A COMPREHENSIVE REVIEW OF SCHOOL FEEDING PROGRAMS ACROSS ELEVEN COUNTRIES

Final report

By

Deepika Swami

Anjula Gurtoo

Vinay Kumar C

Anant Arora

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INDIAN INSTITUTE OF SCIENCE

BANGALORE

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Terms and Acronyms

1. Height for age (Stunting): Stunting is defined as below minus two standard deviations from median height for age of reference population (UNICEF, 2020)

2. Weight for height (Wasting): Wasting is defined as below minus two standard deviations from median weight for height of reference population (UNICEF, 2020).

3. Weight for age (Underweight): Underweight is defined as below minus two standard deviation from the median of the World Health Organization Child Growth Standards among children under 5 years of age (WHO, 2017).

4. Undernutrition: Refers to deficiency of nutrients in form of protein, energy, vitamins and essential minerals. It manifests as child stunting, wasting or micronutrient deficiency.
5. Malnutrition: A problem associated with manifestation of poor nutrition and unbalanced diet which includes undernutrition, over nutrition, overweight and obesity.
6. BMI: BMI refers to Body mass index is a measure of body fat based on height and weight. It is calculated as the weight in kilograms divided by the square of the height in metres (kg/m^2) (WHO, 2020).
7. Infant and child mortality: Infant mortality rate refers to death of child during the first year of child birth while child mortality refers to the death of child between 1-5 years (WHO, 2017).
8. SFP: School Feeding Programs
9. MDM: Mid-Day-Meal
10. NSLP: National School Lunch Program
11. PNAE: Programa Nacional de Alimentacao Escolar (Brazilian School Feeding Program)
12. UNICEF: United Nations Children's Fund
13. WHO: World Health Organization

Abstract

In this white paper we review the School Feeding Programme (SFP) of eleven high, middle- and low-income countries with the objective of understanding the priorities, objectives, coverage, meal standards, challenges, impacts, funding support and cost of feeding each child in these countries. Vicious cycle of poverty, food shortage, insufficient food uptake and food insecurity, results in undernutrition, malnutrition, underweight, stunted growth and increased burden of diseases among children which is viewed as one of the most critical problems around the globe. Most of the school feeding programs running across the countries have proved to quite effective in reducing the child vulnerability by improving the health and nutritional status of children. Globally, school feeding program (SFP) has covered almost 368 million children and adolescents and has fared quite well on multiple fronts including education, nutrition, employment and local agriculture. Our analysis shows that priorities, objectives and the outcomes of these programs are governed largely by the income of these countries. The review is based on the relevant literature from past 30 years and drafts the learnings that can be utilized to improve the SFP in each country along with highlighting the positive and negative aspects of SFP in these countries. The current study can also help the policy makers while formulating the child health and nutritional policies and can also act as a guide for initiating a new school feeding program in any low, middle- or high-income country. Table 1 provides the summary of objectives and prescribed standards of school feeding programs across these countries.

Table 1: Summary

Country	Objectives												Prescribed standards					
	O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	O 10	O 11	O 12	S 1	S 2	S 3	S 4	S 5	S 6
Japan	√	√							√			√		√	√	√		√
Italy	√				√	√	√		√		√	√		√	√	√	√	√
Sweden	√	√	√	√	√	√			√	√	√	√		√		√		√
USA	√	√					√	√	√		√	√		√		√		√
Brazil						√		√	√	√	√			√	√	√	√	
India			√				√		√	√					√			√
China	√		√						√	√								√
Tanzania									√	√			√					
Somalia									√	√			√					
Kenya					√		√	√	√				√					
Mali					√				√	√			√					

O1: Improve child nutrition; O2: Reduce/prevent obesity; O3: Reduce/prevent malnutrition; O4: Tackle health inequalities; O5: Support parents and local community; O6: Learn healthy habits; O7: Improve cognitive abilities; O8: Support local agriculture; O9: Improve school enrolment and attendance; O10: Tackle undernutrition; O11: Enhancing diets; O12: Health and nutrition education

S1: No food-based standards for food and drink provided; S2: Specified amounts of fruit and vegetables must be provided; S3: Restrictions on sugar, fat, saturated fat; S4: Restriction on processed foods; S5: Restriction on soft-drinks; S6: Restrictions on energy intake

1. Introduction

Globally, 821 million people are suffering from hidden hunger, over 144 million children under five are stunted, 47 million are wasted and 38 million are overweight depicting that one in every three children is not growing well (UNICEF, 2020; WHO, 2018). 97% of the undernourished population reside in low and middle income countries with major contribution from Asia and Africa (FAO, 2015). China, India and Vietnam has progressed significantly in reducing the rate of undernourishment among Asian countries. Among all the regions, sub-Saharan Africa shows the highest prevalence of undernourishment as it is constantly affected by natural disasters and conflicts. African countries that are suffering from recurring hunger and undernutrition are South Sudan, Kenya, Mali, Ethopia, Somalia, Niger and Tanzania (World Food Programme, 2013). Child undernutrition can also happen in developed countries as well. For instance, 10% of children are underweight along with 32% obese in developed countries. The regional disparities show that different regions of the world face different problems in tackling child health and nutrition. For example, obesity and overweight are the major issues in high-income countries i.e., USA, France, Italy and Sweden (Aliyar et al., 2015). Middle and low-income countries have immediate and long-term objectives. In short term, they aim to eliminate hunger, increase enrollment in schools and as a social safety net i.e., providing employment opportunities to the local public, farmers and women. While, in long-run, they aim to improve the cognitive ability, attendance and nutrition status of children (Jomaa et al., 2011). Low income countries such as Rwanda, Mali, Kenya, Ghana even lack the proper guidelines on nutrition and menu designs (USDA Foreign Agricultural Service, 2009). Condition of food insecurity in poor households commonly lead to frequent issues of poor health, stomachaches, headache, psychological, chronic and mental health problems among children (Gundersen et al., 2012). Apart from these, child obesity is also found to be associated with negative social, psychological and physical health issues subsequently resulting in reduced life expectancy. Children suffering from hunger are more likely to develop infections and diseases which adversely affects their learning and cognitive abilities. Mostly, infants and young children bear the burden of poor health and malnutrition that increases the risk of death and disabilities among them (Badri, 2014). World Health Organization, (2009) attributed 50-70% of diarrheal diseases, malaria, measles and respiratory infectious diseases to malnutrition and undernutrition which is mainly the result of poverty, food insecurity, inadequate food intake and food shortage. Apart from this, natural disasters, conflicts, war, global economic crisis, and COVID-19 have exacerbated the condition of hunger and undernutrition among

children during the present time resulting in their impaired immune system which adversely affects their cognitive, physical and psychological health in long-run. Consequently, number of school-age children drop out from school, especially in food insecure regions. Ideally, food and nutritional intake determines the growth, cognitive abilities and development of a child (Smith and Cunningham, 2014). As a result, school feeding program have proved to be an effective tool that helps in increasing the enrolment of children in schools. SFP are considered as social safety net by World Bank, (2020) which aims to benefit the most vulnerable children by increasing enrollment, retention, educational achievement and alleviating immediate hunger (Bundy et al., 2009). Greenhalgh et al., (2007) reported how school feeding programs (SFP) improved the cognitive ability and growth of children from their study over five continents. SFP also help in reducing the gender inequality by reducing the cost of sending girl child to school. Significance of SFP can be realized from the fact that 368 million children are fed on daily basis via School Feeding Program (SFP) running across 169 countries worldwide that has helped immensely in tackling hidden hunger, malnutrition and undernutrition (World Food Programme, 2013).

However, SFP exists for almost all the countries in world, but the target, focus and priority of these countries vary as per the income level of these countries (World Food Programme, 2013). For instance, SFP in high-income countries mainly focuses on overweight and obesity while low-income countries have provision of SFP is limited to only a few geographic regions such as less educated and food insecure regions. Few countries only provide SFP to a few vulnerable individuals and not to the entire population. Disparities among countries about SFP are so large that it acts as a source of heath and nutritional knowledge in few of the countries (especially high income countries) while for others (low income countries), it is a source to deal with hidden hunger, undernutrition and malnutrition. In most of the high income countries, it is mainly provisioned to tackle overweight and obesity while a means for improving school enrolment and attendance in middle and low income countries. These discrepancies between high/middle/low income countries will help us to understand the different models of SFP along with their priorities in each region. Despite having SFP in almost every country of the world, still 340 million children are suffering from micronutrient deficiency and 0.8 billion are lacking from accessibility to food highlighting the gaps and problems with the existing SFP of these countries. These gaps and issues need to be addressed in order to improve the health and nutritional status of children which requires rigorous understanding of SFP across these countries. So far, number of studies such as (Aliyar et al., 2015; Badri, 2014; Gelli and

Daryanani, 2013; Jomaa et al., 2011) have reviewed the SFP across different countries of globe. For instance, (Aliyar et al., 2015) focused on understanding only the nutritional standards and objectives of SFP across different countries of globe, (Badri, 2014) reported implications of school meals on educational outcome of students along with identifying the challenges of school meals in these countries. (Gelli and Daryanani, 2013) explained the sustainability of school lunch in low-income countries and (Jomaa et al., 2011) evaluated the health and educational outcome of SFP in developing countries. However, these studies have been quite successful in evaluating the objectives, impacts and nutritional outcome of SFP across different countries but the comprehensive information about priorities, objectives, coverage, meal standards, challenges, impacts, funding support and cost of feeding each child for high, middle and low income countries was found to be missing. Considering this, present study is an attempt to fill the gap in existing literature by a thorough and comprehensive understanding of school feeding programs across eleven countries comprising four high, three middle and four low income countries across globe. The current review holistically tabulates the objectives, outreach, funding agency, impacts, challenges and food based standards of SFP across these countries. The current study can be refereed by policy makers in devising the structured policies for improving the health and nutritional standards of children along with formulating an entirely new school feeding program for the countries that have not introduced these meals so far in their countries. Current review is based on peer reviewed articles and review papers published during last 30 years.

2. Methodology

Relevant literature including research papers, review papers, government reports, country specific reports and documents were considered for understanding the school feeding programs of high, middle- and low-income countries. World Bank classification was followed to categorize the countries into high, middle, and low income countries (World Bank, 2020). We grouped the upper and lower middle-income countries into single middle income category. The information on school feeding program was retrieved using Google scholar, Science direct, PubMed, United Nations Children's Fund, World Health Organization, World Bank and World Food Program of United Nations. Keywords for the search included "School feeding program", "school meal", "nutrition of children", "health status of children" and "food for education". We only kept the documents that matched our aims and objectives. The peer reviewed articles,

book chapters, newspaper and magazine articles published during last 25-30 years were screened and analyzed further for the current study. Table 2 specifies the inclusion and exclusion criteria used for the review process.

Table 2: Criterion followed for reviewing SFP across countries

	Considered	Not-considered
Study sample	Countries from low, middle and high income groups	Children above 14 years
	Children from 2 to 14 years old	Infants and toddlers
Policies	School Feeding Program including in-school meals, take-home ration	Health, nutritional and educational policies of different countries
Peer reviewed articles and papers	From 1990-2020	Articles before 1990

3. School Feeding Programs across High/Middle/Low income countries

We reviewed SFP of Japan, Italy, Sweden and USA in high income countries; India, China and Brazil in middle income countries; Tanzania, Somalia, Kenya and Mali in low income countries. The country-specific details and provisions of SFP are tabulated in Table-3 and objectives and food standards are mentioned under Table-4.

3.1. High income countries

3.1.1. Japan

SFP in Japan was implemented under "School Lunch Act" in the year 1954 with the objective of preventing malnutrition and improving nutrition among children (Ishida, 2018; Miyawaki et al., 2019). Japan's school lunch is named as "*shokuiku*" that symbolizes "food and nutrition education". Japan's school menu is designed by the nutritionists which is primarily dominated by the fruits, soup, vegetables and rice. Owing to the efforts of healthy menu designed by nutritionists, Japanese population has the lowest obesity rate and highest longevity i.e., 83 years on an average which is highest among any country of the world. 98% of elementary and 70% of primary school children are beneficiary of SFP in Japan. School meal is offered at highly subsidised rate i.e., at $2.50 per meal which does not economically burden the parents. SFP of Japan has contributed significantly in improving the health and

nutrition related knowledge of children, in teaching them the cleanliness and hygiene by asking them to clean their plates along with addressing the socio-economic disparities by provisions of serving the meal to each other (Kirk, 2017). School menu is designed by nutritionists and it has minimal interference from bureaucrats i.e., they only step in when unhealthy meal is being served in the schools and so far, there is not even a single complaint regarding it (Harlan, 2013). It depicts the better regulatory standards of health and nutrition in Japan.

3.1.2. Italy

School meals are considered as part of Italian culture and signifies the close association with their locality and territory. Main objectives of SFP in Italy is to improve child nutrition, support parents and local economy along with improving attainment and school attendance of children. Apart from these, SFP in Italy also focuses on learning about food traditions, culture, health promotion and disease prevention of children. Italy has strict provisions regarding nutrient based standards in lunch and snacks, their presentation, dining space and facilities. Normal food based standards in Italy include provision of fresh drinking water, frequency of serving red meat, non-meat and protein, percentage of energy, fat, protein, fibre, calcium, iron and fat in food (Italian Ministry of Health, 2010). Organic food and sustainability are the main focus areas but genetically modified food is not permitted in Italian school meals. Meals are served without any charge to poorest families while on subsidized prices i.e., around $4.7 to middle income families (Liquori, 2001). Italy school feeding program also provides mid-morning snack that controls their hunger upto lunch time along with providing sufficient calories (Pearce et al., 2005). In Italy, teachers are also involved in providing knowledge to the students about school kitchen including food, health, nutrition, cooking practices, Italian diet, food culture, food quality along with informing them about the role and challenges faced by Italian framers. Owing to their efforts, Italian students prefer to host parties at their own home with home cooked meal instead of hosting at fancy restaurants. Recently, Italy has made provisions about posting their daily menu so that parents can have an idea about the kind of food being served to their children during lunch which can help in preparing their dinner menu accordingly. It depicts the support of parents, teachers, and government towards school meals in Italy.

3.1.3. Sweden

Swedish people share their thinking and feeling via school meals (Hofstede, 1996). Swedish school meals are provided without any charge to the children aged between 7-16 years and also to most of the students aged from 16-19 years. Swedish SFP is funded by government and implemented with the help of local authorities (Osowski, 2012). Sweden has both centralised kitchens where meal is prepared in bulk and then transported to the respective schools along with provisions of decentralised kitchens where meal is prepared on-site (Svenska, 2020). The main objective of school meal is to promote social and gender equality, tackle malnutrition, inculcate healthy eating habits among children, provide knowledge about health, nutrition, safety and hygiene to children and also to control obesity (Gullberg, 2006). Sweden SFP has undergone a huge transition from focusing on feeding poor children in the beginning to improvement in health and diet along with tackling obesity during the current time (National Food Administration, 2007). Nutritional guidelines for food are prepared by the National Food Administration which mandates inclusion of cooked main dish, skimmed milk, drinking water, and raw/cooked vegetables in the school meals served by Swedish government (National Food Administration, 2007). Sweden has prescribed standards for energy, fat, fibre, protein, vitamin C, folate and sodium in school meals of children (Bonsmann et al., 2014). Deserts, soft drinks and processed foods are not part of Swedish school meal policy. However, the schools have prescribed guidelines for vitamins and micronutrients, still vitamin D and fat makes only 51% and 41% of the diet which is far less than the prescribed standards. It depicts that requirements and standards are not strictly monitored and non-binding in Sweden (Lucas et al., 2017). Despite this, Swedish school meals are considered as considered as one of the healthiest and nutritionists school meals worldwide.

3.1.4. USA

Federal assisted National School Lunch Program (NSLP), 1946, is second largest child food assistance program in USA which provides low cost or free lunches to more than thirty one million students across 100,000 schools (Byker et al., 2014). Main objectives of the program are towards betterment of health and well-being of children, promoting local agriculture and farmers along with improving educational outcome of students. School meal is provided on the individual basis i.e., free of cost to poor and vulnerable children whose household income is less than or equal to 130% of poverty level while at subsidized prices to students from middle income families who have household income between 130-185% of poverty level and accounts for 17% of government expenses (Ralston et al., 2008). Initially, the program was introduced to overcome malnutrition and poverty but now the rationale for

NSLP has shifted more towards meeting the calorie target and controlling obesity and thereby, more fruits, vegetables and whole grains are included in diet. NSLP menu has provisions of vitamin A, calcium, magnesium, iron, sodium and phosphorus (Smith and Cunningham, 2014). Unsubsidized meals, lack of variety in menu options and diverse preference of students are few of the major challenges for reducing the participation rate of students for NSLP (Bhatia et al., 2011). Food and Nutrition Service of USDA implements NSLP at federal level while state agencies implement at state level (USDA, 2012). NSLP leads to increase in student participation rates in schools along with reducing the dropout rate, obesity and food insecurity of households (FRAC, 2020).

3.2. Middle income countries

3.2.1. Brazil

SFP named Programa Nacional de Alimentacao Escolar (PNAE) started in Brazil in 1945. PNAE was introduced for reduce undernutrition and increasing enrolment of children in school. Now the rationale of PNAE is more on bio psychological development of students along with increasing the knowledge of children about food, health and nutrition (Sidaner et al., 2013). SFP in Brazil is considered as the basic right of children who are enrolled in basic education. Diet related diseases such as overweight, anaemia, hypovitaminosis A, obesity, food insecurity and malnutrition are the most common occurring problems in Brazil. Incidences of overweight and obesity was quite high among children with 35% of children are overweight and 17% are obese in the age group of 5-9 years respectively. Along with it, 21% and 5% of adults in the age group of 10-19 years suffered from overweight and obesity (Planejamento et al., 2010). It is mainly attributed to their consumption of saturated fats and sugar while reduced consumption of fresh fruits and vegetables. Considering this, provisions of SFP are made within regulatory limits which incorporates restrictions on serving processed food, sugar, fats, saturated fats and soft drinks. The scheme has largely benefitted the family farming system by inclusion of local fruits and vegetables in the menu (Sidaner et al., 2013). This way, PNAE also resulted in reducing the intermediaries along with improvement in education, nutrition and national economy of Brazil (Campbell, 2007).

3.2.2. China

School lunch program started in 1987 in China with the objective to improve the health and physique along with combating malnutrition and anaemia among Chinese children and adolescents (Liu et al., 2016). Chinese children consume excessive amount of meat but insufficient amount of vegetables and dairy products that increases the risk of overweight and

obesity among them (Huang et al., 2017). Chinese SFP is third largest in the world and implemented by government which provides meal to 26 million students on daily basis (World Food Programme, 2013). Lack of essential nutrients, insufficient funding and human resources are the major challenges for SFP in China (Wang et al., 2020).

3.2.3. India

India's school feeding program is referred to as Mid-Day Meal scheme which was launched in 1995 with the objective of universalisation of elementary education by enhancing retention, enrolment, and attendance of students along with focus on improving the students' nutrition or eliminating classroom hunger (Afridi, 2005). MDM has been utilized as an opportunity by some states to deal with micronutrient deficiency and facilitating health intervention including mass deworming. MDM is considered as the largest feeding program worldwide as it provides cooked meal to over 120 million children (Khera, 2006). From 1995-2001, most of the states used to provide dry rations i.e., wheat and rice to the children on the basis of their attendance in school. However, the situation got changed after judicial order in 2001, which directed to provide cooked meal to the students in all the government aided schools with the minimum content of 300 kilo calories and 8-12 g of protein for minimum 200 days. On line of this, the guidelines were further revised by government of India with the objective to universalize the scheme by its full implementation in 20 states, 7 Union territories and partially in remaining eight states (Khera, 2006). As per the updated guidelines, children in primary schools need to be provided with 450 calories and 12 grams of protein; and children in upper primary schools with 700 calories and 20 grams of protein (Mathur, 2019). MDM has been quite effective in multiple other dimensions including inter-caste socialization, better school participation, enrolment of dalits and girl child in school, better learning outcome in students, providing employment along with increasing knowledge and awareness about hygiene among children (Drèze and Khera, 2017; Kaye and Lhungdim, 2018).

Table 3: Details about school feeding programs across different countries

Country Name	Name Of Scheme	Start Year	Out-Reach	Coverage	Implemented By	Target	Impacts	Challenges	Annual Cost Of Feeding/Child (Dollars)
High Income Countries									
Japan	School Lunch Program	1954	10 Million Children Every Day	Public And Private Schools	Government	Universal	Increased Awareness Among Child About Health And Nutrition; Better Quality Of Life; Reduction In Number Of Children Skipping Breakfast		799
Italy	Linee Di Indirizzo Nazionale Per La Ristorazione Scolastica		1.8 Million Children Every Day	Public And Private Schools	Government	Individual	Enhanced Learning Of Children About Health And Nutrition, Promotion Of Food Culture And Italian Diet, Increased Attainment Of Children In Schools	Sustainability Of School Feeding Program	1278
Sweden	Sweden School Feeding Program	1946	1.1 Million Students Every Day	Public And Private Schools	Government	Universal	Decrease In Obesity And Malnutrition Rate, Increase In Health And Nutritional Knowledge Of Children, Improved Attendance In Schools	Strict Enforcement Of Policies And Standards For Meals, Monitoring The Nutritional Content Of School Meals	535
Usa	National School Lunch Program	1946	31 Million Students Every Day	Public And Private Schools	Government	Individual	Better Health And Nutrition Of Children; Increased Enrolment In Schools	Less Student Participation, Unsubsidized Meals, Limited Menu Options, Student Preferences And Lunch Service Capacity	389

Country Name	Name Of Scheme	Start Year	Out-Reach	Coverage	Implemented By	Target	Impacts	Challenges	Annual Cost Of Feeding/Child (Dollars)
Middle-Income Countries									
Brazil	Programa Nacional De Alimentacao Escolar; Pnae	1954	45 Million Students Every Day	All Public And Community Schools In The Basic Education System, From Day Care, Kindergarten, Elementary School, High School	Government	Universal	Promotes Family Farming; Increased Food Quality And Availability; Elimination Of Intermediaries	Infrastructure Problems At The School Level, Compliance With Legislative Standards At The Implementation Level, And National Monitoring And Evaluation System Shortcomings	30
India	Mid Day Meal Scheme	1995	113 Million Children Every Day	Public Schools	Government	Universal	Improved Enrolment Of Children In Schools; Helped In Increasing The Employment Options, Women Employment	Insufficient And Delayed Receipt Of Funds, Infrastructural Challenges, Food Wastage, Ill Maintenance Of Hygiene And Sanitation, Poor Implementation Of Scheme	-
China		1987	26 Million Children Every Day		Government	Geographical	Improved Health And Nutritional Status Of Children, Combating Anaemia	Lack Of Essential Nutrients, Insufficient Funding And Human Resources	_

Country Name	Name Of Scheme	Start Year	Out-Reach	Coverage	Implemented By	Target	Impacts	Challenges	Annual Cost Of Feeding/Child (Dollars)
Low-Income Countries									
Tanzania	Primary School Feeding Program	2000	1.2 Million Students Every Day	Public Schools	World Food Program, Government	Geographically	Increased Enrolment Of Students In School; Improved Attention And Nutritional Outcomes	Poor Infrastructure And Cooking Facilities; Lack Of Funding; Unavailability Of Clean And Safe Water; Limited Awareness And Lack Of Government Participation	27
Somalia	School Feeding Program	2005	76000 Students Every Day	Public Schools	World Food Program	Geographically	Increase In Enrolment Of Children In Feeding Schools. Higher Completion And Retention Rate Of Students.	Infrastructural And Funding Issues	_
Kenya	Home-Grown School Meals Program	2009	2 Million Students Every Day	Public Schools	Government And World Food Program	Geographically	Enrolment Of Students In Schools Increased; Helped Local Farmers; Positive Impact On Economy	Infrastructural And Funding Issues	38
Mali		1962	0.3 Million Students Per Day	Public Schools	Government And World Food Program	Geographically	Increase In Enrolment Of Children In Schools	Infrastructural And Funding Issues	117

Target: Individual, geographic and universal are three modes of target by SFP across countries. When selection of children for providing school, meals is on the basis of their age, gender, or poverty then it is referred to as "Individually" targeted programs. "Geographically" targeted programs have provision of school meals to a few limited areas that suffer from low educational achievements, poverty and food insecurity. When school meal is provided to all the children irrespective of their age, gender, poverty, socio-economic status then it is referred to as "Universally" targeted program. Outreach: It refers to the coverage of program on everyday basis i.e., approximate number of children that are being benefitted by the scheme every day. Coverage: The Program covers private, public or both the school type. Implemented by: SFP are funded and implemented by government, world food program and private agencies.

Table 4: Immediate and long-term benefits of school feeding programs

	Immediate	Long-term
Low-income countries	Reduced drop out, increased enrolment and attendance in school, improved cognitive abilities, reduced drop-out rate, reduced gender inequalities, addressal of short-term hunger, improvement in energy and nutrient intake	Better literacy rate, poverty cycle broken, educated future generation, improvement in completion rate for school children, Future jobs
Middle-income countries	Increase in school enrolment and attendance, increasing employment opportunities, women empowerment, reduction in undernourished and malnourished children, addressing micronutrient deficiency	Decreasing social inequalities and gaps, promotion of gender equality, improvement in national economy and well-being of population, better quality of life, increased learning and human capital creation
High-income countries	Control of obesity and better health standards	Health and nutritional knowledge to children, healthy future generations and society, strengthening of health and nutritional network

3.3. Low-income countries

3.3.1. Tanzania

Most of the children in Tanzania do not go to school and work as a labourer in house or some factory due to their poor economic status. Hunger and low income of households prevent children from going to school which adversely affects their concentration in studies resulting in increased dropout rate. Thereby, school feeding program in Tanzania was introduced in the year 2000 to increase the enrolment and attendance of students in school (Oganga, 2013). SFP in Tanzania is implemented by the World Food Program (WFP) and government of Tanzania. However, the coverage of SFP is not universal and is limited only to a few geographies that are suffering due to hunger from past many years. SFP in Tanzania covers 6 lakh students in 1166 schools of 15 districts. Here, parents do not contribute towards SFP due to the poor economic status, thereby, entire funding for SFP is dependent on government and other donor organizations (Sanya, 2015). SFP in Tanzania has faced numerous challenges including lack of infrastructure like kitchen, dining, cooking facilities, cooks; lack of funds ad donor organizations; no budget for school feeding; clean and safe water; lack of participation from government leaders; and limited awareness of local population about SFP.

3.3.2. Somalia

Prolonged conflicts, war, floods, droughts, famine, economic collapse, mass displacement from last twenty years resulted in devastating effect on the Somalian population (Farah, 2014). Due to combined effect of these factors, Somalia has performed very poorly concerning health and education of children. Number of school going children is the lowest in Somalia. Concerning this, World Food Program initiated a school meal program in Somalia in the year 2005 with objective of increasing enrolment and attendance of children in school along with reducing the drop-out rate from schools. Owing to the efforts of WFP in Somalia, primary gross enrolment ratio of students increased to 41% in 2011 and 47% in 2012 along with significant improvement in retention rate (Omarm, 2019). Parents of children do not contribute towards SFP owing to their poor socio-economic status in the country. Somalia suffers from the lack of infrastructural facilities and adequate funding for running SFP.

3.3.3. Kenya

Objective of school feeding program in Kenya is to improve the overall literacy rate of population by increasing enrolment, attendance and retention of students in school. Due to lack of sufficient funds, the coverage of program is limited to only a few geographies which are food insecure and have low level of agricultural productivity. Funding for SFP is facilitated by government of Kenya along with parents in few of the regions. SFP is managed by the authorities at local, regional and district levels. Kenya lacks the food security and safety guidelines including handling, cooking, product quality and storage (USDA Foreign Agricultural Service, 2009). Despite this, Kenya has very strict procurement policies which limit the participation of farmer based organizations and traders in the SFP. National guidelines to implement SFP in Kenya strongly emphasize on stimulating the local economy by ensuring procurement from smallholder farmers (Aliyar et al., 2015).

3.3.4. Mali

20% of students in Mali do not go to school and thereby, main objective of SFP in Mali is to increase the school enrolment and attendance of children upto 100%. Government of Mali anticipates that community participation either in form of kind or cash is required to sustain the school feeding program in Mali. SFP in Mali aims to improve the income of local communities and smallholder farmers by buying their products to use for school meal (USDA Foreign Agricultural Service, 2009). However, poor households have low level of income and thereby, unable to contribute towards SFP. Here, government only contributes in providing oil

and sauce for food and expects donation of staple food i.e., rice, millet and sorghum from parents. SFP in Mali is run by government, parents and teachers where teachers themselves go and buy food from market. SFP is also limited to only a few geographies that are food insecure and have high level of illiteracy. No strict guidelines exist for implementation of SFP in Mali.

4. Discussion

Current review analyzed that the implementation, objectives and nutritional content of food is largely governed by the income of the country. Immediate and long-term benefits of school feeding programs across high, middle and low income countries are mentioned under Table-3.

Most of the high income countries have SFP from middle of twentieth century and thereby, they possess strong regulatory framework, strong institutionalization, well-established nutritional guidelines and thereby, targeting only education. Main provisions of SFP in high income countries is that free school meals are mainly meant for the children from vulnerable background while it is offered at subsidized cost to the children who are not at risk, which is also reported by Bundy et al., (2009). Outreach of SFP is lowest for the countries where the need is highest. For instance, most of the children have access to school meals in high and upper middle income countries while only to certain geographies in low income countries. For instance, only 18% children in low income countries such as Somalia, Tanzania, and Kenya received school meals in comparison to 49% in middle income countries. (Drake et al., 2017) estimated that 1.3 billion dollars of additional investment is needed to increase the program outreach in low-income countries at par with middle income countries which will incur 2-3% of global investment. In high income countries, cost is also recovered from income of well-to-do families in order to support feeding to vulnerable children, which is not the case with low-income countries. Thereby, high income countries do not face funding challenges as much as faced by the low and middle income countries. Middle income countries mainly focus on increasing the enrollment and improving the cognitive abilities of students. They mostly emphasize on extending the coverage of SFP to maximum number of children along with acquiring funding from different sources. Middle income countries also require additional funding from other sources to extend the coverage of scheme and also to enhance the nutritional content of meals. Middle income countries do not follow well-prescribed food standards i.e., the amount of energy, fat, protein, vitamin needed in the diet, instead, their main priority is to eradicate hidden hunger by last mile connectivity approach. We identified that the low-income countries mainly target undernutrition and malnutrition; middle income countries target hidden

hunger while high income countries target the issues of overweight and obesity. Take-home-ration and onsite feeding is combined in few SFP of these countries. Coverage of SFP in low-income countries is based on food insecurity and thereby, limited to only a few geographic regions such as areas that require more education. Take-home-ration is mainly for vulnerable children which comprises children that are affected by HIV (human immune-deficiency virus) and girls that lack in education due to gender inequality. These take-home-ration are associated with lesser administrative costs and provide higher value transfer and thereby, preferred over in-school meals in low-income countries. Comparatively, high income countries invest a lot on feeding one child which results in the better growth, cognitive abilities, and intellectual development of child. Mainly, these countries suffer from the challenges of sustainability of these practices along with strict enforcement of policies. Challenges for middle-income countries are related to infrastructural, hygiene, food safety and standards. Low-income countries mainly have funding as the major issue along with poor access to water, sanitation and hygiene. Teachers, parents and local authorities participate in high-income countries to provide health and nutritional information to the students while SFP in low-income countries is solely the responsibility of only a few members and lack any participation or cooperation from parents, staff and high level authorities.

5. Conclusions and learnings from each country

This section highlights the learning from each country which can be used by policy makers to improve the SFP in their respective countries and also in initiating a new school feeding program in the country where it has not started till now.

Japan's model of school feeding is most admired in the world due to its high priority on providing healthy and nutritious meals to students. Japan has minimal bureaucratic influences in regulation of school meal which is mainly designed with the help of nutritionists. School children set an example of equality by serving each other followed by cleaning their own plates after eating. Children are taught about importance of healthy meal and nutrition from a very young age which reduces the obesity rate along with increase in longevity. In Italy, nutrition and health knowledge is provided by teachers to the children and parents which led to effective changes in their dietary habits including hosting the birthday parties using home cooked meals. Provision of mid-morning snacks helps in regulating the diet and calorie intake of children which promotes the culture of healthy eating among the children. NSLP of USA has been effective towards reducing food insecurity, poor health and obesity but proved to be ineffective towards promoting health outcomes.

Largest school feeding program in the world is India's mid-day meal scheme which provides free meals to 113 million children every day. Indian school feeding program of Mid-Day Meal is one of the largest in the world and has improved the enrolment and attendance rate of children in schools. Mid-day meal (MDM) acts as a social safety net for children from low-income households and proved to be highly effective in improving the psychological, physical and social behaviour of children. The next largest are Brazil's national school feeding program which provides daily food to 43 million children and China's national nutritional improvement plan which provides daily meals to 33 million children (Liu, 2016). Brazils' school feeding policy of integrating local produce with school meals and nutritional education has proved to be quite successful in improving the child health and nutrition which can be adopted by other countries in their respective policies. As can be learnt from Brazil's example, government is a very important institution in shaping the school feeding programs due to its well defined procurement policies and involvement in supporting local farming and agricultural practices by doing bulk purchases.

Hunger, illness, malnutrition, undernutrition and increased dropout rate from school are very common among children in low-income countries which necessitates their focus on school feeding programs. Low income countries should particularly focus on inclusion of foods and vegetables in the school meals. Schemes should be driven towards respecting regional cultures, adopting local food habits along with addressing the specific nutritional needs of children. SFP in low-income countries are mainly dependent on external funding i.e., 83% of SFP in low-income countries receive funding from different organizations which is only 5% for middle-income countries whereas high and middle income countries arrange it from their own national budgets. Low-income countries lack any sustainable and effective way of implementing SFP. Thereby, the scenario of SFP in these countries can be improved by arranging national funding support, integrating school feeding into national policies, in particular, educational policies, and national capacity building along with proper implementation. Kenya school feeding program also helps in improving the income of local farmers by buying product directly from them which helps in stimulating local economy. Mali SFP teaches about coordination between government, parents and teachers in effective implementation of SFP. Here, teachers themselves go to market to buy the raw material for cooking the food for school meals. It also helps in stimulating the income of local communities and smallholder farmers.

Current review identified what's gone good vs. bad in school feeding models of different countries. Standards such as food nutrition quality, knowledge and awareness of parents,

expansion of scheme specially for lower income children to school meals should be improved. Smart lunchroom initiatives are needed to nudge students towards healthy eating habits, sanitization, discipline etc. Simultaneously, effort should also be diverged towards increasing attractiveness and normativeness of healthy foods. We identified a very few studies focusing on home environment and food preference of children that needs to be considered for increasing the effectiveness of these schemes. Despite having huge benefit of SFP, it cannot act as replacement for home food, instead, they are meant to be complementary to child's diet along with home food. The fine line of difference between substitution and complementary needs to be properly understood.

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