

**Assessment of Hazard Analysis and Critical Control  
Points Principles in Primary School Feeding Schemes in  
the Western Region of Gauteng**

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degree Master of Science (Dietetics) at the Potchefstroom campus of the North-  
West University**

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**Ps 16:8**

“Ek het die Here altyd by my: omdat Hy by my is, sal ek nie struikel nie.”

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## Abbreviations

AIDS:	Acquired <i>immune deficiency syndrome</i>
CCP:	Critical control point
CDW:	Community development worker
CL:	Critical limit
DoE:	Department of Education
FAO:	Food and Agricultural Organisation
FH:	Food Handler
FSO:	Food safety objective
GMP:	Good manufacturing practices
HACCP:	Hazard analysis of critical control points
HIV:	Human immunodeficiency virus
INP:	Integrated nutrition program
NASA:	National aeronautics and space administration
NSNP:	National school nutrition program
PHC:	Primary health care
PHF:	Potentially hazardous food
PRP:	Prerequisite program
RDA:	Recommended dietary allowance
RTE:	Ready to eat
SOP:	Standard operating procedure
US:	United States
WHO:	World Health Organisation

## **Addenda**

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## **Abstract**

### **Assessment of Hazard Analysis and Critical Control Points Principles in Primary School Feeding Schemes in the Western Region of Gauteng**

**Objective** The objective of this study is to investigate the need for standard hygiene and safety practices for the National School Nutrition Program (NSNP). Food safety procedures and practices can be implemented as part of the Hazard Analysis of Critical Control Points (HACCP) program.

**Background** The National School Nutrition Program (NSNP) forms part of the Integrated Nutrition Program (INP) of South Africa and was implemented as a poverty alleviation strategy introduced in 1994 by government as part of the newly founded democratic Republic of South Africa. The NSNP is implemented in primary schools.

**Design** A questionnaire was designed to investigate the hygiene and safety practices in primary schools in the Western Region of Gauteng. Both rural and urban schools using the NSNP were targeted.

**Research Project** The NSNP staff from 26 primary schools completed the research questionnaire focused on hygiene and safety practices.

**Results** Data collected indicated the need to implement a very basic HACCP program that includes identifying the HACCP team, training for food handlers, standardized equipment and the implementation of hygiene and safety procedures.

**Conclusion** To implement HACCP in the NSNP, the role players from the managerial structures and food handlers at schools, the training needs of the target group and the equipment needed to comply with HACCP procedures, should to be identified. Documentation must be in place for monitoring, evaluation and verification procedures to implement the HACCP program.

**Keywords:** HACCP, food safety, hygiene, food service units, food borne illness

## Opsomming

### Ontleding van die Gevaar Analise van Kritieke Kontrole Punte (GAKKP) in die Nasionale Skoolvoedingsprogram in die Westelike Streek van Gauteng

**Doel** Die doel van die studie is om die standaard van higiëne en veiligheidspraktyke in die Nasionale Skoolvoedingsprogram te bepaal. Voedselveiligheidsprosedures en -praktyke kan geïmplementeer word as deel van die GAKKP-sisteem.

**Agtergrond** Die Nasionale Skoolvoedingsprogram vorm deel van die Geïntegreerde Voedingsprogram van Suid Afrika en is geïmplementeer as deel van 'n armoede verligtingsprojek in 1994 wat deel vorm van die nuwe demokratiese Republiek van Suid Afrika. Die Nasionale Skoolvoedingsprogram is in primêre skole geïmplementeer.

**Ontwerp** 'n Vraelys is ontwerp wat primêre skole in die Westelike Streek van Gauteng geteiken het. Beide stedelike en landelike skole is ingesluit.

**Navorsingsprojek** Personeel wat vir die Nasionale Skoolvoedingsprogram werk in 26 laerskole is geïdentifiseer om 'n vraelys in te vul wat op higiëne en veiligheidsaspekte gefokus het.

**Resultate** Die verwerkte data dui op die behoefte aan die implementering van 'n basiese GAKKP program wat fokus op die identifisering van 'n GAKKP span, opleiding vir die voedselhanteerders, gestandaardiseerde toerusting en die toepassing van standaard veiligheids- en higiëne praktyke.

**Samevatting** Om GAKKP in die Nasionale Skoolvoedingsprogram te implimenteer moet rolspelers van die bestuurstrukture en voedselhanteerders by skole, opleidingsbehoefte van die teikengroep en gestandaardiseerde toerusting geïdentifiseer word, om by die GAKKP program in te skakel. Relevante dokumentasie oor monitering, evaluasie en verifikasie moet in plek wees om die GAKKP te implimenteer.

# CHAPTER 1 PREFACE

## 1.1 Problem Statement

Serving safe food is a critical responsibility for a school foodservice and a key aspect of a healthy school environment. The purpose of a school food safety program is to ensure the serving of safe food to children by controlling hazards that may occur along the flow of food from delivery to serving the food (USDA, 2005:7). Research on household food security has shown that South African children are, in general, prone to several micro nutrient deficiencies against a background of low income, unemployment and poverty. Nutrition education plays an important role in improving food and nutrition security. Sufficient food is needed to address both the quality and quantity of food needed to maintain good health (Maunder & Labadarios, 1999:2). The National School Nutrition Program (NSNP) implemented in South Africa emphasizes the provision of nutritious supplementary meals to learners to alleviate temporary hunger, improvement of learners' active learning capacity and, therefore, increasing school achievement, attendance and punctuality (GDoE, 2003:2).

In a study by Du Toit & Venter (2005:85) in South Africa on preparation of food for female students in hostels, the catering company staff prepared food under supervision and in accordance with food-borne disease prevention guidelines. When the female students prepared food in self-catering residences, only some bacterial food-borne prevention guidelines were followed and personal and general hygiene practices were neglected. Education is needed to prevent food-borne disease to improve standards in all areas of food preparation and service, more so in primary schools. The Hazard Analysis and Critical Control Points (HACCP) program is a scientific and systematic approach to identify hazards and control measures to ensure the safety of food. HACCP can be applied throughout the chain from primary production to consumption because the program focused on safety and hygiene practices throughout an organisation and not only on end product testing (WHO, 1999:21).

## 1.2 Aims and Objectives

### 1.2.1 Primary Objectives:

The objective of this study was to analyze the hygiene and safety practices of the NSNP staff as well as assessing the conditions at the premises used for preparation of the food. The following aspects were considered:

- The type of food served at schools;

- The suitability of facilities used in the process;
- The knowledge of the food handlers in the NSNP at various primary schools in the Western Region of Gauteng in order to identify safety risks; and
- To give guidelines for implementing safety and hygiene practices for the NSNP in the Western Region of Gauteng.

### 1.2.2 Secondary Objectives:

The research focused on interviews combined with the completion of a questionnaire with the NSNP staff of the various schools. The activities for the research project included the following:

- Develop a questionnaire to collect information on the types of food served;
- The suitability of the facilities at the school; and
- To determine the knowledge of the food handlers from the participating primary schools

## 1.3 Structure of the mini-dissertation

The article format was used for the dissertation and the outline of the text is as follows:

*Chapter One* will explain the orientation of the study, which includes an introduction, problem statement, purpose of the study, research objectives, the scope of the study and the research design.

*Chapter Two* contains a detailed literature review. The literature review will identify the components of a school feeding scheme as well as the food safety risks and implementation of HACCP.

*Chapter Three* The mini-dissertation will be done in article format, which will include research design and methodology. It will include the collation and analysis of the results of the research findings and questionnaire. The data collected from the questionnaire will identify the type of food served at the different primary schools, food preparation techniques, facilities and equipment used to prepare food, hygiene practices during food preparation, safety measures for food and equipment during the preparation process and knowledge of staff about safety and hygiene practices to identify training needs of staff. A summary of the research findings and literature review will be included. Recommendations will be made on the research findings and final conclusions will be drawn. The

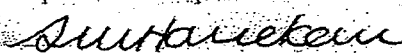
article will be written according to the specifications of the South African Journal of Clinical Nutrition.

#### 1.4 Author's contributions

The study reported in the dissertation was planned by a team of researchers. The role of the researchers is given in the table hereunder. Also included in this section is a statement from the co-authors confirming their individual roles in the study and giving their permission that the article may be part of this dissertation.

Name	Role in the study
Ms C Müller (BSc Nutrition)	Responsible for literature searches, statistical analysis and writing up of the data. First author of the paper.
Dr SM Hanekom (PhD Nutrition)	Supervisor of MSC dissertation. Involved in statistical analysis and writing of paper.
Prof W Oldewage-Theron (PhD)	Co-supervisor. Critically revised paper.

I declare that I have approved the above mentioned article, that my role in the study, as indicated above, is representative of my actual contribution and that I hereby give my consent that it may be published as part of the MSc. Dissertation of Ms. C Müller.



Dr SM Hanekom



Prof. W. Oldewage-Theron

## 2.1 Introduction

The Gauteng Provincial Government states that South African children are our country's most precious resource and the foundation of building a caring and prosperous nation (GPG, 2005:1). The Program Bana Pele (Children First) was introduced to focus on children and their basic rights, for example the right to education, recreational facilities, adequate nutrition, proper shelter, peace, good health, the right to protection from poverty, disease, abuse, exploitation, suffering, neglect, violence and hatred (GPG, 2005:1). The NSNP focus on improvement of health through supplementation of diets of learners through meals served in schools (DoH, 1994:4).

In developing countries where the food staples namely maize and groundnuts, can be susceptible to contamination by mycotoxins that can influence morbidity, strict safety control is necessary (UNFAO, 2001:10). Both maize and peanut butter form the basis of the NSNP menu (DoH, 1994:4). A Hazard Analysis and Critical Control Points (HACCP) program focuses on safety and hygiene, identifying all significant hazards in raw materials and put control measures in place during production, distribution and preparation (UNFAO, 2001:10). The HACCP program ensures a safe product at the moment of consumption (Van Schothorst, 2005:813).

## 2.2 Barriers to optimal nutrition

Household food security is defined as access by all households at all times to adequate safe and nutritious food for a healthy life (Bonti-Ankomah, 2001:1). Socio economic conditions play an important role in food security or insecurity. Children in South Africa are faced with challenges of poor nutrition and food insecurity that may influence their physical and cognitive development negatively (Bonti-Ankomah, 2001:2). In the following paragraphs, the barriers will be discussed in more detail.

### 2.2.1 Poverty in South Africa

According to Labadarios *et al.* (2001: 70) a large part of South Africa's population still lives under adverse socioeconomic conditions with unemployment and inadequate income being very prevalent. Indications were that only one out of five mothers in a household was a wage earner and more than 50% of mothers were unemployed. According to the Income and Expenditure Survey of South Africa during 1995, 43% of households experienced poverty. High poverty rates were found with decreased income, increased household size, among households headed by females and in households in rural areas (Rose & Charlton, 2001:386).

### **2.2.2 Stunting**

At the national level stunting (short for age) remains by far the most common nutritional disorder affecting nearly one out of five children. The disorder is by far more prevalent in rural areas. One in ten of all children in South Africa aged 1 – 9 years were found to be underweight (Labadarios *et al.*, 2001:70). The integrated nutrition approach of supplementing learners' diets at school address disease specific nutrition support, growth monitoring and contributes to household food security (Witten *et al.*, 2002:5).

### **2.2.3 Deficiencies**

Poor nutrition is a major problem in the rural areas of South Africa where large numbers of people are unemployed, the children are malnourished and therefore vulnerable to disease (ANON., 1995:7). Micro nutrient deficiencies in iron, iodine and vitamin A are a public health problem in developing countries worldwide. These deficiencies can have adverse effects on the mental development and learning abilities of school children (Popkin, 1996:11). Lack of vitamin A was reported to impair the immune system, while iodine reduces mental capacity and iron leads to fatigue and dizziness (Labadarios *et al.*, 2001:72; Popkin, 1996:11; Witten *et al.*, 2002:3). Resources like clinics, food delivery, crèches, water supply and roads are fundamental in fighting under-nutrition (Fincham & Ross, 1995:5).

## **2.3 The Integrated Nutrition Program and National School Nutrition Program**

The Integrated Nutrition Program (INP) was formulated to address current nutrition problems in the country. The INP aims at implementing programs that are integrated, sustainable, people and community driven and are targeted at the most vulnerable groups in South Africa (Department of Education, 2004:1). The mission of the INP is to improve the nutritional status of all South Africans through the implementation of integrated nutrition activities. The National School Nutrition Program (NSNP) forms part of the INP of South Africa and was implemented as a poverty alleviation strategy introduced in 1994 by government as part of the Reconstruction and Development Program of the newly founded democratic Republic of South Africa (Hall & Monson, 2006:49). The program targets schools from farm, rural and informal settlement areas where 100% of learners benefit. In urban areas, only 75% of learners were going to benefit (GDoE, 2003:2).

The implementation of the INP needs to be done in a manner to ensure that no risks are taken with possible food poisoning incidences. Special care must be taken, when an operation caters for populations considered at risk, for example - the elderly, infants and children or patients who may be immune system-compromised (Hall & Monson, 2006: 45; Witten *et al*, 2002:5).

Focus areas of the INP are:

- Disease specific nutrition support;
- Growth monitoring and promotion;
- Nutrition education, promotion and advocacy;
- Micronutrient malnutrition control;
- Food service management;
- Promotion and support of breast feeding;
- Contribution to household food security; and
- Children and women vulnerable groups (Witten *et al.*, 2002:5).

The NSNP formally known as the Primary School Feeding Scheme of The Department of Education focused on:

- Provision of nutritious supplementary meals to learners to alleviate temporary hunger;
- Improvement of learners' active learning capacity and, therefore, increasing school achievement, attendance and punctuality (GDoE, 2003:2);
- Enhancing the implementation of school gardens;
- Enhancing programs for orphans and vulnerable children (Department of Education, 2004:4).
- Improvement of health through micro-nutrient supplementation; and
- Improvement of health through providing education on health and nutrition (DoH, 1994:4).

In a study at Insingizi Primary School (ANON., 1995:8) in a poverty stricken area of the South Coast in South Africa, results showed that the food provided by NSNP was the only meal that the learners received during the day. Teachers noticed a marked increase in school attendance since the NSNP program began. Learners used to fall asleep in the classroom and could not concentrate in class because they were so hungry. Promoting health care is important in NSNP. A study by Wentzel-Viljoen (2003:351) in the North-West Province showed that learners benefit from school feeding as it encourages school attendance and increases potential for learning. Other indicators that improved due to school feeding were punctuality, discipline, average scores, alertness, physical well-being and behaviour.

## **2.4 Food safety and hygiene programs in the NSNP**

A food safety program for hospitals or nursing homes and people at risk will have more critical control points (CCPs) than one implemented at a fine dining or fast food restaurant. Procedures for maintaining food safety and food quality must be taught and managed so that they are mutually supported. The international principles for Hazard Analysis and Critical Control Points (HACCP) consist of all the procedures a company needs to learn to provide safe food (Hall & Monson, 2006:49).

The importance of supplying safe food to school children and a safe working environment for employees must be monitored by means of tested procedures. A more detailed discussion will follow.

### **2.4.1 Food Handlers**

The food handlers in the NSNP are people who in the course of their normal routine work come into contact with uncovered food not intended for their personal use. A food handler is therefore any person involved in the processing, production, manufacturing, packaging, preparation, sale or serving of any foodstuff, including water and beverages (DoH, 2000:1). Food handlers suffering from upper respiratory tract infections can easily contaminate their hands with micro-organisms by coughing, sneezing, and touching their nose or mouth (Aycicek *et al.*, 2004:259).

A proposed strategy for health surveillance of food handlers include:

- Management commitment;
- Education and training;
- Health interviews;
- Reporting illness to management;
- Applying basic food handling practices;
- Applying basic personal hygiene practices (DoH, 2000:3).

The main emphasis for food handler surveillance should fall on personal hygiene, clean protective clothing, effective supervision of the health of employees and appropriate action timely taken when indicated, and maintaining hygienic food handling practices (DoH, 2000:10).

### **2.4.2 Duties of employers to ensure safety**

According to the South African Occupational Health and Safety Act (1993) the general duties of employers to their employees are:

- Every employer shall provide and maintain, a working environment that is safe and without risk to the health of his employees;

- Make arrangements for ensuring, as far as is reasonably practicable, the safety and absence of risks to health in connection with the production, processing, use, handling, storage or transport of articles or substances; and
- Provide such information, instructions, training and supervision as may be necessary to ensure, as far as is reasonably practicable, the health and safety at work of employees.

The international principles for HACCP consist of all the procedures a company needs to provide safe food. Basic training for food handlers should cover basic food handling procedures. Proper training of staff implementing the HACCP program will be needed to ensure success (Norton, 2002a:52).

## **2.5 Concerns relating to the impact of implementation of school feeding programs on children's health**

The NSNP provides only a small amount of food once a day to primary school learners, that assists to relieve child hunger (Hall & Monson, 2006:48). The energy content of the approved NSNP menus ranged between 17,6% to 27,4% of the RDA for children 7-10 years of age. The quantities of food served to learners in the North West province were less than indicated on the approved menus due to poor or no portion control at the schools (Wentzel-Viljoen, 2003:345). Issues of concern related to the managing of the NSNP that may have an impact on the children's health are discussed below.

### **2.5.1 Pupils targeted by the NSNP**

Only primary school learners (grade R to 7) participate in the NSNP and they have to cope without a school feeding program when entering grade 8, the beginning of the secondary school phase (ANON., 1998:29). The National Guidelines from Department of Education states that the NSNP will apply to any public school with a registered site, which also includes Grade R classes (Department of Education, 2004:3).

### **2.5.2 Insufficient menus**

Most provinces preferred to choose "cold" menus that do not require cooking facilities. Equipment and the facilities available at the school determine the menu choice (Department of Education, 2004:25). This menu consists of brown bread with margarine, peanut butter and jam, served with a powdered milkshake supplement enriched with micro-nutrients or a powdered vitamin C enriched cold drink (Hall & Monson, 2006: 48). Wentzel-Viljoen (2003:187) found that the menu provided on average 20% of the RDA for energy for 7-10 year olds and did not meet the national or the North

West Province guideline of 25% for 7-10 year old children. Therefore, these menus are seen as insufficient.

### **2.5.3 Insufficient storage**

To cook for large groups of people, secure, spacious, and pest free storage areas are needed. This is not the case in many schools as the staff kitchen is mostly used as the basis for food storage and preparation for the NSNP (Paton, 1998:29).

### **2.5.4 Theft**

It may seem that food allocated for school going children disappears from school storage facilities and parents are concerned that the food is stolen. Hall & Monson (2006:48) raised concerns that food handlers and other staff members in rural schools in South Africa take the food meant for the learners, for their own use.

### **2.5.5 Accounting to parents**

A limitation of the school feeding program is the lack of a system of accountability to the parent body. Many caregivers do not know whether their children receives food regularly. Food handlers say that all the children in the class receive food, while others believe that the program is only for those children whose parents are unemployed, or only for orphaned children (Hall & Monson, 2006:48; Department of Education, 2004:7).

### **2.5.6 Environmental constraints**

A number of factors hinder the proper implementation of a school feeding program, such as:

- Schools that do not always operate during regular school hours, closing half-way through the morning.
- Delivery of bulk supplies are to be made weekly or monthly, but most of the rural areas are inaccessible by road after even a light rainfall and this make deliveries an uncertainty (Department of Education, 2004:7).
- The milkshakes/cold drinks require a clean, safe water supply to reconstitute and schools without this facility reported diarrhoea episodes in children (Hall & Monson, 2006:50).

### **2.5.7 Problems with volunteers**

For proper cooked meals, a school needs a committee of local women (mothers, grandmothers, aunts or well-wishers) who would, with their own resources (time, hands, ovens) cook proper meals for the children. Paton (1998:28) found in her report on two school feeding programs in the Eastern Cape that women lacked experience and did not have knowledge on mass catering and could not keep basic

accounts for costing purposes. The school pays the volunteers an honorarium which is a minimal salary and excludes benefits (Department of Education, 2004:24).

## **2.6 Hazard Analysis and Critical Control Points (HACCP)**

HACCP was originally developed as a microbiological safety system in the 1960s for the United States operated space program in order to guarantee the safety of astronauts' food. Until then most food safety systems were based on end product testing and could not fully assure safe products as 100% testing was impossible. A pro-active process-focused system was needed and the HACCP concept was born (USDoHHS, 2001: 5; Bryan, 1999:9).

The HACCP program monitors hygiene and safety practises for food production from raw materials through processing to end products, and serving based on controlling time and temperature which are factors that, if mismanaged are known to contribute to food borne disease outbreaks (UNFAO, 2001:7).

### **2.6.1 The seven principles of HACCP**

According to a study conducted by Bryan (1999:14), the seven principles of the HACCP concept are important because they are based on historical data on causes of illness:

- It focuses on critical operations where critical control is needed;
- It is comprehensive because it includes ingredients, processes and end products;
- It is continuous because problems are detected as they occur and corrective actions are taken as an ongoing process; and
- It is systematic because it covers step-by-step operations.

These attributes give a high degree of assurance that the end product in a HACCP program produces low risk to food borne illness (Bryan, 1999:14).

The seven principles of HACCP will now be discussed in more detail.

#### **Principle 1**

*Conduct a hazard analysis investigation by identifying hazards and assess the risk associated with them at each step from receiving to serving.* These hazards may be of a microbial nature (for example pathogenic organisms), a chemical nature (for example pesticides) and/or a physical nature (for example pieces of glass). While performing a hazard analysis investigation the likely occurrence of

hazards and the severity of their adverse effects on the health of the people should be taken into consideration. Identification of specific control measures for the hazards identified is needed (CAC, 2003:25; UNFAO, 2001:29; WHO, 1999:10).

### **Principle 2**

*Determine the critical control points.* A critical control point (CCP) is a step at which control can be applied and is essential to prevent or eliminate a food safety hazard, or reduce it to an acceptable level (CAC, 2003:26; UNFAO, 2001:30; WHO, 1999:10).

### **Principle 3**

*Establish critical limits.* Each control measure associated with a CCP must have an associated critical limit, which separates the acceptable from the unacceptable control parameter. Measurable and observable criteria used to set critical limits may include measurements of temperature, time, pH and level of available chlorine. However measurements of many of these criteria may be beyond the means of most operations because of either lack of knowledge, lack of access to support services or simply because of the cost of some measurements. Operations should be encouraged to make the best use of the time and temperature criteria that are more relevant to everyday experience and practices. Sensory evaluation is a poor tool to access critical limits, but could be used in support of the other measurements listed (CAC, 2003:26; WHO, 1999:12).

### **Principle 4**

*Establish a monitoring system.* Monitoring is the scheduled measurement or observation at a CCP to assess whether the step is under control, for example within the critical limits specified in Principle 3. Monitoring will identify where a loss of control has occurred or if there is a trend towards loss of control. It will also identify the required corrective actions to the process to restore or maintain control. A trained person must record and evaluate the monitored results and implement corrective actions. Monitoring is the responsibility of each individual establishment (CAC, 2003:26; UNFAO, 2001:29; WHO, 1999:14).

### **Principle 5**

*Establish a procedure for corrective action, when monitoring at a CCP indicates a deviation from an established critical limit.* Specific corrective actions must be developed for each CCP. Corrective actions must specify what needs to be done to bring the CCP under control and ensure that potentially unsafe products are not used.

Corrective action includes:

- Steps to correct the problem;
- Steps to deal with the affected product.

The corrective action must be easy to implement and understood by the food handler performing the activity (CAC, 2003:26; USDohHHS, 2001:29; UNFAO, 2001:29; WHO, 1999:14).

#### **Principle 6**

*Establish procedures for verification to confirm the effectiveness of the HACCP plan.* Verifications should occur regularly to ensure that the HACCP plan is being followed to prevent unsafe food reaching the consumer. Review deviations and product dispositions and do random sampling and checking to validate the whole plan.

Verification activities include:

- Ensuring that prescribed practices are followed;
- Ensuring that the food handlers have the correct tools and adequate facilities; and
- Ensure that control procedures are being followed (CAC, 2003:27; UNFAO, 2001:29).

#### **Principle 7**

*Establish documentation concerning all procedures and records appropriate to these principles and their application.* Documentation and records should be adequate to enable the business to be confident that controls are in place and being maintained. The record-keeping system can use existing paperwork, such as delivery invoices and simple checklists (CAC, 2003:227; USDohHHS, 2001:29; WHO, 1999:15).

#### **2.6.2 Benefits for consumers by implementing HACCP**

HACCP is widely accepted as a system to put hygiene and safety measures in place. Benefits include:

- Reduce the risk of foodborne disease;
- Increase the awareness of basic hygiene;
- Increase the confidence in food supply (WHO, 1999:15); and
- Improve quality of life – especially when catering to vulnerable groups like children and pregnant women (Paton, 1998:28; Witten *et al.*, 2002:3).

#### **2.6.3 Barriers to implementing HACCP**

Implementation of HACCP in an organization requires planning, assessment of current systems used and commitment of all role players in the organization to make it work. The barriers to implementation include:

- Lack of government commitment;
- Lack of customer demand;
- Absence of legal requirements;
- Financial constraints;
- Human resource constraints;
- Lack of expertise; and
- Inadequate infrastructure and facilities (WHO, 1999:15).

HACCP builds on the foundations of well established quality management systems such as Good Manufacturing Practice (GMP), identifying of CCPs and standard operating procedures (SOPs) (Norton, 2002b:52).

## **2.7 Strategies for implementing HACCP in small catering operations**

It is important to recognize that there is a critical interdependency between HACCP implementation and prerequisite programs (PRP). Prior to implementing HACCP operations must be engaged in good hygiene practices (WHO, 1999:19; Norton, 2002a:54).

### **2.7.1 Good Manufacturer's Practices (GMPs)**

GMPs include processes and facilities that must be in place before the HACCP program can be implemented. GMPs will focus on aspects like the design of facilities that must be appropriate for the type of operation, adequate levels of maintenance and sanitation, transportation that must keep quality intact and food handlers must be trained on personal hygiene and on the operational procedures. When applying HACCP, all GMPs must be adhered to (USDoHHS, 2001:27; Norton, 2002a:52).

Food may be contaminated by naturally occurring micro-organisms or pathogens transferred to food during harvest, slaughter or a food preparation step. Measures to protect the food from contamination are fundamental to GMP's (Baker, 2002:371). For best quality, ingredients of reputable suppliers should be used, and strict purchasing standards that include specifications for food safety should be adhered to (Norton, 2002c:54).

### **2.7.2 Food premises**

By ensuring that the layout of a kitchen is conducive to a HACCP plan, it allows a continuous flow of product without any crossovers between clean and dirty processes (Norton, 2002d:52). Kitchen

design and the food handling processes must be of such a nature that a hygienic flow of food is adequate and uninterrupted. The raw food area must be kept totally separate from the prepared food area to prevent cross contamination (Aycicek *et al.*, 2004:258).

Establishing that the building meets strict standards will promote the safe handling of food. Floors, walls and drains should be easy to clean. Floors must be waterproof, and non-absorbent without crevices or cracks (Aycicek *et al.*, 2004:258). Surfaces should be smooth, impervious, non-toxic, non-absorbent and resistant to damage by cleaning agents. Equipment must be in good working condition (Maunsell & Bolton, 2002: 99).

The following regulations for food premises according to the South African Health Act No. 63 of 1977 must be in place in organizations catering for the public:

Food premises shall:

- Have a wash-up facility with hot and cold water for the cleaning of facilities;
- Be rodent proof in accordance with the best available method; and
- Have a waste water disposal system approved by the local authority (DoH, 2000:8).

With regards to food premises, according to regulations of The Department of Health (2000:7) one latrine and one hand basin must be available for every ten staff members. For staff facilities where less than 10 people work on a food premises, separate sanitary facilities shall not be required for workers of different sexes. Hand washing facilities shall be provided with cold and/or hot water for the washing of hands by workers on the food premises together with a supply of soap and hand drying material /equipment.

Refuse containers must be liquid proof, easy to clean with close-fitting lids suitable for the hygienic storage or refuse removal from the food handling area. Storage space for the hygienic storage of food, facilities and equipment and a suitable separate area for the hygienic storage of refuse containers on the food premises must be made available. An adequate water supply for the type of organization is required (DOH, 2000:7).

The room in which food is handled must not have a direct connection with any area in which gas, fumes, soot deposits, offensive odors or any other impurity is present or may arise in such a manner that food in the food-handling room could be contaminated or spoilt (DOH, 2000:7).

### **2.7.3 Equipment**

Determine if equipment is designed not to harbour bacteria and can be easily cleaned (Norton, 2002a:52). Equipment used for chilling food should be capable of keeping food at the correct temperatures. It is important to keep perishable food such as dairy and meat products at the correct temperatures to prevent bacteria from growing and multiplying (Maunsell & Bolton, 2002:107).

### **2.7.4 Storage**

Storage areas must be well ventilated, cool and easy to clean to control hygiene. Fridges or chilled areas should be capable of maintaining the food at temperatures of  $-1^{\circ}\text{C}$  to  $5^{\circ}\text{C}$ . Deep freezers should be capable of maintaining food at temperatures of  $-18^{\circ}\text{C}$  or lower (Maunsell & Bolton, 2002:100). Storage facilities must be maintained for appropriate temperature control and sanitation procedures to discourage the growth of *micro-organisms* (Norton, 2002b:52).

Maize, for example, can be stored relatively safely for one year at a moisture level of 15% and a temperature of  $15^{\circ}\text{C}$ . However, the same maize stored at  $30^{\circ}\text{C}$  will be substantially damaged by moulds within three months (USDoHHS, 2001:31). Maize meal porridge forms a major part of the hot menu for the NSNP (Department of Education, 2004:24).

Insects and mites (arthropods) can also make a significant contribution towards the biodeterioration of grain because of the physical damage and nutrient losses caused by their activity. The metabolic activity of insects and mites causes an increase in both the moisture content and temperature of the infested grain that lead to faster deterioration (USDoHHS, 2001:31).

### **2.7.5 Manufacturers and suppliers**

HACCP deals with the safety of a product “from farm to fork” and not from raw material to finished product. A manufacturer needs to consider what may happen with the product after purchase (USDoHHS, 2001:10).

A HACCP study starts with identifying all significant hazards in raw materials and the effect of the control measures during production, distribution, preparation and use in order to evaluate the safety of a product at the moment of consumption. The control measures and good practices employed during agriculture, manufacturing, preparation and use are derived from food safety standards or objectives (FSO) (Van Schothorst, 2005:813). In developing countries where the food staples namely maize and groundnuts, can be susceptible to contamination by mycotoxins (more detail in 2.7.5.2) that can

influence morbidity, strict control is necessary (UNFAO, 2001:10). These standards and/or objectives will now be discussed in more detail.

#### **2.7.5.1 Food safety objectives (FSOs)**

Microbial safety is a major risk concern, which has led to a much greater focus on public health and methods for establishing clear health targets. The concept of FSOs provide meaningful guidance to food safety management in practices of manufacturers. It is important to demonstrate the relationship between food safety management practices and national public health goals. It is critical that food safety objectives are achievable by current industrial and consumer practices as we inevitably seek to improve standards of public health protection (Stringer, 2005:776).

Defining an acceptable level of risk is exceedingly difficult and it is important to understand that a level of zero risk cannot be obtained or expected. The FSO must be for consumption of the end product. It is important to set a target level at the moment of consumption. Microbial examination of food is still used when no more reliable means to judge the acceptability of food is available (Tebbutt, 2007:889; Van Schothorst, 2005:814).

FSOs must be set for the point of consumption of a product. This is sensible for ready-to-eat products (RTE) but more difficult for raw products like meat or vegetables, before preparation. The management of a specific organization must determine the acceptable level of a risk in the context of the food production process. This will influence the standards set for manufacturers (Stringer, 2005:777). Food safety is one of the democratic rights of a healthy nation and should be fostered at all costs (Limson, 2001:3).

#### **2.7.5.2 Mycotoxins**

Certain moulds produce toxic secondary metabolites such as ergot alkaloids, which are described as mycotoxins and the disease they cause are called mycotoxicoses. When fungal metabolites are ingested, inhaled or absorbed through the skin, lowered performance, sickness or death in man or animals, including birds are caused (UNFAO, 2001:31).

Mycotoxins are considered to be among the most significant food contaminants with regard to their negative impact on public health food security and the national economy of many countries, particularly developing ones like Sub-Saharan African countries. In developing countries where the food staples – maize and groundnuts – are susceptible to contamination, it is likely that significant additional losses will occur amongst the human population because of morbidity and premature death

associated with the consumption of mycotoxins. Aflatoxin is a type of mycotoxin that can be found in peanuts and peanut products (UNFAO, 2001:10).

The tolerance levels of aflatoxins in human food products like maize are regulated internationally and in South Africa by Government Notice No. R 313 of 16 February 1990 (Government Notice, 1990:1). Strict control of treatment of soil, harvest conditions, storage and moisture control are recommended. Products are sampled and tested for mycotoxins at mills using a quality control program before supplied for human consumption (Riley & Norred, 1999:26).

Peanut butter forms a major part of the cold menu in the NSNP in South Africa (Department of Education, 2003:24). Peanuts and peanut butter must be sampled and tested for aflatoxin by the manufacturer. Aflatoxin is produced by the fungus *Aspergillums flavus* which grows on peanuts in poor storage conditions either before or after harvesting. Because of their cancer causing properties, the tolerance levels of aflatoxin are strictly regulated worldwide. The maximum level of aflatoxins in food in South Africa is 10 micrograms per kilogram. High levels cause cancer in humans. The synergy between aflatoxin B and the hepatitis B virus can cause liver cancer (Medical Research Council, 2001:21).

Commercially available peanut butter differs in composition from peanut butter that is supplied in bulk to the schools in the NSNP. Rigorous quality control measures need to be enforced by Department of Health (DOH) on the manufacturers and distributors to ensure that suppliers comply with existing legislation aimed at reducing the risk of exposure to aflatoxins (Limson, 2001:2; Medical Research Council, 2001:21).

HACCP in the peanut industry is still in the implementation stage and challenges included: lack of data on import and processing methods, generic HACCP plans for different peanut processing sectors and lack of capacity of authorities to implement HACCP (Jansen van Rijssen, 2003:2).

## **2.8 Critical Control Points (CCPs)**

When a food safety hazard has been identified, appropriate control measures should be considered. This includes any action or activity that can be used to control, prevent, eliminate or reduce, the identified hazard to an acceptable level. Critical control points (CCPs) must be implemented for the following areas: receiving, storage, preparation, cooking, hot holding and chilling equipment. The procedure for HACCP application in a food service unit (kitchen) is to: (1) list the food served on the

menu; (2) find the hazard locations and list them on a flow chart for the food preparation and; (3) determine CCPs for the types of food that pose hazards (Sun & Ockerman 2005: 327).

### 2.8.1 Temperatures

Bacterial colonisation and growth is limited by holding hot foods hot, cold foods cold, and by ensuring that hot food are cooled to appropriate storage temperatures before bacterial multiplication (Baker, 2002:372). Food used in the NSNP is divided into two types of menus: (1) the cold menu that consists mainly of sandwiches and fortified biscuits; and (2) a hot menu that consists of cooked food items. It is important to determine the process flow of food through the temperature danger zone (USDoHHS, 2006: 41, Maunsell & Bolton, 2002:108).

Storage temperatures appropriate for frozen food is  $-18^{\circ}\text{C}$  and for chilled foods between  $0^{\circ}\text{C}$  to  $5^{\circ}\text{C}$  (Martinez-Tome & Murcia, 2000:443; Maunsell & Bolton, 2002:100). Cooked food must be cooled to below  $7^{\circ}\text{C}$  in three hours. To ensure the safety of food products for human consumption, food must be stored at temperatures below  $7^{\circ}\text{C}$  or above  $60^{\circ}\text{C}$  (referred to as the temperature danger zone). Food stored according to these critical limits prevents the growth of pathogenic and toxic bacteria in the catering and the foodservice environment (Baker, 2002:374).

According to the United States Department of Health and Human Services (2006:16) there are three processes that food undergo that influence bacterial growth:

- In the first process food preparation requires no cooking, for example:

#### **Receive-Store-Prepare-Hold-Serve:**

There is no cooking step to destroy pathogens. Inspection of delivery / receiving is important in food preparation with no cooking step. The food must be as safe as possible and must therefore be in good condition and from approved sources. Without a kill step to destroy pathogens, the primary responsibility of the operator will be to prevent further contamination by ensuring that employees follow good hygienic practices (USDoHHS, 2006:16).

- In the second process preparation and cooking are done for same day service for example:

#### **Receive-Store-Prepare-Cook-Hold-Serve:**

There is only one process through the temperature danger zone. Food is usually cooked and held hot until served or can also be cooked and served immediately. Proper cooking is important to destroy bacteria and parasites. Food is not stored to be used at a later stage.

- The third process, also seen as the complex food preparation process, includes a reheating process that takes the food twice through the danger zone and involves cooling, storing and reheating that require strict temperature control (USDoHHS, 2006:19).

The intervention strategy for temperature correction can be done immediately on site by using correct equipment like a thermometer and good standard operating procedures (SOPs) (Baker, 2002:372).

### **2.8.2 Cleaning materials**

All procedures for cleaning and sanitation of equipment (utensils, containers, crockery and cutlery) in the facility should be documented and appropriate foodservice chemicals used (Norton, 2002a:54). Cleaning equipment like wipes, dish clothes and towels must be washed daily. Disposable wipes are the best to prevent microbial contamination. Cutting boards, work surfaces and pot scourers must be disinfected after every use. A cleaning and sanitation plan should be in place (Maunsell & Bolton, 2002:102).

A cleaning schedule should include the following:

- What needs to be cleaned;
- Who is responsible for performing the cleaning and inspection;
- How often it needs to be done;
- How the cleaning should be done;
- What actions should be taken if the person checking the cleaning finds it has not been performed satisfactorily; and
- Cleaning instructions should state what chemicals to use, how to use the chemicals (diluted if required to do so) and how the chemicals should be stored (Maunsell & Bolton, 2002:102).

### **2.8.3 Training**

It is essential to assure that personnel are trained and aware of correct food handling practices when applying HACCP. Considerations for training include handling of specific ingredients, packaging, sanitation procedures, employee health and hygiene, identifying of CCPs and application of preventative measures (Norton, 2002e:58). Staff must be trained on proper hand washing techniques (Norton, 2002c:54).

Training of food handling staff should include safety training, such as how to conduct a risk assessment and hazard evaluation, learning how to minimize risk and control hazards, and identifying safe procedures that include correct time and temperatures for chilling and freezing for food. The value of safety is a positive, integral part of daily activities and cannot be compromised. Safety

procedures protect the worker, co-workers, and others from suffering from food poisoning episodes and improve the quality of people's lives (Hill, 2003:10).

The implementation of HACCP will have to take place within the existing constraints of the organisation with regard to time and resources. The implementation process is approached by breaking it down into a number of key tasks for management. All personnel must have an understanding of the HACCP concept and how it affects their particular working environment. Compliance to GMP will mean that personnel must understand how their commitment is important for overall food safety management. To reduce cost and to internalise the process it is important to train the trainer to educate other personnel. Personnel must be trained to create an awareness of their role within the food safety management program (Mortimore, 2001:214).

Training tools that the staff will need to implement the HACCP process can range from basic office supplies to a wide range of temperature measurement and monitoring equipment. Useful items range from accurate thermometers, timers with alarms, temperature calibration blocks, colour coded chopping boards and temperature strips for dish washing machines (Maunsell & Bolton, 2002:104; Norton, 2002b:60).

Other prerequisites to establish a HACCP program include:

- A good preventative maintenance program (Maunsell & Bolton, 2002:110);
- Incident reporting program;
- Documentation of staff and training developments; and
- A disaster preparedness plan (Norton; 2002a:52).

## **2.9 Standard Operating Procedures**

Standard Operating Procedures (SOPs) must be employed throughout an operation. People expect to eat in a food service operation that is clean. Prerequisite programs for HACCP would include SOPs for supplier control, written specifications, written cleaning and sanitation procedures and documented employee training (Youn & Sneed, 2003:55).

SOPs can be an extensive document of many pages or a plainly written list of steps for the staff to use. Whatever the case may be, some of the information included in specific SOPs will now be discussed in more detail.

### 2.9.1 Personal hygiene

Food service staff should wear protective headgear, gloves and clean and sanitised uniforms. Staff must be trained in good personal hygiene, use of correct hand washing techniques and follow the correct procedures in the preparing, cooking, serving and cleaning procedures in the kitchen to prevent the spread of infection (Sun & Ockerman, 2005:326).

Hands can be vectors in the spread of food borne disease because of poor personal hygiene or cross-contamination. An employee might, for example, contaminate his hands when using the toilet, or bacteria might be spread from raw meat to salad greens. When retail food personnel use gloves to prepare and serve food, they must be trained to realize that micro-organisms adhere to the surface of gloves and therefore gloves can be a source of cross-contamination just as much as unwashed hands. Food service staff must be trained on the frequency of glove changing and also to wash their gloved hands after touching contaminated products. Single-use gloves should be used for only one task such as working with ready-to-eat food or with raw animal food, used for no other purpose, and discarded when damaged or soiled or when interruptions occur in the production operation. When wearing gloves, it is recommended that hands be washed and sanitised with an effective product prior to wearing the gloves (Aycicek *et al.*, 2004:258). Wearing gloves is not a substitute for hand washing but only an additional safeguard if used correctly (Norton, 2002c:52).

### 2.9.2 Preparation

Employees must clean and sanitise work surfaces, utensils, clothes, aprons and hands to avoid the possibility of cross-contaminating to foods or food contact surfaces. Household sponges, cutting boards, dish cloths, counter tops and other surfaces represent areas where microbial pathogens can deposit and must be sanitised before use because unclean areas can lead to cross-contamination (Rayner *et al.*, 2004:37; Baker *et al.*, 2002:372).

The prevalence of bacteria on surfaces as well as salad vegetables has significant implications regarding the accurate cleansing ability of commercial sanitizing and cleaning products. Inadequate washing may leave micro-organisms behind on the fabrics and food from which subsequent bacterial re-growth may occur and therefore lead to cross-contamination (Rayner *et al.*, 2004:37; Sun & Ockerman, 2004: 328). Checklists for SOPs range from personal hygiene, preparation, cooking, cleaning and serving must be in place to make monitoring a clear procedure for the food handler as well as the manager.

Some important hygiene practices during food preparation are:

- Precautions to contain meat juices when opening pre-packed meat must be taken and done in a designated area;
- Packaging material must be disposed of immediately and in the correct manner to avoid cross-contamination;
- Place raw meat on the lowest refrigeration shelves to prevent drips from contaminating other foods, their containers or the refrigerator shelves (Baker, 2002:375);
- Cutting boards should be cleaned and sanitised each evening, using heat and/or chemical treatments (Baker, 2002:375);
- Double wash fruit and vegetables under running water if they are to be served raw; and
- Stock should be rotated on a 'first in – first out' basis, taking into account the 'best before' and 'use by' dates (Maunsell & Bolton, 2005: 103; Norton, 2002c:52).

### **2.8.3 Record keeping documentation**

Managerial control is important for an effective food safety program. SOPs must be in place to ensure safety for example:

- Recipe cards that contain the specific steps for preparing a food item and the food safety critical limits such as final cooking temperatures that need to be monitored and verified;
- Purchase specifications;
- Monitoring procedures;
- Record keeping;
- Employee health policy; and
- Manager and employee training (USDoHHS, 2006:30).

## **2.10 Hazard Analysis and Critical Control Points (HACCP) Implementation**

To implement HACCP in a restaurant or food service environment, four stages and twelve steps have been identified. Table 2.1 indicates the stages and the steps for HACCP implementation. Communication both upward and downward in an organisation plays a very important role in successful HACCP plan implementation (Norton, 2002a:54; Mortimore, 2001:212). Addendum A gives an outline of the Codex Logic Sequence for HACCP implementation.

**Table 2.1: Four Stages for the implementation of HACCP** (Norton, 2002a:54; Mortimore, 2001:212)

Stage	Steps
I ( Stage 1)	<ol style="list-style-type: none"> <li>1. Assemble the HACCP team that are tasked to define the operations food and distribution patterns</li> <li>2. Describing the food's intended use and its consumers</li> </ol>
II ( Stage 2)	<ol style="list-style-type: none"> <li>3. Developing and verifying a flow diagram for food production</li> <li>4. Conducting the Hazard Analysis</li> <li>5. Determining the Critical Control Points</li> <li>6. Establishing critical limits</li> <li>7. Establishing monitoring procedures</li> <li>8. Establishing corrective action</li> </ol>
III (Stage 3)	<ol style="list-style-type: none"> <li>9. Establishing verification procedures</li> <li>10. Establishing record keeping procedures</li> <li>11. Validating the HACCP plan</li> </ol>
IV (Stage 4)	<ol style="list-style-type: none"> <li>12. Ongoing Evaluation and Maintenance of the HACCP Program</li> </ol>

These stages and steps will now be discussed in more detail

### 2.10.1 Stage 1

#### 2.10.1.1 The HACCP Team

When HACCP was first implemented in organizations a single person was appointed to drive the program which frequently ended in failure. The lack of a team approach with appropriate levels of support and empowerment was often the underlying reason for failure. The first step in the implementation process would be to identify team members and appoint a HACCP program coordinator (Mortimore, 2001:210; UNFAO, 2001:30). The coordinator is responsible for the development of the plan, with each team member performing his or her assigned function. The most successful teams draw from all layers of an organization. For a food service operation, minimum members for a team will include a chef, a buyer, a receiving/storeroom person and a sanitation worker. The team leader must convene team members.

The following additional people are required to be part of the team:

- The specialist with detailed knowledge of the food service procedures able to draw up flow diagrams
- Several other specialists, each with an understanding of their particular hazards like food handlers and cleaners.
- A secretary must be appointed to keep record on the team's progress (UNFAO, 2001:31).

### 2.10.1.2 Food's intended use

The team needs to do a full description of the products and processes used, including relevant safety information such as: composition, treatments (heat-treatment, freezing, brining and smoking), packaging, durability and storage conditions. Products with similar characteristics or processing steps can be grouped together for the purpose of developing the HACCP plan (UNFAO, 2001:32).

## 2.10.2 Stage 2

### 2.10.2.1 Flow diagram

The first goal will be to define the types of food the operation produces, how ingredients are received, how they move into production, and then to the customers, or into holding facilities. This information forms the basis for the use of a flow chart, in identifying the CCPs in the operation. First categorize the food used in groups (fresh, frozen, shelf stable). The next goal is to track the food's distribution patterns. The basic distribution would be from receiving, storage, issuing and preparation to holding to service. For practical purposes the flow chart will typically begin where food arrives at the foodservice operation. The food purchase specifications should include criteria specifying producers, distributors and manufacturers who have handled food products previously and also use the HACCP approach. A flow chart is an evolving document, subject to change and revision as operations and processes change (USDoHHS, 2006:12; CAC 2003:25).

### 2.10.2.2 Hazard Analysis

Effective hazard identification and hazard analysis are the keys to a successful HACCP plan. All real or potential hazards that may occur in each ingredient and at each stage of the commodity system should be considered. Food safety hazards for HACCP programs have been classified into three types of hazards:

- Biological: Typical food borne bacterial pathogens examples such as *Salmonella*, *Listeria* and *E.coli*, also viruses, algae, parasites and fungi.
- Chemical: There are three principle types of chemical toxins found in foods: (1) naturally occurring chemicals for example cyanides in some root crops, and allergic compounds in peanuts; toxins produced by micro organisms, for example mycotoxins; (2) algal toxins; and (3) chemicals added to the commodity by man to control identified problems, for example fungicides or insecticides.
- Physical: Contaminants such as broken glass, metal fragments, insects or stones. Once a food safety hazard has been identified, appropriate control measures should be considered.

These are any action or activity that can be used to control the identified hazard, such that it is prevented, eliminated, or reduced to an acceptable level (UNFAO, 2001:32).

To start the process of hazard analysis, a full description of the product, including customer specification, should be prepared. This should include information relevant to the safety of the product for human consumption, information about the packaging, storage conditions and transportation. Appropriate labeling information should also be included. Information on whether the product will be consumed directly, or be cooked, or be further processed, will all have an effect on hazard analysis. Specify if consumption is meant for a specific target group like the elderly or infants and children (UNFAO, 2001:32).

The steps 5-8 in stage 2 compare with the HACCP principles 2 –5 and were discusses as part of the seven HACCP principles (see 2.4.1).

### **2.10.3 Stage 3**

#### **2.10.3.1 Verification**

Verification is carried out to determine if the HACCP system is working correctly. Verification is usually performed by someone other than the person responsible for performing the activities specified by the plan. Verification can be carried out by the manager or supervisor of the food handlers in the organisation. Verification should occur at a frequency that ensures that the HACCP plan is being followed in order to minimize the risk of unsafe products reaching customers (UNFAO, 2001:34).

Verification activities should ensure that:

- the prescribed practices are consistently followed;
- the food handlers have the correct equipment and facilities for procedures like hand-washing, cleaning equipment and temperature measuring devices;
- calibrations of the equipment are correct; and
- control and monitoring procedures are being followed (CAC, 2003:25).

#### **2.10.3.2 Record Keeping**

HACCP procedures should be documented. Accurate documentation and record keeping is essential to the application of a HACCP program. Documentation and records should be sufficient to ensure the organisation to maintain standards.

Records document that the critical limits at each CCP were met or that appropriate corrective action were taken when the limits were not met. The record-keeping system can use existing paperwork, such as delivery invoices and simple checklists for documenting product temperatures (CAC, 2003:24; Mortimore, 2001:213).

#### **2.10.3.3 Validation**

When implementing the HACCP program, confirmation activities are required to validate that the HACCP plan is effective. These activities need to take place at all the stages of the HACCP program for example, confirmation of the critical limits, or the identified hazards must be reduced to acceptable levels or eliminated (CAC, 2003:25).

#### **2.10.4 Stage 4**

##### **2.10.4.1 Evaluation and maintenance of HACCP**

Management is responsible for regular evaluation of ongoing HACCP plan maintenance activities. The HACCP plan must be reviewed and finally approved. This ongoing process should be viewed as a risk management process that will in the end take far less time and cost less than damage control and liability issues that would have to be dealt with in the case of a food borne illness incident. A HACCP program not only enhances the quality of the food and the professionalism of the organisation, but also contributes to the overall quality of management that exists in a food service operation (WHO,1999:23).

Standards must be defined and audit schedules determined to analyse incoming data. Problem solving in the form of corrective action plans must be developed if deviations from the standard are encountered. The following processes will help with the monitoring procedures:

- Record keeping;
- Data analysis;
- Updating the HACCP plan; and
- Identifying ongoing training requirements (UNFAO,2001:32).

## 2.11 Conclusion

Good nutrition is a cornerstone of the primary health care approach, and is considered a key developmental priority for the NSNP in South Africa. A further focus for the NSNP is to improve the nutritional status of children (Department of Education, 2004: 2). Good menu planning guidelines for children, coupled with good hygiene and safety practices, all contribute to the quality of care. Ultimately, the implementation of such standards of care can positively affect the growth and development of children. However achieving these standards requires sound nutrition knowledge on the part of the food handlers (Pietersen *et al.*, 2002:14; DoH, 2000:12).

Recommendations to improve the outcome of nutrition interventions are adequate numbers of workers to promote interventions like safety, ongoing skills development and continuous funding to strengthen and improve nutrition programs (Hendricks *et al.*, 2006:215).

The ultimate responsibility for food safety lies with the management of an organisation. Most food safety management systems are based on the HACCP program (USDoHHS, 2001:5). The HACCP program is a scientific and systematic approach to identify hazards and measures for their control to ensure the safety of food. HACCP can be applied throughout the chain from primary production to consumption because the program focused on safety and hygiene practices throughout the organisation and not only on end product testing (WHO, 1999:21).

To be successful in implementing a HACCP program, the whole organisation, from food handler to top management must believe in the approach. The critical factors for success include proper preparation of food, training of food handlers and commitment to food safety by all employees (Mortimore, 2001:214). The HACCP program requires skill to be implemented as each organisation needs an individually developed HACCP plan for specific needs.

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# Assessment of Hazard Analysis and Critical Control Points Principles in Primary School Feeding Schemes in the Western Region of Gauteng, South Africa

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## Abstract

**Objective** The objectives of this study were to analyse the type of food served as part of the NSNP and the suitability of facilities were evaluated. To assess the knowledge of the food handlers on hygiene and safety in the NSNP in primary schools in the Western Region of Gauteng in order to identify safety risks. To give guidelines for implementing safety and hygiene practices for the NSNP in the Western Region of Gauteng.

**Research Design** A questionnaire was developed that focused on systems currently used in schools that influence the hygiene and safety aspects of the NSNP. Twenty-six primary schools, in both rural and urban areas were targeted which included 44 food handlers.

**Results** The study found no standardization of safe food handling procedures and equipment for food preparation and serving food to the learners. A lack of training in basic hygiene, safety and food storage, and preparation of food for the food handlers was identified. A need for protective clothing for the food handlers and safety measures in the kitchen were identified.

**Conclusion** A definite need for a quality control system was identified by the analysis of the questionnaires. HACCP can play a key role to improve the hygiene and safety of the NSNP. To implement a system like HACCP will need the support from the management. A HACCP team needs to be identified from all levels of employees of the NSNP. Other factors that will play a role will be standardization of equipment and facilities as well as training of the NSNP employees.

**Keywords:** HACCP, food safety, hygiene, food service units, school feeding, food borne illness

## **INTRODUCTION**

The aims of the National School Nutrition Program (NSNP) are to provide nutritious, supplementary meals to learners, to improve learning capacity and school achievement and attendance.<sup>1,2</sup> Serving safe food is a critical responsibility for school foodservice and a key aspect of a healthy school environment. The purpose of a school safety program is to ensure the serving of safe food to children by controlling hazards that may occur along the flow of food from delivery to serving the food.<sup>3</sup>

Worldwide, it is recognized that the application of the HACCP system to food production and preparation has clear benefits and the potential of enhancing of food safety and preventing many cases of food borne diseases.<sup>4</sup>

The seven steps in the HACCP Plan include:

- Conducting the Hazard Analysis;
- Determining the Critical Control Points;
- Establishing critical limits;
- Establishing monitoring procedures;
- Establish a procedure for corrective action;
- Establish procedures for verification to confirm the effectiveness of the HACCP plan; and
- Establish documentation concerning all procedures and records.<sup>5,6</sup>

The objective of this study was to analyse the hygiene and safety practices of National School Nutrition Program (NSNP) staff as well as assessing the conditions at the premises used for preparation of the food by investigating the type of food served at schools, the suitability of facilities used in the process, and the knowledge of the food handlers in the school feeding scheme at twenty six primary schools in the Western Region of Gauteng in order to identify safety risks for food served to learners.

## **METHODOLOGY**

### **Sample Selection**

The research project focused on schools that form part of the Gauteng Department of Education NSNP. Twenty six primary schools in the Western Region of Gauteng, in urban and rural settings, were selected as a convenient sample. All the schools that were selected form part of the Mogale City Municipality. Urban schools in affluent areas that supplied their own school feeding scheme on a small scale or funded the local tuck shop to assist needy learners, were excluded from the study. All other primary schools in this region were included. Learners were excluded from the study. Names of

the schools included in the study are available from the author on request. A total of 44 food handlers (FHs) in the schools were included in the study.

### **Questionnaire Design**

A written, structured questionnaire was designed for this study with the help of a Bio-statistician from the North-West University (Potchefstroom Campus). Close ended questions were mainly used because it only deals with a limited selection of possibilities, which makes statistical analysis easier. The average time to complete the questionnaire was 45 minutes per school. The first part of the questionnaire relate to demographic information about the school NSNP facilities and resources. The second part of the questionnaire investigated the menu served in the schools. Data on demographic questions for food handlers and volunteers of the NSNP were grouped according to personal hygiene, knowledge on safety and hygiene practices and attendance of specific training workshops of the FHs. Other aspects, ranging from the equipment used and hygiene and safety conditions at the schools, followed.

Questionnaires were systematically examined for content validity to determine whether it covers a representative sample of the hygiene and safety conditions to be measured. Two questionnaires were tested twice for face validity in two schools, where after, the necessary changes were made to the final questionnaire. These four tested questionnaires seemed to note all possible problems encountered with unclear questions. No translation of the questionnaire into an African language was done since schools visited used Tswana, Zulu, Xhosa and English, respectively, as a second language. Any language barriers were solved and sorted out by the trained fieldworkers conducting the questionnaires. This may have been a limitation of the questionnaire, which will be addressed with further research. Only one FH per school completed the questionnaire. The data from twenty six final questionnaires were fully completed and was used for statistical analysis. Questionnaires were submitted weekly to the researcher who scanned it for any missing data, where after the data capturing took place. Missing data was followed up and corrected.

### **Ethical approval**

The author received written permission from the Gauteng Department of Education, Research Unit, to conduct the study in the selected schools. The principals of the selected primary schools were informed by a letter of the NSNP research request. A letter for informed consent was made available to the FHs of the various schools, which they signed and submitted to the researcher, before commencement of the study. The North West University (Potchefstroom Campus) approved the ethical application for the research study, numbering NWU-00046-07-S6.

### **Fieldworkers/research assistants**

Eight community development workers (CDWs) from the Mogale City Local Municipality conducted the interviews for the research study. They attended a training session where the questionnaire, specific detail on standardized hand washing procedures, examples of measuring and portioning equipment and general hygiene and safety aspects were discussed, demonstrated and practiced. The CDWs assisted with language barriers where the FHs were not fluent in English, by translating the specific question into the language of choice.

### **Statistical analysis**

The completed questionnaires were analysed and statistical calculations done by the North West University, Potchefstroom Campus, Statistical Department. The analysis consisted of quantitative data that include means, averages and frequency tables. The relatively small scale (26 schools) of the study indicated no need for other statistical procedures.

## **RESULTS**

The results were compiled from questionnaires done in 26 primary schools of which sixteen (15) were located in urban and ten (11) in rural areas. Only 2 urban schools (Table 1 (a) and (b)) had less than 500 children in comparison to the 6 rural schools. Very few rural schools (4) had more than 500 children, while only 1 had more than 100 children, compared to the urban schools with 7 schools with more than 500 and 6 more than 1000 children. Table 1(a) and 1(b) indicates that not all the learners in the schools participated in the NSNP. From table 1(a) and (b) it is clear that schools smaller than 500 children per school could supply 100% of the children in the school feeding program (SFP), irrespective of rural or urban. As soon as the schools are larger than 500, but smaller than 1000 children, less children benefited from the NSNP, 90% and 85%, respectively, for urban and rural schools. For schools with more than 1000 children only 75% and 40% of urban and rural schools, respectively, benefited from the NSNP.

All grades in primary schools participated in the NSNP.

**Table 1(a): Urban schools and school feeding beneficiaries**

	Urban Schools < 500 children	Learners (n)	Learners Beneficiaries SFP
n=2	Itumeleng	150	150
	Khaselihwe Primary	450	450
		<b>Total: 600</b>	<b>Total: 600 (100%)</b>
	Urban Schools >500 and < 1000	(n)	SFP
n=7	Sandile	578	578
	WD Oliphant	620	620
	Zuurbekom Primary	630	630
	Tsholatshega Primary	760	226
	West Rand Mine School	820	820
	Tsakani	857	857
	Lesego Primary	887	887
		<b>Total: 5152</b>	<b>Total: 4618 (90%)</b>
	Urban Schools > 1000	(n)	SFP
n=6	Thembile Primary	1047	350
	Diphalane	1107	476
	Phatudi	1132	1004
	Thuthuzekani	1335	1335
	Patrick Mashego	1400	1200
	Khukhulekani	1800	1500
		<b>Total: 7821</b>	<b>Total: 5865 (75%)</b>

U=Urban school; SFP= School Feeding Program

**Table 1(b): Rural schools and school feeding beneficiaries**

	Rural Schools < 500 children	Learners (n)	Learners Beneficiaries SFP
n=6	FJ Kloppers Primary	134	134
	Doornbosch Primary	137	137
	Randgold Primary	164	164
	Die Poort Primary	172	172
	Kwaggafontein	180	180
	Maloneys Eye	300	300
		<b>Total: 1087</b>	<b>Total: 1087 (100%)</b>
	Schools >500 and < 1000	(n)	SFP
n=4	Mphe Thuto	822	822
	Tarilton Intermediary	543	543
	Unity Primary	710	273
	Westonaria Primary Mine School	930	930
		<b>Total: 3005</b>	<b>Total: 2568(85%)</b>
	Schools >1000	(n)	SFP
n=1	Malta Combined School	1058	425
		<b>Total: 1058</b>	<b>Total: 425 (40%)</b>

**Table 1(c): Data of NSNP schools used in research study**

Schools (n=26)	Total	% of total
Rural Schools	11	42%
Urban Schools	15	58%
Schools using only the cold menu	14	54%
Schools using the cooked menu combined with the cold menu	10	38%
Cooked menu exclusively	2	8%

**Food items**

Two sets of menus were used (Table 1(c)). Fourteen (54%) schools used a cold menu mainly consisting of brown bread sandwiches and fortified biscuits. Twelve (46%) schools used a hot menu, consisting of cooked food, which included maize meal, samp, beans, soya mince and soup. Only two (2) schools used the cooked menu exclusively (five out of five days), while ten (10) of the schools combined sandwiches for two (2) of the meals served to learners per week on the hot menu (two of the five days). Table 2 shows the total items served to learners as part of the NSNP for the week.

**Table 2: Items served to learners as part of NSNP (% schools on specific menu per weekday)**

MENU ITEMS (Schools: n =26)	Monday	Tuesday	Wednesday	Thursday	Friday
	% of schools on a specific menu				
<b>Fortified biscuits</b> (4 biscuits x 25g)	65% (17)	0	0	0	0
<b>Bread</b> (2 x slices - brown)	15% (4)	73% (19)	69% (18)	85% (22)	62% (16)
<b>Margarine</b> (10g)	12% (3)	50% (13)	42% (11)	38% (10)	42% (11)
<b>Peanut butter</b> (15g)	12% (3)	54% (14)	23% (6)	54% (14)	12% (3)
<b>Jam</b> (20g)	12% (3)	35% (9)	42% (11)	54% (14)	38% (10)
<b>Vitamin C rich drink</b> (200ml/1x small glass)	69% (18)	58% (15)	54% (14)	58% (15)	46% (12)
<b>Maize meal porridge</b> (2 x serving spoons)	27% (7)	8% (2)	8% (2)	8% (2)	27% (7)
<b>Soya mince, cooked</b> (1 x serving spoon)	23% (6)	12% (3)	12% (3)	12% (3)	27% (7)
<b>Soup</b> (200ml/1x small glass)	4% (1)	4% (1)	8% (2)	0	12% (3)
<b>Samp, cooked</b> (2x serving spoons)	0	19% (5)	19% (5)	12% (3)	12% (3)
<b>Dried beans, cooked</b> (1 x heaped) serving spoon	0	15% (4)	23% (6)	4% (1)	8% (2)

Table 2 illustrates that seventeen 17 (65%) schools served fortified biscuits on Mondays. A vitamin C rich drink was served at more than 50% of the schools for most of the week. The majority of the schools served brown bread sandwiches with a combination of either peanut butter and margarine or jam and margarine. Table 2 also shows the frequency of peanut butter served in the schools. Soup was seldomly served in the schools because it was still a new item on the menu. The research questionnaire was executed in schools in summer and could have contributed to soup being served seldomly. Samp was also seldomly served because of the long cooking time.

### **Food handlers**

Food handlers (FHs) are staff appointed by Department of Education to prepare the food for the NSNP. Fourteen (14) schools had one (1), nine (9) schools had two (2), and three (3) schools had four (4) FHs in service of the NSNP. From these 44 FHs, only three (3) received training in safety; hygiene and hand washing and only one (1) received any training in cooking methods. No FH had any evidence of training attendance or certificates.

Only three (3) schools mentioned that they have appointed one volunteer from the local community while one (1) school appointed two (2) volunteers to help with food preparation. Fourteen (14) schools indicated that the personnel turnover for FHs is six months while twelve (12) indicated no FH turnover at all. The volunteers indicated that they received no training on any aspect of the NSNP. In terms of visitations by NSNP fieldworkers, 18 schools indicated that the visits took place at least once or twice a month, seven (7) schools indicated every second to third month while one (1) indicated every third to fourth month.

### **Deliveries**

On the question regarding problems experienced with late delivery of food by the supplier, six (6) schools complained (Table 3). A further complaint indicated that no food is served on the first school day of a term as deliveries are only scheduled to arrive that day. Twenty one (21) schools indicated that they have adequate storage facilities (Table 3). A general observation of storage facilities showed no stock taking records, storage space was limited and often shared with books. Dried bean and maize meal bags were often stored directly on the floor. Table 3 illustrates the types of storage facilities found in schools.

**Table 3: Storage facilities and delivery challenges in schools**

n= 26 schools	Delivery challenges and number of stores available	%
Quality of deliveries (late deliveries)	6	23%
General storage facilities	21	81%
Store room separate from kitchen	12	46%
Fridge	9	35%
Freezer	8	31%
Lockable cupboard	5	19%
Air tight containers	21	81%

### Equipment

On the question asked about the type of cutting boards used (Table 4) only two (2) schools indicated that they used plastic and two (2) schools used wooden cutting boards. No usage of colour coded chopping boards was indicated. In addition, six (6) schools mentioned that they used spoons as measuring equipment. Nine (9) schools also used measuring jugs. Table 4 indicated that the equipment used at schools was not standardized.

The FHs of thirteen (13) schools used metal spoons, eight (8) used wooden spoons, six (6) used plastic spoons and four used soup ladles for measuring and food preparation (Table 4). There were no standardized spoons found in schools for preparation, portioning and serving. The FHs used cups, jugs and random spoons for serving food. The FHs in sixteen (16) schools had table knives in the kitchens for spreading fillings for the sandwiches, followed by seven (7) schools with bread knives and three (3) with vegetable knives. None of the schools used chefs' knives. With regard to plates, nineteen (19) schools had plastic plates; while two (2) had enamel and one (1) had porcelain plates in the kitchen for serving food to the learners. Some learners used their lunchboxes for plates. In terms of glasses, twenty (20) schools provided plastic glasses while five (5) schools indicated that learners had to bring their own glasses to school.

Table 4 indicates that gas stoves were supplied to 21 schools by Department of Education. Eleven (11) of these schools kept the gas cylinder in the same room as the gas stove while two (2) schools kept the cylinder outside the room. The remaining schools were not presently using the gas stoves supplied to them by Department of Education (DoE) and prepared the cold menu where no cooking was required while the DoE is phasing in the hot menu.

**Table 4: Preparation and cooking equipment in schools**

n=26 schools	Number available	%
<b>Preparation and serving equipment</b>		
Total Cutting Boards in schools	4	15%
Colour coded cutting boards	0	0%
Measuring spoons	6	23%
Measuring jug	9	35%
Table knives	16	62%
Pairing knives (vegetable knife)	3	12%
Chef's knife	0	0
Wooden spoons	8	31%
Metal spoons	13	50%
Soup ladle	4	15%
Plastic spoons	6	23%
Plastic plates	19	73%
Enamel plates	2	8%
Porcelain plates	1	4%
Plastic glasses	20	77%
Standardized serving equipment	0	0
<b>Cooking Equipment</b>		
Gas stoves	21	81%
Gas cylinder in the kitchen	11	42%
Gas cylinder outside	2	8%

### Hygiene and safety

Twenty (20) schools used plastic (rubber) garbage bins to dispose of refuse (Table 5). Eight (8) of the schools indicated that their garbage bins had lids and three indicated that they also used plastic bags inside their bins. Six (6) schools did not have garbage bins near the kitchen to dispose of waste and used plastic shopping bags to dispose of garbage at a central dumping terrain.

Figure 1 indicates that fifteen (15) schools made use of plastic buckets for washing dishes. Table 5 indicated that fifteen (15) schools had only cold water in their kitchens while six (6) schools indicated they also had hot water. Only two (2) schools had separate basins for hand washing and dish washing. Five (5) schools indicated the use of standardized methods for washing of hands. The FH from nineteen (19) schools used the dishtowel and five (5) schools used hand towels to dry their hands. Cleaning agents that most schools used included liquid dish wash soap (23) followed by disinfectant (16), hand wash soap (11) and bleach (8). When asked about cleaning equipment used, most schools mentioned a bucket (25) followed by a broom (24) and a mop (21). The indication of the water supply of the twenty six (26) schools visited were only six (6) schools had hot water supply in the kitchen, fifteen (15) had cold water supply and fifteen (15) schools used buckets for washing dishes (Table5).

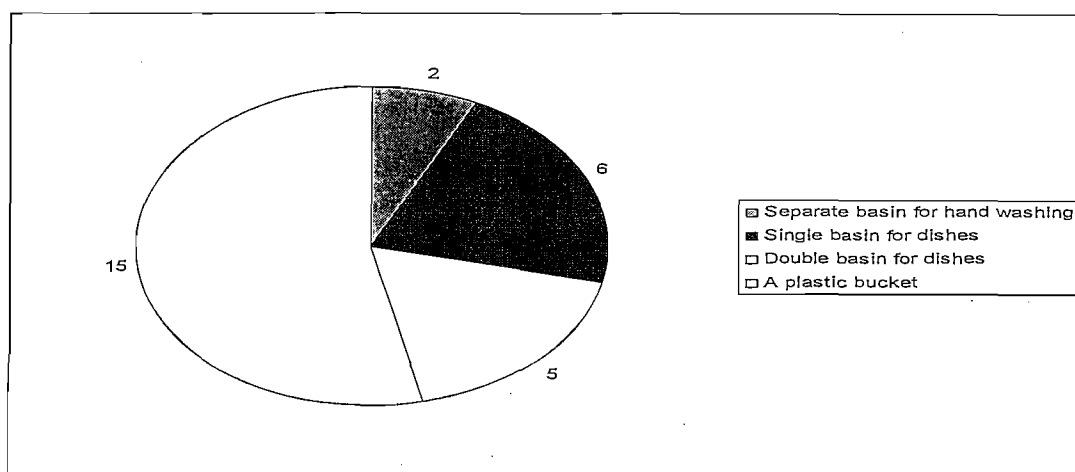


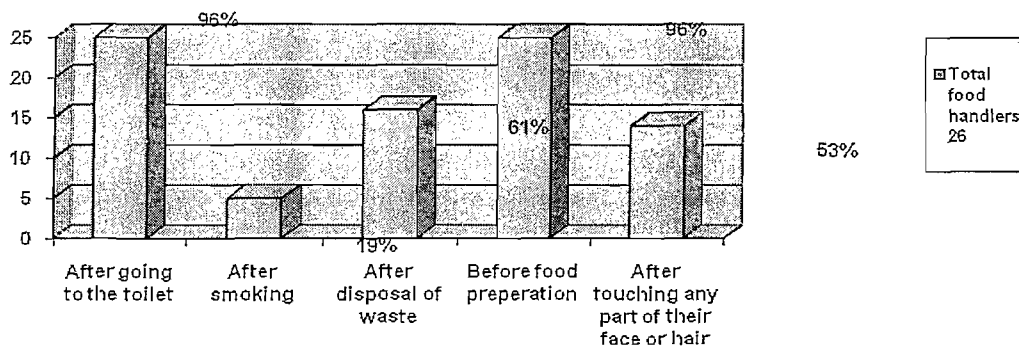
Figure 1: What kind of wash basins do you have?

Table 5: Hygiene and safety

n=26 schools	Number available (n)	%
<b>Water availability in kitchen</b>		
Cold water	15	58%
Hot water	6	23%
Bucket system for washing dishes	15	58%
<b>Cleaning material/equipment</b>		
Broom	24	92%
Mop	21	81%
Bucket	25	96%
Liquid dish wash soap	23	89%
Disinfectant	16	62%
Bleach	8	31%
<b>Waste disposal</b>		
Plastic (rubber) garbage bins	20	77%
Garbage bin with lid	8	31%
Plastic bags inside garbage bin	3	12%
<b>Personal hygiene and uniform items</b>		
Chef's jacket	0	0%
Over coat	1	4%
Plastic apron	1	4%
Material apron - self supplied	17	65%
Disposable hairnet	0	0%
Bandana	19	73%
Disposable gloves	3	12%
Clogs	0	0%
Hand wash soap	11	42%
Hand towel	5	19%
Dish towel used for drying hands	19	73%

On the question whether the volunteers/FH wore aprons, seventeen (17) school's FHs indicated they wear cloth aprons supplied by themselves while only one (1) FH used a plastic apron. This means that from a total of 26 schools, only eighteen (18) school's FHs wore any protective clothing (Table 5). With regard to headgear, nineteen (19) schools indicated that their volunteers/FH supplied their own bandanas. Three (3) schools added that their FH worn disposable gloves. Twenty four (24) schools indicated that NSNP staff shared the toilets of the teaching staff and all the toilets were reported to be flush toilets.

Twenty four (24) schools reported hand washing facilities in their cloakroom. Figure 2 indicates the knowledge of the FHs on the frequency of hand washing. Twenty five (96%) indicated that they knew hands had to be washed after visiting the toilet, while only 5 (19%) knew that hands had to be washed after smoking.



**Figure 2: Food handlers' knowledge on the frequency of hand washing when preparing food**

In terms of smoking habits (Table 6) by FHs, two (2) schools indicated their staff did smoke but were not allowed to do so inside the kitchen. In terms of staff meals, twenty two (22) schools reported their school feeding staff only eats after serving food and twenty one (21) ate in the kitchen. None of the FHs had experienced any accidents in the past six months. However, eleven (11) FHs indicated that they had access to the First Aid Box of the school in case of accidents. First aid boxes in ten (10) schools mostly contained disposable gloves, plasters, bandages and only four (4) schools indicated disinfectant and ointment for burns. As part of safety measures, six (6) schools indicated that they had fire extinguishers in their kitchens.

**Table 6: Habits of food handlers at work**

n=26 schools	Number (n)	%
Smoking at work	2	8%
Eat at work	22	85%
Eat in kitchen after serving	21	81%
<b>Safety Measures</b>		
Access to first aid boxes	11	19%
Fire extinguishers in kitchens	6	23%

## DISCUSSION

### The NSNP and the impact on learners

From the data it was clear that 76.8% of learners in the 26 schools benefited from the NSNP program. The evidence of the cognitive benefits to these children was also clear from the literature. A study<sup>2</sup> in the North West Province showed that learners benefited from school feeding as it encouraged school attendance and increased potential for learning. Other indicators that improved due to school feeding were punctuality, discipline, average scores, alertness, physical well-being and behaviour<sup>7</sup>. Learners in primary schools in South Africa are faced with challenges of poor nutrition and food insecurity that may influence their physical and cognitive development negatively.<sup>7</sup> Micro nutrient deficiencies such as iron, iodine and vitamin A are a public health problem in developing countries worldwide. These deficiencies can have adverse effects on the mental development and learning abilities of learners.<sup>8</sup> It would be a good investment in the cognitive development of the adolescents of the country if this program could be extended to secondary institutions, as learners have to cope without any feeding scheme on secondary level.<sup>2,7</sup>

The NSNP is supposed to provide at least 25%– 30% of the nutrient needs for a child per day. The energy content of the approved NSNP menus ranged between 17,6% to 27,4% of the RDA for children 7-10 years of age.<sup>2</sup> The quantities of food served to learners vary due to poor or no portion control at the schools.<sup>2</sup> Results indicate that no standardized equipment for portioning and serving was used. In a study at Insingizi Primary School<sup>9</sup> in a poverty stricken area of the South Coast in South Africa, results showed that the food provided by NSNP was the only meal that the learners consumed during the day. At the national level, stunting (short for age) remains by far the most common nutritional disorder affecting nearly one out of five children. Stunting is by far more prevalent in rural areas. One in ten of all children in South Africa aged 1 – 9 years were found to be underweight.<sup>10</sup> Additionally, protein sources from peanut butter and cooked beans from the

NSNP are vegetable proteins which contains non-haem iron similar to the iron found in vegetarian diets that need vitamin C for optimal absorption of iron.<sup>11</sup>

### **Food handlers**

Food handlers (FHs) indicated that only 12% of them received training on hygiene and safety and no one were able to produce attendance certificates as proof of training. Protective clothing were mostly supplied by the FH's themselves, the indication was that 73% supplied their own bandanas and 65% their own aprons. Only one FH had an over coat and one a plastic apron. The FHs indicated that 42% had access to hand wash soap, 19% to hand towels and 73% used dishtowels to dry their hands. Food service staff should wear protective headgear, gloves and clean and sanitised uniforms. Staff must be trained in good personal hygiene, use of correct hand washing techniques and follow the correct procedures in the preparing, cooking, serving and cleaning procedures in the kitchen to prevent the spread of bacteria and infection.<sup>12</sup> The HACCP program monitor hygiene and safety practices for food production from raw materials through processing to end products, and serving based on controlling time and temperature. These factors, if mismanaged, are known to contribute to food borne disease outbreaks which would be detrimental to school children.<sup>6</sup>

### **Deliveries**

Problems with delivery of supplies were experienced by 23% of schools. The Department of Education<sup>15</sup> indicated that rural areas were inaccessible by road after even a light rainfall. Schools do not always operate during regular school hours, closing half-way through the morning, which means that deliveries can not be made.<sup>15</sup> If deliveries are not made in time and stored at proper temperatures, it may not be safe to use for feeding of children, due to microbial growth at temperatures above 10°C.<sup>16</sup> This may be especially problematic during the summer months and rainy season, when roads are inaccessible.

### **NSNP conditions at school premises**

Only 23% of school kitchens had hot water, 58% had cold water and 58% made use of the bucket system to wash dishes. Results indicate that 89% of the FHs used liquid dish washing soap, 62% had disinfectant and 31% had bleach. Most schools had a broom, mop and bucket for cleaning floors. For cleaning and disinfecting of food contact services and cleaning equipment, proper wash instructions and monitoring procedures must be in place.<sup>13</sup> The prevalence of bacteria on surfaces has significant implications regarding the accurate cleansing ability of commercial sanitizing and cleaning products. Inadequate washing may leave behind micro-organisms on the fabrics and food from which subsequent bacterial re-growth may occur and therefore lead to cross contamination.<sup>12,14</sup> Appropriate

facilities and procedures should be in place to ensure that any necessary cleaning and maintenance is carried out effectively and that an appropriate degree of hygiene is maintained.<sup>5</sup>

Results indicated that 81% of the schools made use of general storage space inside the kitchen, 81% had airtight containers, 46% of schools had a separate storage room, 35% had a fridge and 31% had a freezer. Storage areas need to be well ventilated, cool and easy to clean to control hygiene. Fridges or chilled areas should be capable of maintaining the food at temperatures of  $-1^{\circ}\text{C}$  to  $5^{\circ}\text{C}$ . Deep freezers should be capable of maintaining food at temperatures of  $-18^{\circ}\text{C}$  or lower.<sup>16</sup> To cook for large groups of people, secure, spacious, and pest free storage areas are needed. This was not the case in many schools as the staff kitchen is mostly used as the basis for food storage and preparation for the NSNP.<sup>17</sup> Guidelines for storage spaces should specify separate storage areas for food items and non-food items, good ventilation, lockable storage and food should be stored on platforms away from the floor.<sup>1</sup>

High risk areas for contamination must be identified when working in a kitchen. This includes work surfaces, unhygienic cleaning material and appliances, poor personal hygiene, unhygienic and inadequate food storage facilities and unhygienic waste disposal.<sup>12</sup> For waste disposal 77% of schools used plastic (rubber) garbage bins, where 31% indicated that the bins had lids and only 12% used plastic bags inside the bins. Refuse containers must be liquid proof, easy to clean with close fitting lids suitable for the hygienic storage or refuse removal from the food handling area.<sup>18</sup> No colour coded cutting boards were used and 15% of schools indicated they made use of a cutting board. Physical observation indicated table surfaces were used for food preparation. Most schools used plastic plates and glasses for serving food to learners, which are not ideal as they may be scratched with continuous use and difficult to clean properly, raising the possibility of cross contamination. Employees must clean and sanitise work surfaces, utensils and equipment to avoid the possibility of cross-contaminating to foods or food contact surfaces. Cutting boards, dish cloths, counter tops and garbage bins represent areas where microbial pathogens can deposit and must be sanitised before use because unclean areas can lead to cross contamination.<sup>14</sup> The awareness of basic hygiene should be increased.<sup>17</sup>

The results indicated that 81% of schools had a gas stove with 42% that stored the gas cylinder in the kitchen next to the stove. The room in which food is handled must not have a direct connection with any area in which gas, fumes, soot deposits, offensive odours or any other impurity is present or may arise in such a manner that food in the food-handling room could be contaminated or spoiled.<sup>18</sup>

### **HACCP and school feeding**

Hygiene and safety conditions at schools must be controlled to ensure that high quality, safe food are served to give learners the maximum benefit. The use of HACCP offers a practical way forward to food safety management, but the personnel in charge of implementation must have the proper knowledge and expertise to apply it effectively. The involvement of senior management is essential to ensure proper location of resources. In a small company like a school, the likelihood of having a skilled individual to conduct a Hazard Analysis is low and could be outsourced.<sup>19</sup> To implement a HACCP program, a team needs to be identified that include employees from a specific school's FHs as well as officials from the Provincial Department of Education that oversee the NSNP, needs to be identified. Standard operating procedures must be in place for receiving deliveries, personal hygiene, cleaning procedures, cooking and serving practises. The standard operating procedures serve as a basic food safety foundation and control hazards on a day to day basis.<sup>3</sup>

### **CONCLUSION**

The Integrated Nutrition Program (INP) was formulated to address current nutrition problems in South Africa. The INP aims at implementing programs that are integrated, sustainable, people and community driven and targets the most vulnerable groups in South Africa.<sup>15</sup> The NSNP forms part of the INP of South Africa and was implemented as a poverty alleviation strategy introduced in 1994 by government as part of the Reconstruction and Development Program of the newly founded democratic Republic of South Africa.<sup>15</sup> The implementation of the INP needs to be done in a manner to ensure that no risks are taken with possible food poisoning episodes. Special care must be taken, when an operation caters for populations considered at risk, such as learners attending primary schools.<sup>20</sup> In a study of ten schools in six provinces in South Africa on children living with HIV and AIDS, the results indicated that the NSNP is not adequate for vulnerable groups. The suggestion was that principles need to take on the added responsibility of addressing the problem.<sup>21</sup>

Concerns identified regarding the NSNP are the lack of structure and standardization at the various schools used in the study. The following concerns were identified:

- Food Handlers:
  - No training for FHs on personal hygiene, cooking techniques, cleaning procedures and safety precautions;
  - No standardized uniform;
- Conditions at school premises that influence standard operating procedure implementation negatively are:
  - No standard measuring and serving equipment and techniques;

- o No safety guidelines especially when working with gas;
- o Gas cylinders are not kept in safe places;
- o Limited storage spaces;
- o No standardized recipes observed; and
- o Limited indication of portion sizes and portioning equipment for the hot menu.

The objectives of this study were to determine the type of food served and the suitability of facilities at the schools. The knowledge of food handlers on hygiene and safety as well as the conditions of the premises at the primary schools were assessed. The research indicated that all government schools in South Africa can make use of the NSNP. The questionnaire showed in detail the food served at schools in the week and that two menus are available, hot or cold to suit the facilities at the specific school. Schools indicated that the personnel turnover for the majority of FHs was every six months which limited training opportunities, and no food handler had any evidence of training attendance.

Guidelines for implementing safety and hygiene practices in schools were required as the last objective. To implement a hygiene and safety program, standard operating procedures for personal hygiene, cleaning procedures as well as food handling, cooking and serving procedures must be in place. The standard operating procedures serve as a basic food safety foundation and control hazards on a day to day basis.<sup>3</sup> Training of FHs as well as management in the food service industry on standard working practices and procedures form a key part of implementing a HACCP approach.<sup>5</sup> A HACCP system that really works in practice will require intensive training to understand the HACCP principles and require standard operating procedures that are in place.<sup>19</sup>

To implement a basic safety and hygiene program in primary schools in Gauteng will require commitment from management at provincial level and basic standard operating procedures to be put in place and intensive training for all stakeholders to make it work. The identification of members that could be selected for a HACCP team for the NSNP and the identification of training requirements for FHs can form part of further research.

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## CHAPTER 4 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

### 4.1 Discussion

The four primary objectives of this study were identified as:

- The type of food served at schools;
- The suitability of facilities used in the process;
- The knowledge of the food handlers on hygiene and safety in the NSNP at various primary schools in the Western Region of Gauteng in order to identify safety risks; and
- To give guidelines for implementing safety and hygiene practices for the NSNP in the Western Region of Gauteng.

The first primary objective was achieved by an interview at the 26 identified schools with the NSNP staff, aided by the completion of a questionnaire. The menus served from Monday to Fridays were discussed in detail.

To achieve the second and third objectives, questions on the type of facilities and work conditions were included in the questionnaires. Basic questions on knowledge about hygiene and safety identified the weaknesses in knowledge of the food handlers. All interviews were conducted at the school premises to ensure observation as a tool to verify answers from food handlers.

The fourth objective was to give guidelines to implement a basic safety and hygiene program in schools. The indication for implementation was:

- Firstly, support from the management of the NSNP on Provincial level;
- Secondly, a need for training of the NSNP staff; and
- Thirdly, standardization of equipment, storage facilities, proper uniforms for FHs and standard operating procedures are needed to ensure effective implementation.

The literature study firstly focused on barriers to optimal nutrition in South Africa. The INP and NSNP were explained to indicate the importance of the supplement feeding to primary school

learners. Special note was given to the concerns relating to the implementation of the NSNP at schools. HACCP was explained in detail to emphasize the need for hygiene and safety practices for the NSNP.

The results of the research study reflected the need for the implementation and training of the FHs on hygiene and safety. It is important to serve good quality and safe food to vulnerable groups such as primary school learners.

The research study showed a limitation in the study design, which was straight and depended only on the questionnaire results. No statistical comparisons were possible due to the design.

## **4.2 Conclusion**

The research on the 26 schools that were included in this study indicated a need for the incorporation of a hygiene and safety program in the NSNP. The implementation of a hygiene and safety program needs a national approach. A HACCP program is labour intensive and requires extensive knowledge and training to be able to teach people these principles. To initiate safety programmes in schools, a less complicated system than HACCP can be used. The CCPs can be used as a guide to set standard operating procedures for FHs to adhere to.

## **4.3 Recommendations**

A hygiene and safety program for the NSNP can enhance the quality of the food that learners consume and therefore ensure a better and safer end product. The importance of a hygiene and safety program must be communicated to the management of the NSNP.

A very general test could have been included in the questionnaire to test the knowledge on safety and hygiene of the FHs. The highest qualification of the FHs could also have been included in the questionnaire to determine the literacy levels. The level to start training for FHs would have been easier to access.

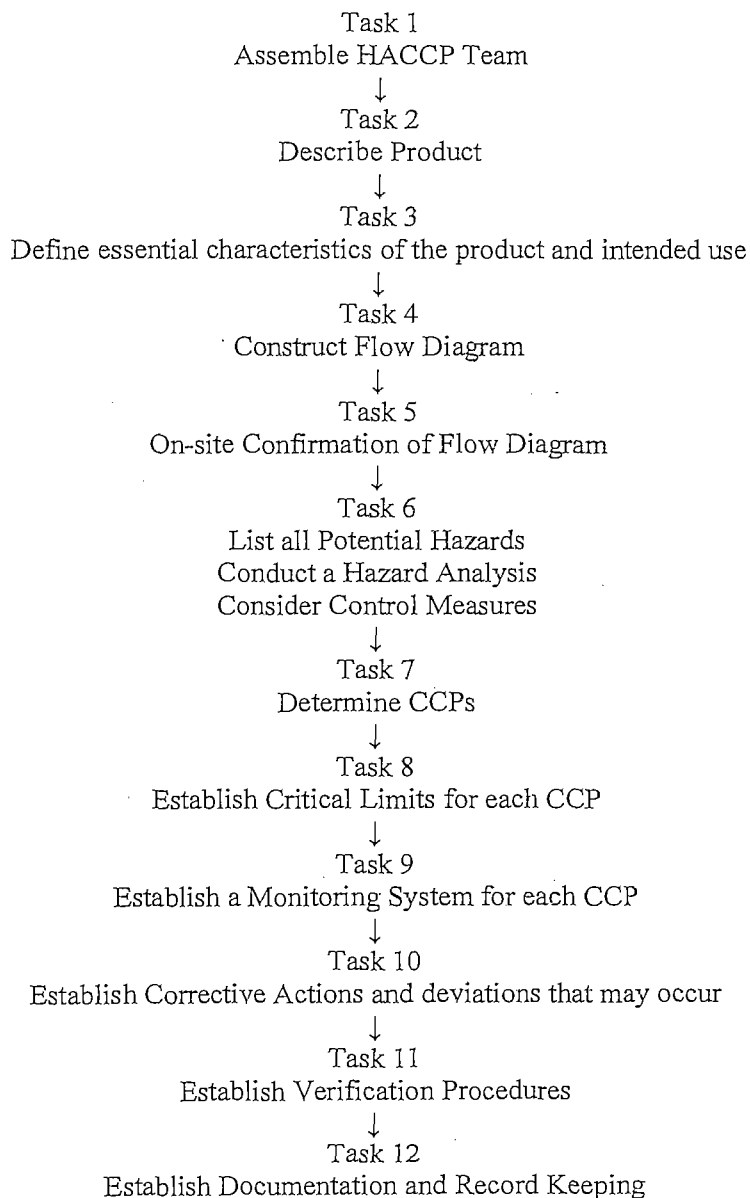
A further recommendation can be for a similar study in other provinces to compare findings and emphasize the importance of incorporating safety programs in the NSNP. Implementation of a hygiene and safety program will need buy in and extra budget provision from Department of Education.

## ADDENDA

### Addendum A: Codex Logic Sequence for HACCP (CAC 2003:45).

#### DIAGRAM I

#### LOGIC SEQUENCE FOR THE APPLICATION OF HACCP



**Addendum B: Research request to Department of Education**

Rhodes Street  
Krugersdorp North  
Krugersdorp  
1739

**GAUTENG DEPARTMENT OF EDUCATION**

Head Office: 111 Commissioner Street  
Marshall Town  
Johannesburg

**The Director of Transport and Nutrition:  
Mr. Jordaan**

**Request to use the PSNP for research as part of a M.Sc. degree**

Various studies have been done in the past on the implementation, effectiveness, menus and other factors regarding the National School Nutrition Program (PSNP). I am currently enrolled for a M.Sc. Nutrition degree at the University of the Northwest, Potchefstroom Campus, and would kindly request to use the NSNP as the basis for doing a study on safety and hygiene, and the implementation of a HACCP (Hazard Analysis of Critical control points) program.

HACCP is a widely accepted approach to monitoring and maintaining the safety of food and water. The goal of a HACCP plan is to protect food and water from physical, chemical and biological hazards that can cause food borne illnesses. HACCP programs combine the principles of food microbiology, quality control, and risk assessment to obtain, as nearly as possible, a fail safe system for managing food production and water safety.

The study would aim to develop a simplified safety program that can be used for any kitchen or food service unit that prepares hot or cold food. The research size of the project would involve about 20 schools in the Western Region of Gauteng.

It is an academic procedure and all research results will be made available to your office. Your permission will be highly appreciated.

Yours Faithfully

Carina Muller  
082 764 6883  
Student number: 10085351

**Addendum C: Approval of research by Gauteng Department of Education**

16.AUG.2007 10:52

DEPT. OF EDUCATION

00.025 P.2



UMnyango Wozomfundo  
Department of Education

Lefapha la Thuto  
Departement van Onderwys

Enquiries Shadrack Phele

(011) 355 0285

16 August 2007

Ms Carina Muller  
22 Rhodes Street  
Krugersdorp North  
Krugersdorp  
1739

Dear Ms Carina Muller

**APPROVAL TO CONDUCT ACADEMIC RESEARCH**

The Gauteng Department of Education hereby grants permission to conduct research in its institutions as per application.

Topic of research: "Assessment of Hazard Analysis of Critical Control Points (HACCP) principles in Primary School Feeding Schemes in the Western Region of Gauteng".

Degree: Master of Science Nutrition. (MSc Nutrition)

Name of university: North West University.

Upon completion of the research project the researcher is obliged to furnish the Department with copy of the research report (electronic or hard copy).

Wish you success in your academic pursuit.

Sincerely,

pp Shadrack Phele

Albert Chane  
Divisional Manager  
Education Financing, Planning and Monitoring.

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Room 1501, 111 Commissioner Street, Johannesburg, 2001 P.O. Box 7710, Johannesburg, 2000  
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Reference: 2008e1pm

**Addendum D: Letter of consent from food handlers**

21 September 2007

To all interview subjects:

Dear Sir /Madam

**Informed consent: Completion of a questionnaire regarding a university research study on the National School Nutrition Program**

I am currently studying towards my Master's Degree in Nutrition at the North-West University. I am not working for the Department of Education or Health and do this degree on my own costs. As part of the Master's Degree Program I must get information for research.

The research is about the safety and hygiene aspects in the school feeding program. The study will look at the menu that is served to learners, knowledge of the food handlers, preparation techniques, equipment and general safety of the environment.

The information gathering will be done by a person asking questions from a questionnaire and then filling the answers in. To fill in the questionnaire will take about one and a half hour. There will be no payment for taking part in the research.

The food handler is under no obligation, and no information can be used against the person as it is confidential. The food handler can at any time decide not to take part without any negative impact on the person.

The details of the food handler are as follows:

Name: \_\_\_\_\_

School: \_\_\_\_\_

Date: \_\_\_\_\_

Your assistance will be appreciated.

\_\_\_\_\_  
Carina Muller  
Researcher

\_\_\_\_\_  
Food Handler

Addendum E: Approval of research by the Northwest University,  
Potchefstroom Campus



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Ethics Committee  
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Email: [Ethics@nwu.ac.za](mailto:Ethics@nwu.ac.za)

Or S M Harekoni

Dear Dr Harekoni

26 February 2008

ETHICS APPROVAL OF PROJECT

The North West University Ethics Committee (NWU-EC) hereby approves your project as indicated below. This implies that the NWU-EC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: Assessment of Hazard Analysis of Critical Control Points Principles in Primary School Feeding Schemes in the Western Regional of Gauteng	
Ethics number:	N W U - 1 8 0 1 0 - 0 1 7 - 5 0
Approval date:	26 February 2008
Expiry date:	25 February 2013

Special conditions of the approval (if any): None

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed on the application form, please note the following:

- The project leader (principal investigator) must report in the prescribed format to the NWU-EC annually (or as otherwise requested) on the progress of the project without any delay in case of any adverse event (or any matter that threatens core ethical principles) during the course of the project.
- The approval applies strictly to the protocol as stipulated in the application form. Should any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-EC. Any change that deviates from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically invalidated.
- The date of approval indicates the last date that the project may be started. Should the project have to continue after the expiry date, a new application must be made to the NWU-EC and your approval received before of set on a date.
- In the interest of ethical responsibility the NWU-EC retains the right to request access to any information or data at any time during the course or after completion of the project.
- with any or postpone approval if:
  - any unethical practices or practices of the project are revealed or suspected,
  - it becomes apparent that any relevant information was withheld from the NWU-EC or that information has been falsified or misrepresented,
  - the required annual report and reporting of adverse events was not done timely and accurately,
  - new institutional rules, national legislation or international conventions deem it necessary.

The Ethics Committee would like to remain at your service as a consultant and researcher, and wishes you well with your project. Please do not hesitate to contact the Ethics Committee for any further enquiries or requests for assistance.

Yours sincerely

Prof MMJ Lywes  
(Chair NWU Ethics Committee)

**Addendum F:****List of Schools in the Western Region of Gauteng  
used in research**

	<b>School</b>	<b>Principal</b>	<b>Contact number</b>
1.	Khaselihle Primary	Mr P Kobokae	011 410 1098
2.	Themobile Primary	Mr MH Matrose	011 410 1040
3.	Tsholatsega Primary	Mr Madia	011 410 0642
4.	Zuurbekom Primary	Ms R Duncan	011 851 1016
5.	Itumeleng School	Ms D Xeza	011 753 1192
6.	Doornbosch Primary	Mrs P Kekae	014 577 4422
7.	Rand Gold Primary	Mr J Kgang	072 494 0509
8.	Die Poort Primary	Mrs. Mapoti	073 257 6221
9.	FJ Kloppers Primary	Mr L Maretele	014 576 1336
10.	Kwaggafontein Primary	MS MM Merafe	011 952 2854
11.	Unity Primary	Mr CJ Botha	011 952 1028
12.	Matla Combined School	E.S. Matloga	011 957 0302
13.	Maloneys Eye Primary	Ms C Masibi	014 577 3025
14.	Mphe-Thuto Primary School	Mrs P Mogorosi	014 577 2090
15.	Tarlton Primary	Mrs MS Khashane	011 952 2436
16.	Khululekani Primary	Mr AL Ndlovu	011 765 1011
17.	Patrick Mashego Primary	Mrs E Mabambe	011 765 8265
18.	Thuthuzekani Primary	Mrs L Tshabalala	011 765 8421
19.	Diphlane Primary	Mr L Seopasengwe	011 665 2650
20.	Phatudi Primary School	Ms MD Mohube	011 660 2185
21.	West Rand Primary Mine	Ms LP Xakaza	011 953 4910
22.	Lesego Primary	Mrs Y Mulovhedzi	011 957 2109
23.	Westonaria Mine Primary School	Mr Sibisi	011 756 0047
24.	Tsakani Primary	Mr DN Chauke	011 410 6181
25.	Sandile Primary	Mrs LM Khumalo	011 410 1024
26.	W.D. Oliphant Primary	Mr MJ Mhlontlo	011 410 1841

## Addendum G: NSNP Questionnaire

### GAUTENG SCHOOL FEEDING SCHEME: QUESTIONNAIRE

Mark with an X where applicable

School: \_\_\_\_\_ Questionnaire Number: \_\_\_\_\_

Principal of school: \_\_\_\_\_ Contact number: \_\_\_\_\_

1. Classification of school: Rural  Urban
- 2.1 How many learners attend your school? \_\_\_\_\_
- 2.2 Does all the learners benefit from the National School Feeding Scheme (NSNP)?  
Yes  No
- 2.3 If all learners do not participate, how many benefit from the NSNP scheme? \_\_\_\_\_
- 2.4 Indicate your position: Volunteer  Food Handler

Indicate, for each day, which of the following items are served to school children as part of the NSNP

3 MENU						
	Items	Monday	Tuesday	Wednesday	Thursday	Friday
3.1	Fortified Biscuits (4 biscuits x 25g)					
3.2	Bread (2 x slices - brown)					
3.3	Margarine (10g)					
3.4	Peanut Butter (15g)					
3.5	Jam (20g)					
3.6	Drink Vitamin C (200ml/1x small glass)					
3.7	Maize meal (2 x serving spoons)					
3.8	Soya mince (1 x serving spoon)					
3.9	Soup (200ml/1x small glass)					
3.10	Samp (2x serving spoons)					
3.11	Cooked Beans (2x serving spoon)					

#### **Definitions:**

1. Fieldworker: Visiting schools – evaluating NSNP at schools. Report to the coordinator
2. Food handler: Employed by the NSNP to prepare and serve food at schools.
3. Volunteer: Appointed by schools where food has to be prepared and cooked for the NSNP. The school pays the volunteer (mostly parents) by means of a honorarium.

3.12 Variations on menu? Yes  No

3.13 If yes, specify the variations:

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**4 People employed for NSNP:**

4.1 How many food handlers is in service of the National School Nutrition Program (NSNP)?

one  two  three  four

4.2 Did the food handlers receive training? Yes  No

If yes, which topics did the training cover?

4.2.1 Safety Yes  No

4.2.2 Hygiene Yes  No

4.2.3 Hand washing techniques Yes  No

4.2.4 Cooking methods Yes  No

4.3 Name the number of volunteers appointed from the local community.

one  two  three  four

4.4 How often do the food handlers rotate?

4.4.1 First to third month

4.4.2 Every fourth to fifth months

4.4.3 After six months

4.4.4 Never

4.5 Do the volunteers undergo training for the NSNP? Yes  No

If yes, which topics did the training cover?

4.5.1 Safety Yes  No

4.5.2 Hygiene Yes  No

4.5.3 Hand washing techniques Yes  No

4.5.4 Cooking methods Yes  No

4.6 How often does the field worker for the NSNP visit the school?

4.6.1 Once or twice a month

4.6.2 Every second to third month

4.6.3 Every third to fourth months

4.6.4 Never

**5 Deliveries:**

5.1 Do you experience problems with the delivery of the food? Yes  No

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If yes, what type of problems do you experience?

- 5.2 Late deliveries Yes  No   
5.3 Poor quality food Yes  No   
5.4 No deliveries Yes  No

6 **Storage:**

- 6.1 Does the school have storage facilities? Yes  No

If yes, please answer the following:

- 6.2 Separate store room Yes  No   
6.3 Fridge Yes  No   
6.4 Freezer Yes  No   
6.5 Lockable cupboard Yes  No   
6.6 Air tight containers Yes  No

7 **Equipment**

- 7.1 What kind of cutting boards is used?

- 7.1.1 Plastic Yes  No   
7.1.2 Wood Yes  No   
7.1.3 Colour coded Yes  No

7.2 **Measuring equipment**

- 7.2.1 Do you use measuring spoons? Yes  No

If yes indicate the sizes you use.

- 7.2.2 1 ml Yes  No   
7.2.3 2 ml Yes  No   
7.2.4 5 ml Yes  No   
7.2.5 10 ml Yes  No   
7.2.6 15 ml Yes  No

- 7.3.1 Do you have a measuring jug? Yes  No

If yes indicate the sizes you use.

- 7.3.2 250 ml Yes  No   
7.3.3 500 ml Yes  No   
7.3.4 1 l Yes  No   
7.3.5 2 l Yes  No

- 7.4 Which of the following knives does the kitchen have?

- 7.4.1 Table Knives Yes  No   
7.4.2 Bread knives Yes  No   
7.4.3 Vegetable (pairing) knives Yes  No   
7.4.4 Chef's knife Yes  No

7.5 What kind of serving spoons do you use?

- 7.5.1 Wooden spoon Yes  No   
7.5.2 Metal spoon Yes  No   
7.5.3 Soup Ladle Yes  No   
7.5.4 Plastic spoons Yes  No

7.6 Do you use plates? Yes  No   
If yes, which plates do you use?

- 7.6.1 Plastic plates Yes  No   
7.6.2 Enamel plates Yes  No   
7.6.3 Porcelain plates Yes  No

7.7 What kind of glasses do you use glasses for the juice?

- 7.7.1 Plastic glasses Yes  No   
7.7.2 Glass glasses Yes  No   
7.7.3 Paper cups Yes  No   
7.7.4 Learners supply own Yes  No

7.8 Do you have a stove to prepare food for NSNP? Yes  No   
If yes, which stove type do you use?

- 7.8.1 Two plate electrical stove Yes  No   
7.8.2 Four plate electrical stove Yes  No   
7.8.3 Gas stove Yes  No

If using a gas stove, where is the gas cylinder installed?

- 7.8.4 Outside the kitchen  7.8.5 In the same room as the gas stove

7.9 Do you use a garbage bin? Yes  No   
If yes, can you specify?

- 7.9.1 What kind of material is the bin made of? a Plastic  b Galvanized steel   
7.9.2 Do you use a garbage bin with a lid? Yes  No   
7.9.3 Do you use plastic bags inside the bin? Yes  No

## 8 Hygiene & Safety

8.1 What kind of washing basins do you have?

- 8.1.1 Separate basin for hand washing Yes  No   
8.1.2 Single basin for dishes Yes  No   
8.1.3 Double basin for dishes Yes  No   
8.1.4 A plastic bucket Yes  No

8.2 8.2.1 Does the kitchen have cold water? Yes  No

8.2.2 Does the kitchen have hot water? Yes  No

8.3 8.3.1 Do you use the standardized method for washing hands? Yes  No

- 8.3.2 Do you dry your hands? Yes  No   
If yes, can you specify?
- What do you usually use to dry your hands?
- 8.3.3 Paper Yes  No
- 8.3.4 Towel Yes  No
- 8.3.5 Dish towel Yes  No
- 8.4 Indicate what type of cleaning agents you use?
- 8.4.1 Liquid dishwashing soap Yes  No
- 8.4.2 Handy Andy Yes  No
- 8.4.3 Bleach Yes  No
- 8.4.4 Hand wash soap Yes  No
- 8.5 Indicate which of the following cleaning equipment you use?
- 8.5.1 Broom Yes  No
- 8.5.2 Mop Yes  No
- 8.5.3 Bucket Yes  No
- 8.6 8.6.1 Does the food handler/volunteer wear an apron? Yes  No   
If yes, specify.
- 8.6.2 Plastic apron Yes  No
- 8.6.3 Material apron Yes  No
- 8.7 Does the food handler/volunteer wear head gear? Yes  No   
If yes, specify.
- 8.7.1 Disposable hairnet Yes  No
- 8.7.2 Bandana Yes  No
- 8.7.3 Chef's hat Yes  No
- 8.8 Does the food handler/volunteer wear gloves? Yes  No   
If yes, specify.
- 8.8.2 Disposable gloves Yes  No
- 8.8.3 Thick rubber gloves Yes  No
- 8.9 Indicate if any of the following uniform items is supplied?
- 8.9.1 Clogs Yes  No
- 8.9.2 Chef's jacket Yes  No
- 8.9.3 Over coat Yes  No
- 8.10 Does the NSNP staff share the toilets of the teaching staff Yes  No   
What type of sewerage system is used?
- 8.10.1 Flush toilets Yes  No  8.10.2 Bucket system Yes  No
- 8.11 Are there hand washing facilities in the cloakroom? Yes  No   
When does the staff need to wash their hands?
- 8.11.1 After going to the toilet Yes  No

- 8.11.2 After smoking Yes  No
- 8.11.3 After disposal of garbage Yes  No
- 8.11.4 Before food prep Yes  No
- 8.11.5 After touching any part their face or hair Yes  No
- 8.12 Does any of the school feeding staff smoke? Yes  No   
If yes, where do they smoke?
- 8.12.1 In the kitchen Yes  No
- 8.12.2 Outside the kitchen Yes  No
- 8.13 When does the school feeding scheme staff eat?
- 8.13.1 Before serving the food Yes  No  8.13.2 After serving the food Yes  No
- 8.14 Where does the school feeding scheme staff eat?
- 8.14.1 In the kitchen Yes  No  8.14.2 Outside the kitchen Yes  No
- 8.15 Did the school feeding scheme staff experience any of the following accidents in the past 6 months?
- 8.15.1 Cuts Yes  No
- 8.15.2 Falls Yes  No
- 8.15.3 Burns Yes  No
- 8.16 Is there a First Aid Box? Yes  No   
If yes, specify.
- 8.16a In the kitchen Yes  No
- 8.16b In the school Yes  No
- If yes, does it contain the following?
- 8.16.1 Disposable gloves Yes  No
- 8.16.2 Plasters Yes  No
- 8.16.3 Bandages Yes  No
- 8.16.4 Disinfectant Yes  No
- 8.16.5 Ointment for burns Yes  No
- 8.17 Is there a fire extinguisher in the kitchen? Yes  No

9 Recommendations

Do you have any recommendations on how to improve the NSNP?

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**Addendum H: HYGIENE & SAFETY ASPECTS OF THE NSNP**

