SUCCESS EVIDENCE REPORT OF SCHOOL FEEDING PROGRAMS

A SNAPSHOT

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Abstract

The report provides three case evidence on the success of the School Feeding Programme (SFP). Analysis of TAPF data; a comprehensive literature study of school feeding programs across different countries, and analysis of the DHS data of 12 lakh children was conducted at the TAPF@IISc lab.

Results point to the following -

a) *82% of the reviewed studies demonstrate positive impact on child health and nutrition by targeting micronutrient deficiencies that reduced the susceptibility of a child to infection. School meals provide sufficient calories and energy that help in dealing with iron deficiency resulting in reduced anaemia prevalence in child.*
b) *Regular consumption of MDM reduces the probability of a child being underweight and obese and increases the probability of being in the average weight and overweight category. Similarly, consumption of MDM increases the probability of being in average and taller height category.*
c) *Better diet significantly increases the probability of a child to move from being underweight to overweight, and from being small in height to being normal in height. Better diet also significantly increases the probability of a child to move from being poor in health to being healthier by significant reduction in fever, diarrhoea, and cough; and move from being anaemic to significant reduction in anaemia.*

1.0 Introduction

Globally, 821 million people are undernourished with 80% contribution from Africa and Asia (Webb et al., 2018). 150 million children under the age of five are stunted and 55% of them belong to Asia and 39% to Africa (WHO, 2018). 697 million people are severely food insecure and 40% of this food insecure population lives in Africa, more than half reside in Asia and 10% live in Europe, America and Oceania (Roser and Ritchie, 2013). Food insecurity is strongly linked to undernourishment, malnutrition and hunger. Undernutrition, malnutrition and short term hunger leads to impaired immunity, poor cognitive abilities (Worobey and Worobey, 1999), shorter attention span, reduces interests in any activity, and increases mortality rate , adversely affecting the economy (Broca and Stamoulis, 2003).

To address this problem, policy makers, national governments, and international organizations such as World Food Program of United Nations have introduced the food for education programs (FFE) in several countries across globe. Take-home ration (THR) and school feeding programs (SFP) are the main variants of the FFE programs. Cooked meals are provided in schools during SFP while dry ration is given to the children for their consumption at home during THR (Lawson, 2012). SFP is preferred over THR owing to its larger benefits in improving educational enrolment and nutritional status of a child. SFP provides nutritionally rich and contain additional nutrients such as vitamins, calcium, iron and other micronutrients which may not be available in the home food (Aurino et al., 2018).

In this report, we provide case evidence of the positive impact of the SFP program for children. Three type of analysis is demonstrated in the report.

a) A review of around 105 academic articles to evaluate the SFP across countries. Keywords for the search included “School feeding program”, “school meal”, “impact of school feeding programs’, “health status of children” and similar. Studies for children in the age of 2-16 years who got MDM were considered for review.
b) A regression analysis taking SD of height and weight, from a survey of 594 children carried out by the Akshaya Patra Foundation (TAPF) in Karnataka.
a) Data from the Demographic and Health Survey (DHS) to investigate the factors influencing the Nutritional Status of children in India. To measure the nutritional status of a child, the Dietary Diversity Score (DDS) was calculated as the main indicator of nutritional health.

Case Evidence 1

Review of feeding programs in various countries

Measures of SFP

Predominance of height and weight: The results of the reviewed studies indicate that height and weight for age are the most widely used measures for assessing outcome of school feeding programs. However, outcome of school feeding programs is also measured by checking anaemia, bone growth, haemoglobin levels, BMI for age, dietary diversity, food insecurity, overweight and obesity.

	Bone growth	Height for age	Weight for age	Overweight /obesity and BMI for age	Anaemia rate	Haemoglobin levels	Infections /diseases
No of studies	10%	30%	26%	10%	8%	: 8% of	10%

Outcome of school feeding program (summary) -

- 82% of the reviewed studies show positive impact on child health and nutrition by targeting micronutrient deficiencies that reduces the susceptibility of a child to infection.
- 5% identify negative impact while 13% report non-significant impact on health of child.
- School meals provide sufficient calories and energy that help in dealing with iron deficiency resulting in reduced anaemia prevalence in child (World Food Programme, 2020).
- School lunches contribute towards increased calcium and vitamin intake in the students who regularly take up the meals (Nozue et al., 2010). Japanese school meals have led to significant improvement in physical strength, health promotion alongside inculcating healthy dietary habits in school children (Toshiyuki et al., 2016).
- Indian Mid-Day Meal 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).

- **Height and weight impact studies**: While SFP results in positive impacts in most of the cases, negative and insignificant impact is also seen in some height and weight impact studies. 13% of the studies did not find any significant impact on height and weight of children. For instance, Buttenheim et al., 2011 conducted a study in Laos where they identified non-significant impact on stunting and underweight. Insignificant impact on stunting, wasting and underweight was found by Kazianga et al., 2009 on children in Burkina Faso. Muthayya (2009) also identified non-significant impact on underweight by his study in Bangalore, India. Van Stuijvenberg et al., (1999) also reported non-significant impact on stunting and underweight among children in South Africa. Wang et al., (2020) via their study in China reported insignificant effect of school meals on weight for age of children.

Case Evidence 2

Analysis of data from Akshaya Patra

A survey of 594 children carried out by the Akshaya Patra Foundation (TAPF) in Karnataka demonstrates the criticality of the meal for children coming from low income families. The results indicate that consumption of Mid-Day meal (MDM) is associated with healthy weight of children in comparison to the children who do not consume MDM on regular basis. The results are mentioned under Table-1.

Table-1: Logistic regression results for impact of MDM on height and weight of children

(** denotes significance at 95%)

Height	Regularly eat MDM	Weight	Regularly eat MDM
Severely stunted	0.070	Severely underweight	0.106
Stunted	0.086	Underweight	-0.028**
Average Height	0.007**	Average weight	0.003**
Tall	-0.168	Overweight	0.033
Taller	0.005**	Obese	-0.114**

Analysis of the impacts of midday meal on height and weight of the children was done by categorizing the weight into five types, namely, severely underweight, underweight, average weight, overweight and obese, along with categorizing the height into five types, namely, severely stunted, stunted, average height, tall, and very tall[1]. Multinomial logistic (MNL) regression was used to regress weight and height categories upon multiple independent variables including 'regular consumption of MDM'. Results show (Table 1) that regular consumption of MDM reduces the probability of a child being underweight and obese and increases the probability of being in the average weight and overweight category. Similarly,

[1] These five categories of weight and height represent the (Normal -2 standard deviation), (Normal -1 standard deviation), (Normal), (Normal +1 standard deviation), and (Normal +2 standard deviation) respectively.

consumption of MDM increases the probability of being in average height, and taller category (Table-1).

Overall, our research depicts the relevance and significance of MDM for better well-being of children manifesting as healthy weight and average height of children. Specifically, for low-income households, midday meals play a vital role in alleviating hunger, providing proper diet and improving the health and nutritional status of children.

Case Evidence 3

Analysis of Demographic and Health Survey (DHS)

Data from the Demographic and Health Survey (DHS) was utilized to investigate the factors influencing the Nutritional Status of children in India. The data set from the DHS includes information regarding child's household, maternal characteristics, socioeconomic, environmental, among others. We include 78 variables for 2.5 lakhs children from the DHS data set. The children were aged 2 years to 6 years.

To measure the nutritional status of a child, the Dietary Diversity Score (DDS) is calculated as the main indicator of nutritional health. Dietary Diversity is defined as the number of different foods or food groups consumed in the previous day. DDS was calculated by summing the number of times a unique food group was consumed during the last 24 hours. Food groups considered were cereals/roots, vegetables, fruits, legumes/lentils, meat/fish/egg and milk/dairy products. DSS takes into account the quantity of any food group eaten that day. The DDS ranges from 0 to 6.

Results are as follows -

Overall (Table 2)

- Better diet significantly increased the probability of the child to move from being underweight to overweight, and from being small in height to being normal in height.
- Better diet significantly increased the probability of the child to move from being poor in health to being healthier by significant reduction in fever, diarrhoea, and cough.
- Better diet significantly increased the probability of the child to move from being anaemic to significant reduction in anaemia.

Male versus female child (Table 3)

- Better diet has little impact on the height of the male and female child BUT has significant impact on the weight of the female child. The female child moves (a big shift) significantly from being under weight to being normal or overweight.

Low income versus high income (Table 4)

- Better diet increased the BMI of the children significantly.

Child with health problem versus without health problem (Table 5)

- Better diet increased the probability of the child with no health problems to move from being under weight to being normal and overweight.

Table 2: Overall Regression Analysis Results for DDS

Child's Anthropometric measurements Factors:				
	estimate	Std. error	Statistic	P. value
Height for age- 2 (Normal) Base Variable: Stunted	0.0053	0.0089	0.5975	0.5502
Weight for age- 2 (Overweight) Base Variable: Underweight	0.0963	0.0270	3.5652	0.0004
Weight for age- 3 (Normal) Base Variable: Underweight	0.0090	0.0097	0.9256	0.3546
Weight for height- 2 (Overweight) Base Variable: Wasted	-0.0268	0.0248	-1.0809	0.2797
Weight for height- 3 (Normal) Base Variable: Wasted	0.0251	0.0100	2.5073	0.0122
Child's Health Problems Factors:				
	estimate	std. error	statistic	p. value
Health problems- 1 (fever, diarrhoea, cough) (Yes)	-0.1581	0.0083	-19.1380	< 0.01
Child Anemia level- 2 (Moderate) Base Variable: Severe	-0.0564	0.0255	-2.2083	0.0272
Child Anemia level- 3 (Mild): Base Variable: Severe	-0.1028	0.0258	-3.9836	< 0.01
Child Anemia level- 4 (Not Anemic) Base Variable: Severe	-0.1662	0.0256	-6.4867	< 0.01

Table 3: Overall Regression Analysis Results for Male and Female Children

	MALE CHILDREN			**FEMALE CHILDREN**		
Child's Health Problems Factors:						
	Std. error	Statistic	P. value	Std. error	Statistic	P. value
Health problems (fever, diarrhoea, cough) (Yes)	0.0148	10.7427	< 0.01	0.0153	9.7564	< 0.01
Child's Anthropometric Measurements Factors:						
	Std. error	Statistic	P. value	Std. error	Statistic	P. value
Height for age- 2 (Normal) Base Variable: Stunted	0.0157	0.0473	0.9623	0.0163	0.7483	0.4543
Weight for age- 2 (Overweight) Base Variable: Underweight	0.0548	0.7085	0.4786	0.0576	2.6185	0.0088
Weight for age- 3 (Normal) Base Variable: Underweight	0.0171	0.2726	0.7851	0.0178	-0.0365	0.9709
Weight for height- 2 (Overweight) Base Variable: Wasted	0.0515	1.1664	0.2435	0.0537	-0.8666	0.3861
Weight for height- 3 (Normal) Base Variable: Wasted	0.0185	-1.4130	0.1576	0.0191	-0.4312	0.6663

Table 4: Overall Regression Analysis Results for Low Wealth and High Wealth Index DDS

	LOW WEALTH INDEX			HIGH WEALTH INDEX		
Child's Health Problems Factors:						
	Std. error	Statistic	P. value	Std. error	Statistic	P. value
Health problems- 1 (fever, diarrhoea, cough) (Yes)	0.0117	14.1517	< 0.01	0.0151	10.5226	< 0.01
Child's Anthropometric Measurements Factors:						
Independent variables	Std. error	Statistic	P. value	Std. error	Statistic	P. value
Child's height (cm)	-0.0119	0.4819	0.6298	0.0157	0.4407	0.6594
Child's weight (kg)	0.1117	-0.6652	0.5059	0.0496	0.3161	0.7519
Child's BMI	0.0026	3.8578	0.0100	0.0040	3.1358	0.0170

Table 5: Overall Regression Analysis Results for Children facing health problems and not facing health problems

	FACE HEALTH PROBLEMS			DO NOT FACE HEALTH PROBLEMS		
Child's Anthropometric Measurements Factors:						
	std. error	statistic	p. value	std. error	statistic	p. value
Height for age- 2 (Normal) Base Variable: Stunted	0.0242	0.1556	0.8764	0.0128	0.6143	0.5390
Weight for age- 2 (Overweight) Base Variable: Underweight	0.0843	0.7228	0.4698	0.0450	2.3204	0.0203
Weight for age- 3 (Normal) Base Variable: Underweight	0.0263	0.4719	0.6370	0.0140	-0.1120	0.9108
Weight for height- 2 (Overweight) Base Variable: Wasted	0.0788	-0.1112	0.9115	0.0421	0.2745	0.7837
Weight for height- 3 (Normal) Base Variable: Wasted	0.0282	-1.1251	0.2605	0.0151	-0.8924	0.3722