Food Provision in Schools in Low and Middle Income Countries: Developing an Evidenced Based Programme Framework

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Abstract

This paper aims to develop an evidence based rationale for school feeding programmes, exploring some of the trade-offs associated with the different modalities of food service provision in schools in terms of costs, benefits and the associated demand for food.

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Executive summary

Background: Access to primary education has improved significantly in many parts of the world. Yet challenges in school access remain, 75 million children of primary school-age, 44 percent of them in sub-Saharan Africa, are not in school and 55 percent of them are girls. Poor nutrition and health among schoolchildren contributes to the inefficiency of the educational system. School feeding is a very popular programme that has been used to support the education, health and nutrition of children living in vulnerable food-insecure areas. However, school feeding is a complex intervention and designing effective programs requires an evidence base that allows careful trade-offs among targeting approaches, feeding modalities, and costs. The near universality of school feeding, and the inadequacy of programs in low-income settings, suggest an important opportunity for development partners to assist governments in improving the implementation of school feeding. In particular, there is a need for the development of new technical guidance and knowledge management tools to support the design of school feeding programs.

Objectives: To develop an evidence based rationale for school feeding programmes, exploring some of the trade-offs associated with the different modalities of food service provision in schools, in terms of costs, benefits and the associated demand for food.

Approach: Review of the recent literature on the impacts and costs of school feeding to inform the development of the programme theory for school feeding following a standard programme evaluation approach.

Conclusions: The programme theory on the educational benefits of school feeding is generally well established and underpinned by an increasingly robust evidence base: School feeding programs can help to get children into school and help to keep them there, through enhancing enrolment and reducing absenteeism; and once the children are in school, the programs can contribute to their learning, through avoiding hunger and enhancing cognitive abilities. These effects may be potentiated by complementary actions, especially deworming and providing micronutrients. In practice, school feeding programmes are complex interventions with many different possible configurations, involving a broad range of activities by different stakeholders at different levels. Policy makers and implementers can benefit from careful examination of the context, and trade trade-offs associated with the different design options of school feeding. Building the evidence base on the agricultural and community level benefits of school feeding, as well as tackling the issue of cost-effectiveness and metrics, are important areas of ongoing and future research.

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Background and rationale

In the last decade, access to primary education has improved significantly in many parts of the world. Yet challenges in school access remain, 75 million children of primary school-age, 44 percent of them in sub-Saharan Africa, are not in school and 55 percent of them are girls (UNESCO, 2008). The burdens of hunger, malnutrition and ill-health on school-age children are major constraints in achieving the Education for All and the Millennium Development Goals (MDGs) on education (WFP, 2006). Poor nutrition and health among schoolchildren contributes to the inefficiency of the educational system (Pollitt, 1989). Children with diminished cognitive abilities naturally perform less well and are more likely to repeat grades and to drop out of school; they also enrol in school at a later age, if at all, and finish fewer years of schooling (Jukes et al., 2008). The irregular school attendance of malnourished and unhealthy children is one of the key factors in poor performance. Even short-term hunger, common in children who are not fed before going to school, can have an adverse effect on learning (Jacoby et al., 1998). Children who are hungry have more difficulty concentrating and performing complex tasks (Grantham-McGregor et al., 1998). In 2006, monitoring data from the World Food Programme (WFP) school feeding programmes showed that in newly-assisted schools 63 percent of pupils on average do not have any food before going to school (WFP, 2007).

The recent food, fuel and financial crises have highlighted the importance of school feeding programmes both as a social safety net for children living in poverty and food insecurity, and as part of national educational policies and plans. A joint analysis developed by the World Bank, WFP and the Partnership for Child Development (PCD) identified that every country (for which data was available) is in some way and at some scale seeking to provide food to its schoolchildren (Bundy et al., 2009). Countries with the greatest needs in terms of education, poverty and food insecurity, are those where the school feeding programs are currently least adequate. School feeding is a complex intervention and designing effective programs requires an evidence base that allows careful trade-offs among targeting approaches, feeding modalities, and costs. The near universality of school feeding, and the inadequacy of programs in low-income settings, suggest an important opportunity for development partners to assist governments in improving the implementation of school feeding as part of social protection programmes. In particular, “Rethinking School Feeding” identified the need for the development of new technical guidance and knowledge management tools to support the design of school feeding programs. Existing tools to assist the design of school feeding programs require updating in light of new findings and knowledge on the topic.

Objectives of this paper

The purpose of this paper is to build an evidence based framework to guide school feeding design and evaluation. The paper will explore some of the trade-offs associated with the different modalities of school feeding, in terms of costs, benefits and the associated demand for food. This work is part of a series of complementary papers being developed by PCD and partners to inform the development of the Home-Grown School Feeding (HGSF) programme theory.

This paper is structured as follows: we first review the recent literature on the impacts and costs of school feeding. We then develop some of the programme theory for school feeding following a standard programme evaluation approach (Rossi et al., 2005). The approach first sets out to describe the needs of the programme and the characteristics of the target population, and then develops some of the programme theory for school feeding, covering both impact and process dimensions. We then describe the some of the trade-offs involved in programme design and evaluation of school feeding, and then conclude.

Box 1. Millennium Development Goals and Education For All Goals for Basic Education

MDG's related to education include:

- Goal 2: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling (universal primary education).
- Goal 3: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015.

EFA goals include:

- Ensure that by 2015 all children, particularly girls, children in difficult circumstances, and those belonging to ethnic minorities, have access to and complete free and compulsory primary education of good quality.
- Ensure that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programmes.
- Eliminate gender disparities in primary and secondary education by 2005, and achieve gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality.
- Improve all aspects of the quality of education and ensure excellence of all so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills.

What is school feeding?

School feeding can be defined as the provision of food to children through schools. In general, school feeding programmes come in one of two basic modalities:

1. On-site meals or snacks are generally implemented to support access to education and enhance learning by reducing short-term hunger, and in the case of fortified foods by improving micronutrient status.
2. Take-home rations conditional to attendance are generally used to provide the incentive to support access to education, primarily through the income transfer effect.

In some contexts school feeding programmes combine on-site meals/snack programmes with an extra incentive from take-home rations targeting a specific group of vulnerable children[1] identified in the problem analysis (e.g. orphans, or older girls). By spreading the extra costs of the take-home rations across all the assisted population, benefits to targeted vulnerable groups can be achieved at relatively small additional cost.

Historically, on-site meals have been the most popular modality of school feeding interventions. There are four main options for on-site feeding: breakfast, mid-morning snack, lunch, and dinner (only for boarding schools). The timing and nature of the meal depends on the length of the school day, the local customs, availability of trained cooks and a kitchen, clean water and many other factors. In order to address short-term hunger and support learning in the classroom, the meals have to be provided early in the school day. Providing cooked meals on time is often challenging, as cooks must start their work very early, which is often rather impractical. Cooking food in school also involves considerable costs; it requires amongst other things, suitable water and sanitation, cooking facilities, cooks, stoves, firewood, pots, bowls and spoons…etc…

When facing considerable infrastructure constraints, as in the aftermath of a conflict or natural disaster, some school feeding programmes may choose to implement a school snack consisting of fortified, high-energy biscuits. This choice is aimed at delivering a basic school feeding service whilst minimising the associated school level costs (those that are usually borne by the community, which is generally not in a position to cover the costs over a long period of time). Biscuits are usually packed in individual packets that can be easily stored

[1] 28 percent of beneficiaries of WFP SF programmes in 2008 belonged to combined programmes. About 14 percent of these children received both on-site meals/snacks and take-home rations. Notably, the proportion of children receiving both modalities varied considerably from country to country, reflecting the targeted, context specific nature of the extra take-home rations assistance.

and distributed without to much effort on the part of the schooling authorities, and are therefore usually less disruptive to the school day than cooked lunches. In order to support learning in the classroom biscuits tend to be delivered as snacks early in the school day. school feeding programmes that use fortified biscuits potentially have another major advantage over conventional on-site feeding: a biscuit is regarded as a snack rather than a meal, and is therefore unlikely to replace meals given to the child at home. Furthermore, the biscuit is a compact source of nutrients (including different micronutrients) that is easy to store, easy to distribute, and needs no preparation. However, biscuits are not always the preferred choice of children, and may lead to unhealthy eating practices.

School feeding programmes providing take-home rations are more suitable to target individual students such as girls, and less complex to implement than conventional school meal programmes that require substantial investments both in terms of infrastructure and community inputs. For instance, take-home rations in the form of 4 litre vegetable oil cans are fairly easy to store and distribute, and take-home rations distributions take place only once per month or less, conditional on school attendance rates above a certain threshold, usually set at 80 percent. Take-home rations provide a direct, higher value income transfer to families than school meals, which can provide a strong incentive for increased school participation. From this perspective, each take-home rations provides an immediate, income based benefit, usually of the order of about 10-20 percent of monthly household income per child.

Reviewing the evidence on the impact and the cost of school feeding

In this section we review the recent literature in to summarise evidence of the benefits of the different modalities of school feeding. In this review, literature databases were searched to identify relevant studies on the physical and social benefits of providing school feeding to primary-school age children. In considering the type of outcome measures to assess, we adapted those chosen by a recent systematic review of school meals (Kristjannsson et al., 2007). Physical health outcomes included nutritional status (anthropometry, body mass index, micronutrient status, hemoglobin, and hematocrit) as well as the reduction of hunger and nutrient intake. Educational outcomes included school participation (including enrolment, attendance and drop-out) and school achievement (including intelligence test scores, psychomotor and mental development, attention, memory, reasoning, verbal fluency, vocabulary, on-task behaviour). Primary school age children were the primary subjects of all the studies we considered. The results of recent studies identified in the review are summarised below.

In northern Burkina Faso, a randomised control trial[2] (RCT) assessed the impacts of two alternative school feeding interventions, onsite meal and take-home rations, on enrolment, academic performance, cognitive development and pre-school children nutritional status (Kazianga et al., 2008). The study population consisted of children in 46 villages randomly assigned to three groups (onsite meals, take-home rations and controls) after a baseline survey was conducted in 2006. School feeding was then implemented in the following year in form of cooked lunches served each school day for the onsite meal group, whilst take-home rations consisted of 10kg of cereal flour were provided to girls conditional to 90 percent school attendance. 48 households selected at random were surveyed around each school, for a total study population of 4140 children aged between 6 and 15 years. Household data was collected on socio-economic status, as well as schooling outcomes and nutritional status for all children. Hemoglobin levels were collected for all children as well as women of reproductive age. Both onsite meals and take-home rations were found to increase enrolment by 6 percent. Though there was no difference in raw math scores, small increases in time-adjusted math scores were found for girls. The study found no impact on cognitive development. Students receiving onsite meals on average missed 0.7 days more than controls, whilst take-home ration beneficiaries missed 0.4 days more than controls, though differences were not significant. This surprising result was associated with constraints in the supply of household labour and the opportunity costs of schooling. For younger siblings of the student beneficiaries, take-home rations were found to have increased weight for age by

[2] See section below on impact evaluations for a brief description of randomised control trials.

0.38 standard deviations and weight for height by 0.33 standard deviations. Onsite meals had no significant impact on nutritional status of younger children.

A RCT set in Internally Displaced People (IDP) camps in Northern Uganda assessed the impact of alternative school feeding modalities, in this case school feeding and take-home rations (Alderman et al., 2010). The study used a prospective, cluster randomized, controlled field experiment carried out between 2005 and 2007, to provide causal estimates of program impact on primary school enrolment, school attendance, age at school entry, grade promotion, and progression to secondary school for a random sample of school-age children living in the service area of the schools. The nutritional benefits of the interventions were also examined (Adelman et al., 2008), assessing impacts on anthropometry and anaemia for primary-school age children. The experimental design was achieved by randomly assigning to three groups (onsite meals, take-home rations and controls) similarly-eligible IDP camps providing the catchment area for the assisted schools. The school feeding interventions were designed to provide food in equal amounts and of the same quality to children in both treatment groups. Two rounds of data were collected over a two year implementation period. Both school feeding interventions had a positive impacts on school participation, including enrolment for children not enrolled prior the introduction of school feeding, and on morning and afternoon attendance. Small effects on age at entry and reduction in grade repetition were also identified for both types of school feeding modalities, though no effects were found on progression to secondary school. Measures of anthropometry showed no positive impact of either program on nutritional status of primary school age children. However, large and statistically significant impacts were found on height for age of preschooler siblings of on-site meal beneficiaries.

One source of field-oriented lessons has come from the WFP standardized school feeding surveys, implemented since 2001, to provide a sound basis for monitoring, evaluation, management, and reporting of school feeding programmes. Findings from a meta-analysis of data from surveys in 32 countries in sub-Saharan Africa, covering over 4,000 WFP-assisted primary schools, indicated that school feeding programmes are associated with positive effects on enrolment (Gelli et al., 2007). In this analysis, schools were grouped according to the type and length of the program: those with existing programs, those that had had the program for less than 1 year, categorized as those with on-site meals or take-home rations, and those that had received no food yet and were going to initiate a program within the year (used as proxy controls). This study found that during the first year of school feeding assistance, absolute enrolment in WFP-assisted schools increased by 28 percent for girls and 22 percent for boys. After the first year, enrolment trends varied according to the type of school feeding programme that was in place. Where take-home rations for girls were

combined with on-site feeding for all pupils, the increase in girls' absolute enrolment was sustained at 30 percent even after the first year. In schools providing on-site feeding alone, changes in absolute enrolment after the first year reverted to those found in the year prior to school feeding implementation. The provision of take-home rations also appeared to reduce the dropout rate of female students, particularly in the higher primary school grades.

Evidence of benefits from on-site meals

A systematic review of school feeding (Kristjansson et al., 2007) including total of 8 studies in middle or low income countries assessed the impact of on-site meal programs on education and nutritional outcomes[3]. The meta-analysis identified small but significant improvements in attendance, cognition and nutritional status in students receiving on-site meals compared to students in control groups. RCTs showed statistically significant increases in attendance equivalent to 4 to 6 days over a 200 day school year. The effect was much greater but not statistically significant in the control before after studies[4] (CBAs). School feeding had a positive impact on math performance (effect size ~0.3 SDs in CBAs). Positive effects were also identified in short-term cognition, on-task and classroom behaviour. Significant effects were also identified in weight gain (0.25 kg per year in RCTs, 0.73 kg in CBAs) and height (0.25 cm per year in RCTs, 1.47 cm per year in CBAs).

In Jamaica, a RCT evaluated the impact of a school feeding program covering 814 school children (Powell et al., 1998). Equal number of children were assigned to receive breakfast (supplying 576-703 kcal) or a quarter of an orange (18 kcal) as a proxy for placebo within each school and class. Testers were blind to the subject's group, and both groups of children received the same attention throughout the trial. The children receiving school feeding showed small (~2 percent) but significant improvements in attendance. Significant benefits of receiving breakfast were also found in achievement in arithmetic, mainly in grades 2 and 3, but not in spelling or reading. Children in the treatment group also gained more weight and increased in height and Body Mass Index (BMI) significantly compared to the control group. On average, over the 8 month intervention period, compared to the control group, height increased in the treatment group by an additional 0.25 cm and weight increased by 0.4 kg.

A RCT of in Kenya (Vermeersch and Kremer, 2004) assessed the impact of school feeding on pre-schoolers. 25 schools were randomly selected from a pool of 50 to receive a school breakfast programme and both group of schools had similar characteristics prior to the introduction of the programme. The breakfast provided about 433 kcals to pupils aged

[3] The review did not cover enrolment or micronutrient status outcomes.

[4] See section below on impact evaluations for a brief description of control before after studies.

between 4-6 years. Individual level regressions that controlled for child and school level characteristics identified a increase in school participation of 8.5% in the treatment group compared to the control. School feeding also had a positive effect on test scores (~0.4 SDs) but only in schools where teachers was relatively experienced prior to the programme.

In Colombia, an observational longitudinal study examined the influence of a school snack on children's health and nutrition status in Bogota (Arsenault et al., 2009). The study population consisted of a random sample of 3202 children (from 3032 households) enrolled in public primary schools selected using a cluster sampling strategy. The clusters were defined as the primary school classes (grades 1-5) of the 361 schools in the capital city. Sampling units were the classrooms (n=8500) and 166 were randomly selected to reach the sample size. 38 schools were covered, and 25 of these were covered by the school feeding programme. The coverage of the school feeding programme was not randomised, and was first introduced in the poorer school districts. The study compared health and nutrition outcomes between children receiving school feeding and those who didn't. Micronutrient status outcomes included measures of iron, vitamin B-12 and folate. Growth outcomes included height for age and BMI scores using the 2007 WHO reference data. After adjusting for socio-economic status, the provision of school feeding was associated with improved vitamin B-12 status and linear growth, as well as decreased morbidity in the intervention group. School feeding was not associated with significant changes in haemoglobin, ferritin or folate.

An econometric study examined the effects of a wide range of determinants of school participation in rural northern India, focusing on school participation as a household decision (Drèze & Kingdon, 2001). The study analysed data from a PROBE survey collecting household data in 122 randomly-selected villages of Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh, and Himachal Pradesh. In each village, all school facilities were surveyed and a random sample of 12 households were interviewed. Amongst school quality determinants, it was found that female school participation was about 15 percentage points higher when the local school provided a mid-day meal (MDM). Mid-day meals also were found to be associated with improved girls' grade attainment; chances of completing primary education were 30 percentage points higher for girls living in a village with MDM. However, the MDM did not affect the enrolment of boys.

Evidence of benefits from fortified biscuits

The literature review identified a fairly limited number of studies on the impact of fortified biscuits. In total, five evaluations were found in the recent peer-reviewed literature, one set in Bangladesh (Ahmed, 2004), two in the Republic of South Africa (van Stuijvenberg et al., 2000, 2001), one in Chile (Walter et al., 1993) and one in Vietnam (Hall et al., 2007). The studies set in Chile and Vietnam however focus solely on nutritional outcomes (iron status in

Chile, and weight and height in Vietnam). Other than the peer-reviewed studies mentioned above, two field-oriented evaluations of WFP assisted school feeding programmes were found, one in India and the other in Indonesia.

In Bangladesh, IFPRI evaluated the impact of a school feeding program implemented by the Government of Bangladesh and WFP that covered approximately 1 million children at the time in a CBA study (Ahmed, 2004). The school feeding programme raised gross school enrolment rates by 14.2 percent (10 percent increase in net enrolment rates), reduced the probability of dropping out of school by 7.5 percent, and increased school attendance by about 1.3 days a month. The calories consumed from the biscuits were almost entirely (97 percent) additional to the child's normal diet. Average energy intake of participating students was 11 percent and 19 percent higher in rural and urban slum areas, respectively, than energy intake of primary school students in corresponding control groups. Participating students also appeared to share the biscuits with younger siblings and energy from the biscuits accounted for 7 percent of total energy intake of children aged two to five in beneficiary households in the rural area. The BMI of participating children increased by an average of 0.62 points, a 4.3 percent increase compared to the average BMI of schoolchildren in the control group. Participation in the school feeding program increased test scores by 15.7 percent points. Participating students performed particularly well in math tests. Based on budget figures, Ahmed found that the cost of providing biscuits was $18 USD per child per year.

The studies set in South Africa focused on identifying the short-term and long-term effects of the provision of fortified biscuits on the micro-nutrient status in primary school-age children (van Stuijvenberg et al., 2000, 2001). The study assessed micronutrient status in 115 children aged between 6 and 11 year's old before and after consumption of biscuits (fortified with iron, iodine, and b-carotene) for 43 weeks over a twelve month period. The control group consisted of 113 children receiving non-fortified biscuits. Cognitive function, growth, and morbidity were assessed as secondary outcomes. There was a significant improvement in serum retinol, serum ferritin, haemoglobin, transferrin saturation and urinary iodine during the first 12 months of the biscuit intervention. Fewer school days were missed in the intervention than in the control group because of diarrheal-related illnesses. However, when the school reopened after the summer holidays, all variables, except urinary iodine, returned to pre-intervention levels. Serum retinol increased again during the next 9 months, but was significantly lower in a subsequent cross-sectional survey carried out directly after the summer holidays; this pattern was repeated in two further cross-sectional surveys. Haemoglobin gradually deteriorated at each subsequent assessment, as did serum ferritin (apart from a slight increase at the 42-month assessment at the end of the school year).

In Chile, fortified biscuits were distributed as part of a national school lunch programme which served over 1 million children in 1993. An evaluation of this programme was conducted in order to identify the impact of biscuits fortified with bovine hemoglobin concentrate on school children's iron status (Walter et al., 1993). Significant differences in haemoglobin concentrations were found in the children from the intervention areas. Low serum ferritin values were also significantly more prevalent in the control group, this despite even the very low prevalence of anaemia in both the intervention and the control school groups.

An evaluation in southern Vietnam attempted to identify the effect of providing fortified milk and biscuits on school children's height and weight (Hall et al., 2007). The results showed a small but statistically significant difference between intervention and control groups in their average gain in weight and height after one year: 3.19 versus 2.95 kg and 8.15 versus 7.88 cm respectively. The programme effect was statistically significant after controlling for clustering of children in schools, sex, age and initial underweight. Notably, the most undernourished children benefited the least.

In India, WFP provided fortified biscuits to approximately 630,000 school children in the five states of Madhya Pradesh, Chhattisgarh, Orissa, Rajasthan and Uttaranchal. In India, the WFP programme was provided in parallel to the universal national mid-day meal (MDM) programme. The Institute of Applied Statistics and Development Studies was requested by WFP to evaluate the impact of the fortified biscuit programme in Chhattisgarh, Uttaranchal and in Madhya Pradesh. The results showed marked decreases in anaemia prevalence in all the three states and improvements in vitamin A deficiency in two out of the three states.

In Indonesia, WFP and the SEAMEO TROPMED Regional Center for Community Nutrition of the University of Indonesia evaluated the school feeding programme that started in 2004 (Lukito et al., 2006). Results showed no substantive significant improvement in anthropometric indicators. A significant improvement from baseline was found in haemoglobin concentration, resulting in significant decrease in anaemia prevalence (from 26% to 10%). Median cognitive performance expressed as the percentage of maximum test scores increased significantly for verbal fluency, visual processing and concentration.

Evidence of benefits from take-home rations

The literature review identified two studies on the impact of take-home rations, one in Bangladesh and the other in Pakistan. In Bangladesh, IFPRI and the World Bank evaluated the impact of a Government school feeding programme that covered over 2 million children in 2000 (Ahmed and Del Ninno, 2002). The enrolment in school feeding programme schools

was found to have increased by 35 percent over the two year period between the programme start and after its first year. This increase was driven by a 44 percent increase in girl's enrolment and by a 28 percent increase for boys. In non-programme schools enrolment increased by 2.5 percent (5.4 for girls and 0.1 for boys) during the same period. Attendance in school feeding assisted schools was found to be 12 points higher than in non-assisted schools (70 percent compared to 58 percent respectively). Drop-out rates were also found to be 9 points lower in school feeding assisted schools than in non-assisted schools (6 percent compared to 15 percent respectively). The overall programme costs were reported to be US$0.10 per child per day though no analysis of the costs was provided.

A WFP supported take-home ration programme for girls' education was launched in Pakistan in 1994 and gradually expanded to reach over half a million girl students living in four food-insecure provinces of the country. WFP evaluated the take-home rations programme in seven districts of the North West Frontier Province in CBA study, surveying all assisted schools and a random sample of non-assisted schools from the same districts (WFP, 2005). This study found that overall enrolment in assisted schools grew by 135 percent between 1998/99 and 2003/04, compared to a more modest 29 percent in control schools during the same period. There was a particularly strong increase in enrolment in the first grade of primary school: 211 percent in programme schools, compared to 5 percent in control schools. This suggested that the programme was particularly successful in supporting enrolment of girls who, until then, had never been enrolled. The programme also appeared to increase the awareness of the benefits of girls' education. Before the programme started, 48 percent of households did not send any of their daughters to school; now all parents were found to educate at least one daughter. While 38 percent of families reported that the food incentive was the only reason for sending their daughter to school, 29 percent reported that they would continue educating their daughters even if the programme was stopped. 27 percent of respondents reported that general hostility to girls' education in the community was no longer an issue.

Issues influencing the potential benefits of school feeding

In this section we review a number of issues have been identified in the literature that mediate the potential to achieve the full benefits of school feeding including food substitution, crowding of classrooms and teachers time spend in food preparation (Bennett, 2003).

Substitution and household reallocation of food

An important issue that affects the potential impact of school feeding involves the substitution effect, where children consume less at home when they benefit from a meal in school, therefore limiting the overall nutrient intake of participating students. The overall impact of household level reallocation depends on the context. If the children receiving the transfer

consume sufficient calories already, the reallocation may in fact allow the household to address the needs of younger siblings. If children benefitting from school feeding are malnourished, substitution within the household could reduce the potential health and nutrition benefits. The evidence on reallocation in households with beneficiaries of on-site feeding generally indicates that most of the calories provided by the programme “stick” with the beneficiaries (Jacoby, 2002. Ahmed, 2004). Interestingly, the evaluations of fortified biscuits in Bangladesh and Indonesia found that gains in nutritional intake were not limited to the children actually receiving the biscuits at school. The two studies found significant evidence that school children shared the biscuits with their younger sister or brother at home. The recent RCTs in Burkina Faso also found that THR programmes led to an improved of the nutritional status of younger siblings in beneficiary households. This provides emerging evidence of a spill-over effect and a window of opportunity to also affect children during a critical developmental stage when nutritional interventions can have the strongest impact.

Crowded classrooms

In the past, the increase in school enrolment due to school feeding programmes has been associated with crowded classrooms, which in turn may have an effect on learning. Programme experiences also highlight increases in pupil to classroom ratios, particularly in the first year of school feeding assistance. Over the years though, there is evidence that improvements in schooling infrastructure are being made by the assisted school communities to accommodate the extra children (WFP, 2007). One study examined this issue in particular using data from an evaluation of school feeding programme in Bangladesh (Ahmed and Arends-Kuenning, 2003). Classrooms in schools with school feeding had 22 percent more students than classrooms in schools without school feeding. In assisted schools, test scores were lower for beneficiaries of school feeding compared to non-beneficiaries. In schools without school feeding, average test scores were comparable to those of non-beneficiaries in assisted schools. Class size though was found to have no effect on test scores.

Other potential concerns for school feeding implementation

Field experience has highlighted the important trade-off in terms of teachers time in preparation and management of school feeding. In India, for example, a survey by the Centre for Equity studies undertaken in 2003, found that though teacher were not usually involved in cooking meals, they did spend time in organising and supervising the meal provision (Dreze and Goyal, 2003). In addition, the preparation of the cooked meals can be disruptive if the kitchen infrastructure is inadequate, resulting in meals being prepared very close to classrooms distracting the children during the lessons. One important factor that can address the issues around teacher’s time in food management is that of having a school feeding management committee composed of parents, teachers and pupils. Strong management

committees can ensure that teachers do not carry the entire burden of running the program. They can also ensure that children—especially girls—are not engaged in cooking, and that eating times are appropriately scheduled so they do not interfere with teaching. Having strong buy-in from the community, in the form of active school management committees can also improve the accountability and governance of the programme, strengthening the feedback loops between the beneficiaries, the implementing agencies and donors.

Evidence on the costs of school feeding

Generally, the costs of school feeding programmes will depend on several different factors, including the choice of modality, the composition and size of the ration, the caloric intake per day, the number of beneficiaries and school feeding days per year. Logistics, security and climatic conditions have an impact on programme expenditures. Remarkably, and despite its popularity as a programme, there is a dearth in the evidence of the costs of school feeding. A handful of field-based studies, mostly from WFP-assisted programmes provide the most recent information on school feeding programme costs. The studies from WFP programmes use practically identical methodologies, thus making comparisons between the findings more meaningful.

Costs of on-site meals

Estimating the full cost of on-site meal programmes is not always straightforward, as providing cooked meals in schools generally includes a range of school level costs that are normally not included within overall programme expenditures. A recent study (Galloway et al., 2008) estimated the full costs of on-site meal programmes by collecting data from school feeding programme implementers at all levels in 4 countries in Sub-Saharan Africa (Kenya, Malawi, Lesotho and The Gambia). Programme costs were standardised using a typical 200 feeding day school year, a 700kcals daily ration, and also adjusted for breaks in the food delivery pipeline. The costs of school feeding ranged from $28 USD to $63 USD per child per year (weighted average $40 per child per year). On average, commodity costs accounted for 59 percent of total expenditure. The contribution from local communities averaged at 5 percent of total cost (varying from 0 in Lesotho to 15 percent in Kenya), or about $2 USD per child per year on average. WFP costs accounted for 60 percent of total programme costs.

Another study covering *only* WFP project expenditures in 42 countries[5] (Gelli et al., 2009) found that in 19 countries providing on-site meals the average cost of the programme,

[5] 26 countries in Sub-Saharan Africa, 5 in Asia, 8 in Latin America and the Caribbean, 3 in Middle East and Central Asia. 19 countries SF programmes provided on-site meals, 3 provided fortified biscuits, 4 provided take-home rations, and 16 combined on-site and take-home rations.

standardised using the same parameters outlined above, was $20.40 USD per child per year. Regional variations in the costs were mostly due to the choice of school feeding modality[6]. Factoring in non-WFP costs, by assuming the same WFP/non-WFP share of full implementation costs as the Galloway et al. study, would imply total costs for on-site meals of approximately $50 USD on average per child per year.

Costs of fortified biscuits

Analyses of school level costs for biscuit programmes have generally found these fairly negligible, making cost estimations for this school feeding modality more straightforward. A recent full cost analysis of WFP assisted programmes in three countries[7] (Gelli et al., 2006) found that the weighted average standardised cost of providing fortified biscuits was $12.77 USD per child per year. The cost per beneficiary varied substantially from one country to another, ranging from $10.86 USD in Bangladesh to 17.59 USD in Indonesia. The cost of commodities accounted for an average of 81 percent of total project costs, about 22 points higher than for other cooked meals.

Costs of take-home rations

As for fortified biscuit programmes, costs at the school level for take-home rations programmes are generally negligible. An analysis of the full cost of the take-home rations programme in Pakistan (Ahmed et al., 2007) found that the full cost of implementing the programme, adjusted over breaks in the food pipeline, was $63 USD per child per year. Food costs accounted for 63 percent of total programme expenditure.

An analysis of only WFP costs (Gelli et al., 2009), covering four countries (China, Ghana, Pakistan and Yemen) found that the average cost of take-home rations was $52 USD. The higher costs for take-home rations compared to other modalities of school feeding were found to be mostly due to the larger volumes of food distributed to each child; in this data set, over a school year, take-home rations delivered approximately twice as much food per child compared to on-site meals. Moreover, the standardisation methodology used in this analysis might not always be appropriate for take-home rations programmes, where food is distributed conditional to attendance. Adjusting costs by planned tonnage over distributed tonnage is likely to overestimate costs for take-home rations.

[6] Notably, in Sub-Saharan Africa, no SF programmes at the time offered fortified biscuits.

[7] Bangladesh, India and Indonesia.

Cost-efficiency considerations

The choice of modality of food delivery in school has considerable implications, both from the programme objectives and costs perspectives. To date there is a dearth in the evidence on cost-effectiveness comparisons across the different modalities, this remains an important area of future research. However, there is some emerging data on cost-efficiency: On-site meals are approximately three times more costly than fortified biscuits: This is a very considerable overhead, particularly if we consider that most schools assisted by WFP are located in vulnerable, food-insecure areas and communities around the schools will generally have to bear these costs.

Table 1: Comparison of average cost per beneficiary, and per nutrient delivery for fortified biscuits and on-site meals (in $USD).

Modality	Standardised cost per beneficiary	Cost per 100 kcals delivered	Cost per mg of Iron delivered	Cost per 100 mcg of Vitamin A delivered	Cost per 100 mcg of Iodine delivered
On-Site[8]	40	11	9	19	130
Biscuits[9]	13	5	2	4	19

Furthermore, as shown in **Table 1**, biscuits are more cost-efficient in terms of energy and micronutrient delivery, making them an ideal choice in contexts where micronutrient deficiencies in school-age children are widespread and the infrastructure and resources for school meal programmes are constrained.

Only one other study was identified in the literature that analysed the costs of school feeding in different countries (Horton, 1992). In this analysis the cost of programmes providing food through schools standardised over 365 days and 1000 kilocalories varied from $19.35 to $208.59. Average costs by region ranged from $79 USD in Sub-Saharan Africa to $91 USD in Asia. In addition, only two other impact evaluations of school feeding programmes in Bangladesh included data on costs. The cost of the Government take home ration programme was reported to be US$0.10 per child per day (Ahmed and Del Ninno, 2002), though no analysis of the costs was provided. The fortified biscuit program costs were reported to be US$18 per child per year, covering 240 school days (Ahmed, 2004).

Cost drivers

There is very limited data on the cost drivers of school feeding programmes. In the WFP analyses, commodity costs were generally found to be the main cost drivers, with the food

[8] Data from Galloway et al., for school feeding in Kenya, Lesotho, Malawi and The Gambia.

[9] Data from Gelli et al., for school feeding in Bangladesh, India and Indonesia.

basket and ration nutritional content varying considerably from country to country. Because of in-kind donations to WFP, in several countries, commodities were used in the food basket that might have otherwise been replaced by foods procured on the market at lower prices. Landlocked countries such as the Central African Republic, Malawi and Mali, or countries with poor road networks to assisted areas such as Madagascar were found to face high transportation costs. This finding may reflect the nature of WFP programmes, where the bulk of the food is not generally purchased in close proximity to assisted schools which are generally found in food in-secure areas. From this perspective, food purchases in the vicinity of schools could be used to offset the transportation costs associated with traditional food-aid programmes. Often, logistics on difficult roads are compounded by volatile security situations, as in WFP assisted areas in Pakistan, Sudan, and Uganda, for example. Further analysis of cost drivers was limited in these studies by the aggregate nature of the cost categories in the data. Staff costs, for example, were aggregated alongside maintenance and other recurrent costs with the Direct Support Costs category. More in-depth country analysis will be required to determine specific cost drivers. The analysis of the costs of WFP school feeding programmes also suggested that the flexibility of the school feeding programme design is often limited by the in-kind donations to WFP, which also contribute to higher costs, and therefore lower the overall cost-efficiency of the programme. The benchmarks presented in this analysis reflect the centralised WFP implementation model that is not always relevant in terms of Government school feeding programmes, particularly those models procuring food in the communities surrounding assisted schools. Understanding the cost drivers associated with the different school feeding models remains an important area of future research.

Other school health and nutrition interventions

Addressing micro-nutrient deficiencies, in particular iron and iodine, has been shown to have a positive impact on learning (see Taras, 2005, for a review of studies on nutrition and school performance). Other school-health and nutrition interventions (see FRESH/Essential Package framework) have also been shown to have benefits on learning in the classroom, some for a fraction of the cost of school feeding. A key intervention in within FRESH/EP is helminth control, or deworming. School-age children typically have the highest intensity of worm infection of any age group (PCD, 2003). De-worming interventions have been shown to reduce the prevalence of anaemia and school absenteeism and contribute to the improvement of cognitive function in school age children (Grigorenko et al., 2006), all for a very modest investment of approximately $0.50 USD per child per year (Brooker et al., 2007). The cost per added year of schooling in deworming interventions was estimated to be approximately $3.50 USD per child per year (Miguel and Kremer, 2004). Iron deficiency

anaemia is thought to affect about 210 million school-age children worldwide, with prevalence of anaemia reaching approximately 40 percent amongst children in various parts of Asia and Africa. Research shows that children with iron deficiencies sufficient to cause anaemia are at a disadvantage academically, and their cognitive performance has been shown to improve with iron therapy. Iron supplementation, coupled with deworming, was found to increase per-school participation by 5.8 percent, at a cost of approximately $1.70 USD per child (Bobonis et al., 2008). Conditional cash transfer (CCT) programmes have been shown to have significant effect on pupils' education, health and nutrition (Rawlings and Rubio, 2005). In Progresa, the CCT programme in Mexico, the costs per added year of schooling were found to be over $4,000USD (Schultz, 2004). On the other hand CCT programmes have also been shown to have contributed to reducing inequality in three Latin American countries, through well targeted, large-scale social transfer programmes .

Developing the school feeding programme theory

"The problem with school feeding is that the impact is so context specific…" [10]

Understanding the context and needs for school feeding

The design of an effective school feeding intervention is to a large degree dependent on a thorough problem analysis of the educational and social context in a given country. An assessment of the education sector needs, gaps and priorities (as included for instance in education sector plans) undertaken in close collaboration with Government and partners is essential to understand the nature and the magnitude of the problem that can potentially be addressed by school feeding. The needs assessment should include an analysis of the main barriers to education, covering different levels of stakeholders ranging from individual children to communities and Ministry of Education resources. Data covering education, health, nutrition and other relevant vulnerability and food insecurity indicators should be examined to provide a detailed picture of the country situation, and where possible describe relevant in-country variations. Generally, educational indicators that are specifically relevant to school feeding include measures of access and retention (enrolment, attendance, drop-out …etc…) and student learning (completion, achievement …etc…). Nutrition and health indicators covering micronutrient deficiencies, intestinal parasites, as well as coverage of relevant nutritional and health services currently provided to school-age children should also be included, alongside a range of other socio-economic indicators covering poverty and food insecurity. As school feeding programmes often involve a wide spectrum of stakeholders and implementers at different levels, from national governments to civil society and NGO's, the assessment should also cover institutional arrangements and capacities with regards to feasibility and implementation.

An important part of the problem analysis involves describing the characteristics of the target population for the school feeding intervention. The risk of not accessing and/or completing primary school, a form of "educational vulnerability" anchored within a context of poverty and food insecurity, may be used to describe the common characteristic shared by the children targeted by school feeding. This idea reflects the reality that household choices regarding education are often a result of complex decision processes, where poverty and hunger play an important role in determining the schooling outcomes (Drèze and Kingdon, 2001). In practice, children do not participate in schooling for different reasons; at the household level, it is often a trade-off between the costs and benefits of schooling that determine whether a child will go to school or not. Costs are not only direct, like school fees for example: The

[10] School feeding impact evaluation expert, phone conversation.

opportunity cost of sending a child to school would mean foregoing the benefits of any work that the child could be doing instead of attending school. Often, the opportunity costs follow seasonal patterns, or increase with age, meaning that older children might need stronger incentives than younger children in order to stay in school. The opportunity costs of schooling may also be higher for girls- girls are often kept at home to look after siblings, help with other work, or simply for cultural reasons. Once in school, children may be too ill or hungry to benefit from the classroom activities. It is important to understand the drivers that keep vulnerable children (e.g. girls) from participating in school: It may be that food is not the appropriate solution to the problem- more women teachers, improved sanitation, parent's perceptions of education and many other reasons have all been found as possible determinants of schooling. The school feeding service utilisation plan, summarising programme flow is shown in Figure 1. The service utilisation plan can be used to highlight the extent to which school feeding can cover children in need. School feeding and other school level interventions will only benefit directly those children who are enrolled, or who will enrol, in assisted schools. In other words, if a child is excluded from schooling altogether, an alternative type of intervention should be considered in order to reach her. Furthermore, once a child has completed primary school, and will no longer benefit from school feeding, complementary services should be provided to further his development. Seen from this perspective, school feeding is one part of a social protection framework that would ideally follow a child from birth through to full educational development (Martinez, 2010).

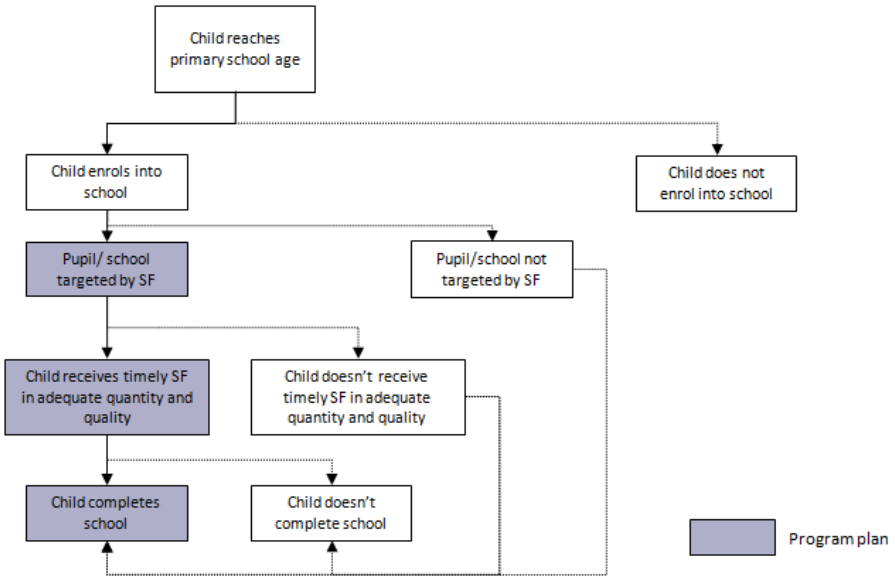

Figure 1: Service utilisation plan for school feeding

Targeting the school feeding programme

The choice of the targeting mechanism for school feeding is very important and has considerable implications on both programme costs and implementation; targeting though also poses important ethical, political and practical questions that often have no easy

answer. Generally, school feeding programmes can either target children individually or target schools (the school becomes the "distribution point" for all the children who are enrolled in it). In high and middle income countries free school meals are generally integrated within social protection programmes targeted to individual children on the basis of vulnerability and well-being proxies: Children not considered at risk would normally pay for the school feeding, though often at subsidised costs. The vast majority of school feeding programmes in Low Income Countries (LICs) tend to target children living in vulnerable, food insecure contexts (Bundy et al, 2009). Certain school feeding programmes combine both forms of targeting; offering on-site feeding to all pupils in a school in food insecure areas and also providing extra take-home rations to children identified more "at risk" than others (e.g. girls in areas with large gender disparities, or to orphans and other vulnerable children in areas of high HIV/AIDS prevalence).

Geographical targeting

Schools assisted by WFP school feeding programs are targeted on the basis of food insecurity and vulnerability analysis and mapping (VAM; VAM assessments analyse the causes of food insecurity and vulnerability among populations affected by conflict, natural disasters, or economic decline) as well as an analysis of the educational context in each country. Geographical targeting is usually undertaken in different stages covering multiple administrative levels, involving both primary and secondary data collection. The idea is to progressively profile regions on the basis of vulnerability, education and food insecurity. As the targeting becomes more detailed, vulnerability data is complemented by information that will affect implementation, such as security, accessibility of schools, coverage of complementary services and availability of partners (WFP, 2006). Urban areas are sometimes overlooked when poverty and food insecurity is assessed geographically (the lowest level of "geographical targeting" is usually done at district level) – where rural areas are often identified as generally worse off. However, increased urbanisation and the rapid growth of shanty towns surrounding many cities today, has led to urban areas with large populations living in extreme poverty. In such conditions, school feeding programmes can be introduced to support vulnerable children; moreover such programmes have been used to rally the community and private sector sponsors to support the assisted schools[11]. Targeting urban slums may also be an efficient way of covering large numbers of vulnerable children.

[11] This was the case of the WFP school feeding programme in the urban slums surrounding Nairobi, for example, which was entirely funded by local sponsors.

Once adequate target areas have been identified, the next stage in the process involves school level targeting. Schools in target areas are generally screened on the basis of implementation criteria, sometimes referred to as “minimum standards”. The standards are developed in collaboration with Government, implementing partners and civil society, and depend on the context and the details of the intended school feeding programme. However, schools that do not meet the standards may often be those serving the most vulnerable communities; this tension is often resolved by integrating the necessary support for infrastructure/capacity building as part of the school feeding programme implementation. Local communities can often be key agents of change, and have been successfully mobilised in support of assisted schools in deprived areas, as demonstrated by the CHILD programme in Ethiopia or in the slums surrounding Nairobi.

Individual targeting

Different forms of means and proxy means testing have been developed to target school feeding assistance to individual children, on the basis of vulnerability and well-being indicators. Targeting criteria are context dependent, and involve inputs from multiple stakeholders at different levels. The systems and data requirements for individual targeting are generally fairly resource intensive, and to date have generally been considered out of scope for most LICs. Individual targeting is being implemented in several national programmes, including Chile for example, that is considered a best practice in terms of school feeding design and implementation. In Chile, the targeting mechanisms has been evolving progressively over time, reflecting a deeper understanding of the drivers of poverty and educational exclusion. Schools are provided free school meal allocations on the basis on a vulnerability index built on socio-economic household data of first grade school children. Teachers are then asked to target the free meal allocations to the most vulnerable children in the classroom. Though targeting individual children on the basis of need can have considerable benefits form the point of view of cost-effectiveness, programme experience with individual targeting has also highlighted the issue of stigmatisation. In certain contexts, beneficiaries of targeted school feeding assistance have been marginalised or picked-on by other children not being assisted. Strong buy-in from the community is needed to ensure that the negative effects of individual targeting are minimised.

School level processes

The provision of different school feeding modalities involves a range of different school level activities. The choice of onsite meals, in sub-Saharan Africa is generally associated with in-school food storage and preparation. As well as having cooks trained to provide adequate meals, preparing food in schools involves providing fuel, pots, pans, dishes for the children and cooking utensils, for example. Ideally, cooks would be trained in hygiene and sanitation,

and the kitchen be equipped with fuel efficient stoves and chimneys as well as a source of potable water. A simplified breakdown of the main processes aimed at providing timely school feeding services of adequate quantity and quality to the targeted population is shown in Figure 2. Biscuits and take-home rations do not require preparation in schools and generally involve only storage, management and monitoring. At the school level, onsite meals are therefore resource intensive relative to other modalities, in terms of cash and in-kind contributions required for adequate service delivery This difference in complexity is usually reflected in the magnitude of the costs associated with delivering the alternative modalities at school level[12]. Though there is a dearth in the evidence on the benefits of school service provision at the community level, conceptually, school feeding service provision can direct financial resources in the school community through two main channels, funds for food procurement and funds for support services in terms of food management and preparation[13]. In terms of food preparation, emerging evidence suggests the potential for community development benefits but this remains another important area of future research[14].

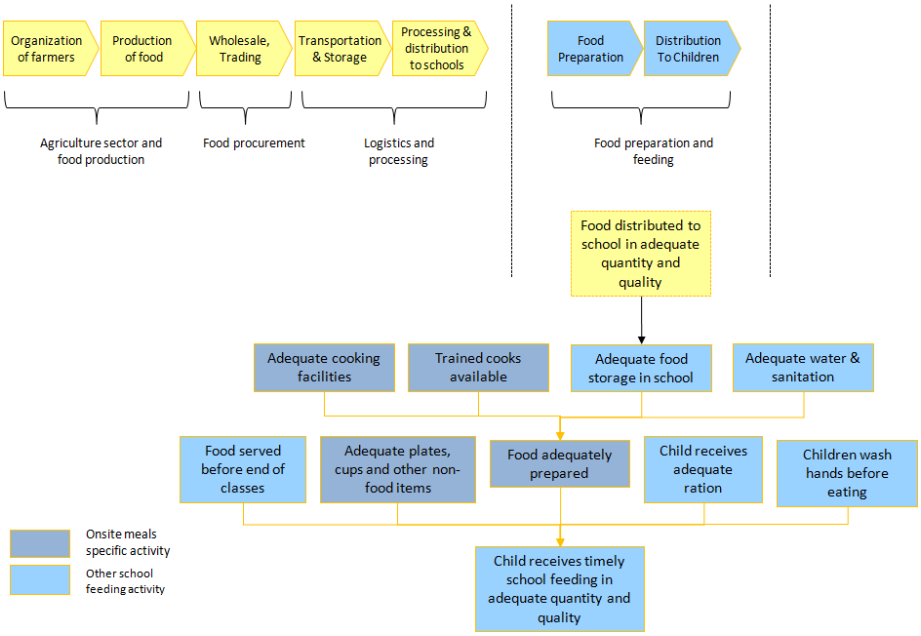

Figure 2: The last step in the supply chain: Simplified school feeding school level processes

[12] See preceding section on costs of school feeding.

[13] A detailed analysis on the food procurement dimension, and potential benefits to small-holder farmers is provided in a complementary paper (Sumberg and Sabates-Wheeler, 2010).

[14] See (Studdert et al., 2004) for an evaluation of community based school feeding in Indonesia.

Impact theory

School feeding programmes in low-income countries are generally aimed at achieving the Millennium Development Goals and Education For All Goals, framed within education sector strategies and plans. In food insecure contexts, household choices regarding education are often a result of complex decision processes where poverty and hunger play an important role in determining schooling outcomes (Drèze and Kingdon, 2001). In building a programme theory for school feeding from the educational perspective, an initial outcome that drives increased school participation is the incentive to households to send children to school. Generally, this incentive is achieved through an income transfer offsetting the financial and opportunity costs of schooling, and through an enhancement of the services provided at school. School feeding may also have an incentive effect on pupils actually wanting to go to school to receive food rather than staying at home and missing out. In theory, both of these effects will contribute to shift short-term household decisions towards increased schooling. The specific effect of the incentive will very much depend on the context in which school feeding is operating. Conceptually, the health and nutrition improvements from school feeding actually reinforce the impact on education. Addressing micronutrient deficiencies, in particular iron and iodine, has been shown to have a positive impact on learning, as has the systematic deworming of school-age children in areas of high prevalence of intestinal helminths (Jukes et al., 2008). Extending the school feeding programme theory to cover explicitly other nutritional benefits is an important area of ongoing work (Adelman et al., 2008). The income transfer incentive and the improved health and nutrition status resulting from school feeding service provision would then lead to improved access and learning outcomes. From the educational perspective, these outcomes would then lead to the long term goals of school feeding programmes as captured by the Millennium Development Goals and Education For All Goals. A basic logic model based on the evidence of the educational benefits of school feeding is presented in Table 2.

Table 2: A high level logical framework for fortified school feeding programmes[15]

			Outcomes		
Inputs	**Activities**	**Outputs**	Initial	Intermediate	Distant
Food provided to school	Food prepared or distributed in school as an early morning snack	Pupils eat snack/ lunch	Incentive for households to send pupils to school Incentive for pupils to go to school	Reduced absenteeism Reduced drop-out	Improved access, promotion and completion for primary school

[15] For take-home rations, the logic model would in theory not include the benefits from classroom short-term hunger relief and micronutrient components.

				Increased enrolment (reduced gender gap)	children (MDG 2 & 3, EFA)
			Improved energy intake in classroom (relieve short term hunger) Improved micronutrient status	Improved learning and cognition	

A proposed impact theory leading to educational goals for school feeding is summarised in Figure 3 for on-site feeding and/or snacks. The causal links are traced between inputs and the desired educational outcome of increased access, promotion and completion for primary school children.

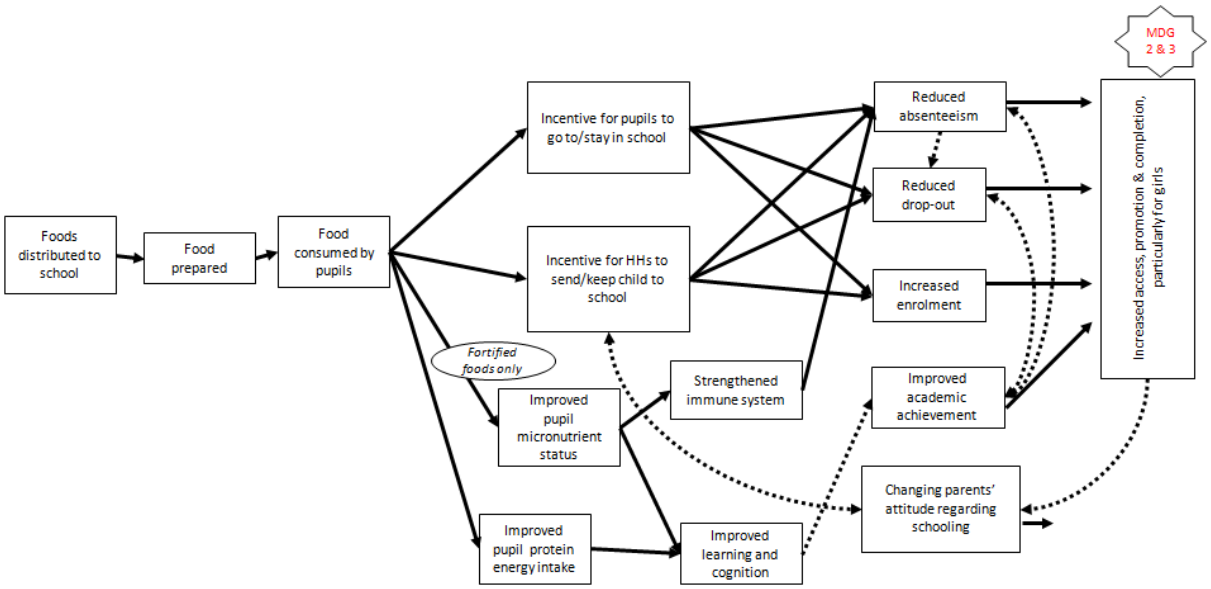

Figure 3: A model tracing school feeding impact pathways leading to educational goals

Impact evaluations

School feeding impact evaluations aim to measure the differences in the outcomes attributable to school feeding. This involves comparing the outcomes for beneficiaries of school feeding to the outcomes from a control group not receiving the intervention. To control for pre-programme characteristics in the beneficiary population, it is usually necessary to collect data before the school feeding intervention begins and after a period of implementation. As described in the review section of this paper and in other recent reviews of school feeding (Adelman et al., 2008) the impacts of school feeding in different contexts are quite heterogeneous. For example, the gender dimension is critical: School feeding has been shown to be particularly effective in supporting school participation of girls in rural areas with large gender disparities in access to education (Dreze and Kingdon, 2001). In addition, school feeding impact has also been found to vary with pupil age, as household schooling

decisions are also affected by the opportunity costs of education, that tend to increase with age and gender (Gelli et al., 2009). School feeding programmes have also been found to have interesting spillovers from the nutritional perspective. Younger siblings of school children have also been found to benefit in terms of food consumption as school feeding rations were shared by their older brothers and sisters (Ahmed, 2004 and Alderman et al., 2010).

In order to capture the different levels and types of impact, school feeding evaluations can follow a mixed method approach, meaning that both qualitative and quantitative data is collected. Instruments used in the evaluations would also generally collect information on context, programme and beneficiary characteristics to enable an analysis of the treatment effect within different groups of interest. Quantitative data is collected at household and school level (see Table 3). The pupil household instrument generally includes a household roster and questions exploring issues including the household socio-economic background and children school participation. Nutritional status can also be assessed for all children in the households and their mothers or primary female caretakers, including data collection on height and weight, and measure of haemoglobin status. The school survey will generally cover outcome and process dimensions, including educational indicators, particularly enrolment and attendance, as well as indicators exploring the issue of short-term hunger in the classroom. Though school level surveys are less complex and costly than household data collection, they are also limited in terms of the validity of the findings they can provide. For example, unlike at household level, at the school level it is very difficult to control for children moving schools- though they may appear as new enrolments in the school feeding schools, they may have in fact migrated from other schools that were not selected for assistance. Participative approaches can used to explore “softer” type changes within rural communities, involving farmer and women groups, small traders and food processors, as well as students, parents and teachers.

Table 3: Types of data collection (Adapted from Ahmed, 2004).

Type of data	Collection method
Community level infrastructure and facilities, provision of basic services, level of education, agriculture production and market prices	Community level survey
School level data on enrolment, attendance, drop-out, learning and completion, teachers qualifications and training, classrooms, sanitation, food management and preparation facilities, other school health and nutrition services, salaries and other costs of school feeding.	School level survey
Household data on demographic composition and gender, socio-economic status including occupation, level of education, food and non food expenditure, school enrolment, attendance and drop-out, cognition, health	Household level survey

and nutrition status (morbidity, anthropometric and micronutrient status measurements), dietary intake by 24-hour recall, participation in school feeding programme.

The gold standard for impact evaluations is the randomised control trial (RCT), where the experimental design is achieved by randomly assigning similarly eligible children communities to the intervention and control groups. Children randomly assigned to the control group can then be brought into the programme in subsequent years. Statistical tests are generally used to determine possible bias from household selection effects and sampling errors. This approach accounts for selection bias, or correlations between beneficiary status and impact variables, thus enabling a causal interpretation on “treatment” estimates. The main assumption here is that the outcomes of interest would have remained unchanged across the two groups in the absence of the HGSF programme. Econometric models are then used to control for fixed effects at the community or household level. In the past, random assignment to the school feeding programme, particularly in programmes operating in food insecure areas, has proven difficult to implement for logistical, ethical and political reasons. Insights on the educational benefits of school feeding can also be gained from programme evaluations of a more operational, and thus less rigorous, nature than randomised control trials. Though quasi-experimental design evaluations may still provide bias estimates of programme effect they provide the next best possible option when randomised design is not feasible. In quasi-experimental designs, school feeding beneficiaries are compared to non-randomly assigned controls that do not receive school feeding. The extent to which a quasi-experimental evaluation will result in unbiased estimates of programme impact will largely depend on how small the differences between the control and intervention groups are.

Conclusions

School feeding programmes are popular interventions designed to support the education of children living in poverty and food insecurity. In this paper we have sought to develop an evidence based rationale for school feeding programmes, exploring the links between food service provision in schools and the associated benefits and costs. We have seen that the programme theory on the educational benefits of school feeding is generally well established and underpinned by an increasingly robust evidence base: School feeding programs can help to get children into school and help to keep them there, through enhancing enrolment and reducing absenteeism; and once the children are in school, the programs can contribute to their learning, through avoiding hunger and enhancing cognitive abilities. These effects may be potentiated by complementary actions, especially deworming and providing micronutrients. In practice, school feeding programmes are complex interventions with many different possible configurations, involving a broad range of activities by different stakeholders at different levels. The benefits of school feeding programmes are also very context specific. Policy makers and implementers can benefit from careful examination of the trade trade-offs associated with the different design options of school feeding, analysing how school feeding can be cost-effective in terms of achieving its programme objectives.

Exploring some of the trade-offs of alternative school feeding designs

The design of the school feeding intervention has considerable implications across the supply chain in terms of specifying the quality and quantity of the demand for food from school feeding, including the following issues, for example:

- **School feeding modality**: the choice between biscuits, cooked meals and take-home rations.
- **Food ration specifications and daily menus**: in terms of quantity and nutritional composition (macro and micronutrients), as well as selection of foods produced in the communities surrounding the schools.
- **Feeding days**: covering every school day, or specifics periods in the school year (e.g. hunger season in areas of food insecurity), seasonality.
- **Targeting criteria**: geographic distribution of beneficiaries, for example selecting particular areas on the basis of food insecurity may limit the opportunities to link with agricultural production.
- **Scale of the school feeding coverage**: the number of children receiving school feeding assistance.

As described in the previous sections of this paper, the choices of specific design parameters involves important trade-offs in terms of costs, efficiency (with respect to outputs), effectiveness (with respect to outcomes) and equity.

Modelling costs, cost efficiency and food demand

These trade-offs can be illustrated more explicitly through some modelling that combines data from pilot data collection undertaken in a small sample of schools in Kenya and Ghana with some of the larger studies published in the literature (see Table 4). This particular example was developed for illustrative purposes only and requires validation from more rigorous empirical studies. In terms of schooling outcomes, as described in the literature review section of this paper, there is to date little evidence in terms of difference in size of the relative impacts of the different school feeding modalities and this remains an important area of future research. In terms of food quantity requirements, using data from WFP programmes in 72 countries in 2008, biscuit programmes delivered on average about one third of the food delivered by onsite meals, and approximately one ninth of the food delivered by take-home ration programmes (Cavallero et al., 2010). The same study reported average programme costs per child per year of US$ 25 for biscuit programmes, or half the cost found for onsite meals and one third of the costs found for take-home rations. According to the latest analysis, in terms of cost per nutrient output delivered to children in school (and not considering take-home rations), biscuits are nearly twice more cost-efficient than on-site meals in terms of the delivery of energy and protein content, and over three times more cost efficient in terms of micronutrient delivery (in particular iron, iodine and vitamin A).

Table 4: Modelling different school feeding design choices and trade-offs in shaping the demand for food[16]

	Biscuits	**Cooked meals**	**Take-home rations**
Outcomes (enrolment, attendance, drop out)	Evidence base suggests only small differences in *size* of relative impact on education outcomes		
Food quantity per child per year[17]	8 kg	25 kg	75 kg
Cost per child per year	$25	$50	$75
School level cost per child per year[18]	~$2.5	$6	~$2.5
Relative cost/protein or energy output	~0.5	1	NA
Relative cost/micronutrient output	~0.3	1	NA

School level costs are also considerably higher for onsite meals (of the order of US$ 6 per child per year) compared to biscuits and take-home rations. However, acoording to a small pilot study recently conducted in three countries[18], about 25 percent of the school level costs for onsite meals are spent on buying fresh fruit and vegetables produced within the

[16] These figures are for illustrative purposes only and this type of analysis will be included in the PCD HGSF programme.

[17] Based on analysis in 72 countries using 2008 data (Cavallero A. et al., 2010, in submission).

[18] Based on pilot study covering a small number of schools in Cote d'Ivoire, Ghana and Kenya.

communities neighbouring the assisted schools, providing clear income generating opportunities for smallholder farmers. Another 33 percent of the onsite cost at school level is spent on employment of cooks and other stakeholders within the school community.

Gaps in the evidence

The example presented in Table 4 highlights that though the choice of school feeding modality may not necessarily affect the effectiveness of the intervention in terms of educational outcomes, it could translate in sizeable differences in both costs and additional demand for food from the programme. Both costs and food demand issues have considerable consequences in terms of budget and sustainability, as well as potential to provide a sizeable additional demand on the agricultural market, or income generating opportunities in the school community. School feeding design options in essence shape the demand for agricultural production including food quantities, food types and nutritional composition, processing requirements and standards. Multiple other trade-offs are involved in managing the school feeding supply chain that are beyond the scope of this paper[19]. Providing decision support to policy makers and programme implementers on how to manage these important trade-offs remains a key item for future work.

Way forward

A number of recent reviews, including the ones presented above, have identified a growing evidence base on school feeding including a broad range of benefits that can be delivered to vulnerable school age children simultaneously across education, health and nutrition dimensions. Strengthening the evidence linking the outcomes to the design of school feeding interventions, the trade-offs between the different food baskets and implementation modalities and other nuances reflecting the complex nature of school feeding, remains an important area of future research. There is also no single metric that captures the cost-effectiveness of school feeding combining the different benefits making comparisons with other interventions incomplete. There is a dearth in the evidence on the costs of school feeding and the associated cost-efficiency and cost-effectiveness trade-offs implicit in the different choices of school feeding design. In addition, field level experiences from middle and high income countries suggest that school feeding may also benefit agriculture and community development. Building the evidence base on the agricultural benefits of school feeding, as well as tackling the issue of cost-effectiveness and metrics, are important areas of ongoing and future research.

[19] Analysing these other trade-offs is the focus of the ongoing HGSF work of PCD and partners (see Gelli et al., 2010).

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