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Does school breakfast make a difference? An evaluation of an in-school breakfast programme in South Africa

Tessa Hochfeld, Lauren Graham, Leila Patel, Jacqueline Moodley, Eleanor Ross*

Centre for Social Development in Africa, University of Johannesburg, PO Box 524 Auckland Park 2006, Johannesburg, South Africa

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ABSTRACT

This article describes an evaluation of an in-school breakfast feeding programme in Johannesburg, South Africa based on a public-private partnership. The purpose of the evaluation was to determine whether there were any changes in the anthropometric and school performance outcomes of children receiving the breakfast feeding programme. The evaluation included a three-phase approach to establish a baseline of learners in relation to performance and nutritional status; an interim phase; and final phase to ascertain any changes after the introduction of the breakfast programme. Triangulation of the anthropometric and qualitative research suggests that children benefitted from the public-private social investment scheme.

1. Introduction

Since the demise of apartheid and the introduction of a constitutional democracy in 1994, South Africa's political transformation has not been matched by social and economic transformation, with the majority of the country's residents continuing to live in poverty. Despite constitutional guarantees of children's rights to basic nutrition, Oxfam (2014) reported that one in four South Africans suffer hunger on a regular basis, while in 2010 two-thirds of South Africa's children continued to live below the poverty line (Hall and Wright, 2010). This article describes a unique school breakfast programme involving a partnership between government and the private sector in addressing child hunger, and investing in human capital development. We outline the benefits and the positive perception stakeholders have of the scheme. Although direct attribution cannot be made, the findings indicate positive trends that suggest the benefits of providing a school breakfast in addition to the nationally state provided school lunch, although further research is required.

1.1. Background to the study

Nutritional deprivation in childhood can have severe and long-lasting negative effects on the physical and intellectual development of children (Agüero et al., 2006). Hence school nutrition programmes are considered important social investments in child well-being that are likely to yield positive long-term benefits in the nutritional status of children and in improved school enrolment, attendance, achievement and in terms of other observable variables such as test scores; attention span; memory; and cognitive, psychomotor and mental development (Devereux and Sabates-Wheeler , 2011; Agüero et al., 2006; World Bank, 2006; World Food Programme, 2009; Bundy et al., 2009; World Health Organization, 2007; Bennett, 2003; Buhl, 2010).

School nutrition programmes not only reduce short-term hunger and allow for better micronutrient intake, they have also been shown to prevent stunting (Gelli, 2010: 8), and increase children's caloric and micronutrient intake (Adelman et al., 2008) which in turn increases weight gain and/or capacity for activity and improved learning (Briggs, 2008). School nutrition programmes also endeavour to break the intergenerational cycle of child vulnerability due to poverty and income inequality (Devereaux and Sabates-Wheeler, 2011). As such they represent important social investments in the early years of a child's life (Patel, 2015).

Approximately 66 million primary school age children go to school hungry in the developing world, and 23 million of these children are located in Africa (World Food Programme, 2011). The consequences of undernourishment include low school performance, low attendance, increased risk of exiting school early (Bennett, 2003) and negative health outcomes related to nutrient deficiencies. Investments in nutrition at the school level are therefore likely to have positive and multiplier effects in the life of a child.

* Corresponding author.
E-mail addresses: tessah@uj.ac.za (T. Hochfeld), lgraham@uj.ac.za (L. Graham), lpatel@uj.ac.za (L. Patel), jmoodley@uj.ac.za (J. Moodley), eross@uj.ac.za (E. Ross).

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Hunger and malnutrition are key factors that not only affect children's immediate health and development over the long term but also hinder their ability to benefit from educational opportunities. It is well known that hunger impairs children's ability to concentrate in class and therefore perform complex tasks (Faber and Wenhold, 2007; Grantham-McGregor in Gelli, 2010; Buhl, undated). In addition, micronutrient deprivation, also known as 'hidden hunger' because the symptoms do not manifest themselves physically, makes children more vulnerable to infectious diseases, harms normal physical and mental development and can result in disability and even premature death (Jamieson et al., 2011; Gelli, 2010; Adelman et al., 2008). Micronutrient deprivation also effectively reduces children's cognitive abilities (Gelli, 2010). Children in these circumstances have significant attention deficits, distractibility and energy depletion (Richter et al., 1997) and are thus more likely to underperform, attend school irregularly, enrol late and/or drop out of school (Faber and Wenhold, 2007). The consequences of poor educational performance mean hunger also imposes a burden on the developing world by reducing people's productive capacity.

School feeding programmes therefore act both as a social safety net that assists impoverished children and a means to help children to access and stay in school and perform better. Their underlying principle is that they attract children to school by providing nutritious meals in exchange for school participation.

1.2. Nutrition in South Africa

While South Africa is food secure at a national level, profound inequality within the country means that many South Africans remain food insecure (Buhl, 2010). For example, there is notable inequity in access to nutrition between rural and urban populations with 26.5% of South African children in rural areas being stunted compared to 16.7% in urban areas (Labadarios et al., 2000). There is inequity in access to nutrition between and within population groups, and there is a clear link between poverty and stunted or underweight people in South Africa, as well as evidence of various micronutrient deficiencies (Vorster, 2010).

Further, there is a co-existence of under-nutrition and obesity in households and, as a result, a prevalence of diseases related to both under-nutrition and obesity exists (Bradshaw et al., 2006). The seeming contradiction is attributed to low-quality staple foods consumed by poor households, primarily a maize-based diet that is inadequate in energy and nutrients (Faber and Wenhold, 2007). In addition, research suggests a relationship between chronic early malnutrition and later obesity, especially amongst black women (Vorster, 2010).

1.3. The benefits of school feeding programmes

Among the benefits of school feeding programmes is that, firstly, they impact positively on the physical health of school going children by improving their nutritional status, reducing short-term hunger and allowing for better nutrient intake (Gelli, 2010). Secondly, school feeding also increases calorie consumption, which benefits children who are undernourished through weight gain and/or increased capacity for activity (Adelman et al., 2008). A study in Bangladesh on the introduction of a fortified snack in schools showed an increase in Body Mass Index (BMI), linked to increased energy consumption as compared to control schools (Ahmed, 2004). Increased calorie consumption at school can however also lead to increases in obesity as was the case in Chile (McEwan, 2013) where the school feeding programme was not adjusted when household income levels rose, facilitating better consumption at home for children. Finally, micronutrient fortification of foods has been linked to improved learning capacity (Briggs, 2008). The Bangladesh study (Ahmed, 2004) showed that children in treatment schools had lower dropout rates, increased school attendance and better performance in math test scores. Micronutrient fortification is also cost effective in relation to the impact it has on children.

1.4. School nutrition in South Africa

In South Africa, a publicly funded National School Nutrition Programme (NSNP) addresses the link between nutrition and education. It also forms part of a social investment policy designed to yield long-term positive social and human capital returns (Patel, 2015). The NSNP provides one meal per school day to 8.8 million primary and secondary school children across the country (Department of Basic Education, 2014). Regulations stipulate that this meal should consist of a starch, protein, and a fruit or vegetable serving; standard menus and preparation guidelines are provided.

The programme focuses on learners in the poorest three fifths of all state schools. In South Africa in the school setting it is common to see children from poor families arriving in class without having eaten since the previous day (Richter et al., 1997). Even when food is available, it is frequently of a poor nutritional quality (Faber and Benadé, 1999), and in South Africa, nutritional deficits play a significant role in poor school attendance and punctuality, as well as poor school performance (Napier et al., 2009).

The NSNP targets all learners in a school, instead of only selecting the poorest ones, thereby avoiding stigmatisation. Despite the national expansion of the scheme and other social protection mechanisms, child hunger still remains a significant problem due to high rates of unemployment and poverty (Hall and Wright, 2011).

While the NSNP evaluates its performance in terms of the number of learners provided with meals, the number of schools served, and the functioning of the programme, it does not provide any information on the impact of the NSNP on the nutritional status of children and on school performance.

1.5. ***A*** *private in-school breakfast programme*

In order to scale up the impact of school nutrition provision in the country, a private non-profit Foundation initiated and implemented an in-school breakfast programme as part of a Corporate Social Investment (CSI) strategy to fill the current gap in the government nutrition programme, which can only provide one meal a day to learners. The breakfast consists of a fortified cooked porridge daily, with one of 5 different porridge types served each weekday morning. As the variously oats, maize, wheat, and sorghum based porridges are all fortified with essential vitamins and minerals, it is suitable for children who are under-weight as well as those who are over-weight or obese, as both conditions have been linked to poor nutrient intake. In South Africa many obese children are fed a predominantly starch-based diet of maize meal which is a staple food in the country but lacks the necessary micronutrients needed for healthy growth and development (Bradshaw et al., 2006). Besides the provision of a nutritious breakfast, the programme also supports the installation or upgrading of kitchen facilities, nutrition education, skills and community development as well as job creation.

In July 2011, the Foundation launched its pilot in-school breakfast programme in six schools (five primary and one combined school) in Alexandra, Johannesburg. This community is located in one of the poorest areas in Johannesburg with 70% of households being moderately or severely food insecure (De Wet et al., 2008).

This article reports on the evaluation of the pilot programme. It was felt that the evaluation could play an important role in decisions around expanding, adapting or reproducing the programme in other areas nationally and assessing whether this public-private nutrition scheme was an effective way to contribute to reducing the negative impacts of poverty and deprivation on children and investing in their long-term social well-being.

2. Design and methods

2.1. Research aim

The overall aim of the research was to evaluate the anthropometric and school performance outcomes for children receiving the school breakfast programme in the six pilot schools in Alexandra during the first year of its implementation. The specific variables measured were the anthropometric status of the learners and learner performance.

2.2. Research design

Our intention was to assess any changes in the anthropometric and school performance outcomes for children receiving the Foundation's school nutrition programme. A true experimental design using a control group was not possible due to practical, logistical and ethical reasons. Firstly, as the programme was a CSI initiative, it did not at the start have a research agenda. Secondly, from an ethical point of view, if the programme was found to be successful we would have had an ethical responsibility to roll out the programme to control group schools. This was not possible as the Foundation had budget limitations. It was therefore deemed ethically problematic to involve a control group. Therefore a pre- and post-test design was chosen (De Vos, 2002). This sought to track the changes in the measured outcomes across time. Nonetheless this design means changes cannot be attributed to the presence of the breakfast programme.

2.3. Evaluation methodology

2.3.1. Anthropometric measurements

Anthropometric measurement is the measurement of weight and height. This measurement was chosen as an indicator of change as it is considered an objective assessment of whether children fall within the normal growth range for their age. Each child's Body Mass Index (BMI), derived from anthropometric measurements, signifies physical growth relative to normal ranges, which in turn indicates levels of stunting, wasting, or overweight for the child. This is a globally accepted indicator for a child's nutritional status (World Health Organization, 2007).

In this study standard anthropometric procedures were followed. Thus all subjects were weighed twice at each of three measurement points in light clothes without shoes on a portable digital electronic calibrated scale to ensure that the measurements were accurate. Height was measured with an upright stadiometer placed against a perpendicular wall at the pilot schools.

The 2007 WHO references for growth standards of children aged five to 19 years were used for statistical analyses of the anthropometric indicators. Results were calculated according to the WHO growth standard in terms of height-for-age and weight-for-height (BMI).

2.3.2. School performance

Grade data for sampled learners were collected using end-of-term school records from the six pilot schools. Grade averages were calculated and differences between first and last school term averages were assessed.

2.3.3. Qualitative research

Individual interviews and focus groups were held with key stakeholders in the pilot breakfast programme to determine other potential outcomes related to the programme, as well as any challenges that the schools faced with regard to the breakfast programme. Focus groups were also held with Grade 6 learners at two of the pilot schools to determine the experience of primary 'users' of the scheme, i.e. the learners.

2.4. Research site: Alexandra

Alexandra is a historically under-developed area, designated for people of African descent during apartheid, in which widespread poverty, inequality and socio-economic deprivation is still prevalent. The township is characterised by high population density and growth rates, high levels of unemployment, a predominantly youthful population, low levels of education and low monthly household incomes (Mathee et al., 1999: 2). Over-crowding and lack of access to sanitation, water and proper housing impact heavily on the well-being of residents (Murray, 2009). Interviews with school stakeholders confirmed that most children come from single-headed households where schools have to supply the most basic necessities including uniforms and food; and many children attend school without having been fed.

2.5. Sampling

The evaluation used stratified random sampling for the quantitative components of the study. The population of each school was roughly similar (approximately 1100 learners each); with a total combined population of 6656 learners. It is important to note that the *entire* population of learners received the school breakfast intervention and not just those selected for the study. In addition, all primary school learners at the poorest schools nationwide have been receiving a state-provided lunch since the start of their school entry year. This includes the schools in this study.

At the start of the evaluation, principals from the six pilot schools in Alexandra provided researchers with class lists of each grade in their school. These lists were used to randomly select learners that would participate in the sample for the research and as substitutes in proportion to grade sizes.

The sample was calculated in two steps. First, a sample was drawn from each school that would allow a confidence level of 95%, and a margin of error of 5%. Given the difficulty of tracking learners over the period of a year because of environmental factors, we doubled the required sample size to include an equal number of substitutes in the baseline measurements, so that in cases where learners did not continue at a school or were absent on the day of measurement, the correct sample size could be maintained. A total of 1975 learners were selected for measurement at the baseline. At the final anthropometric measurement stage, the number of learners who were measured was 857 across all schools (13% of the total population), due to the attrition rate of a time-lapse measurement design. Our analysis reports *only* the children who were measured at *all three* stages; that is, in this article we report on only these 857 children across all stages.

The actual number of learners measured in the analysis of school performance was 1 330, 20% of the overall school population. We report on the whole sample and not just the 857 learners measured anthropometrically.

The children in the anthropometric sample ranged from 6 to 17 years of age with a median age of 10 years. 52% of the sample were female. As Alexandra is an area of Johannesburg historically reserved only for people of African descent, the ethnicity of the population of learners is entirely black African. The area is socio-

economically disadvantaged and so the learner population is largely poor.

2.6. Data collection

Data were collected in a phased approach over ten months. Sampled learners' average grades for the 2011 academic year (terms one to four) were drawn from school records. As substantial numbers of performance records were missing, it was not possible to compare data between different years, but only between term one (prior to the breakfast roll out) and term four of 2011 (after the breakfast roll out).

Anthropometric data collection took place in October 2011, March 2012, and August 2012. The nutrition programme was launched at the end of July 2011, and the first data measurement took place in early October 2011. The reason for the delay in collecting baseline data was that the decision by the state-run National School Nutrition Programme and the Foundation to evaluate the breakfast programme came very late, and thus official permission for the research from the Department of Basic Education, was granted only after the launch of the pilot breakfast programme. Therefore the first anthropometric measurements of learners were conducted directly after a weeklong school holiday reflecting as closely as possible the BMI of learners without access to a school breakfast programme. These data have been used as a proxy for the baseline data. Interim anthropometric data collection took place five months after the collection of baseline data, March 2012, and was timed for just prior to the three week April vacation period to ensure that it reflected children's nutritional status while benefitting from the breakfast pilot. The final phase of quantitative data collection took place in August 2012, and coincided with the end of the pilot phase of the project.

Between June and August 2012 qualitative data based on interviews and focus groups with principals, the Director of the Foundation breakfast programme, educators and Grade 6 learners were conducted. The focus group discussions included asking learners to recall their nutritional intake over the last 48 h. Owing to documented limitations in recall for younger learners (Livingstone et al., 2004; Baranowski and Domel, 1994), it was decided to run focus groups for grade 6 learners only (we were aware that grade 7 learners are under academic pressure as it is their final year of primary school). Other areas covered by these focus groups included: basic nutritional literacy ('good food' versus 'bad food'), their perception of the value of the breakfast programme, their subjective comparison of pre and post breakfast programme experiences, and food culture at school and at home. Learners were also asked to represent some of these issues graphically through drawing.

2.7. Data analysis

2.7.1. Anthropometric data

Results were compared across the three phases of the research and across each of the schools. Data were analysed using IBMM SPSS Statistics. The WHO growth standards for boys and girls aged five to 19 years (http://www.who.int/growthref/en/) were used to analyse the data. The growth standards used included height-for-age, weight-for-age and BMI-for-age. From the onset of puberty, BMI standards are a more accurate measure of excess weight than weight-for-age standards due to the rapid growth in height that young people experience during this period. As a result, we used BMI-for-age to assess the number of overweight children in the sample.

Height and weight measurements were classified according to height-for-age to determine if the children were stunted (≤ -2SD from median or low weight for height), BMI to find out whether the children were wasted (≤ -2SD from median indicating acute malnutrition or weight loss) and to determine whether the children were overweight ($\geq +1$SD from median). For example, the WHO standards indicate that at the age of 6 1/2 years (midway between the ages of 6 and 7 years), the median measurement for girls is 15.3 kg/m^2. In order to be considered within the normal growth range, a 6 year old girl's BMI should fall between 12.7 kg/m^2 (-2 SD from the median) and 17.1 kg/m^2 (+1SD from the median). If she falls BELOW the minimum BMI of 12.7, then she is considered wasted, and if she falls ABOVE the maximum BMI of 17.1, then she is considered overweight. The Wilcoxon Signed Ranks Test was used as a test of significance of the results.

2.7.2. School performance data

Quantitative data were analysed using SPSS, which generated descriptive statistics in averages and frequencies.

It was anticipated that the data used to assess school performance would be based on the term results of learners as reflected in their school reports. However, in the case of junior learners (Grade R to Grade 3), term averages and records across all the schools were poorly and unevenly recorded. This meant that the primary source for assessing change in school performance was unreliable, and therefore an alternative data source had to be found.

By looking at the individual results for each subject for each learner, it was possible to create an average for each pupil for each term. These averages did not reflect a percentage per se but rather a category of performance. These performance categories are from 1 (Not achieved) to 5 (Outstanding achievement), indicating the learner's level of competency. Any change in outcome category is reported on in the findings section, with positive change (improvement in performance) indicated by an increase in category number and negative change (reduction in performance) indicated by a decrease in category number. Term averages regarding senior learners were sufficiently recorded, and therefore these individual percentages were used, without averages having to be created.

It must be noted that despite school performance data collected from all schools for the final phase, these were not used due to the challenges with the data outlined above. Analysis of this data is thus limited to term one to term four of 2011.

2.7.3. Qualitative data

These data were analysed thematically and were triangulated with results from both the anthropometric data outcomes and school performance data results.

2.8. Ethical considerations

Permission for the research was secured at a national, provincial and district level and ethics clearance was obtained from the University of Johannesburg, Faculty of Humanities Ethics Committee. Schools were guaranteed that the outcomes of the research would not affect the continuation of the breakfast programme at the school either during or after the study. Adult respondents were fully briefed on the nature and purpose of the research and were given an opportunity to give informed consent to qualitative interviews. Responses were treated as confidential. Written parental consent was received for every child participant. Research was also conducted in a child-friendly manner and the identities of the participants were protected.

2.9. Limitations and assumptions of the pilot phase evaluation

Assessing the impact of any programme, including nutrition programmes, in the context of a broader social environment is

challenging because of the role that intervening or extraneous variables play on the outcomes being measured. An important variable in this study was the existence of the National School Nutrition Programme already being delivered at all the schools in the study, providing a daily lunch at school. The delivery of this stayed constant throughout the study and its contribution to the outcomes assessed could not be assessed independently of the breakfast outcomes. It is a factor that contributes to nutritional and performance attainments that could not be controlled for in the analysis.

The most significant limitation of this study was the inability to conduct an experimental design where one can systematically control for other intervening factors. Such a design would have included a control group (schools without a breakfast programme) and would have allowed for greater confidence in attributing the results observed in children to the school breakfast programme as it would have been controlled against children not benefiting from such a scheme. As indicated earlier, an experimental design was not used due to practical, logistical and ethical reasons. Nevertheless, this study still demonstrated possible effects of the breakfast programme and confidence in the study was improved due to the testing across six different schools as well as through the longitudinal design which allowed for testing the influence of the breakfast programme over time. As the same children are measured at three different points, the design did control for other possible factors to some extent. These design limitations do mean, however, that any nutritional or performance changes cannot be scientifically attributed to the breakfast programme.

A third limitation pertains to the attrition rate of learners across the three points of measurement, which limited the confidence with which the data can be used to infer the results for the wider learner population in these schools.

Fourth, as the nutrition programme was launched prior to the baseline data being collected, the intervention could have already impacted on learners in relation to their BMI. This limitation was partially reduced by taking baseline anthropometric measurements after the school holidays, when children would not have been exposed to the breakfast programme for a period of time. In addition, these effects are likely to be minor and were not a concern in relation to school performance findings as these were based on past school records which included pre-programme learner results. However, while the breakfast programme is likely to have affected the children's BMI, the effect on school performance was less direct and thus more difficult to establish. Changes in school performance, for instance, are likely to be related to a number of factors that are linked more directly to achievement than nutritional intake. This limitation means findings on school performance need to be interpreted with caution. The difficulty in isolating the effects of school feeding is a common problem in studies in the developing world (Richter et al., 1997).

A fifth limitation is that since the baseline and final data collection points were less than 12 months apart, it is acknowledged that significant jumps in indicators like school performance and BMI over this period must be treated with caution, and conclusive outcomes may only be seen in the longer term.

A further limitation relates to the comments made by participants regarding their subjective perceptions of the nutritional value of the breakfast programme. Although participants were encouraged to give honest answers, one cannot rule out the possibility of social desirability responding as a source of bias.

Finally, missing school performance data for the first two terms of 2012 meant that the influence of the programme could not be assessed for this period. Poor record keeping by the schools meant that compensations had to be made from the beginning of the data analysis, which in turn led to the data analysis being compromised.

3. Results

3.1. Nutritional status

Overall, as Table 1 and 2 indicate, there was improvement in the nutritional status across all schools for height-for-age and for BMI-for-age measurements over the evaluation period. While these improvements cannot be attributed to the breakfast programme solely, these results are suggestive of the positive influence of the Foundation's breakfast programme and affirm the potential of the programme.

Table 1 presents the results for stunting (low height-for-age) in the sample. In the baseline measurements the numbers of children categorised as stunted was 11%, and severely stunted, 7.5% of learners. Together this made up nearly a fifth of the overall sample (18.5%; n = 158), which is a concerning level of malnutrition. This was in line with national estimates as well as those for the province (Labadarios, 2007). We observed a 4.7% reduction in severe stunting levels and a slight increase in stunting levels. The slight increase in stunting is likely accounted for by the changes experienced for severely stunted children moving into the stunted

Table 1
Changes in stunting over time across all schools.

Stunting (height-for-age)						
Cut-off	Classification	Baseline n=857		Final n=857		Total percentage point change over evaluation period
		n	%	n	%	
<-3SD	Severely stunted	64	7.5	24	2.8	-4.7%
<-2SD	Stunted	94	11	97	11.3	0.3%
Not stunted		699	81.6	736	85.9	4.3%

Key: Green highlights indicate positive nutritional changes.

category. An overall 4.3% positive change was seen in the number of children classified as within normal height for age limits at the final phase. The overall change was statistically significant.

Body Mass Index is the relationship between weight and height, and BMI-for-age is a reference to the weight and height combination that is considered normal for the age of a child. A BMI measurement indicates whether the individual falls above the BMI guideline (overweight), within the guideline (normal growth), or below the guideline (wasted) for their respective age. As Table 2 indicates, the category 'within BMI guidelines for age', that is, normal growth, increased by 10% between the baseline and the final stages, meaning there was a 10% health improvement indicated by BMI standards across the sample. The *decrease* in the number of both wasted and overweight children over the measurement period was statistically significant.

Of concern was the high numbers of overweight learners across all the schools. Baseline measurements indicated that 27.6% of all learners were either overweight (16.9%) or severely overweight (10.7%). These figures declined by the end of the measurement period to 13.8% and 6.4% respectively, showing a percentage point reduction of 3.1% for overweight learners and 4.3% for severely overweight learners. This combined percentage point change of 7.4% was the most dramatic health improvement observed in the study. Although this improved health (weight loss) was encouraging, too many children continued to be overweight or severely overweight (20.2%, or a fifth, of the total sample at final measurement).

The decrease in numbers of overweight learners could have been influenced by the provision of healthy breakfasts via the school breakfast programme. For example, learners mentioned that the breakfasts provided to them made them feel fuller and curbed their appetite for junk food.

In contrast to the higher stunting levels, measurements for wasting (low weight for height and age), as indicated in Table, were smaller. This was in line with findings in South Africa that demonstrate that stunting (indicating chronic malnutrition) is a greater problem than wasting (indicating acute malnutrition) (Faber and Wenhold, 2007). Table shows that only 2.8% of children in the sample were wasted, and 2.6% were severely wasted at the baseline stage. Encouragingly, the health of these children improved over the pilot period so that at the final measurement stage, only 2.1% of children were wasted and 0.7% severely wasted.

The nutritional gains are also reflected in the nutritional knowledge that children seem to have gained in the course of the programme. In focus groups with Grade 6 learners they were able to differentiate between 'good food' such as vegetables and whole grain and 'bad food' such as fast food and sweets. They also suggested that the food from school was more nutritious than food they received at home, for example, breakfast and lunch time meals at home often consisted of white bread (no spread) and tea, whereas all the school breakfasts were fortified porridge.

Improvements in underweight (wasted) children were most noticed by research participants, both in relation to themselves as well as to others. There were also cases of particular children, perceived to be those learners who were especially underfed at home, that stood out clearly as having gained weight. Examples of comments to this effect from participants are below:

They love the breakfast. Even their weight, even their facial appearances you see that change [. . .] that they have eaten something special now (Educator)

I was so thin, my friends called me skeleton [···?But] when the [breakfast programme] came, I am big now and I don't have pimples on my face. I am stronger and don't get sick too much (Grade 6 Learner Focus Group)

Principals and educators reported that children were more active on school grounds than prior to the introduction of the school breakfast programme. One principal suggested that increased energy levels were especially noticeable amongst foundation phase learners while physical growth was evident amongst older learners:

Our children are not as weak as they used to be. In the upper grades, the physical development [. . .] is showing [. . .] they are looking fit. With the foundation phase, it is the energy [of children] that we are seeing (Principal)

Learners reported their subjective experience of improved energy as follows:

After a few days you will become stronger and the exercise helps us to be powerful [. . .] I like to be powerful (Grade 6 Learner Focus Group)

We have lots of energy [since the arrival of the breakfast programme]. I play at school. I get home and I play, I sleep and then I play (Grade 6 Learner Focus Group)

Table 2
BMI for age nutritional results over time across all schools.

Overweight/wasting results (BMI-for-age)						
Cut-off	Classification	Baseline n=857		Final n=857		Total percentage point change over evaluation period
		n	%	n	%	
>2SD	Severely overweight	92	10.7	55	6.4	-4.3%
>1SD	Overweight	145	16.9	118	13.8	-3.1%
Within BMI guidelines for age		574	67	660	77	10%
<-2SD	Wasted	24	2.8	18	2.1	-0.7%
<-3SD	Severely wasted	22	2.6	6	0.7	-1.9%

Key: Green highlights indicate positive nutritional changes.

A related issue was the improvements that were seen in the general overall health of the learners.

Before the [Foundation] breakfast started, I used to get sick with high temperatures. Now that I am eating at school, I am stronger. The breakfast has more vitamins and gives us more energy (Grade 6 Learner Focus Group)

[Prior to the breakfast programme] the sick room was full with the learners [. . .] but there is lot of difference now (Educator)

3.2. Learner performance

A key goal of the Foundation's school breakfast programme was to impact positively on learners' educational performance. A quantitative evaluation of this outcome compared school performance, in the form of term marks or grades, during the first term of 2011 (prior to the introduction of the breakfast programme) with that of the fourth term of the same year (when the children would have had the benefit of the breakfast scheme for two terms). The breakfast programme launched in July 2011, at the start of the third academic term. No 2012 data were used, as these were not available from the schools.

The analysis was divided into junior learners (Grade R–Grade 3) and senior learners (Grade 4 to Grade 9) to accommodate the different grading systems. Note that no actual percentages are given for each subject at the junior level. Instead, numerical values from 1 to 5 are ascribed to each subject, indicating the learner's level of competency. These values and their corresponding meaning are as follows: 1 = Not achieved; 2 = Partial achievement; 3 = Satisfactory achievement; 4 = Excellent achievement; 5 = Outstanding achievement.

Because the variance of these values (1–5) is so small, a change that appears very small – for example, from a first term average of 2.00 to a fourth term average of 2.50–in reality is a 25% change in performance over a year, indicating a major swing.

An analysis of junior learners' grades for the first four terms of 2011 indicates that all primary schools improved their junior term average. Table 3 shows that when disaggregating the data by grade, it is clear that there was a positive change across all grades, and this change was particularly high at the Grade R level (25.79%). For all grades, there was a correlation (albeit small) between an improvement in performance and each successive term. Of all the grades, the most marginal improvement (3.75%) was seen at a Grade 3 level.

Although it is expected that learner performance should improve over the school year, it was the strong belief of the research participants that this positive change was due, at least in part, to the Foundation's breakfast programme. One educator expressed this as follows:

After they've eaten, they look bright [. . .] the lesson just flows, unlike where you get other children feeling sleepy (Educator)

A principal linked the breakfast programme directly to improved performance, as expressed below:

Table 3
Term average by grade Grade R to Grade 3.

Performance by grade	Grade R	Grade 1	Grade 2	Grade 3
Term 1 Average	2.563	2.61	2.627	2.721
Term 2 Average	2.945	2.759	2.805	2.743
Term 3 Average	3.187	2.784	2.794	2.767
Term 4 Average	3.224	2.85	2.863	2.823
Total (year average)	2.980	2.751	2.772	2.764
% change	25.79	9.20	8.98	3.75

[Since the Foundation started the breakfast programme] their results are much better [. . .] those that we know [. . .] who had problems at home [. . .] have changed a lot (Principal)

As many variables impact on school performance, these improvements for the junior learners might also have had something to do with the inherent nature of the foundation phase of education. Until certain basic literacy and numeracy skills are grasped in the early years of learning, performance is likely to be poor, but will improve as these skills are mastered over time. Should substantial improvements be noted over a longer time period, one might be able to conclude that a breakfast programme could have been an especially significant support to learners in Grade R, as prior to the first year of formal schooling, needy learners would most likely not have had access to nutritional programmes.

Table 4 provides an indication of term average by grade for the senior grades. Grade 5 learners were the only group to reflect an improvement in overall performance from the beginning of the year to the end (6.58% improvement). Grade 9 learners performed worse than other grades (the deterioration in their grades over 2011 was 18.51%, a startling percentage for a school year that is often considered to be the 'foundation' for achievement in the final year of school, grade 12).

It is important to bear in mind the range of variables – changes in the school curriculum is but one example – that can impact on the performance of learners. One principal indicated that a new curriculum was implemented in 2012, which demanded 'a lot from teachers', making it difficult to compare last year with this year.

Contrary to the lack of positive change in term grades seen in the senior learner results, school educators, all school principals and learners reported that the Foundation's breakfast programme had made a notable *positive* impact on learner performance. Specifically, they reported that it had improved learners' ability to concentrate and participate in class. The following quotes are indicative of these beliefs:

[. . .] when learners are full, their disruption is minimal [. . .] (Principal)

They come, they have their breakfast, they are listening attentively to the educators [. . .] in the past you would find the learners sleeping [. . .] You'd have to try to find something for that learner so that they can concentrate in the classroom (Principal)

School started at 8am and [the DBE lunch scheme] was only at 11:30am [. . .]Before [the breakfast programme] you would find that they were waiting for the bell to ring so that they can go out and eat [lunch provided by the DBE] [. . .] now they are paying attention to the teachers and don't care about when [the lunch] is going to be (Grade 6 Focus Groups)

Grade 6 learners attributed their improved energy levels and better performance at school directly to the breakfast programme. Improved class concentration and participation even when 2011 performance results indicate marginal or no improvement in learner grades is an interesting finding. Concentration and participation are short-term gains from improved nutrition (that is, learners are no longer distracted by hunger or have a lack of energy to participate in learning) and are critical to have in place if any longer-term gains are to be seen. In other words, school performance cannot improve without satisfactory levels of concentration and participation. This is expressed well by one learner:

[. . .] Other children don't eat at home, [therefore] they are not concentrating on school, so they get lower marks (Grade 6 Focus Groups)

However, even when concentration and participation improve, gains may be limited by poor quality teaching, lack of learning

Table 4
Term average by grade – Grades 4–9.

Performance by grade	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9
Term 1 result average	46.53	45.89	48.87	52.73	55.9	48.09
Term 2 result average	44.7	46.71	50.1	47.32	45.03	32.15
Term 3 result average	43.4	47.14	51.11	52.65	51.61	46.7
Term 4 result average	46.47	48.91	45.96	48.59	49.59	39.19
Total (year average)	45.275	47.163	49.01	50.323	50.533	41.533
%change	−0.13	6.58	−5.95	−7.85	−11.29	−18.51

support material and other factors that impact directly on school performance.

On the other hand, the qualitative data indicate that there was a unanimous perception that the breakfast programme had a positive effect on behaviour that was integral to school performance, specifically an improvement in attention span and in class participation.

3.3. Other benefits

School attendance records are notoriously unreliable and so attendance data is not reported here. However, in the qualitative interviews, educators and principals at all schools reported that absenteeism had improved and attributed this to the breakfast programme, as suggested in the quote below:

We have seen learners who used to be absent a lot changing their behaviour and coming to school (Educator)

One school principal suggested that, *'Attendance is the most noticeable change'* as a result of the breakfast programme and that, *'Learners come rushing to school'*, while another principal suggested that the breakfast programme had improved the attendance of older learners in particular. According to one educator, there was also a better understanding of why learners were latecomers:

> *We didn't understand why the learners were always late. The feeding scheme changed many things [. . .] They won't tell you the truth that at home there is nothing, but I had to run around looking for food.* (Educator).

This was supported by a comment made by another principal, suggesting that the breakfast was perceived to be a critical reason to attend school. She expressed this thus:

> *Even those learners who are sick come to eat breakfast, and afterwards you report to their parents that they are not well [and they go home]* (Principal)

Educators and principals were particularly vocal about improved punctuality, reporting that the provision of breakfast at school encouraged learners to arrive at school on time because latecomers were refused breakfast. Examples of how this was expressed included:

> *Learners are enjoying it – they arrive early, especially on a Monday. They are hungry from the weekend with not enough food from home* (Principal)

Grade 6 learners suggested that the breakfast feeding scheme had motivated them to both attend school and arrive at school on time. For example,

> *When you get to school late, you don't get the food* (Grade 6 learner)

One school principal even suggested that late-coming at her school:*'[. . .] has been minimised compared to the school next door, where there are lots of late learners and no [breakfast] scheme . . . [here almost] no learners come after 8am.'*

An important issue raised by a number of principals was that sometimes learners were late due to particularly difficult home circumstances, and further increasing their hardships by denying them breakfast was counter-intuitive to supporting those who are most vulnerable.

4. Conclusions

The overall finding of this study is that the Foundation has introduced a successful model of school nutrition into vulnerable schools in a way that respects the school staff, that builds capacity, and that is connected to, rather than contrary to, government programmes.

There were very positive and statistically significant nutritional changes over the period of the pilot programme, most dramatically in the reduction in numbers of overweight and stunted children. Less substantial changes were seen in the reduction of the incidence of wasting (underweight-for-height and age), but there have been some improvements in this regard. While it is unclear whether these changes are directly attributable to the programme, and which other factors may have also influenced these changes, the breakfast programme can be perceived to have contributed positively to the health and well-being of children participating in the programme.

Learner performance results were largely inconclusive, which is to be expected given the indirect relationship between nutrition and learner performance. Nevertheless, the educators and principals as well as the learners indicated a strong perception that the breakfast programme impacted on children's ability to learn by improving concentration and participation in classroom activities. In addition, they also perceived the programme to have exerted a strong influence on reducing learner late coming. The schools' lack of efficiency in handling performance data was a key limitation of this study and needs to be monitored should the programme expand.

Linked to the Foundation's philosophy of using the feeding programme to build local capacity, there were clear social benefits that were perceived by those involved in the programme. These included strengthening the capacity of school principals, contributing to school infrastructure, and providing employment and business opportunities to community members. A further benefit included the increased knowledge of healthy foods that learners and food handlers expressed.

We can therefore conclude that positive trends are being seen in relation to nutritional status and perhaps performance, which support he continuation and growth of the Foundation's school breakfast programme.

The school breakfast programme provides important evidence for social investment in the early years of life of disadvantaged children. Improved nutrition has multiple positive benefits for children in terms of improved health, cognitive abilities and promoting schooling. Early interventions of this kind serve to close the ability gaps between advantaged and disadvantaged children, are a valuable economic and social investment (Heckman, 2008) and could be an important mechanism for reducing the intergenerational transmission of poverty (Belli et al., 2005). Early interventions of this kind also reduce the cost to society of remedying disadvantage in later life.

The public-private partnership approach used by the Foundation as a complementary and supportive breakfast programme to the NSNP should be applauded as a successful model and could be incorporated within early childhood nutritional policies as a critical social investment. This approach is particularly relevant in middle income contexts characterised by resource restraints.

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