtain because not everyone performs the same kind of work and consequently the time to enter and end work life varies. (The estimate of 50 years’

average work life is drawn from “The Organization for Economic Cooperation and Development,2022)

However, in this assessment, 50 years is supposed as average work-life, considering that children at the age of 15 become eligible for work (i.e., to be employed or unemployed) and until the age of 65 years (OECD, 2022). For instance, the earning projections cannot be estimated for a child that is born in 2021, until the child becomes eligible or enters the workforce in 2036.

3.1.1.6 Net Present Value (NPV)

The NPV allows forecasting the future value in the present currency by applying the rate of interest or discount rate (FERNANDO, 2021). However, whenever NPV is used to analyze data for the health and development sector, the discount rate is presumed a “social discount rate” that represents the particular preference for present over future savings instead of taken as the conventional interest rate. It is denoted by the formula:

$$NPV = R_t / (1 + i)^t$$

3.1.1.7 Losses to the Economy

Despite being a public health issue, malnutrition enormously imposes an adverse impact on individuals, households, and the national economy in the shape of direct and indirect costs (glopan)². However, in particular, due to the prevalence of malnutrition in children under five the short- and long-term economic prosperity is compromised, as child malnutrition also causes long term economic inconsistency due to loss in work force along with the current burden on GDP as a result of impeded learning, poor school performance, compromised productivity at work, and high health care costs (author).

3.2 Qualitative Analysis

To draw effective policy outcomes after reflecting and obtaining empirical results, it is important to analyze the current and previous policy frameworks to suggest new strategies. For this, none is the best source other than the involvement of relevant stakeholders.

As stated, since the study aimed to reflect on policy insight in objective two and open-ended structured interviews were preferred, hence exploratory questionnaire was settled comprising 13 questions using a deductive approach.

²Global Panel on Agriculture and Food Systems for Nutrition

In qualitative analysis, the deductive approach is used to test an already established theory using a “top-down” approach that allows the examiner to induce from literature, theory, and propositions depending on the objective of the study (Bingham & Witkowsky, 2021). The questions were established mainly focusing on elements that contribute to child malnutrition, ways for elimination, program implementation, financial limitations, and the role of monitoring and evaluation, particularly in the case of Pakistan.

Moreover, considering the COVID-19 SOPs and time constraint barriers, the online module was selected for conducting structured interviews using an explanatory questionnaire. After giving a general description of the research and its objectives through email and the telephonic conversation to the targeted stakeholders, the questionnaire was shared via email to all the participants.

4. Empirical Model and Estimation

4.1 Applying Model

The table 08 (see appendix) represents the estimated numbers of affected risk group separately for stunting, wasting and underweight comprising of mixed units (prevalence, average earnings, labor force participation, average work life, coefficient risk deficits), therefore, it is incomplete without using the NPV formula collectively for all forms of malnutrition as prescribed in the consequence model to obtain the estimates (economic value). As stated, whenever NPV is used to analyze data for the health and development sector, the discount rate is presumed to be a “social discount rate” that represents the preference for present over future savings instead of taken as the conventional interest rate. A 3% discount rate has been used to calculate NPV of lost future earnings as a result of child mortality or growth deficits in childhood.

The total GDP of Pakistan was \$280 Billion USD by the end of 2021 (Economics, 2022), that has been taken into consideration to acquire the burden of children malnutrition on the GDP.

The result significantly shows that the country is losing **0.0125%** of its GDP each year on account prevalence of malnutrition in children (under 05) as per the estimate for the year 2021.

4.1.1 Estimating lost in future workforce

As discussed, the long-term economic implications of malnutrition in children due to lost in future workforce is as follows;

“The valuation projects a 50-year work life, based on children entering the workforce at

age 15 and continuing to work until 65 years of age, which constitutes a few years less than Pakistan's national life expectancy at birth, therefore, Delay Earnings=15 was subtracted".

This shows that 188160 children die every year in Pakistan before their fifth birthday because they or their mother are malnourished. The value of this lost future workforce is estimated at US\$1.82 billion annually.

On the contrary, the estimate for lost in future workforce due to malnutrition in children as per the coordinates for PDHS 2012-2013 were accounted as \$1.96 Billion, that indicates that overall, the economic consequences of malnutrition in children have improved however the intensity of improvement is not much satisfactory.

4.1.2 Empirical Findings

The results obtained from the "Consequence Model" clearly reflect the significance of the economic implications of child malnutrition and it is now evident that malnutrition in children has a direct impact on the national economy. Pakistan has already faced many economic challenges in which child malnutrition also contributes to downsizing the GDP by 0.0125%, that has both short- and long-term implications. For Instance, particularly in case of Pakistan, in the short run the total GDP is compromised by 0.0125% as an opportunity cost of GDP growth while in the long run it would have multiplier effect when these malnourished children will not full participate or contribute in the national economy in terms of losses in the future workforce as a result of child malnutrition, restricting the affected children to use their full potential or productivity as compared to normal children, which approximately accounts for \$1.82 Billion per annum.

Moreover, besides the health and economic issue on a national level, it also has an impact on countries ranking on the global SDGs agenda. This area falls under SDG 3; "Good health and wellbeing", which means "To ensure healthy lives and promote well-being for all at all ages." To achieve the goal, a lot of adjustments at both the micro and macro level are required. For which, a detailed qualitative analysis is necessary that has been incorporated in the study after interviewing relevant stakeholders covering key determinants.

4.1 Discussion of Qualitative Results

To diminish the rate of child malnutrition measures must be taken initially addressing the root cause and subsequently focusing on other health and economics- related actions to eventually meet the goal. Therefore, an exploratory questionnaire methodology has been

adopted while interviewing the respondents (05). In the section below, the results obtained from the qualitative analysis are discussed in detail.

4.1.1 Primary cause of malnutrition in children

It has been identified from the results that the two leading sources of malnutrition are; 'Poverty and Maternal health'. First, if someone has access to adequate food through a sustainable economic level, then maternal health will improve with maternal education. Therefore, poverty alleviation is directly proportional to improved maternal health and education (F. Zeb, personal communication, January 19, 2022). In Pakistan poverty is the main reason, a typical poor family has many difficulties, and adequate food for the children is always a problem. Many poor families find it difficult to provide milk and eggs to their children, as they cannot afford them (R. Khan, personal communication, November 11, 2021).

Moreover, having better maternal health and education empowers mothers to make better choices for their babies and be in better health themselves. However, many times it's partly because of poverty that mothers are unhealthy and don't have access to family planning. These are all related and should be addressed when it comes to malnutrition (M. Daget, personal communication, October 02, 2021). Poor care of women in pregnancy and childbirth could pose a longer-term risk to the health of the child, as well as increasing immediate risks for both mother and child. *Immediate* causes of malnutrition are inadequate dietary intake and illness. The *underlying* causes that lead to inadequate dietary intake and infectious disease include inadequate household access to food, poor health services, unhealthy environments, and inadequate care for women. To prevent bad maternal health, women need to be educated/counsel to improve their health. Government shall formulate a policy to incentivize women with poor backgrounds (S. Raza, personal communication, January 02, 2022).

4.1.2 Role of breastfeeding (BF) practices in infants

During interviews, all respondents strongly endorsed that BF practices have a significant impact on the health of infants. To avoid the risk of malnutrition in children, mothers must educate and ensure the importance that BF is beneficial for both children and the mother itself, it also decreases the burden on the household budget (F. Zeb, personal communication, January 19, 2022).

Awareness must be created among the women on a nationwide basis that breastfeeding

is very necessary for the first six months, NGO's can play a significant role. The relevant ministries should include food and nutrition-educated NGOs in their plans (R. Khan, personal communication, November 11, 2021). BF practices must be ensured through the adoption of "Behavior Change Communication" and "Implementation of Protection and Promotion of Breastfeeding laws" (I. Danish, personal communication, November 08, 2021).

Improvement in breastfeeding practices has many advantages to reduce the rate of malnutrition. However, this alone is not enough. If we take the example of Burundi, it has a very high rate of exclusive breastfeeding (above 80%), however, it also has the highest rates of stunting in Africa. The benefits of breastfeeding are multiple: children get their mothers' immunity; the milk is adapted to their needs. However, for that to happen the mother needs to be healthy herself. To increase breastfeeding practices, countries need proper legislation (and enforcement) on Breastmilk substitutes and parental leave (both for men and women), they also need proper maternal education. In some countries, religion also has an impact on those practices, and religious leaders should be made part of the strategy because they have a role to play (M. Daget, personal communication, October 02, 2021).

To literate women about the benefit of breastfeeding through mass media, and community sessions/seminars. Breastfeeding may yield economic benefits to women. It allows the mother to feed her offspring relatively independently of the source of her food, relying on her stores of energy, macronutrients, and micronutrients. Breastfeeding practices can be enhanced through good practices i.e., establishing breastfeeding corners at health facilities, ensuring KMC services, and breast pumps usage (S. Raza, personal communication, January 02, 2022).

4.1.3 Cost-Effective Approach

In response to suggest a cost-effective approach; Growth monitoring (02), Immunization (01), and social safety nets (01) have mainly opted as an economical way of tackling malnutrition in children in the first '1000' days of life. Nutrition education considering the "life cycle approach" is important during the antenatal visit also the family of pregnant and lactating women should be educated about nutritious and safe diets (I. Danish, personal communication, November 08, 2021).

However, as long as policymakers keep prioritizing one element (or sector) over others, it will be difficult to achieve the objectives because everything is interdependent.

Therefore, each ministerial sectoral plan must include nutrition; health, education, agriculture, social affairs, finance, family, and planning, etc. into consideration (M. Daget, personal communication, October 02, 2021).

4.1.4 Family system

The family system plays a vital role in the health of children because they are in the developing stage, for this 'Nucleus' and 'Joint family' systems have a decisive influence on child health. The nucleus family system allows proper accessibility, availability, and equal utilization of the food (F. Zeb, personal communication, January 19, 2022). Each structure has both pros and cons but usually, children in the Nucleus family system have more access to food (I. Danish, personal communication, November 08, 2021).

In Pakistan, especially in the rural areas, there is a common practice of sharing food among family members, neighbors, and relatives. There is easier in a joint family system when it comes to food sharing (R. Khan, personal communication, November 11, 2021). A joint family system may sound easier to put in place (this would potentially reduce big inequalities). In the same way that as long as the world individually deals with their issues, issues will never have been solved. We, as humans, live in an ecosystem. Everything we do has an impact on others (M. Daget, personal communication, October 02, 2021). Moreover, the joint family system allows the availability of multiple caretakers and substitutes to parents are well-established family structures that play a pivotal role in the upbringing of a child not only for nutrition but for developmental milestones and achievements (S. Raza, personal communication, January 02, 2022).

4.1.5 Role of family size

The role of family size has a significant impact on a child's health because there is a strong correlation between resource availability and utilization. To control the family size more opportunities should be created for women to earn income because when women like men are also busy in income generation activities, then the family size will be smaller, and more attention will be given to fewer children (R. Khan, personal communication, November 11, 2021).

If the family size is big then there must be the presence of employment opportunities to maintain the balance, Women should also be empowered to support their family in earning (I. Danish, personal communication, November 08, 2021).

The size of the family must be controlled by effective family planning and to decrease the population growth rate alongside improving the literacy rate so the dependency ratio

could be minimized (S. Raza, personal communication, January 02, 2022).

4.2.7 Therapeutic food and cost-effectiveness

The results have shown that “therapeutic food” intervention alone is not very effective from the aspect of cost-effectiveness. It might be useful in the short run but its effects are not sustainable in the long run if not adjusted with long-term intervention (M. Daget, personal communication, October 02, 2021).

4.2.8 Impact of Father's income

It has been found that ‘father’s income’ is among the primary determinants of the prevalence of child malnutrition because the father is mainly responsible for providing for essential family needs.

Therefore, if the father has a good income, it will allow the children to explore and more access to adequate food that will eventually nourish the mental and physical health of the children otherwise if the father has no proper source of income then this household instability will push the family into the poverty trap. In many countries, fathers are the main providers of the family. Without appropriate financial resources, the family will be stuck in poverty, and this will affect the family’s health (M. Daget, personal communication, October 02, 2021).

4.2.9 COVID-19 and SDGs

Good health and well-being are one of the global agendas under “Sustainable Development Goals” that embark on health as the basic need for people of all ages. However, it becomes an adverse impact due to the COVID-19 outbreak.

Therefore, all health-related national policies and programs also slowed down resulting in delayed effective outcomes, such as improved diets will be difficult to maintain because of issues related to access to food. Unemployment and rises in prices mean that fewer households will be able to afford the best nutrition choices for their diet and health (M. Daget, personal communication, October 02, 2021).

4.3.0 Council of common interests

The “Council of Common Interest” (CCI) has approved 350 Billion rupees for tackling malnutrition induced stunting in Pakistan; aiming to reduce malnutrition from 40.2% to 32% and acute wasting to 10% from 17.7% by 2025 and consequently effective strategies are required for efficient utilization of the resources. The respondents suggested many schemes; Hiring a skilled people to intervene in the nutrition program (Nutrition Experts) along with School Nutrition programs, Safe and healthy food programs in the

community, health centers, and education (F. Zeb, personal communication, January 19, 2022).

Another respondent stresses that 350 billion Rupees can play a significant role in the short term and the amount should be used for subsidizing food in Pakistan keeping in mind tackling malnutrition in children while a further amount should be provided for this in the next budget (R. Khan, personal communication, November 11, 2021). In addition, it was revealed that although, PC-1 has been approved money has not been allocated in the first year of the project (I. Danish, personal communication, November 08, 2021). Moreover, a joint multi-sectoral strategy for nutrition that would integrate nutritional interventions, educational programs, and social safety nets would be implemented as Pakistan is very active within the SUN Movement (M. Daget, personal communication, October 02, 2021). Likewise, to execute educational programs regarding mother-child healthcare and nutritional intervention shall be started after the health education (S. Raza, personal communication, January 02, 2022).

4.3.1 Food Fortification

The results revealed that it is one of the useful yet critical approaches to diminish child malnutrition. However, one should not forget that many times the issue is affordability and availability (remote areas where we see the highest levels of malnutrition may not all have access or availability of these products) (M. Daget, personal communication, October 02, 2021).

4.3.2 Pakistan Multi-Sectoral Nutritional Strategy (2018-2025)

It is one of the most defining strategies in response to eliminating malnutrition among children. It is the “GPS” that will guide all actors and interventions. What is also important is to have a strong accountability mechanism as well as a robust data system (for monitoring and evaluation) to be able to address any issue as quickly as possible. Government and partners also need to fund so that interventions can be implemented. Capacity strengthening is also key as some countries sometimes have the money but no qualified workforce to work in the field. Civil society is key at the subnational level as they usually are the operational arm supporting the government (M. Daget, personal communication, October 02, 2021).

However, financing is the main challenge to efficiently executing the environment because the government has developed the implementation plan but still resources are not allocated to implement this plan (I. Danish, personal communication, November 08,

2021).

4.3.3 Monitoring and Evaluation

There are many factors involved that decide the attainment of any program, but “Monitoring and Evaluation” is the key element for which institutional environment and costing are identified as the main factors. Therefore, if more than adequate funds are provided for monitoring and evaluation, it will set up such a network that will be very helpful in the success of the national health program. Proper M&E can turn PMNS (2018 -2025) toward success (R. Khan, personal communication, November 11, 2021). However, Non-serious National Priorities and health goals can turn into a great challenge for PMNS towards target achievement (S. Raza, personal communication, January 02, 2022). Another important element to keep in mind is that the lack of M&E often leads to duplication of activities and doesn't allow corrective actions when needed to stay cost-effective (M. Daget, personal communication, October 02, 2021).

5. Policy Analysis

The prevalence of malnutrition in children has lifelong consequences on the health of the affected person, their household income, and the national economy. Malnutrition in all forms; stunting, wasting, and overweight contribute to the depletion of lifecycle in terms of increased mortality rates, high treatment costs, and loss in the workforce as a result of compromised physical growth along with weak cognitive development. Good health is the basic requirement to live a natural life but whenever it's adversely affected, it is the immediate responsibility of the government to provide adequate health services whenever and wherever a sick person needs them. However, the government alone can't tackle the problem, therefore all ways of disease prevention must be taken into consideration than later imparting on the curative side of the disease. The prevalence of such disease results in an adverse impact on both national and global health goals. To diminish the prevalence of child malnutrition a strong policy framework from identification to implementation of the problem must be established.

A wide range of policy actions has already been acquired from the relevant stakeholders (interview respondents). Below are policy response options to tackle the issue:

Disease-Related:

1. Nutritional Interventions

2. Educational Programs
3. Social Safety Nets
4. A Joint multi-sectoral strategy incorporating all of the above (03)
5. Food Fortification

Program-Related:

1. Monitoring and Evaluation (PMNS, program implementation-oriented)
2. Institutional environment
3. Costing

Since the possible policy actions two major categories are drawn; ‘Disease Related’ and ‘Program Related’ policy action. During the analysis, it has been observed all policy suggestions eventually lead to the above-mentioned actions. Mother’s education and nutritional interventions such as growth monitoring, immunization, and therapeutic foods (RUTF) were considered primary sources that can be useful to eliminate malnutrition in children. The provision of social safety nets to the affected household may also contribute to reducing the numbers. Moreover, food fortification was also suggested as a useful technique, but it has some limitations like affordability and availability in the remote areas (rural) due to poverty that also affects maternal health. After analyzing the set of policy actions drawn from relevant stakeholders from both disease and program-related intrusions and analyzing previous and existing policies. Preventive health strategies are suggested to policy makers keeping in view the set of criteria suggested by stakeholders.

From the literature review and interviews, it has been observed that government expenditure in response to child malnutrition is too high in terms of funds mobilization for programs implementation (PMNS 2018-2015), Food fortification, etc. On the other hand, the existing cases or prevalence rates are also downsizing the GDP as already discussed in detail. Ultimately a double burden of child malnutrition will occur and subsequently have lasting adverse impact on health-related national and global goals. The curative health strategy validates the prevalent cases (program-oriented implementations) but new cases (incidence) must be treated under the preventive health strategy to control the number of cases. Again all the disease-related possible actions required to be practiced as suggested by stakeholders (nutritional interventions, growth monitoring, immunization, educational programs, etc.).

However, the cost of preventive health strategy as compared to curative health strategy

is a broad topic to be researched. But all over the globe, the developed countries are now practicing preventive health care than curative health care systems because “Prevention is better than cure”. Practically, in the present scenario along with the fund's mobilization for existing programs i.e., PMNS 2018-2025, the government must initiate another program considering preventive health strategy where all sets of possible response options (nutritional interventions, growth monitoring, immunization, educational programs, etc.) as suggested from policymakers must be gathered under one umbrella to address malnutrition in children. This will further refine the required interventions considering prevention from pre-pregnancy education to childbirth till 05 years of age. The reduction in new cases (incidence) will help control the morbidity and mortality rates, the policy may cost more in the short run due to financing of existing programs but in the long run better and long-lasting health outcomes could be achieved that will also decrease the economic losses due to lost in the workforce.

Two major barriers were pointed out during the interviews were:

1. Institutional Environment
2. Costing

The institutional environment is sometimes considered a barrier when implementing newer strategies, policies, procedures, and guidelines because many times it affects a certain group of people. For instance, a new policy will likely replace the previous or existing policies if it turned successful while the people involved in the previous policy making will feel insecure and therefore a strong criticism could be raised. Political instability and lack of coordination among institutions is another barrier to implementing newer policies because an economist's view of tackling child malnutrition may be different from the aspect of a health practitioner.

Costing may be another key impediment to the implementation of newer policies because it has been identified that the funds allocated for existing policies were already delayed. So when a new policy is taken into consideration, the costs (economic and administrative) could turn into a barrier to implementation. Before the intrusion of newer policies, it is important to conduct monitoring and evaluation of previous policies and programs so the duplication of unnecessary protocols could be eliminated and stay cost-effective. However, conducting monitoring and evaluation also endures a cost but this cost could be put to usefulness if efficiently performed to extract beneficial results to save the cost of policies and programs similar in nature in the future.

It can be seen that results obtained from both qualitative and quantitative analyses are in accordance with the theory, the estimated loss in workforce due to child malnutrition was 1.82\$ billion per annum while it was 2.24\$ billion in 2017 (“The Economic Consequences of Undernutrition in Pakistan: An Assessment of Losses”, 2017), the improvement has been observed in line with the Pakistan’s vision 2025. However, the policy analysis carried out in the study emphasizes to adopt “preventative health strategy” concentrating on the betterment of costing and institutional structure in order to achieve the expected outcome.

6. Conclusion

In conclusion, using the “Consequence Model” it is now evident that the prevalence of malnutrition in children (under 05) has significant economic implications. As discussed, the total economic losses projected to GDP are estimated as 0.0125% of the GDP as per estimates for 2021, while the annual losses to the economy due to the loss of future workforce are estimated as \$1.82 Billion/year. This shows that despite a public health issue, child malnutrition is an economic issue too. Health is a basic need and the government is liable to provide adequate health services to everyone whenever or wherever they need them. Thus, in this study, children are assumed as a future resource of the country and due to the prevalence of any form of malnutrition (stunting, wasting, overweight) in children, the future economic growth could be compromised due to conceded productivity as a result of abnormal cognitive development and physical growth that leads to fatigue, lack of attentiveness and lack of utilizing full potential as compared to the other children (healthy) of same age group.

Further, the study identified the two main contributors or primary sources of child malnutrition are ‘Maternal health’ and ‘Poverty’. It has been found that due to unaffordability towards adequate food and improper diet mother’s deprived health also injects malnourishment in children. Other relevant factors include lack of maternal education and inadequate breastfeeding practices that cause malnutrition in children. In addition to that, the father’s income status, family size, and family type (nucleus or joint) also play a vital role in determining the health status of the children. Moreover, the study undertook cost-effective interventions such as therapeutic food (RUTF) and food fortification as curative measures and found that they are useful but not the least cost-effective approaches and their effectiveness is limited to some extent based on the results

obtained from interview respondents.

On the contrary, nutritional interventions, immunization, growth monitoring, and maternal education were considered effective approaches toward child malnutrition. Therefore, a “preventive health strategy” has been suggested in the study as a cost-effective approach incorporating all the said interventions on a joint multi-sectoral level in the study to diminish the rate of child malnutrition.

Lastly, the cost of program implementation has been studied before the effective execution of a newer policy to avoid the loopholes in the existing and previous policies or programs. Considering the current structure, it has been observed that “Institution environment” and “Costing” are the key challenges reductant towards the smooth enactment of existing policies mainly due to funds mobilization and lack of coordination among institutions. It has been revealed in the study the funds previously allocated were yet not fully disbursed leading to delayed outcomes, also without proper monitoring and evaluation of an existing or previous program, there is a chance of duplication of unnecessary protocols/procedures and room for new strategies becomes limited. Therefore, M&E must be performed to save future costs associated with new policies and refine the process//protocols during implementation.

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Appendices

Table A1: Prevalence rate and types of malnutrition in children

Total Population	220892331	Number of Children Under 05	27962852
Prevalence	Total Number of Population under 05		
	27962852		
	Types	Percentage	No. of Prevalence
	Stunting	40.20%	11241067
	Wasting	17.70%	4949425
	Underweight	28.90%	8081264

Table A2: Risk Group

Risk Group	Formula	$(Prevalence*(RR-1)) / (1 + (Prev*(RR-1)))$
	For Stunting	$11241067*(1.11-1) / (1 + 11241067*(1.11-1))$
	(Prevalence*(RR-1))	1236517.37
	(1+ (Prev*(RR-1)))	1236517.37
	Division	0.999999191
	For Wasting	$4949425*(0.45-1) / (1 + 4949425*(0.45-1))$
	(Prevalence*(RR-1))	-2722182.75
	(1+ (Prev*(RR-1)))	-2722183.75
	Division	1.000000367
	For Underweight	$8081264*(1.55-1) / (1 + 8081264*(1.55-1))$
	(Prevalence*(RR-1))	4444695.2
(1+ (Prev*(RR-1)))	4444696.2	
Division	0.999999775	

Table A3: Average Earnings

Average Earnings	Source Estimates	Annual Income (Dollars)
	World Bank (2019)	1410

Table A4: Labor Force Participation

Labor Force Participation		Total Number	Total Number
	National	121490782.1	121490782.1
	Male	183340634.7	183340634.7
	Female	48596312.82	48596312.82

Table A5: Coefficient Risk Deficit

Coefficient Risk Deficit		Under 05 Child Mortality	Total Num. of Children Under 05	Relative Risk
	Due to Stunting	84672	11241067	0.007532381
	General	188160	27962852	0.006728927
	Total	272832	39203919	1.119402936
		Under 05 Child Mortality	Total Num. of Children Under 05	
	Due to Wasting	84672	4949425	0.003028017
	General	188160	27962852	0.006728927
	Total	272832	32912277	0.45
		Under 05 Child Mortality	Total Num. of Children Under 05	
	Due to Underweight	84672	8081264	0.010477569
	General	188160	27962852	0.006728927
Total	272832	36044116	1.55709347	

Table A6: Average work-life

	No. of Years
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Average Work-Life	50
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Table A7: Applying “Consequence Model” using its coordinates

Prevalence	Number Affected		Average Earnings	Labor Force Participation	Coefficient Risk Deficit		Average Work Life
	Stunted	0.402			Stunted	1.11	
	Wasted	0.177			Wasted	0.45	
	Underweight	0.289			Underweight	1.55	
	x	x	1410	x	0.55	x	50
	Risk Group						
	Stunted	0.99					
	Wasted	1					
	Underweight	0.99					

No. Affctd*Risk Group	Stunted	0.398					1.11		
	Wasted	0.177	x	1410	x	0.55	0.45	x	50
	Underweight	0.286					1.55		

Table A8: Number of affected risk group

Number of Affected Risk Group	
For Stunting	17129.1587
For Wasting	3088.42875
For Underweight	17195.5687

Table A9: Net present value

NPV	NPV = $R t / (1 + i) t$	
	Required return	3%
	NPV =	\$35,277.77 USD

Table A10: Percentage losses to GDP

Total GDP of Pakistan	\$280 Billion USD (2021)
Equivalent (Converting in thousand)	280,000,000 USD
Losses to the economy	\$35,277.77 USD
Percentage	0.0125%

Table A11: Losses to the economy

Losses to economy	\$35,277.77 USD
Losses to economy as Percentage of GDP	0.0125%

Table A12: Loss in future workforce

Attributed Deaths		Average Wages		Labor Force Participation		NPV: Worklife		Delay Earnings		NPV
188160	*	1410	*	0.55	*	\$12.50	-	15	=	\$1,823,975,985.00
										\$1.82
Lost in future workforce due to malnutrition in children per annum										\$1.82 Billion/y