

The Causes of Food Waste in the National School Nutrition Programme in Primary Schools

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Abstract

The aim of the study is to explore the causes of food wastage in the National School Nutrition Programme (NSNP) of Johannesburg North Primary Schools. The study was conducted through the use of semi-structured interviews, observations and existing literature. The study revealed that there are various factors that lead to food wastage in the NSNP. The participants revealed that there is a lack of communication between the schools and the government which leads to food wastage, caused by portion size and poor delivery services. Food wasted, in school feeding programmes undermines the goals of the programme and increases the prevalence of food insecurity. The study identified a need for an increase in theory based and experiment based literature for future studies. The NSNP also aims at reducing food insecurity and malnutrition amongst learners. -Such a study aims at the prevention of food wastage in future programmes. The study identifies research gaps and challenges that need to be addressed in the design and implementation of the NSNP and the development of food waste management systems within the NSNP.

Keywords: National school nutrition programme, food wastage, school feeding programme, Johannesburg

Introduction

Food waste has significant adverse impacts on the economy and environment. Economically it is wasted capital investment that can lead to unnecessary loss of income to both farmers and consumers. With regards to the environment, excessive greenhouse gases are emitted and land and water are used unproductively which lead to devastated natural ecosystems. (Lipinski, Hanson, Lomax, Kitinoja, Waite & Searchinger, 2013). Plate waste has been used as a measure of nutrient intake, dietary quality, menu performance and food accessibility in school feeding programmes, in order to ascertain the overall food waste (Shanks, Banna & Serrano, 2017). However, present research on the causes of food waste within school feeding programmes have been limited. By using plate waste as a measure it is possible to apply practical remedies to school feeding programmes and improve the overall quality of the programmes and reduce food waste. School feeding programmes need to be adjusted accordingly in order to satisfy all stakeholder's needs whilst still meeting the overarching objectives of the school feeding



programme. The National School Nutrition Programme (NSNP) is intended to reduce food insecurity and malnutrition among 'nutritionally needy learners' by providing nutritious meals (Blondin, Djang, Metayer, Anzman-Frasca & Economo, 2015). Food waste in these programmes undermines such goals by increasing learners' short- and long-term risk of food insecurity, hunger and/or nutrient deficiencies (Buzby & Guthrie; Blondin et al., 2015).

The present study was conducted in order to identify the causes of food wastage within the NSNP, specifically looking at Johannesburg North primary schools. The study sheds light on the gaps in literature regarding food waste within the NSNP and similar school feeding programmes and other challenges that are found within the implementation of the NSNP and aims to fill these gaps.

Literature review

The exact extent of food wastage on a global scale is unknown, but a phrase that is mostly quoted estimates that nearly half of all food grown is lost or wasted either before or after it even reaches consumers (Lundqvist, de Fraiture, & Molden, 2008; Parfitt, Barthel & Macnaughton, 2010). Attempts have been made to quantify global food waste over several decades, motivated partly by the need to highlight the scale of 'waste' in relation to global malnutrition. As of 2011 the global population surpassed seven billion and has been predicted to approach 9.3 billion by 2050, this leads to an increase in the number of mouths to feed as well as the quantity of food consumed due to increased economic standings, -leading to an estimated increased food demand between 50-70% by 2050 (Bond, Meacham, Bhunnoo & Benton, 2013). With an increase in the number of people to feed and food consumption per person, - it is important to stretch each food item to the maximum capabilities and reduce the incidences of food waste as much as possible so as to keep up with future and current food demands.

Blondin et al. (2015) states how food wastage contributes to food insecurity and is associated with poor diet quality and increased affinity to lifestyle diseases. This food waste simultaneously increases greenhouse gases, which threaten the sustainability of food systems, which inevitably lead to food insecurity through the degradation of the environment and biodiversity. Wasting food has grave consequences on the people it is meant to sustain, and on the economy and the environment as a whole. Therefore, a balance needs to be established whereby the consumption demands of the growing population are met, all while being conducted in an economically, socially and environmentally friendly manner, that provide nutritive and safe food to all people (Bond et al., 2013). Food Wastage, as defined by Bond et al. (2013:3) "refers to edible food products, which are intended for the purposes of human consumption, but have instead been discarded, lost, degraded or consumed by pests, and does not include the inedible or undesirable portions of food stuffs". Through this definition, it is evident that this food was intended for human consumption, but due to various circumstances has been discarded. Food loss as defined by the FAO (2019:5) is "the decrease in the quantity or quality of food resulting from decisions and actions by food suppliers in the chain, excluding retailers, food service providers and consumers" It is food that is discarded, incinerated or disposed of through the entire food cycle from harvest up to and excluding the retail sector.

No two school feeding programmes are the same, objectives may be similar but resources and implementation differ from country to country. School Feeding Programmes (SFP's) are adjusted to meet the needs of the country, such as minimising child trafficking/labour (School Feeding, WFP.org, 2019). In 2018 for the first time ever, half of the world's learners in low and middle-income countries were able to sit down and be provided with a meal at school. That relates to an estimated 370 million learners across the globe. This sizeable investment revolved around two schools of thought, the first was to abate hunger and



improve health and nutrition. The second was to improve schooling outcomes. (Chakrabort & Jayaraman, 2016). An analysis by the WFP and the Partnership for Child Development shows that India now feeds over 100 million learners; Brazil 48 million; China 44 million and South Africa and Nigeria each feed 9 million of their learners (Bundy & de Lara, 2018). However, planning and implementing effective and successful school feeding programmes become difficult as the food service personnel in charge of preparing the foods, have to meet the needs of government, nutrition and safety and learners (Williamson, 2019)

There are two key methods to preventing school food wastage ending up in landfills which are reduction and recycling. Food waste can be reduced by educating learners, volunteer food handler's (VFH) and schools on changing behaviours that cause food waste. Food waste can also be collected and recycled through composting or anaerobic digestion in order to generate beneficial by-products. Wilkie, Graunke and Cornejo (2015) noted that over 75% of the cafeteria waste could be recycled in this manner.

The National School Nutrition Programme (NSNP) is a government intervention programme aimed at enhancing the educational experience of the needy learners. The programme was introduced in 1994 for poverty alleviation, specifically initiated to uphold the rights of learners to basic food and to contribute to learning in schools. In response to the call by the Minister of Basic Education to improve school access, learner retention and education outcomes, the NSNP is thus intended to address barriers to learning associated with hunger and malnutrition by providing nutritious meals to learners on all school days (DBE, NSNP annual report, 2013/2014:10).

The objectives of the NSNP revolve around three pillars. Firstly to provide a nutritious meal to learners, secondly to promote nutritional knowledge and healthy food choices, and lastly to create food gardens, that shall improve production knowledge and environmental knowledge (Devereux, Hochfeld, Karriem, Mensah, Morahanye, Msimango, Mukubonda, Naicker, Nkomo, Sanders & Sanousi, 2018) The NSNP, was implemented in 1994 in order to meet these objectives, that is why it is important to identify what the causes of food wastage may be in the NSNP if any and how to reduce these figures. Food being wasted in the NSNP would be a major issue as wasted food becomes wasted nutrition and food not being utilised as originally intended by the NSNP.

In a Chinese study of six schools in the city of Beijing conducted by Liu and Cheng, (2016) it revealed that the average amount of plate waste experienced in the schools was about 21% of the food served, the main items that were wasted were staple foods (such as rice and noodles) and vegetables, followed by meat. When the buffet meals were served there was also wastage incurred due to over preparation as is the nature of buffets. In schools, learners' preferences changed more rapidly and demands for foods changed due to unforeseen circumstances such as half day classes or out-bound activities. The study went on to show that the quality of the cafeteria service also determined the amount of food consumed and or wasted, as many learners consume their food in the cafeteria the service level and quality played a large role. Majority of the learners found the service to be sub-par or unsatisfactory. The level and quality of food service was determined by seven factors, food choice, food taste, food cost, food hygiene, portion size, diet environment, and tableware. The main source of dissatisfaction lay with the lack of food choice and poor taste. Portion sizes were largely unsatisfactory, as the meals were only offered at a set size (Liu & Cheng, 2016).

A study conducted by Izumi, Akamatsu, Shanks and Fujisaki (2020) looked at the causes of lunch waste in five schools in Tokyo Japan. The study revealed that Japan exhibits a unique case, the National food waste levels are high, however in schools it is relatively low.



These low levels in schools are indicative of the Japanese concept of ‘mottainai’, which embodies a deeply held principal of respecting resources and using them to their full potential (Izumi et al., 2020). Japans School Lunch Act aims at promoting physical, social and mental development of learners, and cultivating a respect for nature and the environment, food labour and food culture (Izumi et al., 2020). Research is limited on the factors causing food waste in Japanese schools, however this study showed that “*self-efficacy to finish a meal,*” time for eating, preference for vegetables and the concept of ‘mottainai’ impacted attitudes towards learners. An alternative study revealed specific food items such as vegetables, rice, fish and traditional Japanese meals were wasted in larger quantities and in younger learners (Izumi et al., 2020). Many countries have seen that the implementation of school feeding programmes yields high returns in investment in the following categories, human capital, security nets for poor families, uplifting local economies and lastly building community resilience in conflict areas (Bundy & de Lara, 2018).

Methodology

This study forms part of a larger ongoing study whereby a pilot study was conducted in Johannesburg North, in five different primary schools. The interview questions were formulated in conjunction with the Department of Basic Education (DBE), as the study was conducted in government (public) primary schools. Permission was obtained directly through the schools, these questions had to be approved by the DBE furthermore each participant was made aware of the study to gain consent. Ethical clearance was obtained through the School of Tourism and Hospitality at the University of Johannesburg. The study made use of a qualitative research method. Qualitative research broadly defined, means "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification", (Strauss & Corbin, 1990:17; Golafshani, 2003:600) and instead, the kind of research that produces findings arrived from real-world settings where the "phenomenon of interest unfold naturally" (Patton, 2001:31; Golafshani, 2003:600). There are four main forms of qualitative research, namely: phenomenology, ethnography, grounded theory and case study (which can either be qualitative or quantitative). The qualitative research method that was used was ethnography.

Ethnography is a branch of anthropology, anthropology refers to the social sciences study of the origins and social interactions of human beings. Ethnography provides systematic descriptions of individual societies/cultures (Astalin, 2013). Ethnographic studies require the researcher to spend extensive amounts of time carrying out the field research in order to participate in the daily lives of the participants being observed, whilst still maintaining distance in order to allow for an objective account of events (Emerson, Fretz & Shaw, 2001; Papargyropoulou, Wright, Lozano, Steinberger, Padfield & Ujang, 2016). Data collection methods for an ethnographic study include: interviews, observations, focus groups, and audio-visual material. (Papargyropoulou et al., 2016; Gobo, 2008). With that in mind, a qualitative approach was used through conducting interviews and observations in the form of interviews and observations that would allow the researcher to have open-ended questions.

As mentioned, the ethnographic data collection methods used were in the form of interviews and observations as part of field research. Field research, “refers to research conducted outside a traditional lab setting, in a user's natural work environment. It involves visiting the site where the product is used and observing the usage in action” (Kumar, 2013:138). Therefore, this is a method of physical interaction with the sample group and actual site visits. The researcher visited the sample population, namely Johannesburg NSNP primary schools and physically conducted interviews with and observations of the participants. Interviews conducted allowed for the participants to comprehensively express themselves and

for the researcher to fully explain the questions to the participants, as language was a barrier, and to allow for complete responses from the participants. Observations refer to watching and understanding how people naturally interact with products or the environment, it usually takes place in the participant’s workplace, home or natural environment and allows for a first-hand look at ways of improvement and innovation (Sauro, 2015).

There are four types of observational research, namely: a ‘complete observer’ whereby the researcher is completely removed from participants and is neither seen nor noticed by participants, to allow for the most natural behaviour by participants. An ‘observer as participant’, in this scenario the researcher is acknowledged and usually the objectives of the research are indicated to the participants, however there is little to no participation on the researcher’s side, in order to maintain neutrality (Sauro, 2015). A ‘participant as observer’, here the researcher is fully immersed with the participants, and is seen as more of a team member or friend and not a neutral third party, however the participants are still aware that it is a researcher. Lastly a ‘complete participant’, which is a completely engaged researcher that almost infiltrates the participant’s environment and completely immerses themselves in the activities without the participant’s knowledge, almost as a spy. (Sauro, 2015). Papargyropoulou et al. (2016) developed a conceptual framework for food waste generation and prevention, Figure 1 is an adjusted version of said framework that was used in the study to identify the causes of food waste in NSNP primary schools.

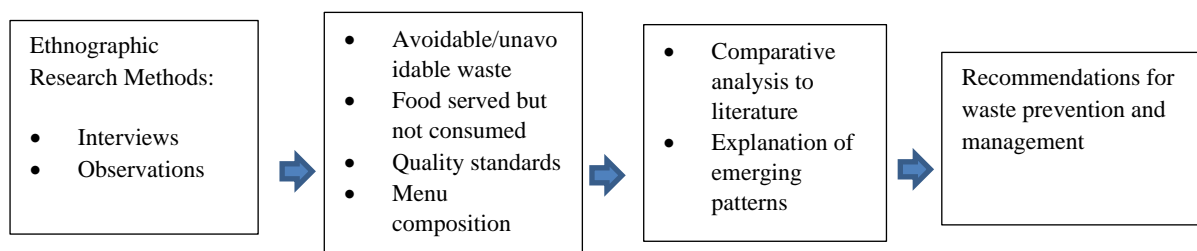


Figure 1: Conceptual framework to understand the causes of food waste in the National School Nutrition Programme in primary schools.

Open-ended questions related to the causes of food wasted as observed by the VFH’s on a daily basis, specifically looking at the quantity and specific food items. The questions also allowed for VFH’s to offer any recommendations they may have to manage food waste in the NSNP. The schools were chosen through random sampling based on the schools that were available to accommodate the study. As there is limited evidence on food waste in the NSNP the research was conducted with no prior assumptions, and was purely explorative in nature. The research was aimed at the principals, school nutrition coordinator or teacher therein and the VFH’s, who prepared the food. The VFH’s are community members as well as parents of learners at the school (DBE, NSNP annual report, 2013/2014). This is a method that the NSNP uses to promote community interaction and ensure that foods are prepared at the highest standards possible, as the learners consuming the food are also learners of the VFH’s.

Nine participants in total were able to participate in the study, consisting of teachers, VFH’s, a principal and co-ordinator. Table 1 shows the demographic of the study participants. Seven of the participants were female and the remaining two were male. There were five VFH’s, two teachers, one coordinator and one principal. None of the VFH’s had tertiary education (University degree or higher degree), majority had either primary or secondary school education.



Table 1: Demographics of school participants (n=9) who took part in the study of food waste management in the NSNP in Johannesburg North primary schools, October – November 2019

Participant ID	Sex	Age	Level of education	Position
A	Female	40 – 49	Technical qualification	Volunteer Food Handler
B	Male	50 – 59	University degree/ Higher degree	Teacher
C	Female	20 – 29	Secondary School	Volunteer Food Handler
D	Female	50 – 59	University degree/ Higher degree	Co-ordinator
E	Female	40 – 49	Secondary School	Volunteer Food Handler
F	Female	40 – 49	Primary School	Volunteer Food Handler
G	Female	40 – 49	University degree/ Higher degree	Teacher
H	Female	40 – 49	Primary School	Volunteer Food Handler
I	Male	40 – 49	University degree/ Higher degree	Principal

Data collection

In order to increase the validity and credibility of the research and enrich the understanding of the causes of food waste in the NSNP, data was collected through the use of multiple sources; in-depth interviews with the participants and observations of breakfast and lunch serving practices. In-depth interviews were conducted with the participants between October and November 2019. The participants were interviewed through the use of a semi-structured interview in order to guide participants through the interview and ensure that all questions were covered. Language was a barrier and so some questions needed to be further elaborated on so as to meet the time constraints of the participants. The interviews were conducted in English and audio-recorded.

Table 2 provides examples of interview questions that were presented to participants of the study. The schools were contacted a week prior to the interviews taking place and given brief information on what the research would be on. The duration of the interviews varied from person to person. For the most part, the interviews lasted about 20 minutes with the VFH's and up to an hour with the teachers/Principal. The VFH's were interviewed just outside of the kitchen, as the interview times were usually just prior to lunch/breakfast being served. The teachers/principal were interviewed in their offices or classroom. Once the interviews were completed it was usually time for lunch or breakfast to be served. At this point the researcher observed the portion sizes served to each learner and observed if the menu (as prescribed by the DBE) was adhered to. The researcher did not observe the learners, however did observe where they ate and how much food was left on the plate. Where the food was discarded was also observed. Once lunch had been served to all learners, the researcher observed if any food was left in the pots and how this was disposed of. During the observations, the researcher made notes of all that was observed and took pictures.

Table 2: Sample interview questions for school participants (n =9) who took part in the study of food waste management in the NSNP in Johannesburg North primary schools, October – November 2019

How much food, in your opinion, does your school waste?
Is plate waste a large contributor of overall waste?
Does your school often receive produce that is in poor condition?
Was the food prepared as per the menu guidelines?



Does your school currently have a program in place for food waste management?

Results and discussion

The first part of this section will describe breakfast and lunchtime in South Africa and the structure of the NSNP as a whole, based off of research and conversations with the participants. The second part will only discuss the findings of the interviews conducted with the participants, and those specific questions. The final section shall summarise the observations that were made during breakfast/lunch times and how waste can be prevented in these areas.

Breakfast and lunchtime in the NSNP

In most, if not all South African government (public) schools (primary and secondary) there are two lunch breaks that take place throughout the school day. One is usually around 10.00 am and the other around 12.00 pm depending on the time schools ends on each day. The lunch breaks last about 30-45 minutes each. The lunch areas are not regulated, so learners may consume their lunch anywhere they please and is generally unsupervised by teachers. With regards to the NSNP, the food is made from scratch in an on-site kitchen, based off the Provincial NSNP menu. The ingredients are supplied by service providers contracted by the provincial education department (DBE, NSNP annual report, 2013/2014). Some schools receive additional aid in terms of foods by private organisations which can be in the form of a once off donation or a partnership. The National Department of Education has partnered with a food corporation, namely “Tiger Brands Foundation” and some schools are identified by the province and district to benefit from this food corporation through an in-school breakfast programme.

In the Gauteng province, a centralised procurement model is used to procure food items whereby service providers contracts are advertised in the National Gazette and awarded with the support of the Gauteng Department of Finance (DBE, NSNP annual report, 2013/2014). Some provinces use a decentralised model whereby funds are transferred to the schools to procure the food items according to the provincial menu. The service providers in the research varied in the standard of delivery as some discrepancies in quality/service depending on the supplier was observed, however the food items delivered across all schools are the exact same e.g. samp, cabbage, milk, mealie meal, as each school needs to comply with the menu guidelines.

The research showed that the number of learners to provide meals to were established the day before, in terms of breakfast learners - this is served around 07.00 am each morning. For lunch the numbers were established the day of, in the morning during registration period. As stated, prior to the close of school, learners that will be eating breakfast are identified in each class and the grand total for the school is handed to the VFH. The VFH's prepare the days' meals anywhere between 04.30 am and 06.00 am (being the latest time). The food is prepared as per menu guidelines each day, without fault. This is largely due to the fact that all schools (barring those with the aid of the food corporation) receive the exact same food items, as the meals are dictated by a prescribed menu that vary in protein, starch and vegetable for each of the five school days in a week. Fresh foods such as vegetables/fruits/bread and those that are consumed in large quantities such as milk, are usually received on a weekly basis. Whilst the other long-life food items, such as samp, tinned fish, soya mince and mealie meal, are received on a monthly basis.



Interview findings and discussion

Tables 3, 4 and 5 below pertain to the answers received by the participants in the interview. Only three questions shall be looked at as these are short questions that the participants were asked, among others, in the interviews.

Table 3: Response to interview questions of school participants (n=9) who took part in the study of food waste management in the NSNP in Johannesburg North primary schools, October – November 2019

Participant ID	If you waste food, what types of food do you waste?						
	Vegetables	Fruit	Grains	Protein	Tinned Fish	Dairy Products	None
A	X						
B	X						
C	X						
D							X
E							X
F				X			
G				X			
H							X
I	X	X	X	X			

Table 4: Response (2) to interview questions of school participants (n=9) who took part in the study of food waste management in the NSNP in Johannesburg North primary schools, October – November 2019

Participant ID	How much food, in your opinion, does your school waste in a day?		
	A large amount	An average amount	Very little
A			X
B			X
C			X
D			X
E			X
F		X	
G		X	
H			X
I		X	

Table 5: Response (3) to interview questions of school participants (n9) who took part in the study of food waste management in the NSNP in Johannesburg North primary schools, October – November 2019

Participant ID	Does your school currently have a program in place for food waste management?	
	YES	NO
A	X	
B		X
C		X
D	X	
E	X	
F	X	
G	X	
H	X	
I	X	

The interview questions aimed at identifying what the causes of food wastage were, namely the quantity of food and specific food items wasted, according to the participants, in order to draw comparisons with literature and to identify if the respective schools currently have a preventative waste management program in place.



When looking at the results of table three (3) the question posed was: *How much food, in your opinion, does your school waste in a day?* The majority of the participants stated that only a very little amount of food was wasted on a daily basis. Upon further questioning during the interview it was discovered that any food that was leftover on the day was usually given to the neediest learners to take home, or to the staff members, such as the VFH's themselves or security guards. Thus eliminating the need for any food produced in excess to be discarded. In a report published by the Department of planning, monitoring and evaluation (DPME) and DBE (2016) it was noted that one reason for food wastage to fluctuate on a daily basis was that not all learners would consume the NSNP daily, therefore the food prepared as approved by the official figure would differ from the actual number of learners present to consume the food. Thus the VFH's could either underprepare or over prepare food leading to wastage.

When looking at the results of table four (4) the question posed was: *If you waste food, what types of food do you waste?* Four out of nine participants stated that majority of food wasted were vegetables, two out of nine stated proteins and the remaining three stated that no food at all was wasted. Upon further elaboration by the participants, the vegetable item that was identified to be the most wasted was butternut, the protein item was soya mince. The VFH's stated that butternut was most wasted as the learners did not like the taste. The NSNP does not provide any spices or herbs to season the foods, only salt. Therefore, when presented with butternut that was merely boiled in salt water, many of the learners did not like the taste. Soya mince was a similar situation. The NSNP, provides only tomatoes and onions that could be used as aromatics to season the food, therefore when the soya mince was cooked with these ingredients a lot of the learners once again did not like the taste. Soya mince was also a foreign food item in many of the households, therefore an acquired taste as most of the learners only learned of and consumed soya mince when they were at school.

In the case of participant "I" who stated that vegetables, proteins, fruits and grains were wasted the following reasons were listed as to why this occurred. In the case of vegetables, it was a logistical issue whereby the supplier would deliver the food late, thus reducing the shelf life of the foods at the school, which would eventually lead to them becoming spoilt. In the case of fruits, the suppliers would sometimes deliver fruit that is over ripe or close to its use-by date, thus ultimately needing to be discarded. The DPME and DBE (2016) noted that many schools experienced challenges in the form of inadequate storage facilities, lack of access to water and poor cleanliness as reasons for food being discarded and wasted. In the case of grains, the school received an in-school breakfast programme where cereals were sponsored by the Tiger Brands Foundation in addition to the government distributed foods. The cereals that the Tiger Brands Foundation provided were enjoyed more than what was subsidized by the government. Thus leading to the government supplied porridge to be left largely uneaten when served. Lastly, the protein that was wasted in this school was beans. The participant stated that the majority of the learners in that school (community) belonged to a specific culture and in this culture beans were hardly ever eaten, so when consumed at school most learners would leave food on their plate as it was an unusual/rarely consumed food item for them.

Lastly when looking at the results of table four (4) the question posed was: *Does your school currently have a program in place for food waste management?* Seven out of the nine participants all stated "yes" however upon further elaboration, the programs were found to be rather elementary. The one program was that of a garden (implemented by the government), however leftover food wasn't used in the garden as compost, leftover food/plate waste was still discarded into the waste bin. So the garden was there as more of an additional supply of food than as a system put into place to alleviate waste. Secondly, if there was any food left over in the pots, this food was given to the neediest learners, the VFH's or to security and grounds keeping staff. Although this is a program being put into place by the respective schools, learners



are the only intended beneficiaries of the NSNP, therefore there is a lack of provisioning for all other parties, this presents a concern as it may reduce the amount of food available to the learners (DPME & DBE, 2016). The way waste was managed was not derived from the government and was more of a personal program from school to school, as schools did not want any food to go to waste.

Results and discussion of observations

The observations aimed at identifying what the causes of food wastage were, specifically trying to identify if portion size, the menu, lack of VFH training, meal times, and kitchen quality (cookware and serving gear) played a role in food wasted at the schools. The researchers observed the following during the school visits. The learners all ate in different areas of the school, without teacher supervision. In some school's learners would be provided with a serving plate to receive their food, however in other schools, the learners were found to be quite reckless with the serving plates (which were made out of plastic) and would start to play with the plate once they had finished eating or would accidentally break it, or leave it lying around causing it to be damaged. Therefore, in these schools they did away with providing learners with serving plates and each learner would be responsible to bring a container/lunch box (empty) to school to receive the food, this was for breakfast and lunch. In another school, the school opted for stainless steel serving plates for the learners as this was more durable. In order to maintain the same portion size for each learner even though they had different containers, standard serving gear would be used, usually a cup in all the schools. i.e. each learner would get one cup of protein, one cup vegetables and one cup of grains. That way the portions could be standardized. However, this method was in contrast to the prescribed portion sizes set out by the DBE menu (2014), the VFH's were not weighing out equal portions of each food group to the learners. Arguably, this would be a rather tedious and time consuming method, given the time restriction for learners to have their lunch break. According to the NSNP mandate and regulations, all meals are supposed to be served by 10.00 am (DPME & DBE, 2016) however in the schools visited this was not the case, majority of the meals were served between 11.00 am and 12.00 pm. In all the schools researched, the learners had to bring in their own utensils, as this was not provided by the schools at all. Most of the time, the learners would consume the food with their hands, as it was easier.

If a learner for example, wanted a little less food than the full cups measure, the VFH would adjust accordingly, so as to prevent wastage. In the same breath if a learner did not want a specific food item, e.g. soya mince, they could ask for this to be left out. Although the learner would not be receiving their dietary protein for the day (from the school), this was still the best option as it would have inevitably been left uneaten should the VFH have forced the learner to take the food item regardless of their personal preference. In one school, there were preschool learners, although they were not part of the sample group (primary school) the researcher observed that when it came to portioning, a full cup of each item would not be given, in this case it would be scaled down to half a cup. In the case of this school, where there were preschool (Grade - R) learners, they would be fed first, as they finish school earlier than the rest of the school and generally had less patience as noted by the teachers.

When asked about training, most of the VFH's at the schools stated that they received no formal training. The report published by the DPME and DBE, (2016) noted that although the schools themselves had received training on the NSNP, the supervision over the VFH's receiving training was poor with only 41.9% of VFH's receiving training across the nine provinces. The VFH's were assumed to know how to cook as they were parents of learners at the school. All the VFH's at each school were female, there were no male VFH's observed at the five primary schools that were studied. Some, but not all of the VFH's had a uniform, they



stated that they were each supposed to have a uniform, however due to late supplies some VFH’s were still without proper uniform (however all did have safety boots). In the case where they did have uniform, many didn’t wear it (the chef’s jacket) as they were each only given one set and so they preferred to wear their own tops, alongside the chefs’ pants and safety boots, and an apron.

All the kitchens were onsite kitchens with industrial grade pots, four out of the five schools had old worn out pots and stove tops, still functional but the VFH’s noted that the pots were in use in excess of 5 years. In each kitchen the menu was plastered onto the wall with the portion sizes as well. In each school the participants noted that they always followed the menu, largely because the ingredients only allowed them to follow the menu and in order to provide the learners with the necessary nutrients as per menu guidelines. Table 5 is the menu that was put into place in 2014 by the NSNP. When the research was conducted in October-November 2019, the same menu was still in use. According to the participants that had been there for some years, the menu did not change in all the years, the menu items would simply shift daily schedules, however the items themselves did not change over the many years.

Table 5: NSNP 2014 updated menu (Gauteng Province)

Days	Meal Plan	Menu (Food Item)	Dry Portion size
1 Monday	Lunch		
	Protein	Soya mince stew	35g
	Starch	Maize pap	40g
	Vegetable/fruit	Butternut/pumpkin	50g
2 Tuesday	Lunch		
	Protein	Pilchard stew	30g
	Starch	Cooked rice	30g
	Vegetable/fruit	Spinach/cabbage	50g
3 Wednesday	Lunch		
	Protein	UHT milk	200ml
	Starch	Maize pap	40g
	Vegetable/fruit	Whole fruit	1 medium sized
4 Thursday	Lunch		
	Protein	Cooked sugar beans	30g
	Starch	Cooked samp	30g
	Vegetable/fruit	Cabbage/peas/green beans	50g
5 Friday	Lunch		
	Protein	Soya mince stew	35g
	Starch	Maize pap	40g
	Vegetable/fruit	Butternut/pumpkin	50g

Application of findings and research to the (NSNP)

Identifying factors that lead to food wastage provides an opportunity to evaluate how these factors can be minimized during the implementation of the NSNP. South Africa has a very vast cultural background, and so identifying these eating patterns and preferences would aid in decreasing food waste. The menu’s that were implemented in 2014 do show differences in menu items from province to province, such as “maize pap” in Gauteng and “Phuthu pap” in Kwazulu Natal, (education.gov.za, 2014) however these changes are only slight. A study conducted in Japan titled “*An ethnographic study exploring factors that minimize lunch waste in Tokyo elementary schools*” (Izumi et al., 2020) describes how learners in Japan are taught to consume without waste as part of a cultural norm and the idea is reinforced with the use of incentives and words of affirmation to learners that were able to consume all their food without wasting. This is a model that can be adapted into the NSNP, in order to reduce waste, whilst simultaneously educating the learners on the effects of waste on the environment. The VFH’s could encourage and praise learners that consume all their food, as they (in the kitchens) are the closest to the learners when they eat their food during lunch breaks, and the teachers could



be tasked with educating learners on the importance of not wasting prior to their lunch breaks, to further reinforce the idea of not wasting food.

Izumi et al. (2020:1148) proposes four methods that may be used to reduce food waste, and these can be adapted into the NSNP, which are as follows:

- (i) measure school lunch waste daily; (ii) educate learners about the importance of reducing food waste; (iii) offer learners flexible portion sizes; and (iv) provide learners with meaningful opportunities to address food waste in their schools.

Based on the findings, only one of the above points is currently being used in the NSNP, which is point three (iii) of allowing flexible portion sizes. Currently, the reduction of food wastage is not one of the objectives of the NSNP, and so there are no structures put in place to reduce this food wastage and no laws in place to monitor/track the levels of food waste in the NSNP. This research may allow policy makers, teachers, school administrators and fellow researchers, to start collecting evidence on the food waste causes in order to better understand the problem and create evidence-based solutions that can be implemented into the structure of the NSNP. The findings of the study show that there is a need for the involvement of VFH's in the planning of the menu, from the interviews, it was indicated that the VFH's and schools as a whole were not involved in devising the menus or on any aspects of the programme. They were simply handed the menus and mandates and proceeded as instructed.

However, the various participants such as VFH's/teachers etc, interact with the learners on a day-to-day basis and would be ideal candidates to get feedback on the measures of the NSNP, and how it can better be implemented in the future. It would especially be beneficial to teach the VFH's on the importance of nutrition and the objectives of the NSNP, so that they fully understand what their purpose is in providing learners with these meals. This would also increase their overall morale. As of 2010, the DBE implemented an awards programme that recognised the top performing schools for their "excellence, innovation and dedication" in the successful implementation of the NSNP (Education.gov.za, 2018). This programme aims at rewarding schools that meet the necessary guidelines as set out by the NSNP. However, in the criteria to be chosen as a nominee, food wastage isn't a factor. By implementing the reduction of food waste as a criterion to be a nominee, this could allow food wastage to be reduced, and more knowledge on what the causes of food wastage are to be identified.

Conclusions and recommendations

There is very little research on the effects and causes of food wastage in the NSNP, the literature is more constrained to the evaluation of the NSNP as a whole but on the topic of research on food waste management the research is limited. Although globally there is a shift to become environmentally friendly and reduce overall waste and eliminate waste, the implication of waste within school feeding programmes is a relatively new endeavour. However, in countries such as Japan, USA, China and Brazil, to name a few, there has been up and coming research on the causes and effects of food wastage on school feeding programmes. South Africa is beginning to follow suit; however quantifiable research is still largely missing. Experimental research needs to be conducted on the causes of food waste within the NSNP and how these causes may have lasting effects on the NSNP as a whole.

The NSNP has very specific objectives that it aims at meeting since its inception in 1994. In earlier times food wastage had very little discussions surrounding it, as food was very readily wasted. In South Africa, of the 31 million tonnes of food produced, 10 million tonnes of it is wasted which equates to a third of all food produced for consumption being wasted and of that 10 million tonnes, 70% comes from cereals/grains, fruits and vegetables (WWF, 2017).



Therefore, if the food service industry and households produces such exorbitant amounts of waste, it can be assumed that this too trickles down into schools. Therefore, it is important to understand what these causes are in schools and find ways to reduce, reuse or recycle the food waste produced.

Going forward there needs to be more cohesion and better monitoring and evaluation of the NSNP as a whole. Although the guidelines state one thing, the reality is different from school to school. Some schools have necessary equipment/uniform etc., whilst others do not, and so there need to be a better system in place to maintain equilibrium amongst all schools. A greater emphasis needs to be placed on theory-based and experimental research on the causes of food wastage in the National School Nutrition Programme. Future studies should include a larger sample, with the inclusion of government officials and facilitators in all provinces of the country.

It should be noted that the study was based on a small sample size, as these were the schools that were available and willing to partake in the study (the study was conducted close to examination period). As aforementioned, this study was a pilot that forms part of a larger body of work, and so this too contributed to the overall sample size. Secondly, language was at times a barrier, as the researcher is not originally from South Africa, and so in a few school's language differences presented a challenge. Thirdly, response bias may have influenced participant responses, as the participants were aware of the researcher's presence. Lastly the study was not exhaustive, the researcher did not physically weigh the food items from start to finish but instead relied on observations and participant responses.

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