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FOOD AND NUTRITION INSECURITY IN PRISONS IN GHANA

BY

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DECLARATION

I hereby declare that, except for the research done by other investigators as well as other reports and documents which have been duly acknowledged and referenced, this work is the result of my original research work done under the direction of my team of supervisors. I further declare that this thesis has not been submitted in part or in whole anywhere else for the award of any degree.

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ABSTRACT

Background: There is food security "when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". Achieving food security is a key goal of existing global conventions on human rights that support the provision of adequate food for all persons. These Rights-based instruments also seek to preserve the rights of legally incarcerated persons so that they can access food of adequate nutritional value, of wholesome quality, and prepared and served with dignity for health and wellbeing. The right to be free from inhuman and degrading treatment or punishment or other conditions that detract from human dignity and worth is entrenched in Ghana's 1992 Constitution. However, there is evidence that these constitutional provisions are lacking in Ghana's prisons. Moreover, very little is known about food and nutrition insecurity in prisons, its drivers, as well as how prisoners are coping with these issues.

Objective: The main objective of the study was to determine the food and nutrition insecurity status of inmates in Ghana's prisons and the driving factors. Specifically, the study sought to assess quality of prisoners' diets, nutritional status and explore their coping strategies during times of food hardship.

Methods: A cross-sectional design was employed and mixed methods were used to collect and analyse data from 449 inmates and 88 prison officers randomly and purposively selected respectively, from twelve prisons. Food insecurity status, diet quality and coping strategies were assessed using the Household Food Insecurity Access Scale (HFIAS), 24 hour dietary recalls to derive Dietary Diversity Scores (DDS) and the Coping Strategies Questionnaire respectively. Data was analysed using SPSS version 25 (IBM SPSS Statistics for Windows., 2016) and Stata version 15 (StataCorp, 2017). Univariate, bivariate and multivariable analysis were conducted and a p-

value <0.05 was used to establish statistical significance for all variables of the quantitative aspect of the study. In-depth interviews were conducted and content analysis of transcripts and field notes were triangulated with the quantitative data.

Results: The mean age of prison inmates was 37.04 (± 14.2) years and more than half (52.6%) were <35 years old. The majority (98.2%) were males; 15.8% had no education, and 57% had completed high school. A majority (86.5%) were convicted prisoners with a mean duration of 61.8 months (± 48.6).

Almost all (91.1%) were food insecure; 83.3% of the food insecure were severely food insecure. Average dietary diversity score was 2.90 ± 0.7. Most prisoners (79%) had low diet diversity (scores ≤ 3). Working while in prison and receiving financial and other support from family and friends were significant predictors of diet diversity ($p<0.05$).

Most inmates (67%) had normal BMI; only 6% were underweight. Similarly, the majority of prisoners (99.5%) had normal MUAC. Mean BMI was significantly low among prisoners with higher levels of food insecurity ($p=0.039$).

More than half of prisoners frequently relied on less preferred foods when they experienced food insecurity. The type of prison ($p=0.006$), overcrowding ($p=0.005$), the level of food insecurity ($p<0.0001$) and smoking ($p=0.014$) were significantly associated with the coping strategies index of prisoners. Relying on produce from prison farms and appealing for food donations were the main coping strategies employed by Prison Authorities. Receiving support from family and friends (β: 0.46, 95% CI: 0.28 – 0.78), working while in prison (β: 0.52, 95% CI: 0.28 - 0.97), engaging in recreational activities (β: -2.0, 95% CI: -3.5, -0.6), and having been previously incarcerated (β: -2.5, 95% CI: -4.66, -0.26,) were significantly associated with food security and nutrition status

of prisoners while smoking, that is, use of narcotic drugs (β: -1.77, 95% CI: -3.5, -0.05), prison overcrowding ((β: 4.03, 95% CI: 1.14, 6.92) as well as the type of prison (prison category) were the risk factors for food insecurity and low nutrition status among prisoners. From the perspectives of inmates and officers, the low feeding budget, health conditions of prisoners, delayed payment of food contractors, power and resource control among prisoners also influenced food and nutrition insecurity of inmates in Ghana's prisons.

Conclusion: The study found almost universal food insecurity; prisoners reported low quality diets, although most had normal BMI. These findings suggest a need for interventions to improve food provisions in Ghana's prisons.

DEDICATION

This research work is dedicated to the Almighty God for His protection, guidance and wisdom throughout my academic journey; to my fathers, Mr. Pius Kwasi Ametepey and Mr. Wisdom Kwasi Attakpah, for providing inspiration, mentorship, coaching and above all for believing in me and pushing me to forge ahead despite life's difficulties; and to Mr. Victor Boadu for the immense contribution he made towards my university education.

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LIST OF ABBREVIATIONS

Abbreviation	Explanation
ACHPR	African Commission on Human and People's Right
AIDS	Acquired Immune Deficiency Syndrome
ADP	Assistant Director of Prisons
ANOVA	Analysis of Variance
AOR	Adjusted Odds Ratio
ASP	Assistant Superintendent of Prisons
ART	Anti-Retroviral Therapy
BMI	Body Mass Index
CARE	Corporation for Assistance and Relief Everywhere
CESCR	Convention on Economic Social and Cultural Rights
CDP	Communicable Disease Prison
CD4	T Cell Count
CI	Confidence Interval
CJS	Criminal Justice System
COHA	Cost of Hunger in Africa
CSI	Coping Strategies Index
CSP	Chief Superintendent of Prisons
CSOs	Civil Society Organization
DDP	Deputy Director of Prisons

DDS	Dietary Diversity Score
DSP	Deputy Superintendent of Prisons
DRC	Democratic Republic of Congo
DPKO	Department of Peace Keeping Operation
FAFS	Framework for African Food Security
FBOs	Faith Based Organizations
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agriculture Organization
FIAP	Food Insecurity Access Prevalence
FIASQ	Food Insecurity Access Questions
FSN	Food Security and Nutrition
FNI	Food and Nutrition Insecurity
GAC	Ghana AIDS Commission
GBD	Global Burden of Disease
GPS	Ghana Prisons Service
GSGDA	Ghana Shared Growth and Development Agenda
HIV	Human Immunodeficiency Virus
HFIAS	Household Food Insecurity Access Scale
IDIs	In-depth Interviews
IFAD	International Fund for Agricultural Development
ILO	International Labour Organization
KG/M^2	Kilograms Per Meter Square

MDAs	Ministries Departments and Agencies
MDG	Millennium Development Goals
MoFA	Ministry of Food and Agriculture
MUAC	Mid Upper Arm Circumference
MPA	Mean Probability Adequacy
NGO's	Non-Governmental Organizations
NRCD	National Revolutionary Council Decree
ODK	Open Data Kit
OHCHR	Office of the High Commissioner for Human Rights
OIC	Officer in Charge of Prisons
PA	Physical Activity
SD	Standard Deviation
SDGs	Sustainable Development Goals
SUPT	Superintendent of Prisons
SPH	School of Public Health
TB	Tuberculosis
UA	Urban Agriculture
UG	University of Ghana
UK	United Kingdom
UN	United Nations
UNDHR	United Nations Declaration for Human Rights
UNDP	United Nations Development Programme

UNICEF	United Nations Children's Fund
UNIPSIL	United Nations International Peacekeeping in Sierra Leon
UNSMRTP	United Nations Standard Minimum Rules for Treatment of Prisoners
USA	United States of America
WHO	

DEFINITION OF TERMS

Prison facility: A prison is a building that has been officially gazetted by government for the confinement of people who have fallen foul of the law, criminals, as well as political dissenters.

Prisoner: A prisoner is any person that is lawfully committed to prison custody. The term is synonymous with 'inmate' and the two terms have been used interchangeably throughout this thesis.

Convict: In this thesis, a convict means a person who committed an offence against the state and was found guilty by a competent court of justice and sentenced to prison custody.

Remand prisoner: A remand prisoner is one that has been committed to prison custody whose case is awaiting hearing at the courts of law, usually the lower courts such as circuit court and, magistrate courts. The opposite of a remand prisoner is a Trial prisoner that is, one whose case is awaiting hearing at the higher courts such as the high court, and the appeals court.

Safe custody: The act of ensuring that prisoners do not escape from prison whether they are inside or out of the prison yard. Officers are supposed to ensure safe custody at all times as a duty imposed on them.

Welfare: The provision of clothing, healthcare, accommodation, food and nutrition as well as spiritual needs for prisoners.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

> "It is said that no one truly knows a nation until one has been inside its jails.
>
> A nation should not be judged by how it treats its highest citizens, but its lowest ones" (Mandela, 1994).

Existing global conventions on human rights including the United Nations Sustainable Development Goal number 2, the United Nations Declaration of Human Rights, support the provision of adequate food for all persons as a basic human right (The United Nations Standard Minimum Rules for the Treatment of Prisoners, (UNSMRTP), 1957; United Nations Declaration of Human Rights, 1948). These Rights-based instruments also provide for every legally incarcerated person the right to food of adequate nutritional value, and wholesome quality, which is well prepared and served with dignity for health and wellbeing (Human Rights Council, 2007). In addition, "potable water should be made available to the prisoner any time he/she needs it" (African Union, 1996; United Nations Standard Minimum Rules for the Treatment of Prisoners, 1957; United Nations Declaration of Human Rights, 1957).

However, in many countries in Africa, the rights of prisoners to adequate welfare provisions such as healthcare service, accommodation and food are not sufficiently respected (African Commission on Human and Peoples' Rights (ACHPR, 2004). Consequently, most prisons in Africa are characterized by inhumane conditions including food and nutrition insecurity, overcrowding and poor healthcare delivery for prison inmates (ACHPR, 2004). It has been

reported that a substantial number of morbidities and mortalities occurring among prisoners are a result of ill-treatment and other forms of torture experienced by prison inmates (Australian Medical Association, 2012). Additionally, it has been argued that because most prisoners come from underprivileged backgrounds that are characterized by high levels of unemployment, low educational attainment, drug and alcohol addiction, insecure housing, and lack of regular medical care among others, they are admitted into prison with prior health conditions including malnutrition, communicable and non-communicable diseases, which require attention from the prison system (Australian Medical Association, 2012).

Ghana's 1992 Constitution provides that "No person shall, whether or not he/she is arrested, restricted or detained, be subjected to torture or other cruel, inhuman or degrading treatment or punishment and any other condition that detracts or is likely to detract from his/her dignity and worth as a human being" (Republic of Ghana Constitution, 1992). Unfortunately, reports have shown that some of these constitutional provisions are lacking in Ghana's prisons (Amnesty International, 2012). Hence, prisons in Ghana have been found to expose prisoners to the risk of food and nutrition insecurity, negative effects of overcrowding and poor health conditions (ACHPR, 2004; Amnesty International, 2012).

Research has consistently shown that food and nutrition insecurity is a significant public health challenge to the successful rehabilitation and reformation of incarcerated persons (Bulten, 2010; Gesch, 2013; Wilson, 2008; Zaalberg et al., 2010). For instance, previous studies have shown that chronic food and nutrition insecurity in prisons is associated with reduced compliance to prison rules and regulations; increased incidence of gang formation and violence among prisoners (Bulten, 2010; Gesch, 2013, Wilson, 2008; Zaalberg et al., 2010). Food and nutrition insecurity

has also been found to be associated with high levels of escapes from lawful custody among prisoners (Bulten, 2010; Wilson, 2008). Furthermore, food and nutrition insecurity is a major risk for the spread of infectious diseases such as HIV /AIDS and STIs among inmates resulting from drug peddling and unhealthy sexual activities (Wang et al., 2013). These behaviours limit the effective management of prisoners (European Union Commission, 2016; Smoyer, 2017; Smoyer & Minke, 2015).

Research has also shown that food insecure prisoners are at higher risk of multiple chronic diet-related health conditions, which reduces their quality of life while in prison and after discharge, especially for prisoners serving long sentences (Cook et al., 2015). Hence, ensuring food and nutrition security for inmates through the provision of well-planned menus can be of great benefit to both prisoners and prison authorities (Cook et al, 2015).

Food and nutrition security also contributes immensely to national development through better reformation and rehabilitation programme outcomes which may result in reduced reoffending and, health care cost among many other benefits (Cook et al, 2015). This is because good nutrition which is influenced by food security, contributes to optimal physical, mental and emotional health (Elmadfa & Meyer, 2010). Mental illness and aggression have been found to be common among prison populations (Carpenter, 2006). A situation that can result in low participation in treatment programmes and low compliance to prison rules on the part of inmates. These also, impact negatively on rehabilitation and reformation programmes in the prisons (Carpenter, 2006). Furthermore, the Global Panel on Agriculture and Food Systems Nutrition has indicated that malnutrition costs $3.5 trillion globally and 6.4% of GDP in West Africa. This militates against development efforts to reduce poverty and improve livelihoods (Global Panel on Agriculture and Food systems Nutrition, 2017). Malnutrition and the associated impact on health affects the

economic growth of the country negatively as funds that should be invested in equally important development sectors are diverted into addressing the health effects of malnutrition (Koryo-Dabrah et al., 2021), thereby depriving other areas of development.

Also, because prison inmates' reformation and rehabilitation become problematic in a food and nutrition insecure environments (Carpenter, 2006). It follows therefore that, a chunk of inmates may be released back into society unreformed and ill-equipped, leading to high chances of recidivism which adds to government's expenditure in maintaining the prisons (Carpenter, 2006).

In a previous study conducted in the Prisons, it was reported that welfare provisions in Ghana's prisons, including adequate food provision, accommodation and health, could be enhanced if adequate budget was allocated to the Prison Service by the government and prison administration and staff received the needed support and commitment (Boadu, 2014). However, the above study was only done in the Nsawam Medium Security Prisons and the findings cannot be generalized to all prisoners in Ghana, and there is also the need to use empirical to further strengthen the evidence. Additionally, reports of previous studies have shown that the diets of individuals have both positive and negative impacts on health throughout life and poor diets have been identified as major modifiable determinants of non-communicable chronic diseases (Afshin et al., 2019; Eves & Gesch, 2003a; Leon et al., 2014; Zaalberg et al., 2010). Moreover, most prisoners are also at increased risk of becoming overweight or obese due to inadequate diets and physical inactivity (Eves & Gesch, 2003a; Leon et al., 2014; Zaalberg et al., 2010). In African prisons generally, prisoners go through many years of confinement under 'bad' conditions such as poor accommodation and inadequate food and nutrition (Sarkin, 2008). Although such bad conditions

may not be uniformly distributed throughout Africa, there is a need to be abreast with their prevalence and the reforms required in penal institutions within the African Region (Sarkin, 2008).

1.2 Problem Statement

Inadequate dietary provision is a chronic challenge in Ghana's prisons. According to a study report on welfare provisions for prison inmates (Boadu, 2014) as well as the Ghana Prisons Service's Annual Report (Ghana Prisons Service, 2017), the daily feeding grant (GH₵1.80) per prisoner is insufficient to provide three meals of adequate quantity and quality. Furthermore, hunger, poor health and diet related mortalities are associated with prisons in Ghana (Amnesty International 2012). A previous study conducted to assess food provisions in Ghana's prisons, (Agyapong et al., 2018), found that food provision is inadequate. However, the study had limitations regarding representativeness of the prisoner population and generalizability of the findings as it was conducted in only three prisons in one Region of Ghana. Additionally, the scope of food insecurity and the driving factors were not investigated. Therefore, little is known about food insecurity, coping strategies and the driving factors from the perspectives of prisoners.

Food and nutrition insecurity has dire consequences for rehabilitation, rehabilitation, health and wellbeing of prisoners and, public safety (Ghana Prisons Service, 2013b). In addition, research has shown that inadequate dietary intake of nutrients is one of the immediate causes of malnutrition, and affects the optimal functioning of the human body (African Union, 2015; Black et al., 2008). Hence, the knowledge gap on the extent of food insecurity among prisoners, quality of diets, their coping strategies and the driving factors deserve attention. This may help the Prisons Service and relevant stakeholders to plan interventions to address the food provision gaps as well as food insecurity in Ghana's prisons.

1.3 Conceptual Framework of the Study

The conceptual framework (figure 1) is based on the definition of food and nutrition security used at the World Food Summit in 1996 which was also affirmed in 2001 (FAO, 1996). It shows the various dimensions of food and nutrition security which include food availability, accessibility and utilization. Each of these dimensions is also driven by distinct and interrelated factors (FAO, 1996, 2008). The conceptual framework has been constructed with a focus on the Ghana Prisons Service, the main site for this study.

For a prison facility or an individual prisoner to have adequate food and nutrition security, there must be adequate and stable availability, access, and utilization of food and these must happen simultaneously (FAO, 1996; FAO, 2008; Naciones Unidas, ALBANI, 2015). The first dimension of food security is adequate food availability. In the prisons, adequate food availability is influenced by factors such as adequacy of government budgetary allocation for food procurement; the level of agricultural activities undertaken by the Ghana Prisons Service with regards to farm inputs; the kinds of food crops and livestock produced; diversity of agricultural production; methods (traditional or modern) of production and land tenure systems practised; direct food donations by NGOs and CSOs; prison leadership and level of support from prisoners' relatives. It must be emphasized that these are national, institutional or facility level factors and hence, are beyond the control of the individual prisoner. (Stamoulis & Zezza, 2003; UNDP, 2016; Depa et al., 2018).

The second dimension of food and nutrition security is a stable and adequate access to food. This in turn is influenced by factors such as availability of adequate resources and strategies to obtain nutritious food as well as income generating activities of the prison, food sources, and food consumption pattern of prisoners, productive assets, conducive market conditions and pricing

procedures of key food crops. There may also exist structural challenges with food procurement procedures and staff attitudes towards prisoners; prisoners' livelihood strategies such as lifestyle, support from relatives and the community among others. The lack or the inadequacy of these intervening factors will reduce the amount of food a prison facility is able to access through procurement or internal production. This could reduce the amount of food to which prisoner can have access. Additionally, these factors could render weak and vulnerable prisoners highly food insecure. For example, the security arrangements in the prison, especially in high security prison facilities, may affect prisoners' food consumption patterns. Since prisoners in these highly secured prisons are supposed to spend only an hour outside of their cells each day, during which time they engage in activities such as exercising, cleaning, and food service among others, the rush for food during meal times may result in reduced food access by weaker or vulnerable prisoners.

Again, market conditions like food pricing and others such as adequacy of money allocated for prisoners' food will invariably affect activities of food contractors and affect how much food can be purchased and accessed by the prison facilities. This will subsequently affect the amount of food served to the prisoner. In other words, if the food budget is adequate, food pricing stable, markets easily accessible, and food providers for the prisons effective and honest, there will be improved food access by the prison facility and this will result in improved food access by the prisoners thereby enhancing their food and nutrition security status.

The third dimension of food and nutrition security is food utilization. This involves meeting the nutritional requirements of individuals and is can be achieved through adequate diets in terms of caloric and nutrient intakes as well as the presence of clean water, sanitation and a hygienic environment and better healthcare (FAO, 1996; FAO, 2008; Naciones Unidas, ALBANI, 2015).

Utilization is also expressed as the processes by which a healthy body synthesizes the energy and various nutrients in foods consumed (FAO, 1996; FAO, 2008; Naciones Unidas, ALBANI, 2015). A good nutritional status will result in better health of the individual and vice-versa. It is only when a person's body system is functioning properly (healthy) that there will be adequate biological utilization of food and nutrients consumed. Good health and nutrition status can be attained when there are good sanitation and clean water sources (UNDP, 2016; FAO, 2008). For example, if a prisoner consumes the right quantity and quality of food at all times, and the body is unable to utilize the food consumed due to frequent morbidities, he/she will be nutrition insecure. The presence of adequate food plus good healthcare, sanitation, water and hygiene in the prisons will enhance prisoners' health and contribute to their nutrition security.

There is the fourth dimension which is the stability of the three dimensions that is, continuous availability, accessibility and utilization for prisoners (FAO, 2008). For example, a break in food availability resulting from seasonality of agricultural activities due to weather variability or the refusal of food contractors to supply food to the prisons could cause a break in both food availability and accessibility. Food shortage can occur if prison managers are not able to purchase prisoners' food because of a delay in the release of a food budget by the government, or due to lack of food on the market. Serious riots among prisoners could occur as a result of lack of stability of availability and accessibility of food.

Finally, at the top of the conceptual framework are the national as well as political, economic and social policies, and climatic conditions. Also important at the top, is the overall knowledge of prison officers on the human rights of prisoners (International Centre for Prison Studies, 2000) and about adequate food and nutrition security. These factors influence prison policies on the main

dimensions of food and nutrition security (FAO, 2008). For example, socioeconomic and overall health statuses of prisoners depend on the healthcare provisions available in the prisons through government policies and support. It must be stated that access to healthcare and nutrition knowledge were not assessed in this thesis.

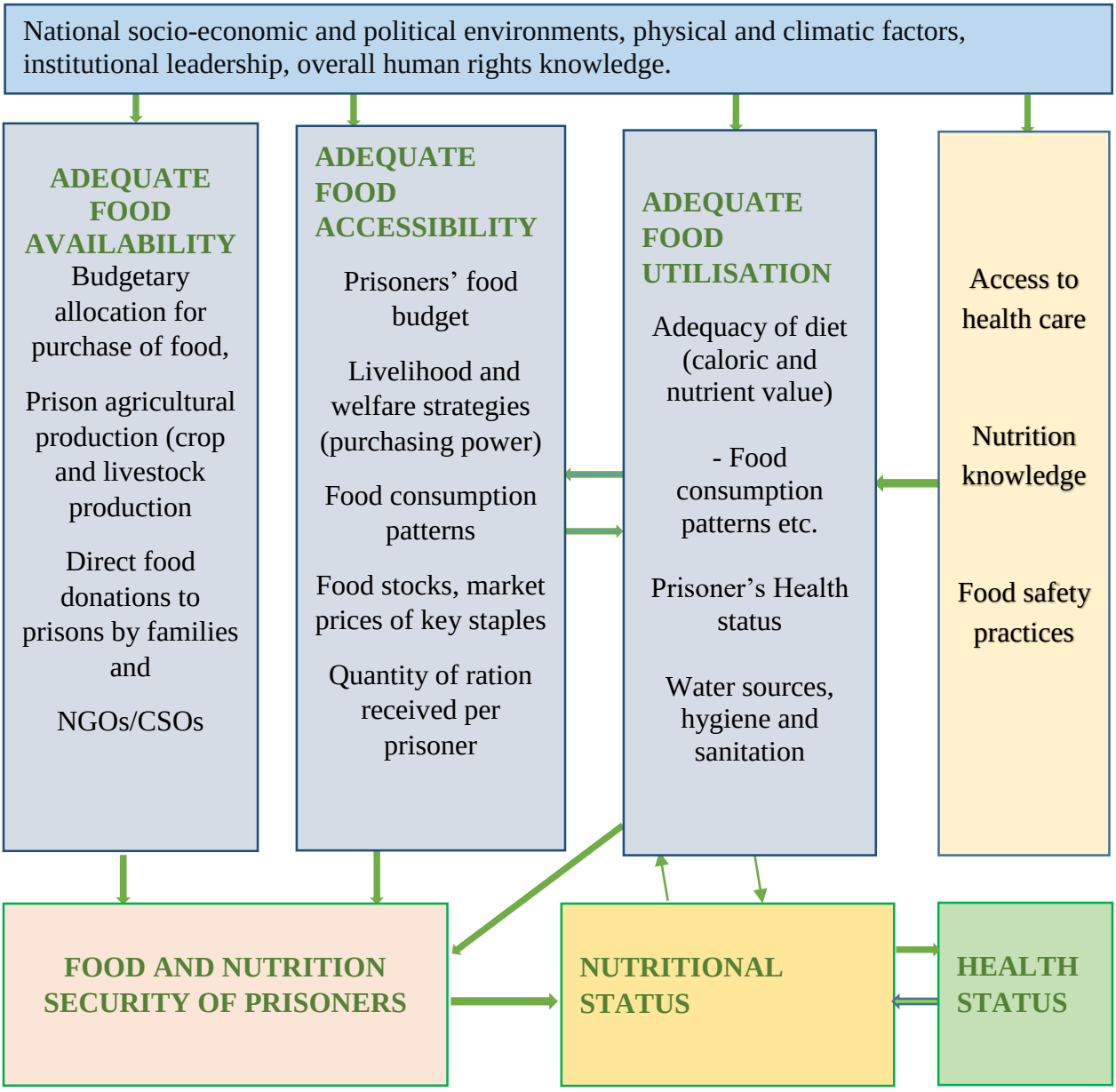

Fig 1.1: Conceptual Framework of Components and Determinants of Food and Nutrition Security in Ghana's prisons. Source: (FAO, 1996; Stamoulis & Zezza, 2003).

1.4 Theoretical Framework

Food security as explained above, is a multi-dimensional concept. Hence, there are many theoretical frameworks on the concept. However, a few of these theories including the Theory of Access, the Food Entitlement Decline and the Intervention Decline Theories are discussed in this study.

The Theory of Access (ToA)

The Theory of Access was propounded by Ribot and Peluso in 2003 (Ribot & Peluso, 2003). The theory differentiates between a person's right to access resources and their ability to benefit from those resources. The proponents of the theory argue that even if people hold the right to access certain things or resources, they still need to be empowered so that they can use the resources in ways that can benefit them. To the proponents of this theory, access goes beyond the right to benefit from things. It also entails the need to incorporate the ability to derive benefits from the things that people hold rights to.

For example, the proponents argue that, securing an adequate access to any resource is dependent on what they termed "bundle of rights (tenure of resources) and "bundle of powers". These "bundles of rights and powers" have been explained by other researchers e.g. Muntea and Colleagues as, all formal and informal rules and norms and, the structural and relational mechanisms respectively, which influence whoever gains, maintains, and controls benefits from resources ((Mutea et al., 2020).

The theory is applicable to this study in many ways. For example, prison inmates have the right to adequate food that is prepared and served with dignity (Kleinig, 2018). However, this right cannot

be realized by inmates if structural and relational barriers are not dealt with adequately. This is because of the individual circumstances of inmates and conditions in the prisons. Prisoners are people who have lost their freedoms including the freedom of movement, freedom to take decisions that affect their welfare i.e. food provisioning, accommodation and health. These decisions depend solely on the state and executed by the Prisons Service. Therefore if the Prisons Service is not in a position to execute this mandate adequately, prison inmates cannot realise the right to adequate food.

It must be emphasised that, the welfare of prisoners is entrusted into the Prisons Service and one may argue that the Service holds the right to be adequately equipped with both static (e.g. infrastructure, agricultural land, water etc.) and dynamic (e.g. funding, skills, etc.) resources, to execute the mandate of food provisioning as a component of prisoners' welfare (Ghana Prisons Service, 2013b). additionally, when it comes to agricultural land ownership as a determinant of food security, it may be argued that since the Prisons Service owns huge areas of viable land in different parts of the country where prisons are located, they should be self-sufficient in food production (Ghana Prisons Service, 2014). However, as the proponents of the ToA (Ribot & Peluso, 2003) argue, there must be availability of other resources including consistent flow of water for irrigation (Adom, 2014); farming inputs like improved seeds and machinery in addition to the ownership of land. These are the driving factors which can help the Service to benefit from the land it owns. If the Service must make substantial contribution towards the food security of prisons through food production, it will require consistent availability of farming inputs and other resources Above all, there must be favourable climatic conditions to support agricultural activities of the Prisons Service. Climate change can affect crop yield and agricultural productivity. It has been found that climate change affects land fertility and this in turn reduces agricultural production

levels (Armah et al., 2011). It could be argued that food availability in the prisons cannot guarantee total food security of all inmates and this brings to the fore the other dimension of food security (access) which can be explained by the theory of Food Entitlement Decline

Food Entitlement Decline Theory (FED)

This FED theory is a critique to other food insecurity theories like the Malthusian and neo-Malthusian approaches which are premised on inadequate availability of food to feed the increasing world population (Milà-Villarroel et al, 2015). Instead, the proponent of the Food Entitlements Decline theory argues that food insecurity is caused by poverty of certain social groupings which deprives them of food access (Sen, 1981). The author argues that while other theories focus on food availability at the national level, the FED theory focuses on families and individuals and this brought about the concept of "household food insecurity" (Sen, 1981). Sen argues that, there are entitlements or capabilities that families and individuals must have in order to access food by legal means. These entitlements include production, purchase, receiving food in the form of donations from the state and communities.

Other scholars who support Sen's proposition also argue that, the 2007/2008 food crisis which created serious food shortages all over the world and especially in developing countries, occurred at a time when the global agricultural production output was high Aden, 2017). The authors observed that, even though evidence from many studies have proven that a decline in food availability is a significant determinant of food insecurity, they viewed food insecurity as a "demand failure rather than supply failure". In other words, people lack access to food rather than the supply of food through agricultural production (Jones et al., 2013). The FAO report on the state of food insecurity and nutrition in the world for 2017 also supports the argument that food

insecurity is more related to inadequacy or lack of access at the household and individual levels than inadequate availability of food (FAO et al., 2017). Additionally, other scientists have asserted that there are sufficient resources to feed the world but people are still hungry because of the commodification of food and the unequal distribution of vital needs of people (Nagappa et al., 2020).

With regard to the prisons, a huge body of evidence show that prison populations are made up of people from low backgrounds characterised by lower income and educational levels, and poor health status compared to the general population and their encounter with the prison system offers an opportunity to address some of their unmet basic needs (Australian Medical Association, 2012). Therefore in order for prison inmates to meet the basic need of food security, adequate provision for food through adequate budgetary allocation and cooking facilities must be ensured by duty bearers including government and the Prison Service. While adequate budgetary allocation to the Prisons Service goes a long way to contribute to food security of prisoners, prisoners' own economic resources can also contribute their food security on the prisons. With the current economic and market trends, there is need for duty bearers to make conscious efforts to ensure consistent access to food through adequate budgetary allocation for food. As suggested by Scanlan (2009), the sociological importance of food in/security comes through a number of interconnected issues including poverty, stratification and inequality (Scanlan, 2009). Poverty is conceived as a lack of enough income that is necessary to buy a number of necessities for the survival of a person. Hence food insecurity is usually considered a subset of poverty which is usually termed as food poverty defined as lack of adequate income to buy food at the given conditions the amount of food required (Burchi & Muro, 2012).

Food entitlement can be enhanced through improved food budget, empowerment of inmates with skills for income generation and learning so they can make healthy food choices and improved their food security.

Food Intervention Decline (FID) Model

The Food Intervention Decline (FID) model as used to explain food insecurity emanates from the growing knowledge that political institutions including governments, donor agencies and NGOs, have a responsibility to protect citizens by promoting direct public interventions (Milà-Villarroel et al., 2015). The proponents of this theory argue that there is starvation among people because food policies and services have failed to ensure a sufficient level of food provisioning and utilisation (Milà-Villarroel et al., 2015). This model indicates that the non-existence or decline in policies and services render people to suffer from severe food insecurity and undernutrition. In this argument, all institutions that are responsible for the production and implementation of measures to achieve food and nutrition security are referred to as actors. People who are in favour of the FID have suggested policies which are either meant to prevent undernutrition among people who are most at risk or policies that respond to the occurrence of food crisis. Some of these policies include improvement in public health and warning systems to prevent food crisis, creating food reserves, reducing the inequalities and ensuring social cohesion; policies of price protection for basic foods, education and improving the health system and other social services. In all of these, the single denominator is, an implementation that conforms to the nature and cause of the food situation being addressed (Milà-Villarroel et al., 2015).

Previous studies done in the prisons have revealed that community support i.e. donations and advocacy by NGOs and CSOs, international development agencies, private organisations, families

and individuals, is an very important driver of welfare provisions for prisoners (Boadu., 2014; Frimpomaa Agyapong et al., 2018). Therefore if community support is enhanced through media campaigns and awareness creation it will to contribute towards food security in the prisons in Ghana.

The discussion of theories of food insecurity in the prisons clearly shows that one theory cannot adequately explain food in/security as a multidimensional concept. While the FAD theory emphasizes the need for consistent and undisrupted efforts to enhance food production in the prisons, the access models emphasise the need for policies that would enhance economic empowerment of the Prison Service in terms of government subvention and livelihood strategies of inmates. These can be achieved through policies and interventions by community members be it NGOS/CSOs, family etc.

1.5 Study Justification

The study makes a number of contributions to both the literature and the practice of public health nutrition programming among prison populations in various ways.

Firstly, the study aims to assess the food insecurity and nutritional status of inmates to ascertain the extent of the problem in Ghana's prisons. The findings of the study provides empirical evidence on issues such as the extent of food insecurity, coping strategies of prisoners, and the associated factors, which may be useful to policy makers including the government and other members of the criminal justice system. The Ghana Prisons Service in particular can use the findings for budgeting towards feeding and attaining other welfare standards for prisoners. The findings may also help the Prison Service Administration to prioritise and plan appropriate interventions to address the nutritional challenges of different groups of inmates.

Secondly, the study uses mixed method research procedures to investigate and document the factors associated with food and nutrition insecurity of prisoners, a situation which has been generally known to be a major chronic public health challenge in the prisons. Studies conducted in different settings to investigate the drivers of food and nutrition security status of individuals and households have documented various determinants for different population groups. As a country, achieving food and nutrition security for all members of the population, both free citizens and prisoners, is a major theme in Ghana's development agenda (National Development Planning Commission (NDPC) 2015). Policy makers strive to design and implement interventions that can help to achieve this goal for the Ghanaian population, and in order not to leave any section of the populace behind, this study investigates the factors affecting food and nutrition insecurity of Ghanaian prisoners. The information may help prison authorities to devise innovative strategies to ensure that factors which are protective of food security are enhanced while efforts are made to mitigate those found to be harmful to food and nutrition security, and overall wellbeing of prisoners.

Also, knowledge of the coping strategies of prisoners helps the researcher to make policy recommendations to relevant stakeholders including the government, the general public for support towards planning and implementation of policies and programmes to improve food and nutrition security and general welfare of prison inmates, which could also improve prison security and ultimately public safety.

Overall, the research report contributes to addressing the scanty literature on the Ghana Prisons Service with regard to food provisions in the prisons. The study report may be helpful for advocacy towards improvement in the overall conditions of prisons in the country. Such a report may also be useful to different categories of persons including those in academia and students for further

research development; the Prison Service Administration for planning of future prisons; and NGOs/CSOs and the general public to justify the need for welfare support and a receptive attitude towards prisoners.

1.6 Research Questions

1. To what extent does food insecurity exist among prisoners in Ghana's prisons?
2. What is the level of quality and nutrient adequacy of prisoners' diets?
3. What is the nutritional status of prisoners in Ghana's prisons?
4. What factors drive food and nutrition insecurity among prison inmates in Ghana's prisons?
5. How are coping mechanisms being employed by inmates with challenges of food and nutrition insecurity in Ghana's prisons?

1.7 Objectives.

1.7.1 Main Objective

The main objective of the study was to determine food and nutrition insecurity among Ghanaian prison inmates.

1.7.2 Specific Objectives

The specific objectives of the study include the following:

The specific objectives of the study include the following:

1. To determine the food insecurity prevalence among inmates in Ghana's prisons.
2. To assess the quality and nutrient adequacy of prisoners' diets
3. To assess the nutritional status of inmates in Ghana's prisons.
4. To identify the factors affecting food and nutritional security status of prisoners.

5. To determine the coping strategies adopted by prisoners during times of food hardship in the prisons.

1.8 Outline of the Thesis

The thesis is organized into Six (6) chapters per the University of Ghana College of Health Sciences standard. Chapter one presents the introduction which comprises the background to the study, statement of the problem, study justification, research questions, research objectives and conceptual and theoretical framework. Chapter two entails a review of empirical literature found to be relevant to the issues under investigation. It is organized into sub themes based on relevance to the variables being studied.

Chapter three comprises the methodology which is the manner in which the study was undertaken. The components in this chapter include research design, study population, study sites, sample size determination and sampling procedure and techniques, data collection instruments, quality control and ethical considerations, validity and reliability, and procedures for data collection and analysis.

Chapter four presents the findings of the study. The findings are put into five main sections according to the study objectives. Section one under this chapter covers findings on food insecurity prevalence of prisoners; section two deals with findings on adequacy of prisoners' diets with regard to DDSs and nutrient intakes while section three presents findings on the nutritional status of prisoners; sections four and five deal with findings on the factors that drive the food and nutrition insecurity status of prisoners and the coping strategies adopted by food insecure prisoners respectively.

Chapter five discusses the findings of the study. The discussions are done with the existing literature to make comparisons where necessary. The discussion is also based on the study variables investigated.

Chapter Six contains the summary and the conclusions drawn from the findings as well as recommendations made based on the findings. References and appendices are provided at the end of the thesis.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter covers the literature review and it is based on the issues under study. The chapter first of all discusses the concept of food in/security which is the primary outcome of this study, and gives an overview of nutrition security which also covers the various food nutrients. Additionally, some pertinent human rights instruments supporting adequate food provisions for prison inmates are also provided. Moreover, the global, local and prison level prevalence of food insecurity; the determinants of food insecurity; the measurement of food insecurity; the review also covers the ways to address food insecurity, the impacts of food insecurity on management of prisoners and health. The coping strategies adopted by food insecure households and individuals during times of food hardship are also covered in this chapter. Additionally, there is a review of literature on dietary diversity as a measure of quality of diets. Finally, the prison population trends and characteristics of prisoners who are the main respondents of the study, are also covered.

2.2 The Concept of Food Security

Food security is "when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 1996). The definition reveals four main components of food security: physical availability of food, physical and economic access to food, food utilization and stability (FAO, 2008; UN Special Rapporteur on Prisons and Conditions of Detention in Africa, 2004).

Food availability is a function of local food production, import and food assistance from humanitarian organizations (Aden, 2017). Food availability can be assessed based on the level of

food production, stocks, imports as well as food aid (FAO, 2008; Naciones Unidas, ALBANI, 2015). Economic and physical accessibility is linked with entitlements and having the means to acquire food (FAO, 2008). Interventions to improve incomes, enhance market infrastructure and stabilize food prices are likely to enhance people's access to food [(FAO, 2008); (FAO, 2010); (United Nations, ALBANI, 2015)].

When food is consumed, the energy and nutrients derived from it are utilized by the body and this points to the third concept of food security which is "food utilization". Food utilization is determined by care and dietary/ feeding practices as well as food preparation and handling to ensure wholesomeness, variety of diets consumed and sharing of food among members of the household. Food utilization is thus linked with dietary needs of individuals or households [(FAO, 2008); European Union, 2008]. Ultimately, the food utilization component determines the nutritional status of individuals or groups depending on how the body assimilates and uses the food consumed.

Stability as a component of food security means the consistent existence of the other three components as explained above. All the three dimensions of food security must be met simultaneously to achieve food security [(FAO, 2008); European Union, 2008]. Other related concepts of food and nutrition insecurity include underweight, undernutrition, hunger, hidden hunger and vulnerability (FAO, 2008; Jones et al., 2013).

Undernourishment is "a state when caloric intake is below the required minimum dietary intake" (FAO, World Food Programme, 2012a) while undernutrition as stated by the FAO, describes the poor biological use of nutrients consumed, by the body (FAO, 2008). Hunger, which is also a related concept in food insecurity discussions, "can be described as the feeling of unease, painful sensation due to lack of food in the stomach" (Jones et al., 2013). The concept, "hidden hunger",

refers to insufficiency in intakes and supply of micronutrients to the body (FAO & WFP, 2012b). All these concepts are important and need to be considered seriously in any intervention that is aimed at dealing with food insecurity among populations, especially a vulnerable population group such as prisoners, the focus of this study.

Vulnerability, another important concept related to food insecurity refers to the range of factors such as poverty, infections and diseases, disabilities of all kinds, and gender, among many, that place people at risk of becoming food insecure (Jones et al., 2013); FAO, 2008). A household or individual's exposure to these risk factors and the capacity to cope with the associated stress determines the degree of their vulnerability (Jones et al., 2013). There is the need to always assess household or individual vulnerability by identifying people who are most at risk, where they are located, why they are at risk and the extent of their risk to food insecurity (Jones et al., 2013). Food insecurity and nutrition insecurity occur as a result of reduced access to food, poor caring practices, and poor physiological capacity of the body to utilize food consumed due to disease conditions (Jones et al., 2013). For instance, the harsh conditions under which prisoners are kept, coupled with poor healthcare and low food budget, are avenues that can render prisoners highly vulnerable to food insecurity.

The WFP (2011) asserted that vulnerability and poverty are related concepts but differ in context because vulnerable people may not always be poor, it is their inability to cope or survive when they are exposed to hazards, risks, shocks, and stress that is of concern. Food insecurity experiences may occur at either the household (economic unit) level or the individual level. For instance, reduced food intake, inadequate diets, or starvation are more related to the individual, but the issues of food provisioning and the amount of food stores available in terms of quantity and quality are household or institutional level experiences (Ballard et al., 2013).

2.2 Overview of Nutrition Security

Nutrition security and food security are sometimes used interchangeably in many discussions but nutrition security is broader and food security is a vital component of nutrition security (Rome Declaration on World Food Security, 1996; Jones et al., 2013). Food and nutrition security has gained prominent attention among different actors including policy makers, practitioners, and researchers due to the negative consequences of the inverse and the public health significance of those consequences (Jones et al., 2013).

Nutrition is "the science of food, the nutrients and other substances they contain, their action, interaction and balance within the body including ingestion, digestion, absorption, transport, metabolism and excretion"(Ellie & Rolfes, 2008). Diet is the food and beverages a person eats and drinks (Ellie & Rolfes, 2008; Lean, 2015). Nutrition security therefore involves a combination of adequate nutrients, well balanced diets and regular physical activity (Ellie & Rolfes, 2008; Lean, 2015).

2.2.1 Nutrients and their Functions in the Body

Nutrients are the chemical substances found in foods which are needed by the body to obtain energy, and serve as structural materials and regulating agents to help growth, maintain the body and repair worn out tissues (Ellie & Rolfes, 2008; Lean, 2015). Nutrients in foods are grouped into two, namely macronutrients and micronutrients. Macronutrients provide structural material and energy in the body. They are needed in relatively large amounts by the body, while micronutrients regulate body processes and metabolism and are required in smaller quantities for proper functioning of the body (Ellie & Rolfes, 2008). A balanced diet contains all nutrients in their right proportions (Ellie & Rolfes, 2008; Lean, 2015; Panthania, 2017).

Foods can be categorized into three main groups, namely energy giving foods, body building foods and protective foods (Ellie & Rolfes, 2008; Lean, 2015). Thus, malnutrition occurs when the diet a person consumes does not provide nutrients in sufficient amounts for growth and maintenance, or when the body is unable to utilize the food consumed due to illness. Malnutrition can also be a result of excess intake of energy and nutrients by an individual (Fuhrman, 2014; Ellie & Rolfes, 2008). A well-balanced diet prevents malnutrition and protects the body against diseases such as obesity, diabetes, and cardiovascular diseases such as stroke, cancer and heart disease (Fuhrman, 2014; Ellie & Rolfes, 2008).

The energy giving foods are foods that contain carbohydrates and fats and supply the body with energy required for daily voluntary and involuntary activities. Examples of foods in this group include cereals and grains such as wheat, brown rice, maize, whole wheat bread, rice, noodles, white flour, biscuits, pasta, sweet potato, and yam, fats and oils, butter, vegetable oils, sugar, and honey among many (Duyff, 2006; Ellie & Rolfes, 2008; Joel, 2014).

The body building foods are those that supply the body with proteins and minerals. These are what support and build the soft and skeletal tissues in the body. Iron for example which is one of the nutrients in this food group helps in the formation of blood. Some of the sources of body building foods include milk and milk products; nuts and legumes such as beans, groundnuts; meat such as chicken and beef, fish and eggs (Ellie & Rolfes, 2008; Joel, 2014). The next group of foods are what are known as protective foods. They are protective because of the role they play in protecting the body from all forms or infections and other diseases. These are minerals and vitamins such as iron, zinc, B-vitamins, calcium and vitamins A, D, E, K. Food sources of vitamins and minerals include milk and milk products, green leafy vegetables, orange and yellow fruits and vegetables

like mangoes, pawpaw, carrots and pulses (Ellie & Rolfes, 2008; Joel, 2014). For the body to have these essential nutrients, people must consume adequate quantities through their diets. There are other chemicals in foods that perform very useful functions and these are known as regulatory substances. They are mostly fibre and water. They help to regulate body processes such as maintenance of body temperature, excretion and digestion (Debruyne et al., 2015).

Macronutrients

Carbohydrates

Carbohydrates are food nutrients which are made of three elements, carbon, hydrogen and oxygen. Examples of carbohydrates are the sugars, starches and fibre. Sugars can be in the form of a monosaccharide (with one sugar unit such as fructose, galactose and glucose) a disaccharide which has two sugar units such as sucrose, lactose and maltose and a polysaccharide with more than two sugar units such as starch, glycogen (Duyff, 2006). Carbohydrates are the main source of energy for the body's activities including breathing, thinking, digesting of food and sports. The main form of carbohydrate is glucose which circulates in the bloodstream after food is digested and absorbed, which is why glucose is usually referred to as blood sugar (Duyff, 2006).

Fats

Fats are another source of energy to the body. Additionally, fats in the body serve as a medium to transport nutrients like the fat-soluble vitamins (A, D, E, K). Fats are a combination of various fatty acids which can be either saturated of unsaturated. The unsaturated fatty acids have been found to be healthier than the saturated ones (Duyff, 2006; Fuhrman, 2014). Every human needs some amount of fat in the body to help protect essential body organs, prevent bone injury as they

serve as shock absorbers, and insulate the body against extreme cold weather (Duyff, 2006; Fuhrman, 2014).

Proteins

These are also macro nutrients which are in the form of amino acids and function to build, repair and maintain all body tissues. It has been reported that the human body can make some of the amino acids it needs on its own while others must be taken into the body through eating foods containing high amounts of them. Hence these are known as essential amino acids (Ellie & Rolfes, 2008; Lean, 2015; Duyff, 2006).

Micronutrients

Vitamins and Minerals

Vitamins and minerals are micronutrients which are needed in smaller quantities but play significant roles towards the optimal functioning of various cells of the body. It has been found that the different vitamins in foods play specific rolls and therefore one cannot replace the other. Vitamins and minerals work together with other nutrients to ensure normal functioning of all body processes (Ellie & Rolfes, 2008; Duyff, 2006). They help energy production from fats, carbohydrates and proteins; support the formation of proteins; help build strong bones and support brain function. Some vitamins function as coenzymes that support chemical processes in the body. For example, vitamin A is needed for normal vision, it and supports the growth of cells and tissues in the body and plays a role in reproduction by enhancing embryonic development (Duyff, 2006). It helps prevent some cancers and promotes immune health. A lack of it can cause night blindness, skin problems and poor growth. Food sources of the vitamin include organ meat like liver, eggs, fortified dairy products, orange and yellow vegetables and fruits as well as dark green leafy vegetables.

Another important micronutrient is vitamin E which works as an antioxidant and inhibits oxidative reactions, thereby lowering the level of bad cholesterol in the blood. This in turn may contribute to lowering the risk of heart disease and strokes. Insufficient intake of vitamin E therefore contributes to low birth weight in infants and other long-term health challenges in adults.

Some body chemicals such as insulin, hemoglobin, and other substances that help the body to fight infections are manufactured with the help of vitamins such as pyridoxine (vitamin B6). Low intake of this vitamin has been reported to cause mental convulsions in children, depression, nausea and flaky skin. Vitamins also work in partnership with other nutrients in the production of red blood cells and assist in the use of fatty acids in the body (Duyff, 2006). Another important vitamin worth mentioning is vitamin C which plays many roles in keeping the body healthy. It contributes to the production of collagen which connects the tissues, muscles and bones together. It also functions to enhance the absorption of minerals like iron from plant sources into the body. The healing of wounds is also enhanced by the activity of vitamin C in the body. Additionally, the vitamin enhances immunity by contributing to the formation of disease fighting substances (antibodies) and works as an antioxidant to prevent damage caused to cells through oxidative reactions. Some of the food sources of vitamins include citrus fruits, berries, peppers, dark green leafy vegetables, tomatoes, chicken, organ meat such as liver; fish, whole and enriched grain products, nuts and beans.

The next group of micronutrients are minerals. There are many minerals in foods that play important roles in the body. These include iron, zinc and calcium. Most minerals in the body do not work in isolation but in partnership with other nutrients. For example, calcium absorption into the bones is enhanced with the presence of adequate amounts of vitamin D. Calcium helps muscle

contraction and regulates heartbeat. It also protects the individual from many health risks that may be encountered in middle adulthood. To ensure adequate bone mass, one must ensure adequate daily intakes of calcium through diets. Additionally, experts say that regular weight bearing exercises such as walking, biking and dancing can help in bone formation (Duyff, 2006).

Iron is another important mineral that supports many essential body functions. It has been found that though iron is needed in only small amounts for a person to stay healthy, its deficiency is one of the most common nutrition challenges all over the world (Duyff, 2006). The principal function of iron is its role in transporting oxygen containing haemoglobin in red blood cells to various parts of the body for energy production and for carbon dioxide excretion from the body. This explains why when the iron levels in the blood go down, it results in body weakness and the inability to be productive. Iron can be found from both animal and plant foods. Iron from animal sources such as meat, fish and poultry except egg yolk is known as heme iron while that plant source is non-heme (Duyff, 2006). Zinc also promotes the growth of cells and tissues in the body. During childhood, zinc deficiency can impair growth. Additionally, low zinc intakes during pregnancy can result in birth defects. Zinc deficiency can also cause reduced resistance to infections in individuals. The major sources of the mineral include meat, seafood, liver, whole grains, black eyed peas and soya beans.

2.13 Human Rights Instruments Supporting Adequate Food Provision for Prisoners

2.13.1 International Instruments

Major international summits are organized with the aim of setting goals and targets which should be attained within specified periods by all countries worldwide. These targets are supposed to be achieved through commitment and accountability on the parts of governments involved.

International agreements like those for human rights are some of the ways to enforce commitments and accountability towards the achievement of goals by governments. One major example of such international agreement is the right to adequate food and freedom from hunger by everyone (FAO, 2012).

In "recognition of the inherent dignity, equal and inalienable rights of all members of the human family", prisoners and detainees inclusive, Article 1 of the **Universal Declaration of Human Rights (1948)** states that "all human beings are born free and equal in dignity and rights". This entreats nations to ensure that all persons including prisoners, the displaced, women and men, children etc., are treated humanely and are provided the right to live in that regard.

The United Nations Standard Minimum Rules for the Treatment of Prisoners (1957), now Nelson Mandela Rules (2015), makes clear the importance of sufficient food for survival and health of prisoners. The document states in Article (20) that (1) "every prisoner shall be provided by the prison administration at the usual hours with food of nutritional value adequate for health and strength, of wholesome quality and well prepared and served", and (2) "drinking water shall be available to every prisoner whenever he needs it". Failure to meet this standard which demands of the GPS to offer prisoners adequate and quality food and water, constitutes a violation of the right to food under Article 11.1 of the **International Covenant on Economic, Social and Cultural Rights.** (International Covenant on Economic , Social and Cultural Rights . Adopted by the General Assembly of the United Nations on 16 December 1966).

To address problems of harsh prison conditions and ill-treatments, Article 20 of the Standard Minimum Rules provides that (1) "the medical officer shall regularly inspect and advise the director (of prisons) upon: (a) the quantity, quality, preparation and service of food; (b) the hygiene

and cleanliness of the institution and the prisoners; (c) the sanitation, heating, lighting and ventilation of the institution; (d) the suitability and cleanliness of the prisoners' clothing and bedding…". **Article 31** further states that "corporal punishment, punishment by placing in a dark cell, and all cruel, inhuman or degrading treatments shall be completely prohibited as punishments for disciplinary offences". All these components have implications for the various dimensions of food security. For example, poor healthcare provisions will affect prisoners' health status which could in turn affect food utilization. In the same way, inadequate food provisions could affect the health of prisoners.

Additionally, the **Body of Principles for the Protection of All Persons under Any Form of Detention or Imprisonment (1988)** and the **Basic Principles for the Treatment of Prisoners (1990)** uphold prisoners' inherent dignity and provide them all the rights as enjoyed by the general public. The only exceptions are those necessary to be curtailed for the purpose of imprisonment. Thus, **Principle 1** of the Body of Principles for the Protection of All Persons under Any Form of Detention or Imprisonment (1988) states that "all persons under any form of detention or imprisonment shall be treated in a humane manner and with respect for the inherent dignity of the human person" whilst Principle 6 reiterates that "no person under any form of detention or imprisonment shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment - no circumstance whatever may be invoked as a justification for torture or other cruel, inhuman or degrading treatment or punishment".

Similarly, **Principle 1** of the Basic Principles for the Treatment of Prisoners (1990) states that "all prisoners shall be treated with respect due to their inherent dignity and value as human beings". The 9th principle further provides that "prisoners shall have access to the health services available

in the country without discrimination on the grounds of their legal situation". Undoubtedly, these principles are provided to help address inhumane conditions like inadequate food provisions characterizing prisons.

2.13.2 Regional Instruments

In addition to the international instruments discussed above, there are also legal and legislative instruments in the form of declarations, conventions and so on. For example, the **Kampala Declaration on Prisons Conditions in Africa (1996)** adopted at the first ever Pan-African Seminar on Prison Conditions in Africa held in Kampala in 1996 recognizes the need for prisons in Africa to ensure that inmates exercise their rights as imprisonment requires. The Declaration recommends in Principle 1 that "the human rights of prisoners should be safeguarded at all times…"and in principle 2 that, "Prisoners should retain all rights which are not expressly taken away by the fact of their detention" (The Kampala Declaration on Prison Conditions in Africa, 1996).

By recognizing the right to life and inherent dignity despite detention, the Kampala Declaration further recommends in principle 3 that: "prisoners should have living conditions which are compatible with human dignity", and the 4th principle states that "conditions in which prisoners are held and the prison regulations should not aggravate the suffering already caused by the loss of liberty". Principle 5 stipulates that "the detrimental effects of imprisonment should be minimised so that prisoners do not lose their self-respect and sense of personal responsibility".

Again, the **Arusha Declaration on Good Prison Practice (1999)** adopted at a conference held in 1999 in Arusha, Tanzania, seeks to ensure effective delivery of welfare provisions to prisoners and compliance with prison standards. The adoption of the Arusha Declaration was in recognition of

the fact that "conditions in most African prisons fall short of minimum standards for the treatment of prisoners" and calls on prison managers to promote and implement good prison practices, offer prison staff the basic skills of managing prisons and collaborate with civil society organizations to improve conditions and delivery of welfare and minimum standards for the treatments prisoners (Arusha Declaration on Good Prison Practice, 1999)(Arusha Declaration on Good Prison Practice, 1999). In Ghana, prison officers, are equipped with the requisite skills they need to be able to manage prisoners even in resource constrained situations. However, there is still need for additional capacity because the offender population has been increasing and has become more sophisticated (Ghana Prisons Service, 2013).

The **Ouagadougou Declaration and Plan of Action on Accelerating Prisons and Penal Reforms in Africa (2002)** outlines ways by which challenges to prison management can be reduced while conditions in prisons and delivery of welfare provisions to prisoners are improved. It recommends among other things that, African prisons must: "ensure self-sufficiency in prison resources by involving prison staff and inmates in agricultural production and prison industries". Additionally, in recognition of the prisoners' right to quality healthcare, **the Declaration and Plan of Action on Accelerating Prisons and Penal Reforms in Africa (2003),** reiterates the need to "emphasize primary health care, hygiene education, nutrition and sanitation promotion in the prisons and link the healthcare of prisoners with the Ministry of Health and national health schemes, and also the need for health information".

2.13.3 Local Instruments

There are many local instruments in Ghana which seek to enhance human rights of all persons including prisoners and detainees.

The **1992 Constitution of the Republic of Ghana** provides for the protection of the fundamental human rights and freedom for all persons. Chapter 5, Article 15 provides for the dignity of all persons including the arrested, restricted or retained, and this emphasizes the need to safeguard the human rights and dignity of persons in penal institutions in Ghana. That is, Article 15 (2) provides that "no person shall, whether or not he is arrested, restricted or retained, be subjected to - (a) torture or other cruel, inhuman or degrading treatment or punishment; (b) any other condition that detracts or is likely to detract from his dignity and worth as a human being" (The 1992 Constitution of the Republic of Ghana, 1992).

Therefore, the GPS is by this provision mandated to ensure no abuse and ill-treatments of prisoners, and to improve welfare delivery in areas such as food security so they can live in dignity and good health while they serve their sentences

Another legislative instrument is the **Prisons Service Act 1972 (Prison Service Decree [N.R.C.D. 46])**. This instrument provides standards for the delivery of health, feeding and accommodation arrangements for prisoners. For example, section 35 (1) provides that:

> "It shall be the duty of the Director of Prisons to ensure that every prisoner (a) is regularly supplied with wholesome and nourishing food in quantities sufficient to maintain him in good health; (b) is at all times supplied with clothing, soap, bedding and other necessities in quantities sufficient to maintain his decency, cleanliness and good health; (c) is at all reasonable times permitted access to washing and toilet facilities sufficient to keep himself clean and decent in his person; (d) is permitted to take daily exercise outside his cell during the hours of daylight for a period not less than one hour in every day; (e) is promptly

supplied with all medicines, drugs, special diets or other things prescribed by a medical officer of health as necessary for the health of that prisoner".

It must be noted however that, despite the existence of the massive literature on the right to adequate food and good health among prison inmates, the Ghana Prisons Service is unable to meet the food and nutrition needs of inmates and this must be addressed since it could have implications for successful achievement of the core mandate of the Prisons Service.

2.3 Global Prevalence of Food Insecurity

Globally, between 720 and 811m people suffered from severe hunger, while 928m experience severe food insecurity in 2020 (FAO et al., 2021). Additionally, about 10% (768m) are undernourished; 2.4 billion do not have access to adequate food and 3 billion do not have access to healthy diets. In North America and Europe, 13m (1.3%) people suffered severe food insecurity and less than 2.5% of the population were undernourished. Also, 310m people in Asia experienced severe food hardship while 520m experienced undernourishment in 2016 (FAO et al., 2017). It was also reported that in 2016, the food insecurity situation deteriorated in parts of the world, especially in sub-Saharan Africa and more profoundly in areas of conflict (FAO et al., 2017) resulting in about 333m people in Africa experiencing severe food insecurity that year. Currently, one-third (282m) and 64m of the world's undernourished and hungry people respectively, reside in Africa (FAO et al., 2021).

Also, 153m individuals 15 years and above in Africa, experienced severe food insecurity and one out of four persons in Africa experienced severe hunger in 2014/2015 (Dufour, 2015). Evidence shows a significant reduction in hunger and malnutrition in the world in general, but the pace of its occurrence has not been universal in all regions including the sub-Saharan African sub- region,

and Asia (UNDP, 2016). It is also reported that out of the number of countries with a high proportion of undernourished people, more than 25% are found in Africa. Additionally, out of the 216 million who were undernourished in Africa in 2015, 30% are found in sub-Saharan Africa, the most affected sub-region. Experts have intimated that even though progress has been made with regard to the fight against hunger and food insecurity, the FAO and partners in the state of the world's food insecurity report indicated that there is still more work to be done in order to achieve the SDG 2 targets by 2030 (FAO et al., 2017).

2.4 Food Insecurity in Ghana

Ghana was reported as the first country in Africa to have achieved the first MDG of halving poverty and hunger (Akotia et al., 2017). Despite this great achievement, Darfour & Rosentrater (2016) noted there was food insecurity at the household level and among vulnerable groups in different parts of the country. The authors also noted that there was insecurity in all 10 regions of the country and they attributed the trend to severely limited resources and lack of alternative livelihood opportunities for individuals to meet their dietary needs. A WFP food insecurity survey in Ghana in 2009 found that about 453,000 people in Ghana experienced food insecurity and 34%, 13% and 10% occurred in the Upper West, Upper East, and Northern regions respectively (WFP, 2009). Additionally, the same WFP report revealed that about 2 million people were vulnerable to becoming food insecure in Ghana and about 1.5m who were projected to become food insecure lived in both rural and urban communities in seven regions of the country including Brong-Ahafo 11%, Ashanti 10%, Eastern 8% and Volta region 7% (WFP, 2009).

In 2012, a study that focused on the then three regions of Northern Ghana found that more than 680,000 people were either severely or moderately food insecure (WFP), 2012). The study also

classified close to 140,000 as severely food insecure people who depended on very poor diets consisting of mostly staple foods (WFP & Ghana Statistical Service, 2012).

However, the Ghana Zero Hunger Strategic Review Report that was published in 2017 reveals a significant improvement in the country's efforts at reducing hunger and food insecurity since the 1990s, and especially within the 2014 to 2016 reviewing period (Akotia et al., 2017; Cooke et al., 2016). According to the authors, Ghana is the first country in Africa to have achieved the MGD1 of halving poverty and hunger, and reducing the number of malnourished people from about 7 million in the 1990s to below 1 million as at 2017 (Akotia et al., 2017)]. In spite of the milestones achieved, Akotia and colleagues reported that hunger and poverty are still significant problems in Ghana with the then three northern regions having the highest prevalence (Akotia et al., 2017)]. Also, there is a widening trend in the gaps between the north-south, rural-urban and female-male inequalities in the country.

From the forgoing discussions on FNI prevalence, it could be observed that food security goes beyond food production and physical food availability which had been the focus in food security interventions for decades. Also, food insecurity experiences could be persistent or short term. Experts and agencies working on this phenomenon such as the FAO have advocated the need to know the duration of people's experiences of food insecurity and the severity of its impact on their overall nutritional status and health. This is to enable policy planners determine the type, magnitude and urgency of assistance to be given to the affected group of people (FAO, 2008). The prevalence of food insecurity in the prisons has not been reported in any national food security report. This may be because this information is non-existent.

2.5 Food and Nutrition Insecurity Prevalence among Prisoners and Other Vulnerable Populations

Food and nutrition insecurity prevalence is not universally distributed among populations of different continents in the world, and this is the case with prisoners and other displaced populations (Abera & Adane, 2017; Collins & Thompson, 2012; Cook et al., 2015; Herbert et al., 2012). For example, in some high income countries such as Canada and Australia, prisons are battling food insecurity in the form of overweight and obesity (Cook et al., 2015; Herbert et al., 2012). However, prisoners in lower and middle income countries are suffering food insecurity in the form of hunger and undernutrition (Abera & Adane, 2017; Collins & Thompson, 2012). Findings from two studies that were done in 16 prisons in England by Edwards, Hartwell, & Schafheitle (2007) to assess the diets and food service provisions for prisoners revealed that though inmates were given food of recommended standards, the diets were still lacking in some nutrients. In a similar study done by the same authors Edwards, Hartwell, & Schafheitle (2009), it was found that prison authorities made efforts to provide meals that conformed to good health standards.

In Ethiopia, a study done in 9 prisons revealed that about 25% of the prisoner population studied was underweight (Abera & Adane, 2017), while in Malawian and Zambian prisons, two studies done in 2016 and 2017 found that 95% and 85% of prisoners respectively were food insecure (Moloko et al., 2017; Topp, Moonga, Luo, et al., 2016).

Additionally, Depa et al., (2018), in their study on food insecurity among food bank users another vulnerable population in the US found about 70% prevalence of food insecurity. The authors however acknowledged the public health implications of this trend and thus recommended that food insecurity interventions also needed to focus on socially disadvantaged groups.

Furthermore, a 2010 report of the Department of Peacekeeping Operations (DPKO) under the United Nations revealed that prisons in the Democratic Republic of Congo (DRC), received very little funding from the government for food and other basic needs. Hence, severe starvation as a result of food insecurity exists resulting in high incidence of deaths among prisoners. Moreover, an Amnesty International report on the conditions in some African prisons, of which Ghana was a part, found that some of the prisons in the DRC served only one meal a day and those meals were woefully inadequate as they lacked vegetables and protein; this was in addition to lack of running water and poor sanitation sanitary conditions (DPKO, 2010). It was also revealed that about 80% of inmates were pre-trial detainees who caused serious overcrowding in the prisons visited. Considering the inadequate food supplies coupled with inadequate prison agricultural production, the strict security arrangements in the overpopulated prisons are highly likely to render prisoners vulnerable to food insecurity (GPS, 2013).

2.6 Determinants of Food and Nutrition Insecurity

The determinant factors of food and nutrition insecurity among different populations are manifold and occur at various levels and in different geographic locations and cultures (Abdullah et al., 2017; Ashby et al., 2016). First of all, a rise in food prices due to inadequate domestic agricultural production, reduction in food imports and inefficient food systems have been found to be major determinants of food insecurity (Naciones Unidas, ALBANI, 2015; Warr, 2014; Yaro, 2013). It has been reported that high domestic food prices; poverty and low incomes of population; poor market infrastructure, and poor food safety standards along the food supply chain which render food unsafe for human consumption, also have a negative impact on different components of food security (Naciones Unidas, ALBANI, 2015; Warr, 2014; Yaro, 2013). For example, it has been reported that about 4 billion cases of water and food borne diarrheal diseases, a condition that can

affect the utilization component of food security, occur annually and account for close to 2 million deaths every year (United Nations & ALBANI, 2015).

Furthermore, reports have revealed that household characteristics such as age, gender, education, unemployment, inflation in assets and diseases are important determining factors of household food insecurity. (Abdullah et al., 2017; FAO, 2008). Specifically, studies have documented determinants of food insecurity such as chronic poverty, lower education, household size, access to markets, household livestock ownership and family support in the form of remittances (Mango, Makate, Nyikahadzoi, & Siziba, 2014; Yaro, 2013). Other determinants are lack of modernised agricultural systems such as irrigation, improved seeds, modern food production and processing technologies (Kassie et al., 2012). For example, in a study conducted on the determinants of food insecurity, Harris-Fry et al., (2015) found that, larger household size increased the risk of food insecurity among household members.

Ballard et al (2013) also reported that social injustice, inequalities, lack of socio-cultural, and environmental guarantees for the right to adequate food, are some underlying causes of food and nutrition insecurity. The author argued that these factors result in poverty and lower people's access to education as well as prevent them from securing good jobs with commensurate wages. For example, gender inequality (male superior-female subordinate concept) can exacerbate household food insecurity. Pandya (2008) asserted that women's role in food and nutrition security can be seen in the three key components food availability (when women get actively involved in food production); food accessibility (when they support economic access to food); and utilization (when women ensure nutritious food in cooking). Moreover, in some parts of the world especially in Africa, women are also exclusively responsible for household sanitation, home making, caring

for children and fetching water. These are also very important for achieving the utilization dimension of food and nutrition security.

The population of interest for this current research (prisoners), most of whom could be described as people who, may at the time of arrest, have no stable incomes of their own; lack remittances from family and friends, and for that matter, depend solely on the prisons where every decision about them is taken by prison authorities. It is therefore imperative to investigate the magnitude of food deprivation experienced by this group of vulnerable people to inform appropriate policy action to address the situation.

2.7 Addressing Food and Nutrition Insecurity

Efforts at addressing food and nutrition insecurity will be successful if those who are most at risk, the type, degree and the magnitude of its existence are known (WFP, 2011). Achieving food and nutrition security entails guaranteed availability, quality and continuity of food access for all people, as well as diversification of food crop production (Cheng et al., 2017; Hilderink et al., 2012).

A study to identify the barriers to food consumption revealed that lack of nutrition knowledge on the value of foods, lack of storage facilities and contamination with agro-chemicals are significant barriers to food consumption (Silverman-Retana et al., 2015). Hence, the authors recommend nutrition education and other interventions, such as implementation of poverty reduction strategies, to remove food security barriers including mass poverty and hunger. It is also known that improvement in incomes alone cannot address the entire food security challenges, but that investment in health, water and sanitation also contributes greatly to food security (AU, NEPAD, WFP & UNECA, 2012; FAO, 2008). The Framework for African Food Security, an African Union initiative and the Global Panel on Agriculture and food systems also provide ways of addressing

food insecurity which include improving risk management; increasing supply of affordable commodities through increased production and improved market linkages; increasing economic opportunities for the vulnerable; and increasing quality of diets through diversification of foods among the target groups (African Union, 2015; Global Panel on Agriculture and Food systems Nutrition, 2017).

Another way to address food insecurity is to develop and implement strategies that can help populations to overcome micronutrient deficiencies. Such strategies, according to research, include dietary diversification, food fortification, vitamin and mineral supplementation as well as public health and disease control measures like indoor residual spraying for the prevention of malaria (Cheng et al., 2017; Naciones Unidas, ALBANI, 2015). There has been an argument for diversification in food production as a reliable means to save the world from over relying on the three most common cereals (maize, wheat and rice) which are the main food crops produced in most parts of the world (Cheng et al., 2017). The authors indicate that diversification enables farmers to explore other crops which have comparable quality and adaptability with the three cereals (Cheng et al., 2017). The focus should not only be on food diversification, but also effort must be made to improve the quality of food production through research evidence supporting food fortification and bio-fortification. These are found to be helpful in improving access to and use of micronutrient-dense foods (Beal et al., 2017).

In the case of ensuring food security in the prison, some experts have suggested that providing raw ingredients for inmates to make fresher foods would be helpful as it stands to improve their knowledge of nutrition and build their capacity to prepare healthier meals (Edwards, Hartwell, Reeve, et al., 2007). Above all, it has been suggested that in order to achieve growth in food supply, efforts must be made to reduce poverty, and to increase investments in transportation, education,

and agricultural research and development (Beal et al., 2017). Another suggestion on ways to address food insecurity is that, policies that improve equitable access to nutritious food also need to be strengthened (Beal et al., 2017).

2.8 Impact of Food Insecurity on Management of Prisoners

People are brought to prison for many reasons including deterrence, punishment and public safety. The core functions of the Ghana Prisons Service are to ensure safe custody and welfare of prisoners while also ensuring their reformation and rehabilitation (Ghana Prisons Service, 2013b)**.** Literally, rehabilitation means restoration of a person to his/her former state while reformation means rectification of a mistake made by someone. Available evidence shows that success in reformation and rehabilitation programmes for prisoners in custody depends to a large extent on conditions in the prisons including accommodation and food security (Cole & Tembo, 2011; Ghana Prisons Service, 2013b; Neely et al., 2014). There is evidence that show that food and nutrition insecurity has negative implications for the treatment of prisoners and prison services (Bulten, 2010). For example, a case-control study on effects of nutritional supplements on aggression and hostility recorded an association between deviant behaviour and nutritional status, in that the number of cases of aggression significantly reduced for the group receiving nutritional supplements compared to those of the placebo group (Bulten, 2010).

Additionally, a badly designed menu, inadequate quantity, lack of variety and poorly cooked food could contribute to serious complaints and dissension among prisoners (Blades, 2001; Godderis., 2006). Prisoners also secretly use food as currency or medium of exchange for other goods among themselves (Blades, 2001; Godderis., 2006). With the arguments about the role of food in the management of prisoners, it is essential that prison managers ensure that all prisoners have adequate access to, and consume a healthy, nutritionally balanced diet, most especially because a

majority of them may be depending solely on prison food for their survival (Edwards, Hartwell, & Schafheitle, 2007b).

Another point raised by Eves & Gesch (2003) in their research is the use of food in dealing with deviant behaviour among prisoners. In a study designed to use food supplements to reduce violent behaviour of some difficult young prisoners in Britain, it was found that increase in consumption of junk food contributed to the rise of violence in the prisons studied (Gesch, 2013). Meedeniya et al (2000) also noted that food is a symbolic experience of prison to prisoners and it controls their lives in many ways. According to other authors, food helps to relieve prisoners of boredom and the monotonous prison life. However, it could also be a channel of aggression is not acceptable to them (Edwards, Hartwell, & Schafheitle, 2007).

In recognition of the role food plays in the successful management of offenders in prison custody, Article 5 of the Arusha Declaration (1999) provides that "no one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment". This supports the notion that any condition or treatment which amounts to cruelty and a threat to life, such as severe food insecurity, could lead to violence and formation of gangs among prisoners. Hence these issues of food insecurity must not be persistent in prisons and therefore need to be addressed.

2.9 Effects of Food Insecurity on Health

There is an enormous amount of literature about the effects of food insecurity on the health of individuals. Food plays an important role in the life of an individual as it is the fundamental ingredient for major body processes such as physical growth and energy metabolism (Meyer & Kolanu, 2011; Wilson, 2008). Hence, inadequate diets can affect vital body processes for active healthy life. For example, it has been reported that inadequate food intakes contributed to the major

causes of deaths and morbidities in the US **(**Collaborators for US Burden of Disease, 2013**).** Moreover, Weiser et al (2009), in their study to determine the effects of food insecurity on viral load suppression among HIV patients, found that 80% of severely food insecure HIV patients were less likely to adhere to ART treatment regimes.

Additionally, severe food insecurity was linked to lower odds (77%) of viral suppression (95% CI = 0.06–0.82) in an adjusted analysis of the same population studied. In another HIV study by Anema et al (2009), the authors found that HIV patients on antiretroviral therapy (ART) had decreased ART adherence, reduced baseline CD4 cell count, incomplete virologic suppression, and decreased survival as a result of food insecurity. The authors therefore concluded that food security should be factored into any HIV interventions for less privileged and vulnerable populations, of which prisoners are a part. In the Ghana Prisons Service, HIV/AIDS and TB were among the major causes of deaths of inmates until the implementation of the Prisons Service Workplace HIV/AIDS and TB Policy (Ghana Prisons Service, 2012). The influence that food insecurity in Ghana's prisons may be having on inmates with these conditions is however unknown and may call for investigation.

There is also evidence indicating that positive dietary changes have a potential positive impact on prisoners' physical and mental health (European Union Commission, 2016). In its report, the European Union Commission indicates that this is especially true in situations where prisoners have access to fresher foods through prison catering or self-catering, supported with education about cookery and healthy eating (European Union Commission, 2016). Poor nutrition affects the growth and development of individuals, both physically and cognitively, as it makes people less productive and disadvantaged in the labour market (FAO, 2008; Jones et al., 2015). Jones (2017)

also found significant associations between food insecurity and gender, age, subjective health status, and smoking, duration of food bank use, school education and family type. The need for public health interventions that will focus more on vulnerable populations such as prisoners due to the high food insecurity prevalence among them and the behavioural characteristics associated with food insecurity, cannot be overemphasized (Jones, 2017).

Unlike in other jurisdictions like Denmark where inmates are allowed to do self-cooking, with the aim of normalizing food preparation and consumption and also for ensuring a wide variation in food consumption in prisons (Eves & Gesch, 2003b), the Ghanaian prison system provides institutional catering food services to inmates who therefore have very limited control over what they eat in prison, and this is why prison food must satisfy nutritional recommendations and provide adequate nutrition and good health for inmates in custody. This is also because most prisoners depend solely on prison food for survival throughout their life in prison.

2.10 Measurement of Food Insecurity

There is no single measure for food insecurity status, unlike other concepts such as mortality or malnutrition, which can be encompassed in a single indicator (WFP, 2011). Rather, available evidence indicates that the use of multiple measures gives a deeper understanding of how households or individuals access available foods that meet their nutritional requirements while at the same time measuring availability, nutritional adequacy, and social acceptability of food. (WFP, 2011, Jones et al,. 2013).

A WFP framework for food insecurity and vulnerability assessment outlined four main objectives, out of which at least one must be in any food security assessment procedure for a defined population. These objectives include estimation of the severity of food insecurity; projection of future food insecurity; identification of groups that are most affected by or vulnerable to food

insecurity and identification of appropriate interventions to improve access to food (WFP, 2011). According to the WFP, food insecurity assessments are done to ascertain people's ability to cope with changes in their environments due to disasters like droughts and conflicts, and this may give early signs as to how any change in their sources of food could affect their livelihoods so that emergency plans could be put in place (WFP, 2011).

Available evidence also indicates that there are many food security measurement methods. Additionally, there has been a shift from objective measurements such as the availability and utilization components of food in/security, to measurement of access and emphasis on fundamental measurement rather than distal and proxy measures (Castell et al., 2015; Webb et al., 2006). It has been noted that each of these numerous food security measurement methods, when used together with another, could provide complementary information to the other (Castell et al., 2015). The authors listed the food insecurity measurement methods such as food balance sheets, household budget and spending surveys, individual food intake surveys, anthropometry and perception of food insecurity (Castell et al., 2015). The authors argue that the first four methods mentioned tend to be complicated, costly and only give information about the consequences of food insecurity, but the fifth method which is perceived food insecurity measurement is premised on the fact that food insecurity experience can be captured and quantified (Coates et al., 2007). The HFIAS is made up of nine questions and makes a 4-12 weeks retrospective reference. One strength of this tool is its ability to capture the different levels of food insecurity due to lack of access, variety and quantity (Castell et al., 2015; Coates et al., 2003, 2007). Since this study is intended to investigate food insecurity in all its forms, the HFIAS is employed in this study.

2.11 Coping Strategies as Early Warning Signs of Food Insecurity

These relate to how households cope with a specific hazard by using their assets to get food and cash and other goods and services. Coping strategies are conceived as "a set of activities that are undertaken, in a particular sequence, by a household in response to exogenous shocks that lead to declining food availability" (Burchi & Muro, 2012). Coping strategies are included in the more general livelihood strategies, which are the combination of activities that people choose to undertake in order to achieve their livelihood goals. Coping strategies vary and fall into distinct stages. Early coping strategies are not necessarily abnormal, usually reversible and cause no lasting damage. They can include collecting of wild foods, selling non-essential assets (including some livestock), reducing expenditure on 'non-essential' items or sending a family member to temporarily work elsewhere. Later strategies, sometimes called crisis strategies, may permanently undermine future food security. Some examples are sale of land, distress migration of whole families, or sale of the last animals or the productive female animals in a herd. It can be added that taking children out of school or sending them to work also undermine the future food security of the household. Increased migration may increase risk of HIV transmission. Coping strategies may also affect the environment through over-exploitation of commonly owned natural resources or be otherwise socially 'undesirable,' such as theft or begging (WFP, 2011). Most vulnerable groups adopt coping strategies that can help them increase food availability for a short term and may engage in borrowing food or money and buying food on credit (Maxwell et al., 2000).

Coping strategies are employed by individuals and households as a response to food and nutrition insecurity caused by situations such as droughts, conflicts and poverty (African Union, 2005). Gundersen et al (2017) reported that food insecure households are more likely to encounter problems than their food secure counterparts, and therefore to resort to some coping strategies such

as selling or exchanging of belongings and eating less expensive foods, they are also three to four times more likely to engage in these strategies compared to food secure households. Strategies to reduce food insecurity in any system must take into consideration all its underlying causes in order to achieve desired results (Gundersen et al., 2017).

Coping strategies are not at all bad especially during early signs of food hardship. Coping strategies such as gathering wild fruits and selling are not damaging and can be reversed when food security is restored. However, others can be damaging to the environment and expose people to infectious diseases such as HIV infection when girls and women for example, resort to prostitution.

2.12 Dietary Diversity Score (DDS) as a Measure of Diet Adequacy

A research in the United States has found that prisoners are more likely to be overweight than the general population, due to their diets being high in processed foods, carbohydrates, fat and salt (Wilson, 2010). When a diet is able to provide enough energy and nutrients to support proper functioning of the body, it can be said that the diet is adequate (Ellie & Rolfes, 2008). Adequate diets are achieved when a variety of foods are selected for each day's meals (Ellie & Rolfes, 2008). Dietary Diversity is the number of food groups consumed within a specified period of time (Hoddinott et al., 2002). A study conducted by Hoddinott et al (2002) to assess whether DDS can be used to assess food security among households in 10 countries of diverse backgrounds using a linear regression model, found that there is an association between dietary diversity and food security. The authors concluded that DDS offers a promising tool for measuring food security in resource constrained settings.

The use of diet diversity score as a proxy indicator for diet adequacy and nutrient intakes has been researched enormously (Ajani, 2010; Arimond et al., 2010; Desta et al., 2019; Faber et al., 2017;

G. Kennedy et al., 2010; Oldewage-Theron & Kruger, 2008; Pingali et al., 2017; Saaka, 2012; Sawadogo et al., 2005). For example, it has been found that the consumption of monotonous diets that are heavily made up of staple foods, presents a heightened risk to inadequate intake of micronutrients, especially in developing settings (Arimond et al., 2010). The authors assessed the potential of using diet diversity as a proxy indicator for micronutrient adequacy in 5 resource poor settings including Burkina Faso, Mali, Mozambique, Bangladesh and the Philippines, using multiple 24-hour recalls: they found an association between diet diversity and mean probability nutrient adequacy. Hence the authors concluded that food group indicators were found to be promising tools in the assessment of micronutrient adequacy (Arimond et al., 2010).

Additionally, a study done to assess diet quality in six Nigerian states used diet diversity found low diet diversity in Nigerian diets. The authors argued that since diet diversity predicts nutrient adequacy, interventions to improve the nutritional status of the Nigerian population must also target diet diversity among diets of different sections of the population (Ajani, 2010). Furthermore, an assessment of overall diet quality using food variety and diet diversity scores, and their association with nutritional status among mothers in a rural area in Burkina Faso, found a significant relationship between DDS/FVS nutrient intakes as well as nutritional status indicators among the women (Sawadogo et al., 2005).

2.15 Prison Population Trends and Characteristics of Prisoners

2.15 .1 Prison Population Trends

There were more than 10 million people held in penal institutions worldwide as of 2015 when the world population was 7.6 billion, with a world prison population rate of 144 per 100,000 (Walmsley, 2016). The United States of America holds about one fifth of the world's total prisoner

population, with a rate of 716 per 100,000 while in Europe, the median rate for western European countries is 84 per 100,000 (Walmsley, 2016). The world's prisoner population has increased globally by about 20% for close to two decades, and this is reported to be slightly higher than the world's population growth rate of 18% (Jacobson et al., 2017). The median prisoner population rate for western African countries is 52 per 100,000 and more than three times this number (188 per 100,000) is reported for southern African countries (Jacobson et al., 2017).

Ghana had a prisoner population rate of 53 per 100, 000 and the total prisoner population stood at 14, 297 against a national population of 27, 583.000 (Walmsley, 2015; Ghana Statistical Service, 2016). Some schools of thought have attributed the huge difference between western and southern African prisoner populations to differences in crime rates and political stability between the two sub-regions (Jackson & Vaughn, 2017). However, Jacobson et al (2017) also argue that a country's prisoner population rate cannot determine its crime rate. The authors explained that there are economic, social and political underpinnings to the nature and size of prisoner populations in countries all over the world. These reflect in the background characteristics of prisoners.

2.15.2 Background Characteristics of Prisoners and Criminal Behaviour

Penal institutions house people with varied socio-demographic backgrounds including age, education, marital status, gender, employment status and religion. There are many arguments by prominent criminologists linking some of these characteristics to criminal behaviour and imprisonment (Hirschi & Gottfredson, 1983; Sampson et al., 2006)

Age and imprisonment

There is massive evidence on the relationship between age and crime. It has been found that criminal activity increases at age 17 but reduces steadily as one grows older (Cornelius. et al.,

2017). The authors have intimated that limited availability of resources for young people may increase their likelihood of engaging in crime. Another school of thought supporting the reason for the lower age bracket of persons in prison has been that as people grow older, they go through many life situations such as marriage and childbirth, becoming graduates, or even joining the security forces. These are milestones that may keep people from engaging in criminal behaviour which could subsequently cause them to be imprisoned (Cornelius. et al., 2017; Sampson et al., 2006).

The majority of persons in prison are in their active working years. Prisons in the United States, Malawi and Madagascar for example, are housing persons most of whom are below the age of 40 years (Bronson & Carson, 2019; Moloko et al, 2017; Ravaoarisoa et al, 2019). Additionally, Hastings B Moloko et al., (2017) & Ravaoarisoa et al., (2019) reported mean ages of 27 years and 33.4 years for their study samples in Malawi and Madagascar prisons respectively. Evidence also shows that about a third of all arrests in the United States are made of people within the ages of 18-24 years and only 7.3% of arrests are made up of adults 50-54 years (Rocque et al., 2016). Given the majority of prisoners are relatively young, they may spend a substantial part of their lives in prison and the need to ensure their welfare in prison cannot be overemphasized.

Gender and Imprisonment

The male to female ratio of prison population is almost the same for different jurisdictions and generally there are more men in prison than women (International Centre for Prisons Studies, 2008). Though the female prison population has increased by about 81% compared to that of males (45%), there are still more men in prison than women. The 2016 US prison report reveals that only 7% of the prison population is female (Bronson & Carson, 2019). In Ghana, male prisoners make

up about 98% of the total prison population, with a female to male ratio of 1:85 (Ghana Prisons Service, 2017).

The lower imprisonment rates of women compared to men in different countries have been noted to be a result of the fact that different countries have different policies regarding imprisonment of females. While some countries have universal laws on imprisonment for both sexes, others have more sympathetic attitudes towards women (International Centre for Prison Studies, 2008). Some researchers have argued that the high female to male ratio in prisons is also due to the fact that women are less likely to engage in criminal activity and delinquent gangs than men. Another school of thought on women and crime is that females are generally seen as less problematic to corrections against criminality and so not much attention is given to crimes they commit (Allen et al., 2015; Barros et al., 2019). Since most of the arguments so far points to the fact that, more than 90% of prisoners in prisons around the globe are made up of able bodied young men, there is the need for resource support in various forms to enable prison authorities plan and implement effective interventions to turn these young men into productive citizens on their release from prison (Bronson & Carson, 2019; Coates et al., 2003).

Religion and Imprisonment

There is a huge body of literature supporting religiosity, "the cognitive and behavioural commitments to organized religion" (Hirschi & Gottfredson, 1983), for reducing criminal behaviour and increasing acceptable behaviour among people. For example, it has been asserted that religion serves as a facilitating tool for prisoners' reformation (DeCamp & Smith, 2019). Other scholars have also established that belonging to a religious sect has a deterrent effect on engaging in unacceptable behaviour and specifically, violent crimes (Burkett & White, 1974; W DeCamp & Smith, 2019; Whitney, 2015; Wang & Jang, 2017; Wencker et al., 2015). In areas where there is

a strong affinity for religion, the expectation is that people will behave in a manner that is morally acceptable, which entails desisting from deviant behaviour

Moreover, findings from many other studies have underscored the importance of religion in the lives of prisoners in all regions of the world. Engagement in religious activity or belonging to a particular religion like Christianity, for instance, has been found to be linked to reduced incidence of illegal acts such as alcohol and drug abuse among the youth (DeCamp & Smith 2019)(Jang 2017 & Thirumalai 2004). The reasons why prisoners engage in religious activities in the prisons are many and some researchers like (Thirumalai, 2004) have intimated that prisoners may use such activities as means of coping with boring life in prison assuaging the guilt associated with criminal behaviour; making amends with themselves and their conscience as well as making up for the loss of freedom and significant others and gaining material benefits or access to people outside the prison.

Employment and Crime

The relationship between employment and crime has been heavily researched. Evidence suggests an inverse relationship between employment and crime. Barnes & Beaver (2012) argue that people who engage in lowly employment are more likely to commit crimes. Additionally, it has been found that officially reported convictions were higher during periods of unemployment compared to periods of employment among individuals who had other high risk exposures such as lower parental control, lower income and lower intelligence (Apel et al., 2007).

It is generally known that the majority of Ghanaians work in the informal sector with many unfavourable working conditions ranging from lack of job security and low remuneration to underemployment (Makochekanwa, 2010; Osei-Boateng & Ampratwum, 2011). Unemployment

has been found to be a major risk factor for engagement in all kinds of activities, both acceptable and unacceptable, to enable people to make ends meet (Nyameky et al., 2011). Furthermore, some previous studies have reported that, prior to their incarceration, a majority of prisoners worked in the informal sector where more than 70% of them were self-employed and less than a tenth were in formal employments (Hastings et al., 2018; Makochekanwa, 2010).

Education and Criminal Imprisonment

Education and crime have been studied extensively and connections between them have been established. Available evidence shows an inverse relationship between education and crime and the resultant imprisonment (Åslund et al., 2015; Farrington et al., 1986). Many researchers in criminal justice research have found that as people educate themselves, their risk of engaging in crime decreases. In other words, the more formal education people attain, the less the likelihood that they will engage in criminal behaviour, and the more the likelihood that they will live decent lives (Gonzales, 2015; Hjalmarsson et al., 2015). Other scholars may also argue that as people educate themselves more and become more intelligent, they tend to use intelligence to promote criminal behaviour. Hence, it is not surprising that we find highly educated people going to prison for various kinds of offenses. As much as this may be true, it must also be noted that the number of uneducated people in prison generally far outweighs that of the educated.

The lack of education tends to reduce an individual's employment prospects and this may lead to increase in criminal behaviour among those for whom it will be difficult to gain employment (Åslund et al., 2015). The converse also holds, in that increase in criminal behaviour reduces one's chances of completing higher levels of education. It is therefore not surprising that the prison population is heavily made up of people with very low educational background (Åslund et al., 2015).

Marriage and Engagement in crime

Marriage has been deemed an important institution that can help promote desistance from crime as it has many financial, spiritual and legal characteristics that are binding on the parties who engage in it (Blokland & Nieuwbeerta., 2005). This assertion is further confirmed by Barnes & Beaver, (2012) and Siddique (2016) who have reported that being in a marital relationship or cohabitating strongly protects one from engaging in criminal behaviour. Prisoner populations all over the world have been found to be generally single or never married individuals (Bronson & Carson, 2019).

Based on these arguments, one can conclude that the prisoner population is dominated by people who have never married or are single, and because they may not have spousal influence which can change their routines and association with others, they are likely to succumb easily to engaging in criminal behaviour.

2.16. A synthesis of the Literature Reviewed

Overall, there is massive literature on human rights provisions which support welfare provisions such as the adequate food and nutrition security, accommodation and healthcare. However, most of these provisions especially conventions and declarations, have not been stated in ways that make them compulsory, leaving their implementation at the discretion of governments and other duty bearers. The right to food provision must be compulsory in order to motivate national governments to show commitment, transparency and be accountable to civil societies of their countries and of the world, since these recognise the vulnerability of the poor and marginalised populations including prisoners (González, 2010).

Additionally, the national constitution of Ghana recognises the need to treat all persons with dignity irrespective of their status in society. However, there is a disconnect between some of these constitutional provisions and other legal instruments, policies and social interventions as they do not make explicit provisions for welfare of inmates such as nutritional health. A typical example of this situation is the provisions in the Public Health Act (2012) of Ghana (Public Health Act , Act 851 Act , 2012) in which no explicit provision is made to promote the nutritional health of prison inmates. Additionally, the National Nutrition Policy (Ministry of Health, 2013) is silent on the nutritional health of prison inmates.

To achieve food and nutrition security in prisons in Ghana, conscious efforts must be made to incorporate into national policies aimed at ensuring growth and development of the nation. These may include agricultural production, health, and education. A report from the MOFA indicates that, Ghana is self-sufficient in production of all staple crops except rice and millet (MoFA, 2018, page 19). However, there is still a proportion of the Ghanaians including prisoners who are still hungry. The Planting for Food and Jobs which is a flagship Programme introduced by the NPP Government in 2018, could have served the Prisons Service a lot of good had there been explicit provisions made to support prison agriculture. It is therefore imperative that keen interest is developed in issues surrounding the food and nutrition security of the prisoners which must also be recognised in all related national policies. This is because of the direct implications it has for the achievement of the core mandate of the Prisons Service and national development as a whole.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents the methods and materials used in the study. It provides a detailed description and justification for the use of key components. These include research design, population, study area, sample size and sampling procedure, data collection instruments, validity and reliability, procedures for data collection and analysis and the limitations of the study.

3.1 Research Design

The design for this study was cross-sectional which employed the concurrent mixed method approach where both qualitative and quantitative data collection and analysis techniques were utilised.

3.2 Study Population

The population for this study comprised adult prison inmates and prison officers. The prison officers included Officers-In-Charge (OICs) and other officers of the selected prisons facilities within the Ghana Prisons Service. The population of prisoners in Ghana in October 2018 was 14,817 (GPS, 2018).

3.3 Study Sites

Profile of the Ghana Prisons Service

Brief History of the Ghana Prisons Service

The penal systems in the then Gold Coast is found to have started in the early 1800s, in an irregular manner whereby administration of forts administered on the coasts under the chairmanship of Captain George Maclean who exercised criminal jurisdiction both inside and outside the Forts. By 1841, a form of prison had been established in Cape Coast Castle where debtors were kept. By

1850, there were prisons in four Forts holding a total of 129 prisoners who were kept in chains (Ghana Prisons Service, 2013). Between 1875 and 1876, the Gold Coast was properly acknowledged as a colony by the British Criminal jurisdiction which later was extended to the southern part of Ghana, and the then Gold Coast Prisons Ordinance, which was based on the English Prisons Act 1865, was introduced. At that time the main function of the prisons was to keep prisoners in safe custody (Ghana Prisons Service, 2013b). Due to the unsatisfactory nature of the prisons in the preceding years, the prison department was then placed under the Police administration. However, as the number of prison facilities and staff increased, the prisons were separated from the police administration and placed under the then Inspector General of Prisons. The prisons Department became autonomous and was renamed the Ghana Prisons Service on 1st January, 1964 (Ghana Prisons Service, 2013b).

The current statutes that govern the Ghana Prisons Service therefore include the 1992 Constitution of the republic of Ghana; the Prisons Service Decree NRCD 46; Prisons Standing Orders 1960; Prisons Regulation L.I. 412 (58); the Declaration of Prisons Instrument and the Prison Service Scheme of Service Administration.

It has been argued that prisons in Africa in general have not seen much change in the penal systems that were inherited from the colonial powers, so that punitive tendencies including prison overcrowding, poor sanitation, hunger and malnutrition have become chronic challenges facing the prisons and these deserve human rights protection actions by African governments (Sarkin, 2008). Ghana's prisons conditions are no exception.

Operations and Management of the Ghana Prisons Service

The Ghana Prisons Service performs four main functions: safe custody, welfare, reformation and rehabilitation of prisoners. Hitherto, safe custody and welfare of prisoners were regarded as the core functions of the Prison Service. However, due to a change in the philosophy of prisons regarding correction and treatment of people who fall fowl of the law, rehabilitation and reformation of prisoners have now become pivotal functions with which the Prisons Service is measured, in line with international best practice (Ghana Prisons Service, 2013b). Thus the Prison Service is required to execute its mandate in a humane manner in order to reduce reoffending; offer opportunities to prisoners to develop their skills through well-structured trade training as well as moral and formal education programmes; encourage the involvement of both public and private sector organisations in providing training programmes; ensure improved welfare services including healthcare, accommodation, feeding, and recreational facilities among others (Ghana Prisons Service, 2013b). In addition to its core functions, the Prisons Service also performs other state functions such as counter insurgency operations, United Nation peace keeping operations, and electoral activities.

Vision, Mission and Departments of the Ghana Prisons Service

The existing vision of the Prison Service as contained in its Ten Year Strategic Plan, 2013-2022 is "To transform the prisons in Ghana into highly efficient correctional facilities managed by well trained and motivated staff", while its mission is as follows: "The Ghana Prisons Service is tasked with the safe custody of convicted persons from the Courts as well as the provision of reformation and rehabilitation programmes for their successful resettlement into society. Out cherished values are Humanity, Vigilance and Fortitude" (Ghana Prisons Service, 2013b). It has been found that training of staff especially human rights training, helps to achieve prison reforms as it helps to

bring change in the attitudes and behaviour of prisons staff towards prisoners (International Centre for Prison Studies, 2000). Other important factors that support prison reforms are the employment conditions and availability of opportunity for staff to seek redress where necessary. Thus, it is not by fluke that the Prisons Service has components of effective staff training and staff motivation in their Vision and Mission respectively, and as these ambitions are pursued, the need for support in all forms from the government and other relevant stakeholders cannot be overemphasized.

The Ghana Prisons Service is a major player in the Criminal Justice System in the country and has seven departments responsible for Finance and Administration, Operations, Welfare, Human Resource Development, Technical, Agriculture and Health, each with sub units under it. For example, the operations department is made up of units in charge of operations, communications etc. The main duty of the operations department is to ensure both static and dynamic prison security. There are about 45 prison facilities currently. These include one Senior Correctional Centre (SCC)[1], Prison officers' Training School and the Headquarters in Accra. Additionally, there is one Maximum Security Prison, one Medium Security Prison, and Minimum, Open Camp and Farm settlement Prisons. The prison population for the past few years has been hovering around 15,000 against an original capacity of about 9000. There is therefore no gainsaying the existence of serious overcrowding which hampers proper classification of prisoners and adequate healthcare delivery, and which result in the abuse of the fundamental human rights of prisoners. Given the international profile of Ghana and the general belief held by many that it is a hospitable nation, there is the need for government to pay attention to the inhumane conditions in Ghana's prisons

[1] A centre for safe keeping, reformation and rehabilitation of juveniles who are in conflict with the law

and other places of detention to ensure that they reflect the nation's international recognition and status.

The study sites for this study were 12 selected prison facilities within the Ghana Prisons Service. The Ghana Prisons Service had 42 prisons located in all 10 regions of Ghana in 2018 (though the regions are 16 now). The 42 prisons are classified based on the level of security required, and these categories include the following:

- One (1) Maximum Security Prison
- One (1) Medium Security Prison
- Seven (7) Central Prisons
- Thirteen (13) Local Prisons
- Seven (7) Female Prisons
- Twelve (12) Open and Agricultural Settlement Camp Prisons
- One (1) Contagious Disease Prison (CDP)

To ensure representativeness in the prisons and generalizability, each of the above categories of prison was represented in the study. Figure 3.1 is a map of Ghana showing locations of prisons involved in the study.

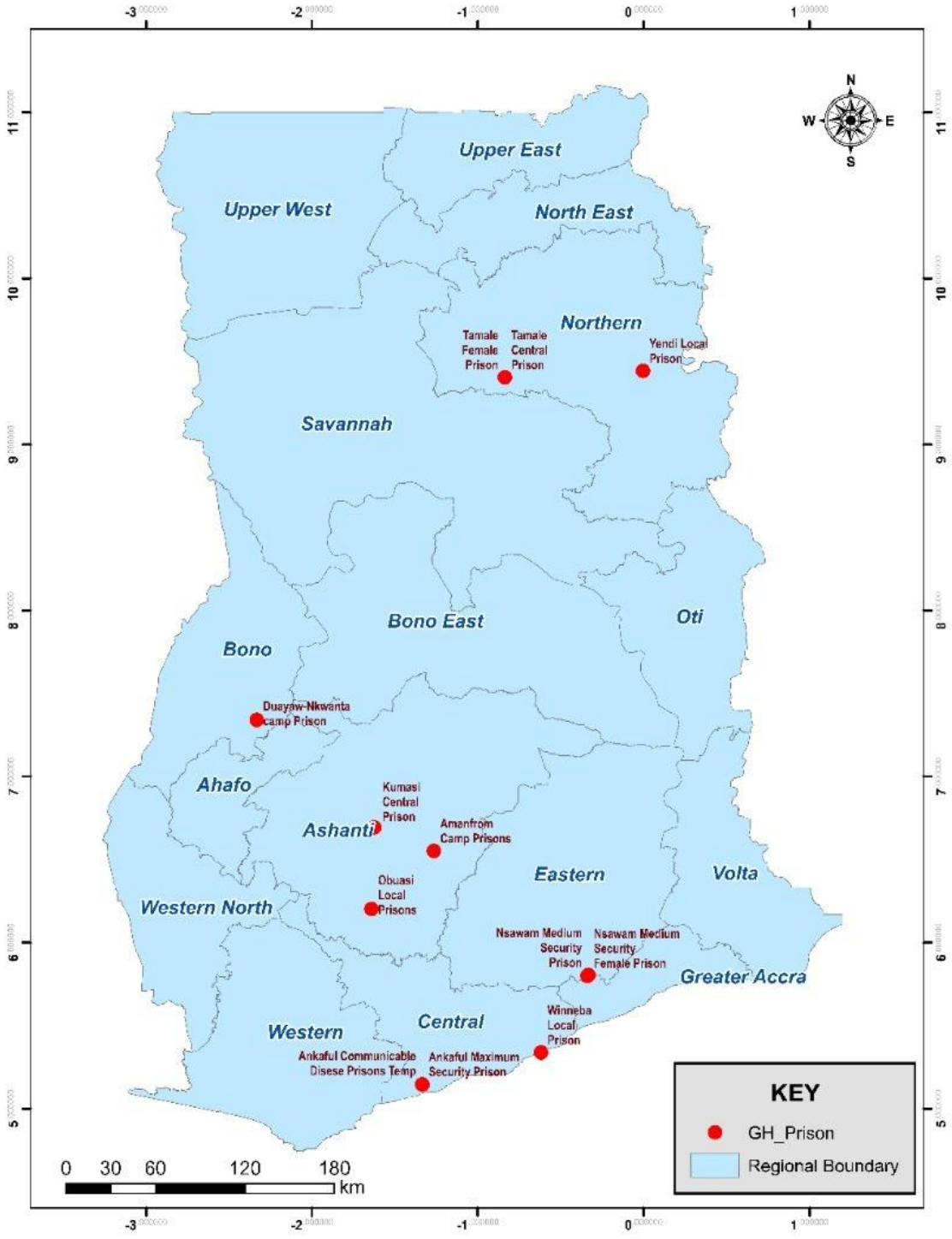

Fig 3.1: Map of Ghana showing locations of selected prison establishments
Adapted from Ghana Prisons Service Annual Report (2012, pg. 7)

3.4 Sample Size Calculation

The sample size for prisoners (n) was calculated using the Yamane, (1967) formula as stated below. This is based on a 5% level of significance and 0.5 population prevalence of the primary outcome (food insecurity).

3.4.1 Prisoners

$$n = \frac{N}{1+Ne^2} = \frac{14,817}{1+14,817\,(0.05)^2} = 389.5$$

Where:

n = Sample Size

e = Confidence interval = 0.05

N = Population size of prisoners 14,817 representing the total adult prisoner population in Ghana.

The sample size (n) obtained after computing for the figures above was approximately 390.

With the addition of 10% anticipated non-response (38.95), the final sample size calculated for prisoners is 429 and this was rounded off to 430.

In order to ensure that female prisoners, though a very small population, were also involved in the study, the researcher used the proportional sample size allocation procedure as follows:

Total number of inmates = 14,817 comprising 14,660 males and 157 females (Ghana Prisons Service Criminal Records Office, 2018) The required number of females in the sample (n) above was calculated as follows:

157/14,817 * 430 = 4.56 which was approximated to 5 females. The sample size for each prison (stratum) was proportionally allocated before the field data collection using the formula:

$ni = (Nh/N)\, n$, (Pandey and Ram VERMA, 2008)

ni = $N1 + N2 + N3$ ……. Nh

n = approximate sample size for the study = (430)

Nh = sample size per stratum (prison)

ni = population per stratum (prison)

It must be stated that the actual sample size calculated was 430 for inmates but in the end a total of 437 inmates were involved in the study.

3.4.2 Sample Size for Prison Officers

Nine (9) Officers-in-Charge and Seventy-seven (77) other prison officers holding various schedules were selected for the study. Unlike the prisoners whose number for each prison was known and sample size calculated before the data collection commenced, the number of officers holding schedules of interest for this study were not known. Hence sample size for officers could not be calculated. However, the researcher expected to obtain a minimum number of 72 officers comprising two caterers, one agric officer, a food store keeper, a receptionist, and a welfare officer from each of the 12 prisons studied. The 77 officers and 9 OICs reported in this study were obtained at the end of the data collection in all the selected prisons.

3.5 Sampling Design

3.5.1 Sampling of Prisons

The first stage of the design was the selection of prisons using the prison categories as indicated on page 61 of this thesis. That is, prisons to be involved in the study were selected from each category of prison using the stratified random sampling technique. This is because prisoners within each category of prison have similar characteristics such as gender, security risk level and terms of imprisonment, based on the Ghana Prisons Service's classification of prisons. Hence the stratification was done to ensure that each category of prison and prisoners within are adequately

represented in the study. Additionally, it allowed for comparison of results across the different prison categories.

3.5.1.1 Maximum Security Prison

The maximum security prison (Ankaful Maximum Security Prison), was purposively selected for the study since there was only one such prison in Ghana. Prisoners in this prison were further re-stratified according to type of sentence (life imprisonment, condemned prisoners, etc.) and their numbers were selected according to the size of population in each to obtain the total number required from this prison.

3.5.1.2 Medium Security Prison

There was only one such prison (Nsawam Medium Security prison) in the Ghana Prisons Service. Hence, this prison was purposively selected for the study. The prisoners in this prison were further re-stratified according to type of sentence (life imprisonment, condemned prisoners, etc.) and the sample selected according to the number of prisoners in each to obtain the total number required from this prison.

3.5.1.3 Central Prisons

There were 7 central prisons. Therefore, for the purpose of sampling from this prison category, the country was divided into two namely, the Northern sector which comprised the then three northern regions and the southern sector comprising Ashanti, the then Brong Ahafo, Western and Volta regions where central prisons were located. This was because of the differences in food security status between the north and the south (Akotia et al, 2017) and also due to the different staple foods grown in each sector. Hence, the re-stratification was done to ensure that each sector is fairly represented.

There were 3 central prisons in the northern sector and 4 in the southern sector. One prison each was selected from the northern and the southern sectors using the balloting method of the simple random sampling. The names of the Central Prisons in the North and South were written on small pieces of paper and placed in two separate containers labelled “North” and “South”. The Kumasi and Tamale Central prisons were selected and formed part of the study.

3.5.1.4 Local Prisons

In sampling from the local prisons, they were stratified (i.e., northern, middle and southern sectors), based on where they were located in the country. For the purpose of sampling from these prisons, the Northern sector constituted local prisons in the then Northern, Upper East and Upper West regions. The middle sector comprised local prisons in Ashanti, Brong Ahafo and Eastern and finally, the southern sector comprised local prisons in Central, Western, Volta and Greater Accra regions. One prison was selected from the northern sector and one each from the middle and southern sectors using the balloting method of simple random sampling. The local prisons selected were Obuasi Local representing the middle sector, Winneba local for THE southern sector and Yendi local prison representing the northern sector.

3.5.1.5 Agricultural Settlement and Open Camp Prisons

The nine (9) agricultural settlement camps and three (3) open camp prisons were merged to form one stratum making a total of 12 prisons for sampling. These prisons are located in six regions of the country: Brong Ahafo, Ashanti, Eastern, Western, Central, and Greater Accra regions. These were further grouped into middle and coastal belts. For the purpose of this study the middle belt comprised Camp prisons in Brong Ahafo, Western and Eastern regions and the coastal belt comprised Camp prisons in, Ashanti, Central, and Greater Accra regions. Simple random sampling

was used to select one each from the middle and coastal belts. The prisons selected for this category were Amanfrom, and Duayaw-Nkwanta camp prisons.

3.5.1.6 Communicable/Contagious Disease Prison (CDP)

There was one communicable disease prison located in the Central Region of Ghana. It is a facility that is meant to house prisoners who have been diagnosed with communicable or contagious diseases such as leprosy and tuberculosis, as well as those diagnosed of serious mental diseases. Prisoners in this prison had the same feeding grant as the general prisoner population. The prison was also purposely selected for the study due to its peculiarity.

3.5.1.7 Female Prisons

The seven (7) female prisons as indicated on page 67, also used the same feeding budget for each prisoner and the same security arrangements as their male medium security counterparts. The female prisons are Nsawam, Tamale, Akuse, Kumasi, Ho, Sunyani and Secondi female prisons. Two female prisons namely Nsawam female and Tamale female prisons. This was because Nsawam female housed the largest number of prisoners, and located in the southern part of the country while Tamale female was the only female prison located in the Northern part of Ghana.

It must be stated that during the data analysis stage, the selected prisons were re-grouped into four main categories because some had very small samples which would not make bivariate and multivariable analysis possible. Hence, based on security arrangements of the prisons as observed during data collection, Ankaful Maximum Security Prison and Nsawam Medium Security Prisons were re-categorised as maximum security prison; Kumasi Central Prison, Tamale Central Prison, Nsawam and Tamale Female prisons were renamed medium security prisons; Obuasi Local Prison,

Winneba Local Prison, Yendi Local Prison and CDP were renamed minimum security prisons, and Duayaw Nkwanta and Amanfrom Camp Prisons were named low security prisons.

Table 3.1 summarizes the prison categories used in the study.

Table 3.1 Prisons, original strata, re-stratification and number of inmates selected for survey

Name of prison	Original stratum	Re- classification
Ankaful maximum security prison	Maximum security prison	Maximum security prison
Nsawam Male Prison	Medium security prison	Maximum security prison
Kumasi central prison	Central prison	Medium security prison
Tamale Central prison	Central prison	Medium security prison
Nsawam female prison	Female prison	Medium security prison
Yendi local prison	Local prison	Medium security prison
Tamale female prison	Female prison	Medium security prison
Obuasi local prison	Local prison	Minimum security prison
Winneba local prison	Local prison	Minimum security prison
Amanfrom camp prison	Open and agricultural settlement camp prison	Low security prison
Dua-Yaw Nkwanta Camp prison	Open and agricultural settlement camp prison	Low security prison

3.6 Prisons and Number of Respondents Selected

The prisons selected covered all the categories of prisons within the Ghana Prisons Service. Nsawam male prison which houses the largest number of prisoners in the country, had the highest

number of inmates sampled (n=186), followed by Kumasi central prison (n=126). Details of prisons selected and number of prisoners selected from each are presented in Figure 3.2.

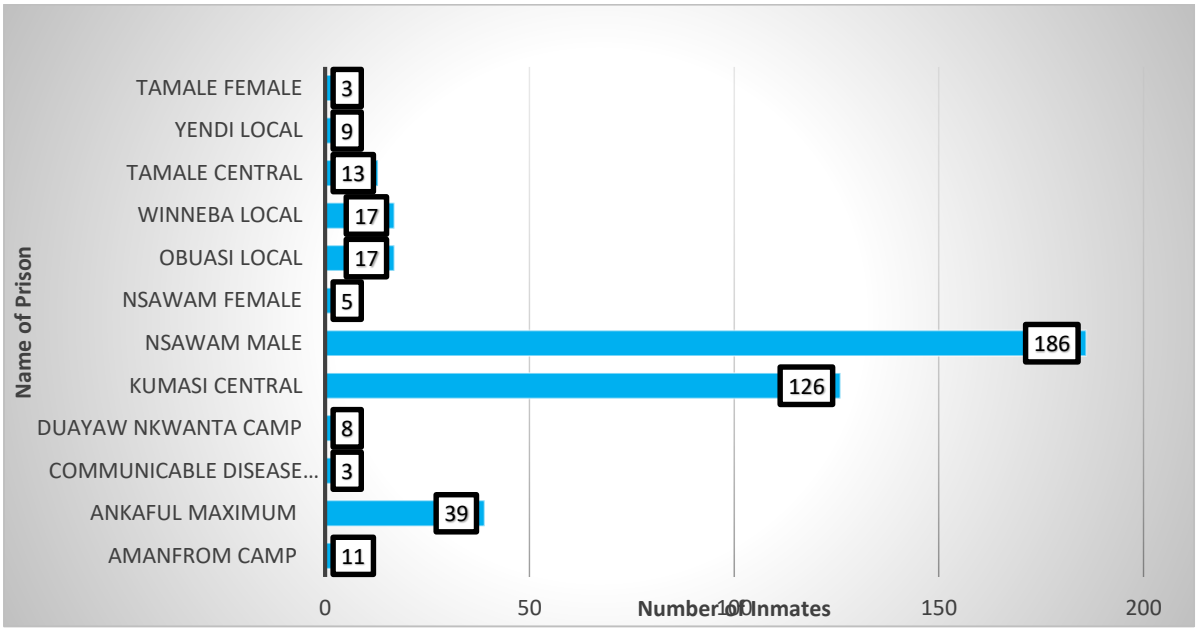

Figure 3.2: Names of prisons studied and number of inmates selected from each

3.6.2 Sampling of Respondents

3.6.2.1 Sampling of Prisoners

The next stage of the sampling design was the selection of prisoners. Selection of prisoners for the quantitative component of the study was done using systematic sampling. The list of prisoners was obtained from each prison which formed the sampling frame for that prison. With a random start based on ballot, every 'Y' numbered prisoner on the list was selected until the number required for each prison was obtained. The 'Y' was calculated based on a fraction of prisoners on the list and the number to be sampled from that list (Creswell, 2008). For example, the 'Y' for Nsawam Medium Security Prison was 18 and this was obtained by diving the total number of prisoners on the list (3,475) by the number required (198), which was approximately 18. Therefore, every 18th

person was chosen. The same procedure was used for all other prisons. Also, a proportional to size sample allocation was used in selecting prisoners from each prison category. This was done to enhance generalizability of the results. The purposive sampling technique was used to select 12 prisoners for the qualitative component of the study.

3.6.2.2 Sampling of Prison Officers

The final stage of the sampling procedure was the selection of prison officers. These comprise Officers-In-Charge (OICs), the heads of prisons; food service officers; agriculture, healthcare and other welfare officers. For the purpose of this study, food service personnel included caterers working in a prison's kitchen or canteen (where food was sold) and managers of food stores. The sampling technique used for this category of respondents was the purposive sampling technique. These officers held schedules that are directly related to the acquisition, as well as preparation and serving of prisoners' meals. Therefore, they have first-hand knowledge in the issues. Hence their responses were complementary to those obtained from prisoners as far as the issues under study were concerned. The table below summarizes the categories of respondents involved in the study, data collection instruments used and the information received from them.

Table 3.2: Respondents' categories, numbers, data collection tools and information expected from them

Respondents Category	Number	Data Collection Tool	Information Sought
Prisoners	437	Questionnaire	Socio-demographic data, Food and nutrition insecurity experiences, weight, height, MUAC and nutritional status assessment, Coping strategies, 24-hour dietary recalls
	12	In-depth interview guide	Experiences and challenges with food access, availability and utilization, etc. in the prisons.
OICs	9	In-depth interview guide	Coping strategies, factors driving food access, food procurement history, prison agriculture activities etc.
Prison officers	77	Questionnaire	Food insecurity issues affecting inmates, information including challenges of feeding inmates, prison agricultural activities, prisoners' health and healthcare delivery challenges, working experience and socio demographic data etc.
	535		

3.7 Study Variables

Two main types of variables were considered in this study: dependent or outcome variables and independent or predictor variables (Creswell & Plano, 2007). Table 3.3 shows study objectives, study variables and how they were measured

Table 3.3: Study objectives, variables and method of measurement

Research objective	**Type of variable**	**Assessment/measurement method**
To determine perceived food insecurity status of prisoners	**Dependent variable**: food insecurity prevalence (Categorical)	FAO /FANTA Food Insecurity Experience Scale (HFIAS, Coats Swindale & Bilinsky, 2007)
To assess the adequacy of prisoners' diets	**dependent variable:** Dietary diversity score (categorical, continuous)	24-hour dietary recall for prisoners, questionnaire items including weekly menu analysis from the prisons, and food procurement records at the prisons studied/
To assess the nutritional status of prisoners	**Dependent variable:** nutritional status of prisoners (BMI) categories, MUAC categories. (categorical and continuous)	Weight and height measurements, Mid Upper Arm Circumference measurements
To explore the factors affecting the nutritional status of prisoners	**Independent variables:** type of prison, duration of incarceration, sanitary conditions in the prisons, socio economic characteristics such as age, gender, education, economic, malaria disease, etc.	Questionnaire and interview items included by researcher. Regression analysis
To explore the coping strategies adopted by prisoners in times of food hardship	**Dependent variable:** Coping strategies index **(continuous variable)**	Adapted coping strategies questionnaire (Caldwell & Maxwell, 2008)

3.8 Exclusion and Inclusion Criteria

It is important to define inclusion and exclusion criteria for study participants because it increases the probability of attaining reliable and valid results; helps to reduce harm to study participants and checks the exploitation of vulnerable persons (Cornell Statistical Consulting, 2021).

3.8.1 Inclusion and Exclusion Criteria for Prisoners

I. Inclusion criteria

A male or female prisoner was included in the study if he/she was 18 years or more, and had been incarcerated for four (4) months and above and given consent. The selection of prisoners with 4 months duration of incarceration was to help to achieve results that might be attributable to their imprisonment as 4 months is quite long enough to impact on food and nutrition security of prisoners.

Exclusion Criteria

Eligible prisoners who had been medically diagnosed with known mental diseases or were bedridden were excluded from the study.

3.8.2 Prison Officers

II. Inclusion and exclusion criteria

In each of the prisons selected, an officer who was head of the prison; a food service employee working in the prison's kitchen, food store or canteen, and any other staff whose schedule is related to food and general welfare of prisoners was included and given consent. A prison officer had worked for less than two years was excluded from the study.

3.9 Data Collection and Analysis

3.9.1 Data Collection

Survey with prisoners and prison officers

The quantitative data was collected using the mobile technology platform called Open Data Kit (ODK). ODK has a collection of free and open source software used for collecting, managing and using data in resource-poor environments. When using the application, forms and survey questions are created for the android phones and tablets on which responses are directly recorded and the data collected is immediately when connected to an internet source. There was a research manager who was in charge of the data collected within the ODK system (Cornell Statistical Consulting, 2021).

In-depth interviews with prisoners and OICs

For the qualitative data collection, in-depth interviews were conducted with OICs and selected prisoners, using interview guides. Audio recorders were used to record responses directly and field notes were also taken. In every prison, prisoners' leaders and other classes of prisoners including the well -to-do, remands and ordinary (less endowed) prisoners were selected for the interviews. This was done because it was realized that these different groups of prisoners had different experiences with regard to food access in the prisons.

3.9.2 Sources of Data

Both primary data and previous literature on the subject were gathered and used for discussion of the issues under study.

Primary Data

Primary data for the study consisted of direct information gathered from the various respondents. Information gathered included socio-demographic data of respondents, prisoners' perception and

experience of food insecurity, nutritional status indicators (weight, height, Mid Upper Arm Circumference (MUAC), feeding conditions including, type of meals served; family and community support and coping strategies. Primary data also included the responses of OICs and prison officers. Moreover, the research team inspected and recorded the conditions of healthcare facilities, water and sanitation systems, and food safety measures in place and general cleanliness of the prison which are related to nutrition security, the main outcomes of the study.

The data was collected by means of questionnaires and in-depth interview guides to help provide first-hand information for the study. Quantitative data was obtained from 437 prisoners and 77 prisons officers while qualitative data was obtained from 9 OICs and 12 prisoners.

Secondary data comprised information from relevant literature as well as organized data related to each of the specific objectives of the study. These were retrieved from documents such as Prison Standing Orders and Regulations, books, journal articles from journal data bases, prison records, research and reports on similar studies, the Prison Service website, national and international.

3.10 Data Collection Instruments and Tools

There were two main categories of data collection instruments used in the study: semi-structured questionnaires and in-depth interview guides.

3.10.1 The Semi-Structured Questionnaires

Questionnaires were used to collect data for prisoners and prison officers. The questionnaires were administered to participants by trained independent research assistants. Items on the questionnaires had both open and closed-ended questions. This was to give respondents the chance to express their views as much as possible, and it was organized under sections based on the research objectives. The questionnaire administration lasted for at least 45 minutes per prisoner and 30 minutes for prison officers.

3.10.2 In-depth Interviews

Face-to-face in-depth interviews were used to obtain primary data from heads of prisons and the twelve (12) purposively selected prisoners, for the purpose of corroboration because their numbers were relatively small. Interviews are used to solicit in-depth responses from a sample (Babbie, 2007). The responses from interviews were recorded using audio recorders and writing of detailed fieldnotes. Interviews lasted for about 45 minutes for heads of prisons and 30 minutes for prisoners.

3.11 Measurement of Variables

Assessment of Food Insecurity

Food insecurity was assessed using the Household Food Security Insecurity Assessment Scale (HFIAS). The HFIAS is one of the food insecurity measurement tools that measures food insecurity experiences for both households and individuals. It is a nine-item validated scale with a crown Bache's alpha of 0.93 that measures the access domain of food insecurity and has been found useful and applicable across diverse cultural contexts (Coates, J., Swindale & Bilinsky, 2007; Weiser, Bangsberg, et al., 2009). Also, the HFIAS has been successfully used in a similar prison setting in a developing country (Moloko et al, 2017). During the data collection, respondents were required to indicate 'yes' or 'no' answers to the nine questions based on their perceived food insecurity experience (Coates, Swindale & Bilinsky, 2007). The answers were recorded directly into the digital data collection device.

Determination of Adequacy of Prisoners' diets

Quality of prisoners' meals was assessed using 3-day 24-hour dietary recall (two week-days and a weekend) to determine the Dietary Diversity Score (DDS) and nutrient intakes for individual prisoners. Menu charts and food records were also obtained from each prison to compare with information provided by respondents. DDS is fined as the number of foods consumed within 9

food groups over a specific period and it is broadly regarded as a key dimension of diet quality in terms of macro and micronutrients (Kennedy, Terri, et al., 2010). A high individual DDS indicates an increased nutrient adequacy of the diet which is also integrated in food-based dietary standards (FAO, 2007). Nutrient adequacies were determined using nutrient composition tables (Gebhardt & Thomas, 2002).

A section of the questionnaire for data collection for prisoners contained questions asking them to describe foods (meals and snacks) they ate or drank during the past 24-hours and whether they did so within the prison yard or outside the yard, in the case of prisoners who went out of the prison to work. This procedure started with the first food or drink eaten in the morning (breakfast).

The research team recorded all foods and drinks mentioned. If a combination of dishes were mentioned, the respondents were then asked to mention the ingredients used if they knew them. Before the data entry stage, the team filled in the food groups in a table for each respondent based on the information they had recorded.

The adequacy of diets of prisoners was determined using, first, the distribution of 3 days of food consumption among prisoners and the average dietary diversity score derived for each prisoner through 3-day-24-hour dietary recalls. The distribution of food consumption for the three days gives an illustration of the pattern of consumption of the 9 food groups used in this study (starchy staples, vitamin ‘A’ rich green leafy vegetables, other vitamin ‘A’ rich vegetables, fruits and vegetables, fish and meat, eggs, milk and milk products, organ meat, legumes nuts and seeds). Nine food groups were selected because the purpose of the study was to determine adequacy of food quality in terms of micronutrient consumption among inmates. Kennedy (2009) suggested that the number of food groups to include when deriving the DDS depends on the purpose of the assessment. The author argued that if the main purpose is to assess the micronutrient adequacy of

the diets, then the fats and oils food group may be ignored since it does not contribute to micronutrient content of the diet.

The total amounts of food that an inmate reported to have consumed over three day period were used to determine the nutritional intakes of the inmate. The food items provided and portion sizes reported were converted into weights (grams) using Ghanaian food composition tables, entered into excel and analysed using macros in Microsoft excel windows 2010. ANOVA tests were performed to determine mean nutrient intakes of prisoners stratified by prison category (Table 4.7 through Table 4.10).

Nutritional Status Assessment

Nutritional status was assessed using Body Mass Index (BMI) and Mid Upper Arm Circumference (MUAC). The use of both BMI and MUAC to assess the nutritional status of prisoners was to ascertain the relationship between the two nutritional status assessment tools. Studies have shown the existence of a positive correlation between BMI and MUAC (Bose et al. 2007, Chakraborty et al. 2009; Tang et al 2018). Hence a combination of the two in this study was to ascertain the accuracy of the measurements.

BMI was computed as a ratio of weight (kg) and height (m) squared (kg/m^2). In taking these measurements, steps such as calibration of equipment and reading of results by more than one person were taken to ensure adherence to measurement protocol.

Weight Measurement

Body weight was measured using the standardized digital Omron weight measuring scale BF- 506 (Omron Healthcare Inc., 2013) and taken to the nearest 0.l kg with subjects in light clothing. Participants stood erect and removed their shoes, jackets and any other items before standing on

the scale. Measurements were taken and recorded immediately after reading of results (Food and Nutrition Technical Assistance III Project, 2016).

Height Measurement

Height was measured with a portable Seca Stadiometer 208 (Vogel and Halke Hamburg, 2017). The individual being assessed stood erect without support, head in a Frankfurt plane, knees and legs together and bare footed. The height was then measured to the nearest 0.1cm.

MUAC Measurement

To measure the MUAC, a respondent was asked to bend the left arm. The shoulder joint and the tip of the elbow were then located and the midpoint between the two was found. The MUAC tape was then wrapped around the arm at the midpoint mark while the arm was hanging downwards and the MUAC was read to the nearest 1mm (Tang et al., 2016). To ensure utmost accuracy, the tape was not too tight or too lose on the arm.

Examining the factors affecting the food insecurity and nutritional status of prisoners

This objective was attained using statistical analysis such as Chi-square tests of associations, logistic and linear regression analysis, etc. P-values less than 0.05 were considered statistically significant.

Coping strategies of prisoners

Coping strategies of prisoners were explored using a modified version of the Coping Strategies questionnaire to generate the coping strategies index (CSI) for prisoners. The coping strategies questionnaire was developed by the WFP and CARE (Maxwell & Caldwell, 2008). It is a tool of up to twelve questions and it is used to determine how households or individuals cope with current food insecurity and challenges they might face in the future.

The questionnaire was adapted in order to make it suitable for use in the prisons since it has questions that did not useful in the prison setting. For example, a question like "limiting adult intakes so that children can eat", in the original questionnaire, does not apply in the prisons. Likewise a question like "engaging in prohibited activities in order to get food", was not part of the original questionnaire. Respondents were asked whether during the past one week there were times when they experienced food hardship, and if they did, how often. Responses were recorded in the software.

3.12 Quality Control

Field staff require good observational, communication and analytical skills. They must be in a position to synthesize findings, be able to critically analyse information, remain unbiased and probe to ensure findings are logical and credible (WFP, 2011). The following quality control measures were implemented before, during and after data collection:

- There were research assistants who were hired and trained on the use of the data collection instruments, their functions and ethical issues as well as appropriate translation of technical terms into local languages.
- They were also trained on how to ensure that the dignity and human rights of participants were protected and how to obtain consent from all participants before questionnaires were administered.
- Pre-testing of data collection tools and equipment was also done through a pilot study at the James Camp Prison in Accra, a prison that was not involved in the actual research. This was done for the purposes of validation, and accuracy and to determine the reliability of the tools.
- The use of digitised data collection system helped to enter and save responses directly into data collection system thereby enhancing validity of data

- A research manager was employed to manage data and ensure adequate backup
- Two data analysis professionals were engaged during data analysis. This served to confirm consistency in the results.

3.13 Data Analysis

3.13.1 Quantitative Data Analysis

The electronic data from the survey was imported into excel for windows 2010 spreadsheet, cleaned, edited and validated. It was then exported into STATA version 15 (StataCorp, 2017) and SPSS version 25 (IBM SPSS Statistics for Windows., 2016) for analysis. There were univariate, bivariate and multivariable analyses done for different study variables. A p-value less < 0.05 with 95% Confidence Interval was used to establish statistical significance.

Continuous variables were summarized using means, medians, standard deviations or standard errors while categorical variables were summarized using frequencies, percentages and proportions.

Table 3.5 gives a description of research objectives with their respect to variables, measurements, analysis and presentation of results.

3.13.1.1 Food Insecurity Prevalence

During analysis of the food insecurity data, three indicators were considered. This was to help understand the features and the differences in respondents' food insecurity experiences better. The indicators used were as follows:

i. "Food insecurity access conditions", the percentage of inmates who responded 'yes' to a specific food insecurity occurrence condition.

ii. Food insecurity access domains which involved the percentage of inmates who experienced one or more conditions in each of the three domains (anxiety or uncertainty about food; insufficient food quality; insufficient food quantity).

iii. Food insecurity prevalence, where prisoners' food insecurity was grouped into four categories including "food secure", "mildly food insecure", "moderately food insecure" and "severely food insecure". These categories were based on the number of affirmative answers respondents gave to food security questions. The more affirmative answers given, the more severe the perceived food insecurity status of the prisoner.

3.13.1.2 Food Insecurity Access Conditions

Descriptive statistics were performed to determine the proportion of inmates experiencing each of the 9 conditions and variations within prison categories were determined using chi-square tests of associations.

3.13.1.3 Food Insecurity Access Domains

The food insecurity domains include: a. anxiety or uncertainty about food, b. reduced quality of the diet (Insufficient quality), and c. reduced quantity and number of meals consumed (Insufficient quantity). The proportion of inmates who experienced one or more conditions in each of the three domains mentioned was determined using descriptive statistics.

3.13.1.4 Food Insecurity Access Prevalence (FIAP)

Food insecurity prevalence was categorized into four (4), namely food secure, mildly food insecure, moderately food insecure and severely food insecure, and these were coded 1-4 respectively (Ashby et al., 2016; FAO, IFAD, WFP, WHO, 2019).

A 'yes' was coded '1' and a 'no' was coded '0'. That is:

i. FIAP = secure (1) if fiaq1 =0 or 1 and fiaq2-fiaq9 =0

ii. FIAP= mildly food insecure (2) if fiaq1-fiaq2= 1 and fiaq3-fiaq9=0

iii. FIAP= moderately food insecure (3) if fiaq1-fiaq5=1 and fiaq6-fiaq9=0

iv. FIAP= severely food secure (4) if fiaq1 to fiaq7 =1 or fiaq8 or fiaq9 =1

Descriptive statistics was used to determine proportions and percentages to describe prevalence.

3.13.1.5 Diet Quality Determination

The quality of prisoners' diets was determined using dietary diversity scores which was derived from 3-day 24-hour dietary recalls. The analysis was done as follows:

All foods consumed by respondents as recorded were placed under 9 food groups. The 9 food groups included: starchy staples, vitamin 'A' green leafy vegetables, Other vitamin A rich vegetable, fruits and vegetables; legumes, seeds and nuts; meat and fish products; organ meat, milk and milk products and eggs. The number of food groups consumed by each prisoner was determined by counting them. A score that was less than or equal to 3 food groups was classified as low dietary diversity, 4-5 groups was categorized as medium diet diversity while 6 or more food groups was categorized as high dietary diversity. Proportions were used to describe DDS for the respondents. Table 3.5 shows variables and analysis done to achieve stated objectives. Food records comprising menu charts, food procurement data, and food store records were also examine to extract the needed information to complement the information obtained from the participants.

3.13.1.6 Nutritional Status Determination

Body Mass Index (BMI) was calculated using weights and height values of respondents and grouped into four: underweight, normal weight, overweight and obese with respective cut-offs of $\leq$18.5kg/m^2, 18.5-24.9kgm^2, $\geq$25.0-29.9 kg/m^2 and $\geq$30 kg/m^2 (WHO & FAO, 2003). The number of prisoners falling within each category was determined using descriptive statistics (percentages and proportions).

Additionally, a MUAC value less than 22cm for women and less than 23cm for men was considered as a risk of malnutrition (Tang et al., 2016). Proportions and percentages were used to describe the risk of malnutrition for respondents and compared to their BMI as well. To assess the relationship between BMI and MUAC measurement for nutritional status assessment, the two-way scatter plot and Pearson moment correlation were used.

3.13.1.7 Factors Affecting Food Security and Nutritional Status of Prisoners

Chi-square tests (bivariate analysis) were used to determine the associations between the characteristics of prisoners (independent variables) and food insecurity. Also, ANOVA test was performed to compare mean nutrient intakes of prisoners to recommended daily allowances. Logistic and linear regression models were also fitted during the multivariable analysis. The independent variables age, type of prison, education, education, imprisonment history etc. A p-value of <0.05 within a 95% confidence interval was considered significant.

3.13.1.8 Determination of Coping Strategies Index of Prisoners

The coping strategies (CS) were grouped into four and weights were assigned to them based on severity (Maxwell & Caldwell, 2008). Weight '1' was assigned to coping strategies that only require dietary change, '2' to coping strategies involving short term measure to increase food availability, '3' to coping strategies that require short term measure to decrease the number of people who eat, and '4' assigned to coping strategies that require rationing and managing the food shortfall (Maxwell & Caldwell, 2008). The higher the weight assigned, the severer the coping strategy. The coping strategies index (CSI) of a prisoner was derived from the summation of the product of the relative frequency and severity weight for all eleven coping strategies. Higher CSI(s) mean either respondents employed more coping strategies or used more severe coping strategies. The table below summarises the analysis of coping strategies of prisoners.

Table 3.4 Determination of Coping Strategies Indexes of Prisoners

Coping strategy	Frequency of occurrence	Relative frequency	Severity weight
1. Rely on less preferred foods	Never	0	1
2. Borrow food or rely on friends	Rarely or less that once a week	0.5	2
3. Obtain food on credit or in exchange of another resource	Once or twice a week	1.5	4
4. Harvest immature food	Often	4.5	
5. Eat less amount of food	Daily	7	4
6. Reduce number of meals	Never	0	1
7. Spend a whole day without food			2
8. Engage in prohibited acts			4
9. Stealing food from cell mates			4
10. Refuse to engage in rehabilitation activities			4
11. Cause commotion in the prison			1
CSI= Σ (relative frequency *severity weight) per each prisoner for all the 11 questions.			

Table 3.5: Summary of Study Objectives, Types of Variables and Analysis.

Research objective	Type of variable	Data Analysis	Presentation
	Socio-demographic characteristics (age, gender, educational status, employment history, criminal history etc.	Univariate analysis/ descriptive statistics	Tables/ proportions & percentages
To assess food insecurity prevalence among prisoners	**Dependent variable**: Food insecurity prevalence (conditions, domains and overall prevalence)	• Univariate (descriptive statistics) • Bivariate (chi-square tests of association	Table and Graphs showing percentages/ proportions
To assess nutritional status of prisoners	**Dependent variable:** nutritional status of prisoners (BMI and MUAC categories)	Univariate analysis (Descriptive statistics) Bivariate analysis (ANOVA)	Graphs/charts

To examine the factors affecting food insecurity and nutritional status of prisoners	**Independent variables:** type of prison, duration of incarceration, socio economic characteristics such as age, gender, education, economic status, family and community support in the form of remittances (like food and money) etc. **Dependent Variables:** BMI an MUAC Food Insecurity status	• Bivariate (Chi-square and ANOVA) • Multivariable analysis (logistic regression model for characteristics of prisoners and food insecurity; • Multiple linear regression for characteristics of prisoners and Nutritional status)/inferential statistics	Tables, using P-values to establish significance
To assess diet quality of prisoners	**Dependent variable:** Mean Nutrient intake Dietary Diversity Score	• Univariate, Bivariate analysis/ descriptive statistics • Multivariable analysis using logistic regression model	Graphs, Tables to showing distribution of food consumption and nutrient intakes
To Explore the coping strategies adopted by prisoners and prison officers in times of food insecurity	**Dependent variable:** Coping strategies index	Univariate analysis: Descriptive statistics Bivariate analysis: Chi-square tests Multivariable: Multiple linear regression	Tables

Procedure for Linear Regression used for Categorical Variables

Linear regression modules are usually used to determine the nature of a relationship between two variables (a dependent variable and an independent variable), and also predict the effect of other covariates in the analysis. (Chan, 2004). Usually linear regression models are fitted for variables

with interval or ratio scales that are normally distributed. Example of a regression equation for a simple linear regression is presented as ($Y= \alpha +\beta X$) where, Y is the dependent variable, α is the constant and β is the slope of the line that shows the change in the dependent variable e.g. (BMI/MUAC) used for the model in this study, associated with a unit change in say prison category as the dependent variable. The categorical independent variables with more than one level also needed to be included in the regression model so that the results could be meaningfully interpreted. In fitting regression module for categorical predictors e.g. prison category, sex, crime type etc., dummy variables were first created by recoding so that numerical values replaced the categorical data (Chan, 2004). For example the reference category for the variable "prison category", is the Maximum security prison which was assigned number '0' and the others within the category, 'medium security', 'minimum security' and 'low security' were assigned '1', '2' and '3' respectively and these were fitted in the model and results were then interpreted.

3.14 Qualitative Data Analysis

The qualitative component was meant for triangulation and deeper understanding of the concepts under study. It also contributed to each of the objectives outlined for this study by complementing the findings of the quantitative survey. Data analysis was done manually.

The data was transcribed verbatim by playing the recording and listening to it several times. It was also cross-checked with field notes taken. The principal investigator did the transcription with support from research assistants and research manager. The scripts were read through several times to identify major themes and sub-themes based on the variables of interest. Similar ideas were put together under various themes through colour coding. They were then merged and arranged under various objectives. Texts and tables were used to present the findings. Direct quotes from respondents were also used to support the findings**.**

3.15 Ethical Considerations

The ethical considerations cover the consent procedures, confidentiality, privacy, risks and benefits, etc.

Ethical approval was given by the Noguchi Memorial Institute for Medical Research (NMIMR) Ethical Review Board (FEDERALWIDE ASSURANCE 00001824; IRB 00001276; NMIMR-IRB CPN 034/18-19). Additionally, permission was sought from the Ghana Prisons Service Administration before undertaking the research in the prisons.

3.15.1 Individual Informed Consent

Informed consent was sought from each participant before questionnaires and interviews were administered. Details of the study objectives, procedures, privacy, risks and benefits, outcomes, voluntarism and right to withdraw without any penalty were explained fully. A copy of the consent form was kept by the researcher and another copy given to the respondent.

3.15.2 Confidentiality and Privacy

Study investigators were trained on the ethics of research and the duty of non-disclosure of information concerning answers given by participants rested on them. Interviews were conducted in environments that secured the identity of respondents. Audio recordings from interviews were stored on a password protected laptops of the researcher. No identifying information was included in the summaries or in the final work. The data was stored on hard drives as backups kept under lock in the residence of the researcher. The data will be discarded ten years after the study when all possible publications and disseminations plans would have been executed.

3.15.3 Risks and Benefits

There were minimal or no risks associated with participating in this study. Each participant was given a parcel containing toiletries after the interview to enhance their living in the prison. The

participants were not informed about the parcel before the interviews. This was to ensure that they maintained independent responses and were not influenced by the parcels received.

3.15.4 Voluntary Participation and Right to Leave the Research

Participation in this study was voluntary and participants were free to withdraw consent at any time. Withdrawal did not affect any respondent in any way. That is, there was no penalty for any respondent who withdrew his/her consent.

3.15.5 Management of Dual Role as a Prison Officer and a Researcher in the Prisons

It has been noted that, the impossibility to remain outside "one's research topic" cannot be ruled out, and this needs to be acknowledged when conducting research (Palaganas et al., 2017). Unlike quantitative research which depend heavily on statistical inferences, qualitative research is dependent on responses provided by research participants and information obtained during this process could be affected by underlying beliefs of the researcher (Dodgson, 2017; Mccabe & Holmes, 2014). It must be noted that the Principal investigator for this study was a Prison Officer and therefore stringent measures were taken to ensure reflexivity in all process and procedures during the data collection and analysis.

Playing a dual role as a member and a researcher in the study environment is not new to to studies such as this. Other researchers have encountered similar situations in their work (Dapaah, 2012; Kotoh, 2013; Mulemi, 2010). The researchers noted that playing such a dual role tends to be more of a benefit than a limitation in research. For example, Kotoh (2013) in her study "Improving Health Insurance Coverage in Ghana: A Case Study", indicated how her dual role gave her easy access to her study sites and the environment enhanced her understanding of the setting, and the

issues under study. She noted that it would not have been easy undertaking such a study and exploring the issues under study as an outsider.

My role as a prison officer therefore gave me easy access to prisoners' lists which would have been impossible to obtain if I had not been part of the Prisons Service. The study particularly data collection would have been prolonged and some vital information not obtained. My role as a prison officer also enhanced our entry into the prisons without any hindrance. The Prison Administration felt more confident and believed in my integrity as an officer who is part of them and would not do anything contrary to the rules in the prison that can undermine prison security.

In spite of these benefits, my role as a prison officer and a researcher in the prisons could have influenced the respondents during the data collection and this could have undermined the accuracy and independence as it could have caused them to feel intimidated which could have affected their responses. Therefore to ensure reflexivity, objectivity, credibility and quality of the data collection and analysis processes, the following steps were taken:

- As a researcher, I developed the data collection and management plan and went to the field with the research team to closely monitor and supervise their activities, but was not directly involved in questionnaire administration and interviews for both prison officers and prisoners.
- Steps were also taken to ensure utmost quality during the data collection process. A research team of four comprising a research manager with a master's degree in public health and three research assistants with degrees in public health and foods and nutrition, were hired to undertake the collection and management of data in the field. The research

manager and research assistants were trained adequately on the data collection tools and taken through the standard conduct in the prisons. Ways to ensure that the dignity and human rights of the participants were protected and how to obtain consent from them before administering questionnaires were also discussed during the training. As a routine to ensure protection of visitors and civilians entering the prisons, the research team was given escort by prison staff during periods they were working inside the prison.

- After each day's work, the researcher met with the team for debriefing. The challenges were discussed and addressed together with other issues for the for the next day's work.
- The researcher employed high sense of integrity in the data analysis process.
- To ensure integrity and quality of the data, the data was entered directly into the server by research assistants, harvested and exported to excel and SPSS by the research manager. The researcher and the research manager managed the data together.
- The data analysis was carried out by the researcher with support from two independent biostatisticians. The researcher, with close supervision by her team of supervisors did not influence the results and the reporting in anyway, and only the true picture of the issues as found in the prisons has been reported in this study.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents findings of the study. The sections have been arranged according to the objectives of the study. Sections 4.2 and 4.3 present results on the socio-demographic and background characteristics, and the measured and self-reported health conditions of prisoners respectively. Section 4.4 presents the results on objective one, which sought to determine food insecurity prevalence among inmates in Ghana's prisons. Section 4.5 covers results on the determination of quality of diets of prisoners while section 4.6 covers nutritional status of inmates in Ghana's prisons. Section 4.7 presents the factors affecting food insecurity and nutritional status of prisoners. The coping strategies of inmates who faced food insecurity in the prisons are presented in section 4.8. The results were triangulated with the qualitative component as narratives.

4.2 Socio-demographic and Background Characteristics of Respondents

4.2.1 Socio-Demographic Characteristics of Prisoners

In all, a total of 449 prison inmates participated in the study. Of this, 437 (97.3%) answered the questionnaire while 12 (2.7%) participated in in-depth interviews. The socio-demographic and other background characteristics of prisoners are presented in Table 4.1.

The mean age of inmates was 37.04 years (± 14.22). More than half of them (52.6%) were less than 35 years. The majority of prisoners (98.2%) were males and 52.4% were Akan. Inmates from ethnic groups in the then three Northern Regions (21.1%) were the second largest. About half (50.8%) of the inmates were unmarried while about a quarter (24.7%) were married. Also, 15.8% of prisoners had no education and 53.6% had completed basic education. Prior to their imprisonment, the majority of prisoners (80.3%) were self-employed while 11.2% were in formal

employments and less than a tenth (8.5 %) were unemployed. Christianity (77.6%) and Islam (21.3%) were the predominant religions in the prisons.

Most of the inmates (86.5%) were convicted prisoners while less than a tenth (8%) were remand prisoners (awaiting trial at the courts). More than a third of the inmates (35.7%) were within their first twelve months of imprisonment. Also, more than a third (34.5%) had spent between 13 and 60 months in prison, with the mean length of imprisonment being 61.8 months (±48.6).

With regard to the types of crimes committed by prisoners, 14.9% had committed serious offenses such as rape, defilement, robbery, dealing in narcotics and murder while 85.1% were committed to prison custody due to misdemeanours including stealing, causing damage, unlawful entry and traffic offenses. Twenty-five inmates, representing (5.7%) had been previously imprisoned while 94.3% were first offenders.

Table 4.1: Socio-demographic and background characteristics of prison inmates

Variables	Frequency (n=437)	Percentage
Age in years		
18-24	80	18.3
25-29	97	22.2
30-34	53	12.1
35-39	54	12.4
40-44	40	9.2
45-49	29	6.6
50-54	25	5.7
55+	59	13.5
Sex of respondents		
Male	429	98.2
Female	8	1.8
Ethnic affiliation		
Akan	229	52.4
Ewe	52	11.9
Guan	2	0.5
Ga/Dangbe	26	5.9

Northern	92	21.1
Others[2]	36	8.2
Marital status		
Married	108	24.7
Separated/Divorced	87	19.9
Widowed	20	4.6
Never married	222	50.2
Level of education		
No Education	69	15.8
Primary	96	22.0
Junior High	138	25.6
Senior High	112	25.6
Tertiary	22	5.0
Religious affiliation		
Christianity	339	77.6
Islam	93	21.3
African Traditional	2	0.5
Others[3]	3	0.5
Class of prisoner		
Convict	378	86.5
Remand	35	8.0
Death sentence (Condemned)	13	3.0
Life imprisonment	10	2.3
Trial	1	0.2
Duration of imprisonment in months		
4-12 months	156	35.7
13-24 months	60	13.7
25-60 months	91	20.8
61-120 months	84	19.2
121+ months	46	10.5
Crime committed		
Serious offenses (felonies)[4]	65	14.9
Non-serious (Misdemeanors)[5]	371	85.1
Previous imprisonment		

[2] Prisoners from other countries including America, Nigeria, Togo, Burkina Faso, Cameroun, Cote d'Ivoire, Liberia, Morocco.

[3] Paganism and Buddhism

[4] Offenses punishable by imprisonment of more than 10 years e.g. murder, manslaughter, rape, armed robbery, child trafficking, defilement.

[5] Offenses punishable by terms of imprisonment below 10 years or a fine e.g. stealing, traffic offenses, causing financial loss, causing damage, illegal mining, unlawful possession of arms.

Yes	25	5.7
No	412	94.3
Employment status before prison		
Formal employment	49	11.2
Non-formal employment	351	80.3
Not employed	37	8.5
Working while in prison		
Yes	82	18.8
no	355	81. 2
Prison job		
Unskilled labour	15	18.3
Construction	4	4.9
Farming	2	2.4
Tradesmanship	19	23.2
Office assistance	8	9.8
Nursing & teaching	7	8.5
Others[6]	27	32.9

4.2.2 Background Characteristics of Prison Officers

The background characteristics of prison officers has been presented in Table 42, at the appendix section (Appendix IX). There were 88 officers comprising 77 other officers and 11 officers-in-charge (OICs) involved in the survey and in-depth interviews, respectively. Nine (81.8%) OICs were males and 2 (18.2%) females. Also, 9 OICS were above fifty years while 2 were between 41 and 50 years. All the OICs (11) were married and had a minimum of 25 years working experience in the Prisons Service. Akan (63.6%) and Ewe (36.4%) were the predominant ethnic groups of the OICs. The ranks of OICs ranged from Deputy Superintendent of Prisons (DSP) to Deputy Director of Prisons (DDP). Five of the OICs (45.5%) were DDPs, 2 (18.2%) each were of the ranks of

[6] Selling at the prison canteen, running errands for other inmates, cleaning and washing for others, outside labour work etc.

Assistant Director of Prisons (ADPs) and Chief Superintendent of Prisons (CSPs). Additionally, 1 (9.1%) each was of the rank of Superintendent (SUPT) and DSP.

Of the 77 other officers interviewed, 54 (70.1%) were males and 23 (29.9%) females. The mean age of the other prison officers was 54.45 years (±8.65). The minimum age was 30 years while the maximum was 59 years. Thirty-three (42.9%) were senior officers while 44 (57.1%) were junior officers based on the Prison Service classification of staff. Sixty-four (83.1%) of the other officers worked as "general duties" officers while 10.4% and 6.5% officers worked as agricultural and vocational/technical skills training officers respectively. Among the general duty officers, 23 worked with prisons' administration and 41 were welfare officers, specifically in food service, chaplaincy, healthcare and education. The administration workers were responsible for reception duties. The OICs and other officers had an average working experience of 30.09 years (±0.79) and 21.8 years (±10.08) respectively.

4.3: Measured, Self-Reported Health Conditions and Lifestyle Habits of Prison Inmates

The results of measured and self-reported health conditions as well as lifestyle habits of prisoners are presented in Table 4.3 (Appendix XI). The measured-health conditions[7] included malaria, haemoglobin in blood and blood pressure.

Inmates reported various health conditions and lifestyle habits during the survey. About 14.2% of inmates reported being hypertensive and were taking medications and less than 1.6% reported having diabetes. Three percent (3%) reported they had stroke while about 5.3% and 1.6% reported

[7] Obtained through measurement by researcher during fieldwork

heart and kidney diseases respectively. Additionally, 40.1% of inmates reported a family history of cardio-vascular diseases (CVDs) such as stroke, diabetes and hypertension.

The rapid blood haemoglobin tests done for prisoners found 61.7% and 39.8% of inmates having normal and low blood haemoglobin levels respectively. Only 3.4% tested positive for malaria parasites. Mean systolic and diastolic blood pressures were 119.5mmHg (± 14.38) and 73.94mmHg (± 9.25) respectively. About half (54.5%) reported they drank alcohol and 50.1% reported smoking, mostly marijuana and cigarettes. Only 13.0% of inmates reported engagement in vigorous intensity activities. Of these, more than half (52.6%) did so five or more days per week. Also, 48.1% engaged in moderate intensity activity, and more than two thirds (73.3%) did so for five or more days per week. About 14.9% also engaged in recreational activity.

4.4 Assessment of Food Insecurity Status of Prison Inmates

4.4.1 Food Insecurity Access Conditions Experienced by Prison Inmates Stratified by Prison Category

The experience of food insecurity conditions by prison inmates stratified by prison category is presented in Table 4.4. About sixty percent (60.4%) of prisoners were worried that there could be food shortage because of lack of money or other resources. This form of perceived food insecurity varied significantly across the various types of prisons ($p<0.001$). Prisoners in the minimum-security prisons worried about food shortage the least (30.8%) while those in the maximum-security prisons experienced it the most (67.4%). Inmates' inability to eat their preferred foods because of a lack of resources was experienced by 71.9% of prisoners. This was also comparatively high in the maximum-security prisons (71.3%), but least in the minimum-security prisons (48.7%). Being hungry and not eating because a prisoner could not get access to food at the time it was

needed was the commonest (82.2%) form of food insecurity experienced by prisoners. The food insecurity condition of "going a whole day and night (24 hours) without eating because there was no food" was experienced by 22% of the prisoners. This condition also varied significantly across the prison categories p<0.001. More prisoners (31.7%) in the maximum-security prisons than those in the minimum-security prisons (7.77%) experienced going without food for 24 hours.

Table 4.4: Proportion of prison inmates experiencing specific food insecurity access conditions by Prison Category (n = 437)

Food insecurity condition	Maximum security prison n (%)	Medium security prison n (%)	Minimum security prison n (%)	Low security prison n (%)	Total n (%)	Chi-square p-value
Worried food will run out						**<0.001***
Yes	155 (67.39)	86 (57.72)	12 (30.77)	11 (57.89)	264 (60.41)	
Not eating un preferred food						**<0.001***
Yes	164 (71.3)	120 (80.54)	19 (48.72)	11 (57.89)	314 (71.85)	
Eating fewer kinds of food						0.500
Yes	170 (73.91)	106 (71.14)	25 (64.1)	12 (63.16)	313 (71.62)	
Eating unhealthy food						0.144
Yes	159 (69.13)	102 (68.46)	21 (53.85)	10 (52.63)	292 (66.82)	
Eating less amount of foods than needed						0.111
Yes	177 (76.96)	114 (76.51)	23 (58.97)	14 (73.68)	328 (75.06)	
Eating fewer meals						**0.022***
Yes	174 (75.65)	115 (77.18)	21 (53.85)	13 (68.42)	323 (73.91)	
Running out of food						0.058
Yes	149 (64.78)	97 (65.1)	19 (48.72)	8 (42.11)	273 (62.47)	
Hungry and not eating						0.247
Yes	189 (82.17)	127 (85.23)	30 (76.92)	13 (68.42)	359 (82.15)	
Going whole day without food						**<0.001***
Yes	157 (68.26)	131 (87.31)	36 (92.31)	17 (89.47)	96 (21.97)	

The food insecurity situation among inmates was explored further through in-depth interviews with prison inmates and results corroborated the quantitative results. The experience of food insecurity access conditions was not the same for different classes of prisoners. For instance, while "ordinary"[8] inmates and inmate leaders claimed they had experienced the condition of being hungry and not having food to eat, wealthier inmates indicated they did not experience this challenge. Those who claimed they had experienced the condition said that it was not only because there was no food available but also due to poor quality and delay in getting food from prison kitchen. Some of the prisoners said:

> *Sometimes the food is there but you cannot eat it because the quality is bad (a medium security male prison inmate);*
>
> *I did not have my own food to eat and I could not eat the prison food either (a maximum-security prison inmate leader);*
>
> *It has never happened. I have a very strong family support so they bring me food and money all the time (a maximum-security prison inmate).*

With regard to going a whole day and night without food as a food insecurity condition, all the 12 inmates interviewed reported they had never experienced such a condition. They explained that there was always some food available, but they did not eat because they did not like it. Some inmates narrated the situation as follows:

> *I haven't faced such problem, nothing like that has happened since I have been here" (a female inmate).*
>
> *I haven't faced such problem; I don't remember; I haven't faced that challenge (a low security prison inmate).*

Running out of food (food shortage) because of inadequate resources or seasonal supply was one of the conditions least experienced by prisoners. The OICs revealed that food shortage did not

[8] Prisoners who were neither well-to-do nor leaders in the prisons

occur in the prisons because that would undermine security in the prisons. OICs' responses included:

> *We don't experience total food shortage, there could be delays in supply but there is always some food available" (a male officer in charge.)*
>
> *We make sure there is enough stock availabl; as for prisoners if you don't feed them for one day you will see the kind of noise they will make here (a male OIC).*

4.4.2 Prevalence of Food Insecurity Domains

The indicator gives information on the proportion of inmates who experienced one or more conditions in each of the three domains namely anxiety, insufficient quality, and insufficient quantity and intake. Details of the food insecurity access domains are shown in figure 4.1. The quality domain was the most predominant (87.6%) reported by the prisoners while anxiety was the least (60.4%).

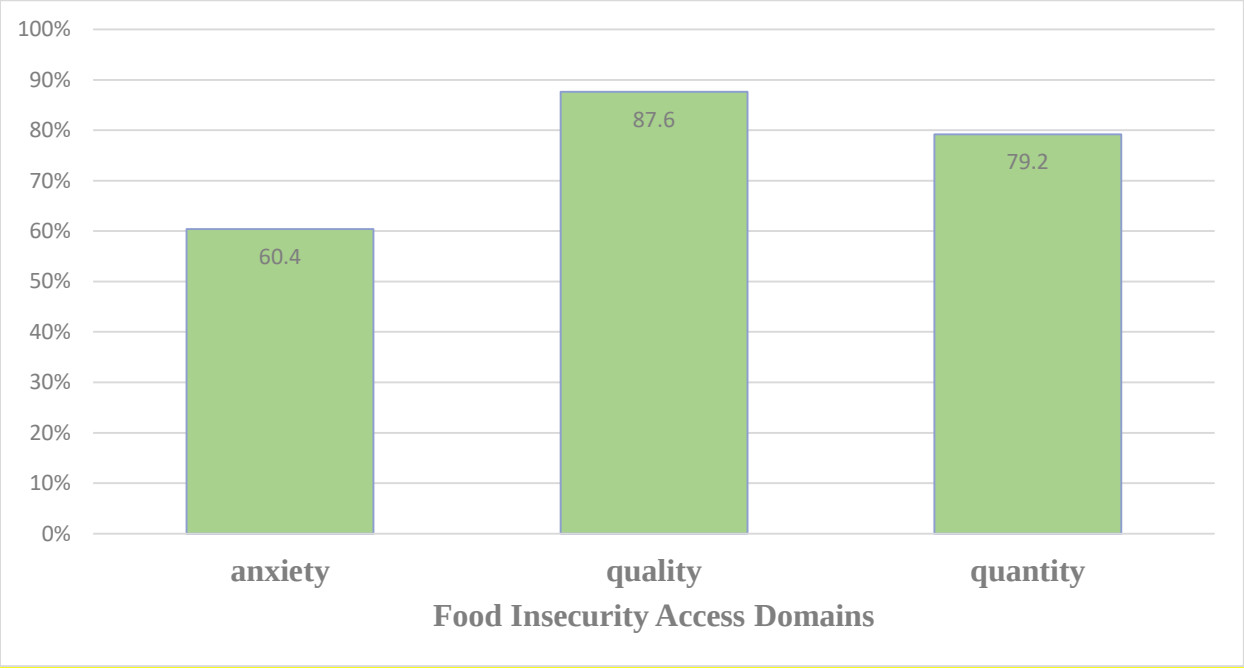

Figure 4.1: Occurrence of food insecurity access domains experience among prison inmates

4.4.3 Overall Prevalence of Food Insecurity Access

Overall, the prevalence of food insecurity among inmates was 91.1% (95% CI: 90.3-95.3%). The proportion of prisoners who were food secure was 8.9% while more than two-thirds (83.3%) of had severe level of perceived food insecurity. Figure 4.2 shows the levels of food insecurity prevalence among inmates in Ghana's prisons.

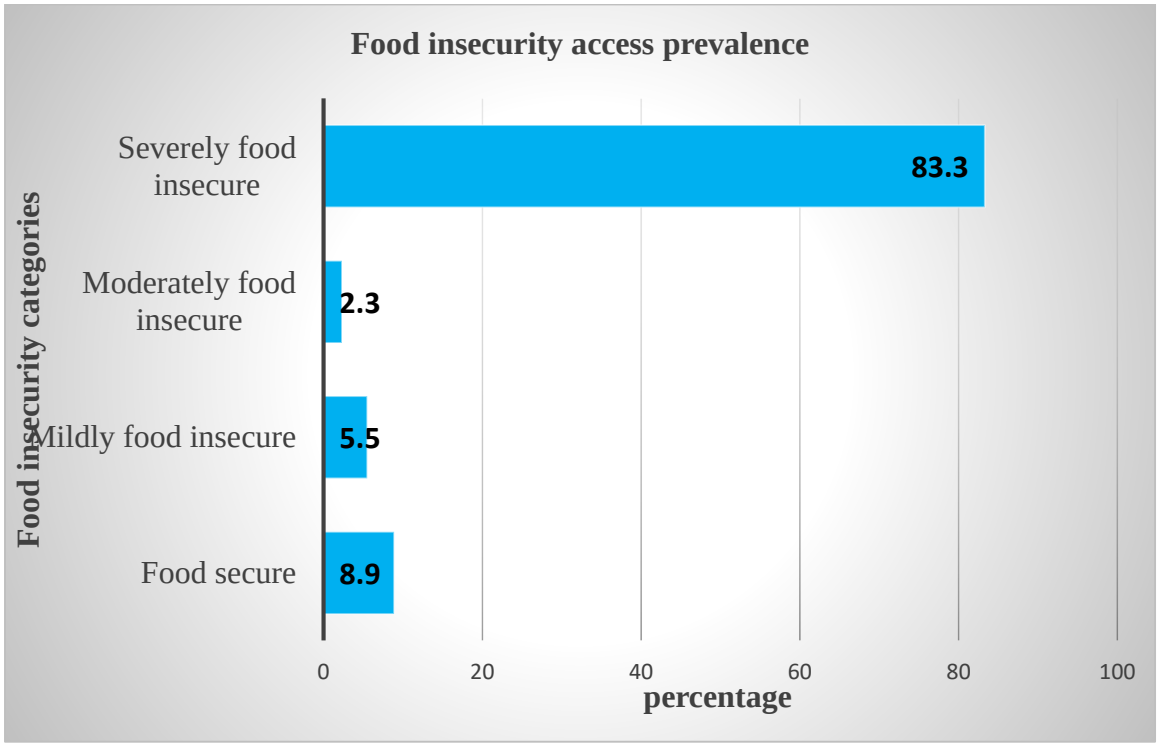

Figure 4.2: Prevalence of food insecurity among prison inmates

4.5 Determination of Quality of Diets of Prison Inmates

4.5.1 Description of food provision in Ghana's prisons as observed

Findings from the prison food store records reviewed during the study showed the existence of a menu chart available in every prison visited. The menu charts were found to contain menus for breakfast, lunch and supper. Breakfast was fermented corn dough porridge, served almost everyday. Rice porridge or roasted corn meal (tombrown) was only served on occasions and in prisons with fewer numbers of inmates. Lunch or supper was either 'banku', a meal prepared from fermented corn (corn dough) or gari (cassava grits) served with either palm fruit or groundnut soup. These were served on all days of the week. Beans was served sometimes, but in few prisons where inmate numbers were smaller.

The food budget per prisoner was GHC 1.80 and this was to be used for a day. The amount of food served to a prisoner was not based on the recommended dietary intakes of the prisoner but rather on the amount that the allocated budget could buy. There were prisoners selected to assist with cooking and serving of food under the supervision of prison catering staff. The selection of inmates to serve in the prison's kitchen was based on years served, good conduct and hard work. Prisoners were at liberty to add other foods to what was served them if they were in a position to do so.

The major sources of prisoners' food were food contractors, prison farms and donations. Generally, food items such as palm fruits, maize, green leafy vegetables ('alefu', 'ayoyo', moringa) were the main food items supplied by prison farms. Prison inmates do not benefit from produce such as livestock and poultry from prison farms due to the low food budget allocated for their feeding. It was found that the prisons operate with revolving funds, hence they were not able to supplement inmates feeding significantly with these relatively expensive produce from the

farms. This was because they had to sell a chunk of these product to the outside market to enable them remain in business.

Also, it was found that the prisons occasionally receive food items such as rice, bread, milk, eggs, tea, cocoa, soft drinks, biscuits, and beef in the form of donations from faith-based organizations (FBOs), NGOs, individuals and philanthropists.

4.5.2 Level of Diet Diversity of Prisoners

The average dietary diversity score (DDS) of prisoners for weekdays was 2.98 ± 1.10 while DDS for weekend was 2.73 ± 1.14. The overall average dietary diversity score for all days was 2.86 ± 1.12 (Table 4.5). Prison inmates from the low security prison category had the highest overall DDS (3.01 ± 1.10). Dietary diversity score did not vary significantly across prison categories ($p>0.05$). In all, 79.4% of prisoners had low dietary diversity scores (scores ≤ 3) while 21% had moderate dietary diversity (scores 4-5) (figure 4.3).

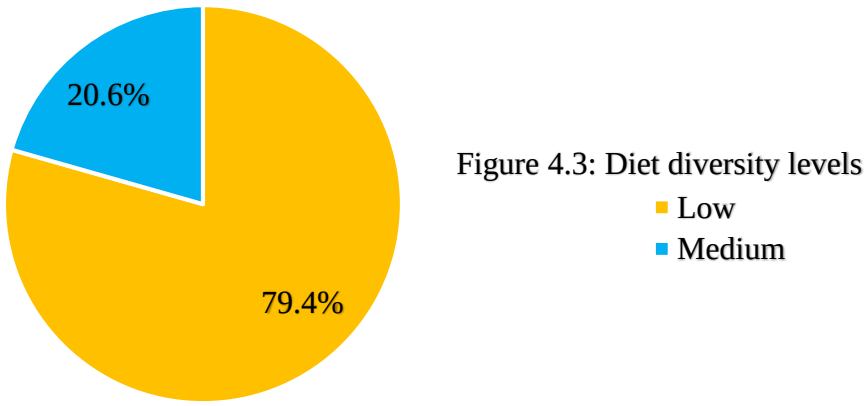

Figure 4.3: Diet diversity levels

Table 4.5: Dietary diversity index among prisoners stratified by prison category

	Prison Category					
	Maximum Security	Medium Security	Minimum Security	Low Security	Overall DDS	
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	P-value
Week Days	2.98± 1.08	3.01 ± 1.06	2.77 ± 1.12	3.13 ± 1.15	2.98 ± 1.10	0.419
Weekend	2.70 ± 1.13	2.78 ± 1.15	2.62 ± 1.27	2.89 ± 1.05	2.73 ± 1.14	0.760
Overall DDS	2.84 ± 1.05	2.89 ± 1.12	2.69 ± 1.20	3.01 ± 1.10	2.86 ± 1.12	0.590

4.5.3 Distribution of 3-day food consumption by prisoners

Across the 3 days of food recalls, starchy staples were the most commonly (over 90%) consumed food group among prisoners. Fruits and vegetables, and meat and fish (over 30%) were rarely consumed. The consumption of organ meat, milk and milk products, eggs, and dark green leafy vegetables was reported by less than 10% of prisoners.

For day one which is a week day, 'starchy staples' were consumed by 100% of inmates from the maximum, medium and minimum-security prisons. For inmates from the low security prison category, about 95% consumed food from the same food group.

Furthermore, there was a significant relationship between the consumption of starchy staples, other vitamin A-rich vegetables as well as legumes, nuts and seeds and prison category ($p<0.05$). Also, for the weekend, there were significant variations in consumption of other vitamin A-rich vegetables, meat and fish, and the legumes, nuts and seeds food groups across the various prison categories ($p<0.05$).

Table 4.6: Distribution of three – day food consumption by prisoners by prison category

	Maximum security prison	Medium security prison	Minimum security prison	Low security prison	Total	Chi-square
	n (%)	n (%)	n (%)	n (%)	n (%)	p-value
Day 1						
Starchy Staples	230 (100)	149 (100)	39 (100)	18 (94.74)	436 (99.77)	**0.043**
Dark Green Leafy Vegetables	7 (3.04)	7 (4.7)	1 (2.56)	0 (0)	15 (3.43)	0.662
Other Vitamin A Rich Foods	88 (38.26)	28 (18.79)	10 (25.64)	2 (10.53)	128 (29.29)	<**0.001**
Fruits and Vegetables	206 (89.57)	128 (85.91)	35 (89.74)	15 (78.95)	384 (87.87)	0.439
Organ Meat	1 (0.43)	0 (0)	0 (0)	0 (0)	1 (0.23)	1.000
Meat and Fish	122 (53.04)	86 (57.72)	15 (38.46)	10 (52.63)	233 (53.32)	0.201
Eggs	7 (3.04)	6 (4.03)	2 (5.13)	0 (0)	15 (3.43)	0.734
Legumes, Nuts and Seeds	69 (30)	64 (42.95)	13 (33.33)	10 (52.63)	156 (35.7)	**0.028**
Milk and milk Products	17 (7.39)	15 (10.07)	3 (7.69)	4 (21.05)	39 (8.92)	0.22
Day 2						
Starchy Staples	216 (93.91)	140 (93.96)	31 (79.49)	19 (100)	406 (92.91)	**0.005**
Dark Green Leafy Vegetables	4 (1.74)	5 (3.36)	1 (2.56)	2 (10.53)	12 (2.75)	0.129
Other Vitamin A Rich Foods	75 (32.61)	19 (12.75)	10 (25.64)	5 (26.32)	109 (24.94)	**<0.001**
Fruits and Vegetables	196 (85.22)	125 (83.89)	31 (79.49)	16 (84.21)	368 (84.21)	0.84
Organ Meat	1 (0.43)	0 (0)	0 (0)	0 (0)	1 (0.23)	1.00
Meat and Fish	72 (31.3)	62 (41.61)	11 (28.21)	5 (26.32)	150 (34.32)	0.131
Eggs	8 (3.48)	4 (2.68)	2 (5.13)	0 (0)	14 (3.2)	0.819
Legumes, Nuts and Seeds	69 (30)	55 (36.91)	12 (30.77)	10 (52.63)	146 (33.41)	0.151
Milk and milk Products	7 (3.04)	10 (6.71)	0 (0)	3 (15.79)	20 (4.58)	**0.023**
Weekend						
Starchy Staples	216 (93.91)	143 (95.97)	35 (89.74)	19 (100)	413 (94.51)	0.31
Dark Green Leafy Vegetables	6 (2.61)	5 (3.36)	1 (2.56)	0 (0)	12 (2.75)	0.946
Other Vitamin A Rich Foods	69 (30)	21 (14.09)	8 (20.51)	0 (0)	98 (22.43)	**<0.001**
Fruits and Vegetables	182 (79.13)	120 (80.54)	27 (69.23)	16 (84.21)	345 (78.95)	0.43
Organ Meat	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Meat and Fish	71 (30.87)	66 (44.3)	10 (25.64)	5 (26.32)	152 (34.78)	**0.023**
Eggs	12 (5.22)	4 (2.68)	0 (0)	2 (10.53)	18 (4.12)	0.137
Legumes, Nuts and Seeds	55 (23.91)	45 (30.2)	19 (48.72)	11 (57.89)	130 (29.75)	**0.001**
Milk and milk Products	11 (4.78)	11 (7.38)	2 (5.13)	2 (10.53)	26 (5.95)	0.478

4.5.4 Assessment of Nutrient Intakes of Prison Inmates

In all, there were significant variations in mean intakes of protein, niacin and sodium across prison categories. Also, prisoners in the medium and low security prisons have higher mean nutrient intakes compared to those in the maximum and minimum-security prisons. With the exception of carbohydrate and vitamin A for which Recommended Daily Allowances (RDAs) were met by more than 80% of the inmates and iron which the RDA was also met by about 43%, all other nutrients were less than 40% met by the inmates. There was a significant positive correlation between diet diversity score grouping and overall mean nutrient intake of prisoners ($R=0.23$, $P<0.0001$).

Table 4.7: Average nutrient intake by prison category

Nutrients	RDA[9]	Maximum Security Prison Mean ± SE[10]	Medium Security Prison Mean ± SE	Minimum Security Prison Mean ± SE	Low Security Prison Mean ± SE	Total Average mean ± SE	P-Value
Energy (Kcal)	2400	1393.23 ± 54.72	1558.95 ± 71.69	1209.16 ± 147.48	1450.31 ± 161.76	1439.65 ± 40.84	0.111
Carbohydrate (g)	300	245.53 ± 9.16	274.97 ± 14.00	204.31 ± 26.84	242.45 ± 25.76	252.67 ± 7.33	0.072
Protein (g)	51	29.63 ± 1.54	36.84 ± 1.89	30.30 ± 4.10	39.46 ± 6.35	32.56 ± 1.14	0.017*
Fat (g)	65	35.10 ± 2.02	36.93 ± 2.28	32.87 ± 3.89	38.60 ± 5.32	35.70 ± 1.39	0.842
Calcium (µg)	1000	174.06 ± 10.00	202.68 ± 13.04	170.74 ± 28.97	212.01 ± 49.64	185.19 ± 7.60	0.293
Niacin (mg)	15	10.05 ± 0.69	14.17 ± 1.39	8.79 ± 1.01	14.74 ± 3.01	11.57 ± 0.63	0.010*
Riboflavin (mg)	1	0.54 ± 0.05	0.63 ± 0.05	0.48 ± 0.07	0.64 ± 0.20	0.57 ± 0.03	0.504
Iron (mg)	13	8.17 ± 0.38	9.22 ± 0.47	9.02 ± 1.29	9.30 ± 1.61	8.64 ± 0.28	0.362
Vitamin E(mg)	15	3.79 ± 0.28	4.50 ± 0.32	3.81 ± 0.79	5.54 ± 0.84	4.10 ± 0.20	0.19

[9] Average of RDAs for men
[10] Standard Error of the mean
*p<0.05

Vitamin B12 (mg)	2.4	0.84 ± 0.13	1.32 ± 0.26	0.24 ± 0.09	0.64 ± 0.27	0.96 ± 0.12	0.079
Vitamin A (µg)	563	836.90 ± 67.03	935.30 ± 75.70	806.97 ± 185.87	815.71 ± 150.55	868.25 ± 47.14	0.775
Sodium (ug)	2300	2024.77 ± 93.84	2520.16 ± 115.29	1991.35 ± 226.60	2413.88 ± 254.36	2209.35 ± 68.36	0.006*
Zinc (ug)	8.1	5.08 ± 0.26	5.92 ± 0.29	5.07 ± 0.66	5.92 ± 0.71	5.40 ± 0.18	0.171
Thiamin B1 (mg)	1	0.88 ± 0.05	1.02 ± 0.06	0.93 ± 0.16	1.07 ± 0.22	0.94 ± 0.04	0.339

Table 4.8: Proportion of prisoners whose nutrient intakes met or did not meet RDAs of selected nutrients

Nutrient	RDA met or not met (N=410)[11]	
	RDA Met n (%)	RDA Not met n (%)
Carbohydrate	351 (85.6)	59 (14.4)
Fat	0 (0.0)	410 (100.0)
Protein	85 (20.7)	325 (79.3)
Calcium	1 (0.2)	409 (99.8)
Iron	175 (42.7)	235 (57.3)
Zinc	6 (1.5)	404 (98.5)
Vitamin A	404 (98.5)	6 (1.5)
Thiamine (B1)	103 (25.2)	305 (74.8)
Vitamin B6	132 (32.4	276 (67.6)
Riboflavin	43 (10.5)	367 (89.5)
Niacin (B3)	91 (22.2)	319 (77.80
Vitamin B12	43 (10.5)	367 (89.5)

[11] Proportion of prisoners whose consumption met between 97% and 98% of RDA

Table 4.9: Nutrient intake by diet diversity grouping

Nutrients	Diet Diversity Grouping				
	Low[12]		Moderate[13]		
	Mean	Standard Error	Mean	Standard Error	P-value
Energy (Kcal)	1374.83	43.630	1689.49	100.926	0.239
Carbohydrate (g)	242.82	8.131	290.31	16.315	0.228
Protein (g)	30 04	1.184	42.18	2.900	0.065
Fat (g)	33 88	1.470	43.66	3.591	0.920
Calcium (ug)	168.91	7.405	248.58	22.092	<0.0001*
Niacin (mg)	10.85	0.734	14.30	1.181	0.010
Riboflavin (mg)	0.52	0.034	0.71	0.081	0.059
Iron (mg)	8.13	0.300	10.59	0.71	0.380
Vitamin B12 (mg)	0.09	0.016	0.16	0.040	0.043*
Vitamin A (µg)	777.82	47.305	1214.03	131.893	<0.0001*
Sodium (ug)	2126.78	74.982	2525.03	159.180	0.748
Zinc (ug)	5.09	0.193	6.579	0.461	0.217
Thiamin (mg)	0.89	0.040	1.162	0.090	0.127

[12] Dietary diversity score of ≤3

[13] Dietary diversity score of 4-5

Association between dietary nutrient intake and dietary diversity score

Table 4.10: Correlation matrix for nutrient intake and dietary diversity score

Nutrient	Pearson R**
Energy (Kcal)	0.266
Carbohydrate (g)	0.220
Protein (g)	0.290
Fat (g)	0.261
Calcium (ug)	0.244
Vitamin C (mg)	0.223
Niacin (mg)	0.205
Riboflavin (mg)	0.233
Iron (mg)	0.249
Vitamin B12 (mg)	0.123
Vitamin A (µg)	0.250
Sodium (ug)	0.221
Zinc (ug)	0.254
Thiamin (mg)	0.222
Mean coefficient (R)	**0.230**

** Correlation is significant at 0.01 ($p<0.0001$), 2-tailed.

4.5.5 Association between Characteristics of Prisoners and Diet Diversity

Table 4.11 shows the relationship between characteristics of prisoners and level of diet diversity. From the chi-square tests of association, receiving support from family members or friends and working while in prison were significantly associated with diet diversity of prisoners ($p<0.05$). The proportion of prisoners with moderate diet diversity was significantly higher among those who received some kind of support in terms of food or money from family members or friends than those without such support (29.8% vs 15.4%, $p<0.001$). Also, the proportion of prisoners with moderate diet diversity was significantly higher for prisoners who work to earn income, compared to those who did not work while in prison (29.3% vs 18.6%, $p=0.031$).

Table 4.11: Association between characteristics of prisoners and diet diversity status

	DDS			
	No, n (%)	**Yes, n (%)**	**chi-square**	**p-value**
Prison Category			4.86	0.182
maximum security prison	185 (80.43)	45 (19.57)		
medium security prison	114 (76.51)	35 (23.49)		
minimum security prison	35 (89.74)	4 (10.26)		
low security prison	13 (68.42)	6 (31.58)		
In overcrowded prison[14]			1.27	0.26
No	49 (74.24)	17 (25.76)		
Yes	298 (80.32)	73 (19.68)		
Crime type			2.35	0.125
Serious crime offenses	300 (80.65)	72 (19.35)		
Non serious offenses	47 (72.31)	18 (27.69)		
Duration of imprisonment in months			2.17	0.705
4-12	127 (81.41)	29 (18.59)		
13-24	45 (75)	15 (25)		
25-60	75 (82.42)	16 (17.58)		
61-120	64 (76.19)	20 (23.81)		
120+	36 (78.26)	10 (21.74)		
Age			3.46	0.326
18-29 years	147 (83.05)	30 (16.95)		
30-39 years	81 (75.50)	26 (24.30)		
40-49 years	56 (81.16)	13 (18.84)		
>=50 years	63 (75.00)	21 (25.00)		
Sex				0.671
Male	341 (79.49)	88 (20.51)		
Female	6 (75)	2 (25)		
Received support			12.67	**<0.001**
Yes	111 (70.25)	47 (29.75)		
No	236 (84.59)	43 (15.41)		
Marital status			4.55	0.103
Single	181 (81.53)	41 (18.47)		
Married	78 (72.22)	30 (27.78)		
Formerly married	88 (82.24)	19 (17.79)		
Have children			0.17	0.682
Yes	239 (78.88)	64 (21.12)		
No	108 (80.6)	26 (19.4)		

[14] *Prisoners from facilities that were housing larger numbers of prisoners than their established capacities (Kumasi central, Nsawam medium security prison, Tamale central, Obuasi Local, Winneba Local prisons, Duayaw Nkwanta camp prion).*

Highest Educational Level attained			8.67	0.07
no education	62 (89.86)	7 (10.14)		
Primary education	73 (76.04)	23 (23.96)		
Junior high	110 (79.71)	28 (20.29)		
Senior high	88 (78.57)	24 (21.43)		
Tertiary	14 (63.64)	8 (36.36)		
Employment before prison			2.83	0.243
Formal employment	37 (75.51)	12 (24.49)		
Informal employment	284 (80.91)	67 (19.09)		
not employed	26 (70.27)	11 (29.73)		
Work while in prison			4.64	**0.031**
Yes	58 (70.73)	24 (29.27)		
No	289 (81.41)	66 (18.59)		
Previous incarceration				0.799
Yes	21 (84)	4 (16)		
No	326 (79.13)	86 (20.87)		
Food insecurity status			0.71	0.951
Food secure	31 (79.49)	8 (20.51)		
Mildly food insecure	19 (79.17)	5 (20.83)		
Moderately food insecure	9 (90)	1 (10)		
Severely food insecure	246 (79.1)	65 (20.9)		
Very severely food insecure	42 (79.25)	11 (20.75)		
Alcohol intake			0.06	0.809
Yes	190 (79.83)	48 (20.17)		
No	157 (78.89)	42 (21.11)		
Smoking			2.82	0.093
Yes	181 (82.65)	38 (17.35)		
No	166 (76.15)	52 (23.85)		

4.5.6 Association between Characteristics of Prisoners and Diet Diversity

In assessing the direction of the association between characteristics of prisoners and the level of dietary diversity among them, the adjusted binary regression model was fitted. From the adjusted binary logistic regression model, working while in prison and receiving support from family members or friends remained significant predictors of level of diet diversity among prisoners ($p<0.05$). The odds of having moderate diet diversity for prisoners who did not receive support in the form of food or money from families or friends was 54% lesser compared to those who received

such support (aOR: 0.46, 95% CI: 0.28 – 0.78). Also, for prisoners who did not work while in prison, the odds of having moderate dietary diversity was 48% lesser than those who did (aOR: 0.52, 95% CI: 0.28 - 0.97).

Table 4.12 Association of prisoners' characteristics on diet diversity status

	Adjusted Logistic Regression		
Variable	**AOR**	**95% CI**	**P-value**
Prison Category			0.085
Maximum security prison	1.00		
Medium security prison	1.70	0.93, 3.12	
Minimum security prison	0.44	0.13, 1.44	
Low security prison	1.54	0.42, 5.62	
In Overcrowded prison			0.323
No	1.00		
Yes	0.64	0.26, 1.56	
Crime type			0.645
Serious offenses	1.00		
Non-serious offenses (Felonies)	1.18	0.58, 2.39	
Duration of imprisonment			0.724
4-12 months	1.00		
13-24 months	1.27	0.57, 2.82	
25-60 months	0.80	0.38, 1.71	
61-120 months	1.38	0.64, 2.98	
121+ months	1.19	0.44, 3.27	
Age			0.575
18-29 years	1.00		
30-39 years	1.41	0.66, 3	
40-49 years	1.01	0.37, 2.74	
>=50 years	1.68	0.62, 4.54	
Sex			0.829
Male	1.00		
Female	0.82	0.14, 4.8	
Received Support			**0.003**
Yes	1.00		
No	0.46	0.28, 0.78	
Marital Status			0.294
Single	1.00		
Married	1.71	0.72, 4.05	
Formerly married	1.00	0.4, 2.49	

Table 4.12b Association of prisoners' characteristics on diet diversity status cont'd

	Adjusted Logistic Regression		
Variable	**AOR**	**95% CI**	**P-value**
Have Children			0.65
Yes	1.00		
No	1.18	0.57, 2.45	
Educational Level			0.103
No education	1.00		
Primary education	2.92	1.11, 7.66	
Junior high	2.54	0.98, 6.59	
Senior high	2.80	1.02, 7.73	
Tertiary	6.58	1.59, 27.24	
Employment before prison			0.167
Formal employment	1.00		
Informal employment	1.45	0.6, 3.49	
Not employed	3.02	0.92, 9.91	
Work while in prison			**0.038**
Yes	1.00		
No	0.52	0.28, 0.97	
Had previous incarceration			0.642
Yes	1.00		
No	1.35	0.38, 4.7	
Food Insecurity Status			0.811
Secure	1.00		
Mild	0.69	0.17, 2.7	
Moderate	0.24	0.02, 2.44	
Severe	0.80	0.32, 1.99	
Very Severe	0.89	0.28, 2.8	
Alcohol intake			0.872
Yes	1.00		
No	1.05	0.61, 1.8	
Smoke			0.397
Yes	1.00		
No	1.28	0.73, 2.25	

Results of the in-depth interviews conducted with prisoners and officers also corroborate the quantitative findings on quality of diets. For instance, 9 out of the 12 prisoners and 9 out of 11 OICs interviewed, lamented the low quality of food in the prisons. Prisoners who reported that

they did not have any problem with food quality were either inmate leaders or wealthy inmates. An inmate expressed concern about the low quality of food given them as follows:

> *The quality is bad; you have to recook the food before you can eat it. It is bad. The soup is very light and not well cooked. If you leave it to stand, it will turn into water (A medium security male prison inmate).*
>
> *I don't have any problem with the quality of food I eat because, I am a leader and I have privilege to cook my own food and also take raw food from the kitchen (A male inmate leader).*
>
> *It is good just like home, I eat variety of foods and "I don't have a problem with quality of food because my food comes from home* (A wealthy inmate).

Overall, prisoners had different ways of assessing the quality of diets served them. These included sensory properties of the food, i.e. appearance to the eye, texture, nutritional content, and packaging. With regard to nutritional content, prisoners were of the view that the low diversity in the diet and the lack of specific foods like fish and vegetables meant that the food was of low nutritional content. Additionally, Officers in Charge (OICS) were asked to give their perspectives of the quality of prisoners' food. Some said:

The quality is not good; it is obvious the quality is not good. We are given GHC 1.80 to provide food for them. Meaning, 60p each for breakfast, lunch and supper. So, I must be sincere with you that the quality is not good" (An OIC from a male prison).

> *I will not come out about the quality. But they are to be fed with 1.80p, so divide that into three and see the quality for yourself, (Another OIC from a male prison).*

However, a female OIC had this to say about quality of food in the female prisons:

> *The quality is good because, we receive donations a lot (A female OIC).*
>
> *The quality is ok due to small number of inmates compared to the male prisons* (*A female OIC).*

A similar perspective was expressed by different categories of inmates as well as OICs from the various prisons on the quantity of food. While some inmates did not find any problem with the

quantity of food served them, others found it to be insufficient. Some of the responses concerning quantity included:

> *Sometimes the quantity is ok, other times it is not (A male inmate).*
>
> *The quantity has limitations it is not enough. Imagine I give you 60p to cook for me (A male (A male OIC).*

The findings show that there were challenges with the quantity and quality of food as expressed by both inmates and officers. It must be emphasized that the experiences were not the same among the different groups of inmates as well as OICs. Inmate leaders and wealthier inmates did not have problems because they received enough food and money from elsewhere other than the prison food, but the ordinary inmates who hardly received external support in terms of food and money, had serious problems with food quality and quantity in the prisons.

4.5.7 Menus and Foods Provided to Inmates in the Prisons

Prison officers' description of the diets was similar to what prisoners reported during the dietary recalls. The diversity of a typical prisoners' diets according to the officers ranged from two to four food groups on a regular day and three to five during occasions. Overall, starchy staples (maize, rice, cassava-based foods like "gari"); legumes (beans, groundnuts); fruits and vegetables (pepper, onions, garden eggs, and tomatoes); meat and fish (smoked herrings); vitamin A-rich foods (palm fruits), were the major food groups procured for preparation of meals in the prisons. Another challenge mentioned by other officers was the monotony in the foods served. For example, when OICS were asked "from where they obtained food items to prepare prisoners' meals", they all mentioned the same three sources (contractors, prison farms and donations). For example, some said:

We give them corn dough porridge or we call it "akasa" or "koko" for breakfast and fermented corn meal ("banku") or Cassava grits (gari) with palm fruits or groundnut soup with herrings (keta school boys) for lunch and supper. It is always the same koko, all the time. We give gari and beans as well sometimes (A male OIC).

We receive inmates' ration through food contractors. They are people who apply to supply food to the prisons. After they have been screened and they meet the requirements, they are employed to supply food to the prisons in their respective regions (A male OIC).

Table 4.13: Menus and food provided for prisoners

Breakfast		**Lunch/Supper**		**Foods items procured Regularly**	**Food Groups**
Regular breakfast	**Occasional foods[15]**	**Regular lunch/supper**	**Occasional foods**		
1. Corn dough/rice porridge 2. roasted cornmeal porridge/with or without sugar	Bread, milk, eggs, tea, cocoa	1. Banku/gari/ rice with groundnut soup/palm nut soup/ beans stew 2. Gari and beans	Beef, chicken, Dark green leafy vegetables Waakye Jollof rice	Corn, cassava, sugar, rice. Pepper, onion, tomato, garden eggs Palm fruits, palm oil Herrings (anchovies) Groundnut, beans	Starchy staples, fruits and vegetables other vitamin A-rich foods, fish and meat, Legumes, seeds and nuts.

[15] Foods given to prisoners during festive seasons such as Christmas, Ramadan, Easter, or when there were food donations

4.6. Determination of Nutritional Status of Prison Inmates

The third objective of the study was to determine the nutritional status of prison inmates. The mean weight and mean height of prison inmates with standard deviations were 67.6Kg (±12.61) and 1.70m (±.0827) respectively. Also, the average BMI of prisoners was 23.6 Kg/m^2 (± 4.5) while the average MUAC was 30.0 cm (± 5.3). Generally, most inmates (67%) had normal BMI with 6% being underweight. Moreover, prisoners from the low and maximum-security prisons had higher mean BMI compared to those from medium and minimum-security prisons (24.28 ± 2.482; 24.00 ± 5.02 vs 23.02 ± 2.933; 22.96 ± 4.250). Similarly, the majority of prisoners (99.5%) had normal MUAC. Figure 4.4 gives further information about the BMI of inmates.

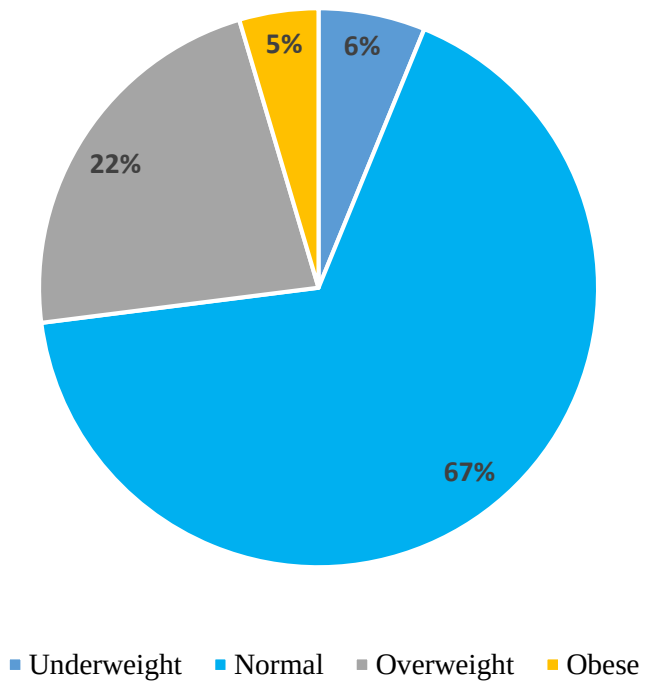

Figure 4.4: Nutritional status (BMI categories) of prisoners

4.6.1 Relationship between BMI and MUAC Measurements for Nutritional Status Assessment of Inmates

Figure 4.5 shows that there was a linear relationship between BMI and MUAC, and the Pearson moment correlation coefficient (r) shows a significant positive relationship between the two measures ($r = 0.33$, $p<0.001$).

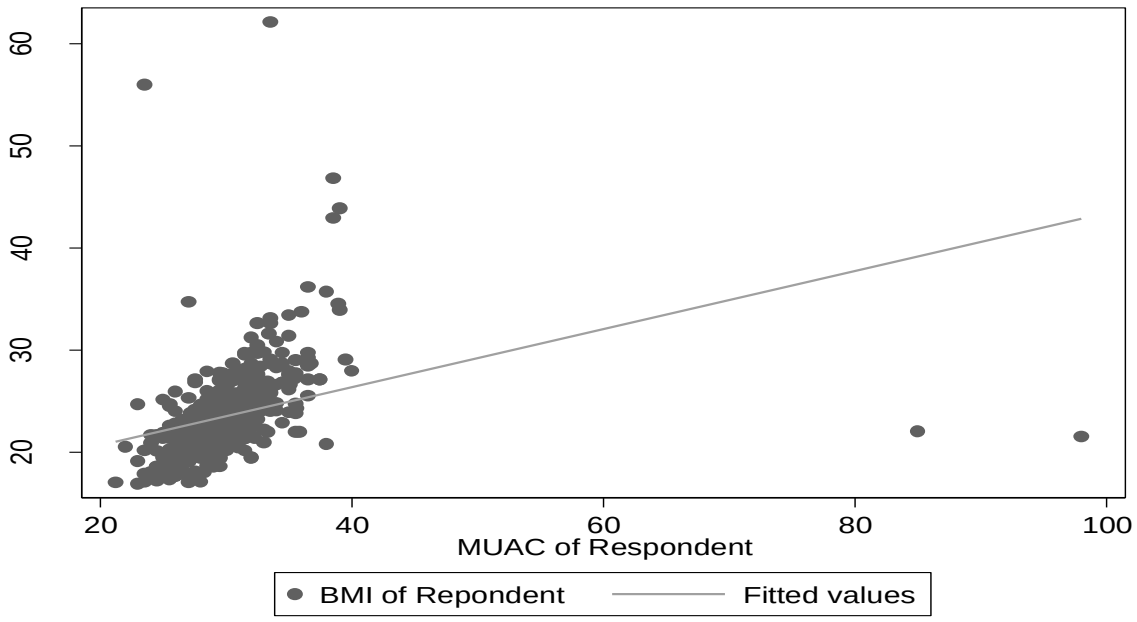

Figure 4.5 Mean BMI by MUAC of prisoners

4.7. Identifying the Factors Affecting Food and Nutrition Security of Prisoners

4.7.1 Association between Characteristics of Prisoners and Food Insecurity

Another objective of this study was to determine the factors associated with food insecurity and nutritional status of prison inmates. From the chi-square tests of association fitted for characteristics of prisoners and food insecurity, there was no statistical evidence to show that, any of the characteristics of prisoners was significantly associated with their food insecurity status, i.e. $p>0.05$ (Table 4.14).

Table 4.14: Association between Characteristics of Prisoners and Food insecurity

	Food insecurity status			
	No, n (%)	**Yes, n (%)**	**chi-square**	**p-value**
Prison Category			8.55	0.054
Maximum security	12 (5.22)	218 (94.78)		
Medium security	10 (6.71)	139 (93.29)		
Minimum security	7 (17.95)	32 (82.05)		
Low security	1 (5.26)	18 (94.74)		
Crime type			0.06	0.806
Serious crimes (Felonies)	26 (6.99)	346 (93.01)		
Non serious crimes (misdemeanours)	4 (6.15)	61 (93.85)		
Duration of imprisonment			0.18	0.073
4-12 months	15 (9.62)	141 (90.38)		
13-24 months	1 (1.67)	59 (98.33)		
25-60 months	3 (3.3)	88 (96.7)		
61-120 months	9 (10.71)	75 (89.29)		
121+ months	2 (4.35)	44 (95.65)		
Age			1.51	0.686
18-29 years	14 (7.91)	163 (92.09)		
30-39 years	6 (5.61)	101 (94.39)		
40-49 years	6 (8.70)	63 (91.30)		
>=50 years	4 (4.76)	80 (95.24)		

Table 4.14 (b) Association between characteristics of prisoners and food insecurity status

	Food insecurity status			
	Yes n (%)	**No n (%)**	**Chi-square**	**p-value**
Received Support			0.11	0.739
yes	10 (6.33)	148 (93.67)		
no	20 (7.17)	259 (92.83)		
Marital Status			0.09	0.955
Single	15 (6.76)	207 (93.24)		
Married	7 (6.48)	101 (93.52)		
Formerly married	8 (7.48)	99 (92.52)		
Have Children			0.24	0.623
yes	22 (7.26)	281 (92.74)		
No	8 (5.97)	126 (94.03)		
Educational Level			0.89	0.926
No education	5 (7.25)	64 (92.75)		
Primary education	5 (5.21)	91 (94.79)		
Junior high	11 (7.97)	127 (92.03)		
Senior high	8 (7.14)	104 (92.86)		
Tertiary	1 (4.55)	21 (95.45)		
Working in prison			0.62	0.43
Yes	4 (4.88)	78 (95.12)		
No	26 (7.32)	329 (92.68)		
Previous incarceration			0.57	0.686
Yes	2 (8)	23 (92)		
No	28 (6.8)	384 (93.2)		
In overcrowded prison			0.06	0.804
No	5 (7.58)	61 (92.42)		
Yes	25 (6.74)	346 (93.26)		
Alcohol intake			1.02	0.312
Yes	19 (7.98)	219 (92.020		
No	11 (5.53)	188 (94.47)		
Smoking			0.00	0.99
Yes	15 (6.85)	204 (93.15)		
No	15 (6.88)	203 (93.12)		

4.7.2 Association of Prisoners' Characteristics and Food Insecurity in Prisons

In assessing the effect of the association of characteristics of prisoners on the prevalence of perceived food insecurity, the adjusted logistic regression model was fitted. The results show that, the characteristics of prisoners fitted in the model had no significant effect on their food insecurity

status (p>0.05). Results of the effect of characteristics of prisoners on perceived food insecurity are presented in Table 4.11.

Table 4.15: Association between Characteristics of Prisoners and Food insecurity among Prisoners

	Adjusted Binary Logistic Model		
	AOR	**95% CI**	**P-value**
Prison Category			0.054
Maximum security prison	1.00		
Medium security prison	0.51	0.18, 1.41	
Minimum security prison	0.22	0.07, 0.65	
Low security prison	1.48	0.14, 15.64	
Overcrowded prison			0.23
No	1.00		
Yes	2.26	0.6, 8.56	
Crime type			0.777
Serious offenses (felonies)	1.00		
Non-serious offenses (misdemeanours)	1.20	0.34, 4.15	
Duration of imprisonment			0.152
4-12 months	1.00		
13-24 months	6.21	0.77, 50.26	
25-60 months	3.08	0.81, 11.67	
61-120 months	0.84	0.29, 2.44	
121 months or more	1.99	0.33, 12.02	
Age			0.53
18-29 years	1.00		
30-39 years	1.99	0.58, 6.83	
40-49 years	1.49	0.35, 6.31	
>=50 years	3.08	0.58, 16.36	
Received Support			0.724
Yes	1.00		
No	0.86	0.37, 2.01	
Marital Status			0.872
Single	1.00		
Married	0.92	0.24, 3.49	
Formerly married	0.72	0.18, 2.83	
Have Children			0.574
Yes	1.00		
No	1.38	0.45, 4.25	
Educational Level			
No education	1.00		0.754
Primary education	1.65	0.42, 6.5	

Junior high	0.84	0.25, 2.87	
Senior high	0.77	0.2, 3.02	
Tertiary	1.63	0.12, 21.61	
Working while in prison			0.758
Yes	1.00		
No	0.83	0.26, 2.65	
Previous incarceration			0.606
Yes	1.00		
No	1.57	0.28, 8.63	
Alcohol intake			0.274
Yes	1.00		
No	1.61	0.68, 3.81	
Smoking			0.71
Yes	1.00		
No	0.85	0.35, 2.03	

4.7.3 Association between Characteristics of Prisoners and Nutritional Status

Average BMI varied significantly across educational attainment, level of food insecurity, and prison overcrowding ($p<0.05$). BMI was significantly low among prisoners with higher level of food insecurity compared to those with lower food insecurity or the food secured. Prisoners in overcrowded prisons (prisons housing more inmates than their established capacities) were identified to have low BMI compared to those in prisons housing number of prisoners within established capacity. Comparatively, prisoners with higher educational levels have higher BMI than those with lower educational levels (Table 4.16).

Additionally, the MUAC of prisoners varied significantly across prison category, previous incarceration, and engagement in recreational activity in one week prior to the study ($p<0.05$). Prisoners in the medium and the minimum-security prisons had higher MUAC than those in the maximum and low security prisons. Also, prisoners with history of incarceration were identified to have higher MUAC compared to first time prisoners (32.4 ± 14.2 vs 30.1 ± 5.7, $p = 0.020$).

Prisoners who engaged in recreational activity had higher MUAC than those who did not (32.2 ± 6.9 vs 29.6 ± 3.2, p<0.001), Table 4.16.

Table 4.16: Association between characteristics of prisoners and nutritional status (BMI and MUAC Levels).

	BMI [16]			MUAC[17]		
	Mean	Standard Deviation	P-value	Mean	Standard Deviation	P-value
Prison Category			0.120			**0.003**
Maximum security prison	24.00	5.02		29.27	3.31	
Medium security prison	22.96	4.25		31.29	7.83	
Minimum security prison	23.02	2.93		29.31	2.49	
Low security prison	24.28	2.49		30.17	2.13	
Crime type			0.070			0.406
Serious offenses (felonies)	23.41	4.20		29.91	5.55	
Misdemeanours	24.51	6.10		30.51	3.64	
Duration of imprisonment			0.326			0.624
4-12 months	23.92	5.56		29.47	3.41	
13-24 months	24.23	5.07		30.20	3.70	
25-60 months	23.05	3.17		30.46	7.81	
61-120 months	23.03	3.38		30.30	6.78	
>=121 months	23.54	4.06		30.10	2.58	
Age			0.367			0.746
18-29 years	23.60	3.72		29.96	6.07	
30-39 years	23.86	5.89		30.43	6.30	
40-49 years	22.72	2.81		29.54	3.11	
>=50 years	23.84	5.23		29.91	3.29	
Sex			0.729			0.682
Male	23.58	4.55		30.01	5.33	
Female	23.02	4.01		29.24	4.47	
Received Support			0.538			0.828
Yes	23.39	3.83		30.07	6.35	
No	23.67	4.90		29.96	4.63	
Marital Status			0.608			0.696
Single	23.67	4.62		30.16	6.71	
Married	23.73	4.92		30.04	3.60	
Formerly married	23.19	3.97		29.63	2.96	
Educational Level			**0.040**			0.549
No education	22.25	2.54		29.53	2.45	
Primary education	23.55	3.39		30.40	6.47	

[16] Body Mass Index
[17] Mid- Upper Arm Circumference

Junior high	24.11	5.48		30.43	6.77	
Senior high	23.46	3.79		29.52	3.30	
Tertiary	24.97	8.57		29.52	3.97	
Prior Employment			0.151			0.827
Formal employment	23.59	5.06		29.58	3.33	
Informal employment	23.42	3.94		30.07	5.64	
Not employed	24.95	7.90		29.91	4.19	
Working while in prison			0.427			0.683
Yes	23.93	5.58		29.78	3.33	
No	23.49	4.27		30.05	5.67	
Previous incarceration			0.929			**0.020**
Yes	23.49	3.88		32.39	14.20	
No	23.58	4.58		29.85	4.21	
Vigorous intensity activity			0.380			0.972
Yes	23.08	3.41		29.98	3.15	
No	23.64	4.69		30.00	5.56	
moderate intensity activity			0.894			0.205
Yes	23.54	4.80		30.33	6.93	
No	23.60	4.30		29.69	3.13	
Recreational activity			0.141			<**0.001**
Yes	24.34	6.02		32.16	11.22	
No	23.44	4.23		29.62	3.23	
Sedentary			0.705			0.162
Yes	23.65	4.72		30.35	6.76	
No	23.49	4.35		29.63	3.08	
Diet Diversity			0.921			0.502
Low	23.58	4.15		30.09	5.70	
Medium	23.53	5.85		29.66	3.41	
FIS			**0.039**			0.466
Secure	25.31	5.01		30.41	3.63	
Mild	25.32	5.71		30.90	3.50	
Moderate	25.03	3.45		31.62	2.91	
Severe	23.32	4.23		30.08	5.88	
In overcrowding prison			**0.002**			0.156
No	25.15	6.07		30.85	3.04	
Yes	23.29	4.16		29.85	5.61	
Alcohol intake			0.536			0.102
Yes	23.45	5.11		29.62	3.22	
No	23.72	3.75		30.45	7.02	
Smoking			0.314			0.602
Yes	23.35	4.24		29.87	5.56	
No	23.79	4.82		30.13	5.06	

4.7.4 Association of Prisoners' Characteristics and their Nutritional Status

Table 4.17.4 shows the results of the multiple linear regression model fitted to determine the direction of the association between characteristics of prisoners and nutritional status (BMI and MUAC). From the results of the

multiple linear regression model, level of perceived food insecurity was the only significant predictor of BMI ($p<0.05$). The results show that the average BMI of prisoners reduces with higher level of food insecurity.

With regard to MUAC, prison category, previous incarceration, and engagement in recreational activity were the significant predictors of prisoners' MUAC ($p<0.05$). First- time prisoners were identified to have lower mean MUAC compared to prisoners who been previously incarcerated (**β**: -2.5, 95% CI: -4.66, -0.26). The beta coefficient (**β**) shows the change in the dependent variable with an increase/decrease in the independent variable. For example, regarding engagement in recreational activity, prisoners who had not engaged in any recreational activities in the week prior to the study were found to have lower MUAC compared to those who did (**β**: -2.0, 95% CI: -3.5, -0.6). With the exception of low security prisons, inmates in the medium and the minimum-security prisons had a higher mean MUAC compared to those in the maximum-security prison.

Table 4.17: Association of Characteristics of Prisoners and Nutritional status (BMI and MUAC)

	β[18]	95% CI	P-value	β	95% CI	P-value
Prison Category			0.440			**<0.001**
Maximum security prison	0.00			0.00		
Medium security prison	-0.49	-1.57, 0.58		2.61	1.36, 3.86	
Minimum security prison	-1.26	-2.9, 0.37		0.35	-1.55, 2.25	
Low security prison	-0.61	-3.07, 1.85		-0.28	-3.14, 2.58	
In overcrowded prison			0.104			0.056
No	0.00			0.00		
Yes	-1.34	-2.95, 0.28		-1.83	-3.71, 0.05	
Marital Status			0.809			0.741
Single	0.00			0.00		
Married	-0.09	-1.47, 1.29		-0.17	-1.78, 1.44	
Formerly married	-0.44	-1.87, 1.00		-0.62	-2.29, 1.05	
Age			0.366			0.894
18-29 years	0.00			0.00		
30-39 years	0.53	-0.76, 1.83		0.19	-1.32, 1.69	
40-49 years	-0.20	-1.86, 1.46		-0.45	-2.38, 1.48	
>=50 years	1.06	-0.71, 2.84		0.08	-1.99, 2.15	
Duration of imprisonment			0.354			0.807
4-12 months	0.00			0.00		
13-24 months	0.47	-0.92, 1.85		0.37	-1.24, 1.99	
25-60 months	-0.80	-2.02, 0.43		0.53	-0.9, 1.96	
61-120 month	-0.81	-2.15, 0.54		0.89	-0.68, 2.46	
>=121 months	0.06	-1.69, 1.8		0.99	-1.04, 3.03	
Sex			0.531			0.328
Male	0.00			0.00		
Female	-1.06	-4.39, 2.27		-1.93	-5.81, 1.95	
Crime type			0.435			0.627
Serious offenses (felonies)	0.00			0.00		
Misdemeanours	0.51	-0.78, 1.8		0.37	-1.13, 1.87	
Received Support			0.203			0.751
Yes	0.00			0.00		
No	0.60	-0.33, 1.53		-0.17	-1.25, 0.9	
Educational Level			0.068			0.406
No education	0.00			0.00		
Primary education	1.28	-0.16, 2.72		1.06	-0.62, 2.73	
Junior high	1.84	0.49, 3.2		1.59	0.02, 3.17	
Senior high	1.20	-0.3, 2.7		1.01	-0.74, 2.75	
Tertiary	2.80	0.28, 5.31		1.29	-1.64, 4.21	
Employment before prison			0.195			0.622
Formal employment	0.00			0.00		
Informal employment	0.34	-1.21, 1.89		0.89	-0.91, 2.69	

[18] Coefficient showing change in mean value of the outcome variable with unit increase/decrease in the independent variable

Not employed	1.79	-0.36, 3.94		0.88	-1.62, 3.38	
Working in prison			0.165			0.761
Yes	0.00			0.00		
No	0.83	-1.99, 0.34		0.21	-1.15, 1.57	
Previous incarceration			0.800			**0.029**
Yes	0.00			0.00		
No	0.24	-2.13, 1.65		-2.46	-4.66, -0.26	
Vigorous intensity activity			0.532			0.595
Yes	0.00			0.00		
No	0.43	-0.93, 1.79		0.43	-1.16, 2.01	
Moderate intensity activity			0.587			0.266
Yes	0.00			0.00		
No	0.24	-0.64, 1.13		-0.58	-1.61, 0.45	
Recreational			0.145			**0.006**
Yes	0.00			0.00		
No	0.94	-2.2, 0.32		-2.04	-3.51, -0.58	
Sedentary			0.571			0.573
Yes	0.00			0.00		
No	0.26	-1.14, 0.63		-0.30	-1.33, 0.74	
Dietary Diversity			0.354			0.154
Low	0.00			0.00		
Medium	0.52	-1.62, 0.58		-0.93	-2.21, 0.35	
Food Insecurity Status			**0.049**			0.924
Food secure	0.00			0.00		
Mildly food insecure	0.33	-2.7, 2.03		0.52	-2.23, 3.28	
Moderately food insecure	1.11	-4.36, 2.13		0.89	-2.89, 4.67	
Severely food insecure	1.94	-3.49, -0.4		-0.11	-1.9, 1.69	
Alcohol intake			0.729			0.058
Yes	0.00			0.00		
No	0.16	-0.76, 1.08		1.03	-0.04, 2.1	
Smoking			0.381			0.743
Yes	0.00			0.00		
No	0.43	-0.53, 1.39		0.19	-0.94, 1.31	

4.7.5 Factors Associated with Food and Nutrition Insecurity of Prisoners from the Perspectives of Prisoners

When prisoners were asked during the survey to mention the factors which they felt affected their level of food access and food intake in the prisons, there were multiple responses. The factors listed were categorized into themes as presented in Figure 4.6.

The main factors reported by prison inmates as drivers of their access to food included money issues and family or friends' visits, inadequate prison food and individual preferences, sickness, anxiety and depression.

With regard to inadequate quantity and quality food in the prison, low nutrient value of the food, 'bad' taste or food not well cooked, unattractiveness of food, food being too small in size and watery soup, among others were mentioned by prisoners. Concerning sickness as a factor affecting food access and intake, inmates mentioned various kinds of disease conditions affecting their intake. These included stomach ulcer, allergies, disabilities, frequent diarrhoea, lack of appetite and diabetes. With regard to anxiety, prison inmates also mentioned that they had been thinking a lot about the imprisonment terms they were serving; their absence from home; and their inability to see loved ones. They lamented these issues caused them to be depressed and anxious about their survival and life in prison generally.

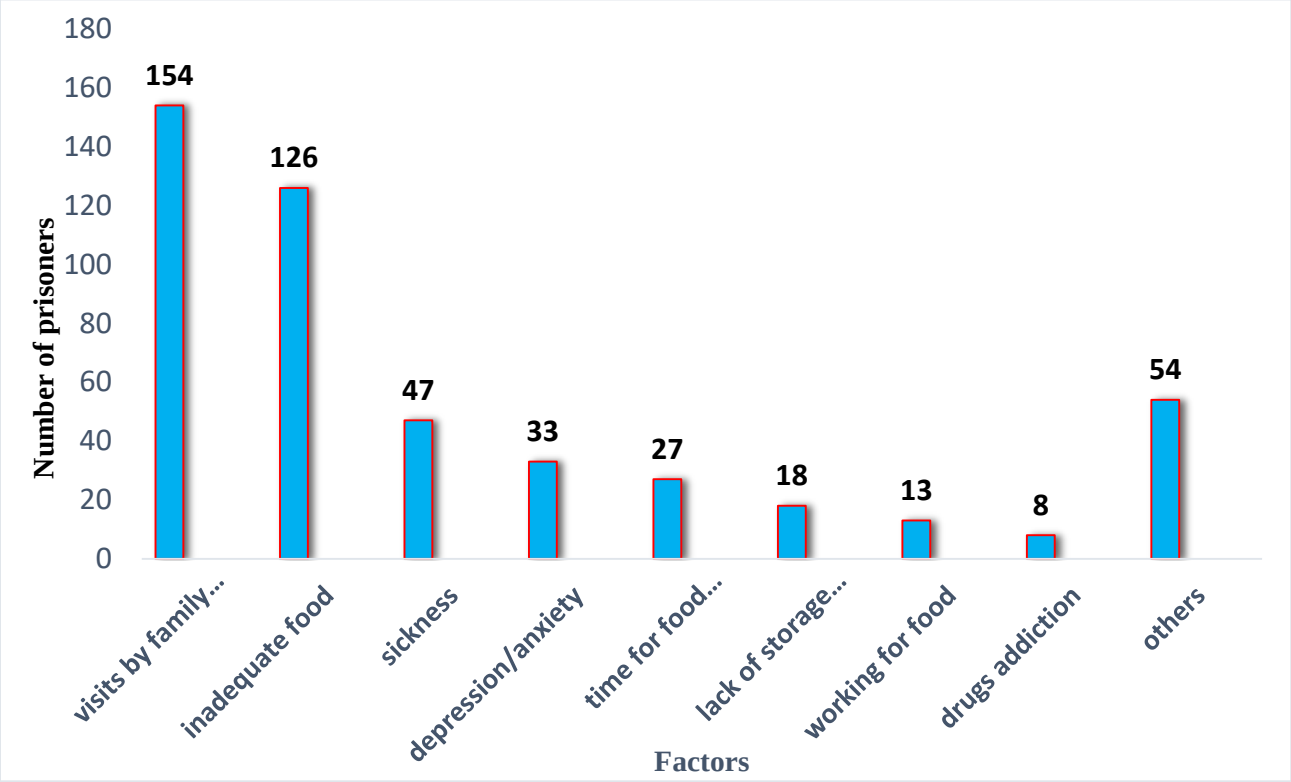

Figure 4.6: Other factors affecting food and nutrition security reported by prison inmates

The findings from the qualitative interviews with prisoners were similar to the above results. Prisoners were asked to mention the major challenges they experienced that might affect their food access and intake. From the results, themes such as money issues, family and friends' visits, health problems, the prison itself, storage facilities, inadequacy of the food and anxiety emerged.

Money issues, visits by family and friends

Prisoners indicated that, regular visits by their family members or friends enhanced their access to food and subsequently their food intake. Some said they received food and money whenever they were visited. The amounts of money received ranged from GHC 50.00 to GHC 600.00. The frequency of visits also ranged from weekly to quarterly. The wealthy and inmates' leaders had more family support compared to ordinary inmates. The following narratives by inmates illustrate the findings:

One inmate said:

Twice a week, they bring me fish, stew with chicken, provisions with 100gh or 150gh (a female inmate).

I receive visits from family and friends and they give me 200gh with food items (a male inmate).

Once a week they bring me food and 100gh, my friends give me 200gh every month (another male inmate).

The condition of the prison and prisoners' accommodation

Prisoners said that one of the major problems they faced was where they slept in the prisons. Prisoners revealed that some of the prisons were housing higher number of inmates than their established capacities (overcrowding) and that affected their food access. Long queues and too many people struggling for food during mealtimes were of major concern to them.

Inadequacy of prison food

Results of the qualitative interviews with prisoners showed that inadequate diet was a major problem. According to the prisoners, food given to them is bad. This put them off and they found it difficult to eat. Prisoners who had the means did not eat the prison food at all. They ate their own food. Those who had no choice had to re-cooked, added spices and other things (what they termed 'modify the food') before they could eat. Below are some of the responses given by inmates:

> *Poor food, I have never eaten food from the prison kitchen for the 10 years that I have been here" (a wealthy inmate).*
>
> *The food is not well prepared and I can't eat it; I work for people before getting food to eat" (a medium security prison inmate).*
>
> *Sometimes you are forced to eat food available even if you are not feeling for it. I am not a Ghanaian and not used to that kind of food (a female inmate).*

Health problems

Health problems also came up strongly as a major food insecurity predictor to prisoners. The major health conditions of prisoners included stomach ulcer, skin diseases, frequent diarrhoea, anaemia, HIV/AIDS/TB and depression. According to prisoners, these health conditions affect their food intake. It was also revealed that depression played a role in food and nutrition insecurity of prisoners. Prisoners said their being in prison was a burden for them because the situation in the prison made them to think all the time to the extent that they did not feel like eating sometimes. The fact that they did not know their fate in the prisons, when they would finish serving their sentences and whether they could complete their terms of imprisonment successfully were major issues of concern. This was a major problem for condemned, new prisoners and those awaiting trial at the courts. For instance, inmates said:

> *I have a health problem; serious stomach problem and eating is a problem (A male inmates).*

I think a lot and this even makes me sick sometimes and I can't eat well (a condemned male inmate).

Lack of storage facilities and timing of food service

The lack of storage facilities in the prison cells was a challenge for prisoners. They reported that they received food two times a day; that was, breakfast around 6:30-7.00 GMT and lunch and supper together between 11.00 and 13.00 GMT depending on the number of prisoners. Prisoners were expected to reserve part of the food they received at lunch time for supper. They complained that they did not have storage facilities in their cells to keep their food hot throughout the day and there was no heating equipment in the cells. This affected the temperature and wholesomeness of their food. They always lost food through spoilage and this was a major challenge for the ordinary prisoners who had fewer privileges.

4.7.6 Factors Affecting Food and Nutrition Security of Prisoners from Officers' Perspectives

Prison officers' perspectives were sought on the factors affecting food and nutrition insecurity among prisoners. When prison officers were asked about what affects prisoners' food access and intake, they gave varied responses and some were direct repetitions of what prisoners said. These have been presented in Figure 4.7. More than half (41) of officers mentioned that inadequacy of the daily feeding fee (GH₵1.80) for a prisoner was a major driving factor of food and nutrition insecurity in the prisons. Additionally, 27 respondents indicated that low quantity and quality of prisoners' food was a major driver. Furthermore, 9 each of respondents mentioned poor storage facilities and delay in payment of food contractors for foods they had supplied to the prisons respectively, as major factors.

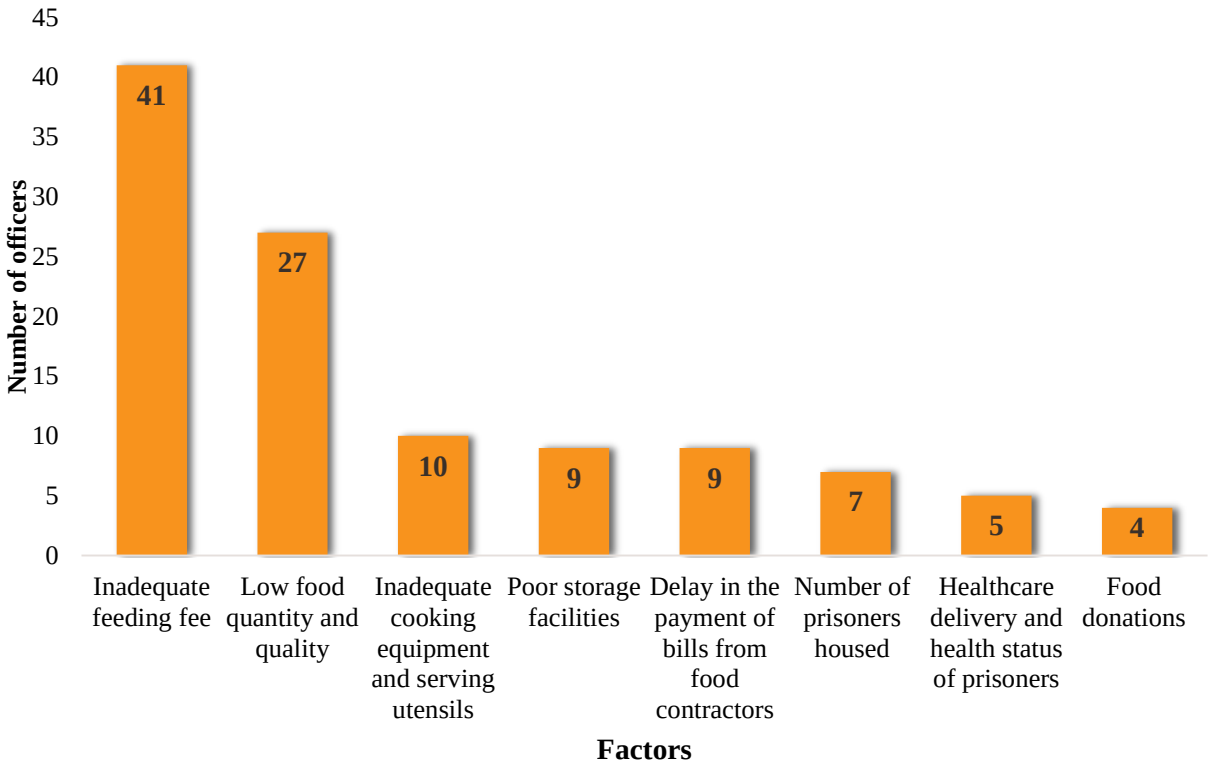

Figure 4.7: Prison officers' perceived factors affecting food and nutrition security of prison inmates

The analysis of interviews conducted with OICs on the factors affecting food and nutrition security did not differ from what were reported by prisoners and prison officers. OICs' major challenges were: inadequate feeding fee for prisoners, the long time it takes for the government to release funds to settle the bills of food contractors and the large number of prisoners in custody. Regarding the feeding fee, OICs expressed serious concern as they indicated that it did not only affect feeding of prisoners but themselves as well, because they were always under stress to give prisoners food as required. The challenges faced by OICs with regard to the feeding fee were given as follows:

> *I will relate it to money, their feeding rate. At every session you are supposed to feed them with 60p which is woefully inadequate (A male OIC).*

> *The feeding situation is not the best due to the inadequate food budget we always give them what food is due them per the food budget (An OIC of a minimum-security prison)*

With regard to the challenge with food contractors, it came up strongly that the government takes a very long time to pay food contractors. This caused contractors to stop supplying food to the prisons; those who still do supply it would be of low quality food stuffs. The reason they gave for this situation was that though prices of food on the market kept rising, the contractor prices given by Prison Service remained the same for a long time. The OICs narrated the challenges as follows:

> *All contractors have stopped supplying except one, because they are not being paid. We do not experience food shortage, but we do experience threats. Should they apply what they are threatening to do there will be shortage of food (a male of a minimum-security prison).*
>
> *The government delays in paying the food contractors; therefore, they are reluctant to supply. But we convince them that government will pay them at all cost, so they should consider and bring the food stuffs for us to feed our prisoners (male OIC of a maximum-security prison).*

4.8 Determining the Coping Strategies Adopted by Prisoners in Times of Food Insecurity

Relying on less preferred foods was a strategy employed often or always by 29.5% and 24.0% of all inmates respectively. This was employed often and always by most inmates in maximum, medium security prisons and often by low security prison inmates. Borrowing food, or relying on help from friends or relatives was also used often or always by 19.2% and 7.3% of prisoners respectively. Details of coping strategies employed by prisoners are presented in Table 4.18.

Table 4.18 Coping strategies adopted by prison inmates in times of food hardship (n=437)

Coping strategy and frequency	Maximum security prison (n=231) n (%)	Medium security prison n (%)	Minimum security prison n (%)	Low security prison n (%)	Total n (%)
Rely on less preferred foods					
Never	42 (18.26)	22 (14.77)	15 (38.46)	5 (26.32)	84 (19.22)
Rarely less than once	34 (14.78)	16 (10.74)	5 (12.82)	4 (21.05)	59 (13.5)
Once or twice a week	28 (12.17)	24 (16.11)	5 (12.82)	3 (15.79)	60 (13.73)
Pretty often	71 (30.87)	46 (30.87)	6 (15.38)	6 (31.58)	129 (29.52)
Always	55 (23.91)	41 (27.52)	8 (20.51)	1 (5.26)	105 (24.03)
Borrow food, or rely on help from a friend or relative					
Never	82 (35.65)	66 (44.3)	21 (53.85)	5 (26.32)	174 (39.82)
Rarely less than once	52 (22.61)	23 (15.44)	9 (23.08)	6 (31.58)	90 (20.59)
Once or twice a week	33 (14.35)	19 (12.75)	3 (7.69)	2 (10.53)	57 (13.04)
Pretty often	46 (20)	29 (19.46)	4 (10.26)	5 (26.32)	84 (19.22)
Always	17 (7.39)	12 (8.05)	2 (5.13)	1 (5.26)	32 (7.32)
Obtained food on credit or in exchange for another resource you have					
Never	133 (57.83)	96 (64.43)	33 (84.62)	8 (42.11)	270 (61.78)
Rarely less than once	44 (19.13)	24 (16.11)	3 (7.69)	7 (36.84)	78 (17.85)
Once or twice a week	24 (10.43)	13 (8.72)	2 (5.13)	3 (15.79)	42 (9.61)
Pretty often	24 (10.43)	11 (7.38)	1 (2.56)	1 (5.26)	37 (8.47)
Always	5 (2.17)	5 (3.36)	0 (0)	0 (0)	10 (2.29)
Harvest immature crops where possible					
Never	185 (80.43)	144 (96.64)	36 (92.31)	14 (73.68)	379 (86.73)
Rarely less than once	20 (8.7)	3 (2.01)	2 (5.13)	2 (10.53)	27 (6.18)
Once or twice a week	7 (3.04)	2 (1.34)	0 (0)	2 (10.53)	11 (2.52)
Pretty often	15 (6.52)	-	0 (0)	1 (5.26)	16 (3.66)
Always	3 (1.3)	-	1 (2.56)	0 (0)	4 (0.92)
Eat less amount of food at mealtimes					
Never	56 (24.35)	30 (20.13)	22 (56.41)	5 (26.32)	113 (25.86)
Rarely less than once	51 (22.17)	25 (16.78)	10 (25.64)	8 (42.11)	94 (21.51)
Once or twice a week	39 (16.96)	23 (15.44)	1 (2.56)	4 (21.05)	67 (15.33)
Pretty often	54 (23.48)	39 (26.17)	2 (5.13)	1 (5.26)	96 (21.97)
Always	30 (13.04)	32 (21.48)	4 (10.26)	1 (5.26)	67 (15.33)
Reduce number of meals eaten in a day					
Never	50 (21.74)	29 (19.46)	21 (53.85)	6 (31.58)	106 (24.26)
Rarely less than once	54 (23.48)	42 (28.19)	9 (23.08)	5 (26.32)	110 (25.17)
Once or twice a week	46 (20)	27 (18.12)	3 (7.69)	4 (21.05)	80 (18.31)
Pretty often	47 (20.43)	24 (16.11)	2 (5.13)	2 (10.53)	75 (17.16)
Always	33 (14.35)	27 (18.12)	4 (10.26)	2 (10.53)	66 (15.1)
Spend entire day without eating					
Never	161 (70)	121 (81.21)	32 (82.05)	19 (100)	333 (76.2)
Rarely/ less than once	42 (18.26)	19 (12.75)	4 (10.26)	0 (0)	65 (14.87)
Once or twice a week	16 (6.96)	8 (5.37)	2 (5.13)	0 (0)	26 (5.95)
Pretty often	10 (4.35)	1 (0.67)	1 (2.56)	0 (0)	12 (2.75)
Always	1 (0.43)	0 (0)	0 (0)	0 (0)	1 (0.23)

Attempt to illegally send food or other prohibited items into the yard					
Never	184 (80)	133 (89.26)	35 (89.74)	15 (78.95)	367 (83.98)
Rarely less than once	33 (14.35)	8 (5.37)	2 (5.13)	3 (15.79)	46 (10.53)
Once or twice a week	4 (1.74)	3 (2.01)	2 (5.13)	0 (0)	9 (2.06)
Pretty often	5 (2.17)	3 (2.01)	0 (0)	1 (5.26)	9 (2.06)
Always	4 (1.74)	2 (1.34)	0 (0)	0 (0)	6 (1.37)
Take and eat food meant for other inmates without their consent/stealing					
Never	204 (88.7)	137 (91.95)	37 (94.87)	17 (89.47)	395 (90.39)
Rarely less than once	21 (9.13)	6 (4.03)	1 (2.56)	2 (10.53)	30 (6.86)
Once or twice a week	1 (0.43)	2 (1.34)	0 (0)	0 (0)	3 (0.69)
Pretty often	4 (1.74)	4 (2.68)	0 (0)	0 (0)	8 (1.83)
Always	0 (0)	0 (0)	1 (2.56)	0 (0)	1 (0.23)
Refuse to participate in reformation and rehabilitation activities					
Never	170 (73.91)	113 (75.84)	37 (94.87)	14 (73.68)	334 (76.43)
Rarely less than once	37 (16.09)	21 (14.09)	2 (5.13)	3 (15.79)	63 (14.42)
Once or twice a week	12 (5.22)	10 (6.71)	0 (0)	2 (10.53)	24 (5.49)
Pretty often	7 (3.04)	5 (3.36)	0 (0)	0 (0)	12 (2.75)
Always	4 (1.74)	0 (0)	0 (0)	0 (0)	4 (0.92)
Instigate other inmates to cause commotion in the prison					
Never	194 (84.35)	135 (90.6)	37 (94.87)	13 (68.42)	379 (86.73)
Rarely less than once	16 (6.96)	4 (2.68)	0 (0)	2 (10.53)	22 (5.03)
Once or twice a week	10 (4.35)	3 (2.01)	1 (2.56)	1 (5.26)	15 (3.43)
Pretty often	5 (2.17)	7 (4.7)	0 (0)	0 (0)	12 (2.75)
Always	5 (2.17)	0 (0)	1 (2.56)	3 (15.79)	9 (2.06)

Prisoners mentioned several activities they performed for the various coping strategies they employed. These activities are presented in table 4.19.

With regard to relying on less preferred foods, prisoners either ate “gar-soakings” or modified the food provided to them by the prison authorities. Additionally, some prisoners also worked for colleagues in order to get food or money to buy food. The activities they performed under this strategy included cooking and washing for others, running errands and going out to work in order to get money. Moreover, prisoners who reported they went to bed with hunger mentioned that they only drank a lot of water during such circumstances before going to bed.

Table 4.19: Specific activities undertaken by prisoners in times of food hardship

Other Coping strategies	**Specific coping strategies**
Engage in religious activities	Fast and pray to God Evangelism Participate in church activities
Call family and friends	Call home for money and food Call friends to send money
Attempt to engage in prohibited acts and instigating other inmates	Fighting Sniffing or smoking weed 'Taxing' other inmates' money and food Stealing Defrauding outsiders Chewing khat to feel high Pretending to have fainted
Rely on family friends or borrow food	Cook or wash for others Fan fire for others who do cook Run errands for other inmates Go out to work for money Call family for money/food
Eat less standard' or less preferred food	Drinking "gari soakings" Modifying[19] the prison food to eat Drinking sugar solution Chewing raw pepper
Obtain food in exchange of belonging or selling	Selling beads Selling provisions Selling personal clothing Exchanging clothes for food or money
Eating less or reduced number of meals	Rationing of food Reserve food for later use Eat once a day
Sleep with hunger	Drink water and sleep Sleep on empty stomach

These were further explored through in-depth interviews with prisoners and some gave deeper explanations to the coping strategies they employed in managing food hardship. For example, prisoners who claimed they exchanged or sold their belongings for food or money said:

[19] Adding more ingredients such as pepper, onions, tomatoes and spices like 'magi' to the prison food

I give out milk, sardines, and other things to get the things I want, but not for money to buy food". Sometimes you may be have things that you may not really be in need of, I always give those things out to people who need them to get what I may be in need of (A female inmate).

I borrow food from my case-partner[20] or at times I beg for food from the Black coat[21] (A male inmate from a minimum-security prison).

Other activities inmates used to cope with their food insecurity situation included going to church in order to benefit from the benevolence of the church.

Sometimes, I go to church programmes so that I can get some of the food being shared to church members though I am not a member of that church (a male inmate).

4.8.1 Association between Characteristics of Prisoners and Coping Strategies

When the unadjusted linear regression model was fitted, it was found that prisoners from the higher security prisons recorded a higher coping strategies index compared to those from the less secured prisons. With regard to overcrowding**,** prisoners who are in overcrowded prisons used more severe coping strategies than those in less crowded prisons. The adjusted linear regression model showed that prisoners from overcrowded prisons scored 4.0 points higher with the coping strategies index compared to those in less crowded prisons (**β**: 4.03, 95% CI: 1.14, 6.92). Also, a positive relationship was shown between level of food insecurity and coping strategies index. More severe coping strategies (higher CSI) were employed by prisoners with higher levels of food insecurity compared to those with lesser or no form of food insecurity. From the adjusted linear regression model, prisoners with moderate and severe forms of food insecurity scored 3.5, and a 9.0-points higher coping strategies index compared to those with no form of food insecurity. Furthermore, the coping strategies index recorded by prisoners who smoked was higher than for those who did

[20] The person with whom the inmate committed an offence and came to prison.

[21] The black coat is an inmate leader selected by prison authorities based on good behaviour and hard work and sometimes the most senior inmate in that prison facility.

not smoke. From the adjusted regression model, non-smoking prisoners scored 1.8 points less with coping strategies index compared to those who smoked (**β**: -1.77, 95% CI: -3.5, -0.05).

Table 4.20: Association between Characteristics of Prisoners and coping strategies among prisoners

	Unadjusted Linear Regression	
	β	**P-value**
Prison Category		**<0.001**
Maximum security prison	0	
Medium security prison	-1.29 (-3.23, 0.65)	0.193
Minimum security prison	-6.82 (-10.01, -3.62)	0.000
Low security prison	-1.58 (-5.99, 2.83)	0.481
Overcrowded		**<0.001**
No	0	
Yes	4.66 (2.19, 7.13)	
Marital Status		0.172
Single	0	
Married	-1.82 (-4.01, 0.38)	
Formerly married	-1.6 (-3.81, 0.6)	
Age		0.600
18-29 years	0	
30-39 years	-1.35 (-3.65, 0.95)	
40-49 years	-1.18 (-3.84, 1.49)	
>=50 years	-1.25 (-3.74, 1.24)	
Duration of imprisonment/months		0.814
4-12 months	0	
13-24 months	0.48 (-2.38, 3.34)	
25-60 months	1.32 (-1.16, 3.81)	
61-120 months	0.25 (-2.3, 2.8)	
>=121 months	1.42 (-1.74, 4.58)	
Sex		0.086
Male	0	
Female	-5.85 (-12.54, 0.83)	
Crime Type		0.984
Serious offenses (felonies)	0	
Misdemeanours	-0.03 (-2.55, 2.5)	
Received Support		0.774
Yes	0	
No	-0.27 (-2.15, 1.6)	
Educational Level		0.078
No education	0	
Primary education	1.63 (-1.32, 4.58)	

Junior high	-0.71 (-3.46, 2.04)	
Senior high	2.44 (-0.42, 5.3)	
Tertiary	2.16 (-2.42, 6.73)	
Employment before prison		0.282
Formal employment	0	
Informal employment	1.92 (-0.95, 4.78)	
Not employed	3.16 (-0.93, 7.24)	
Work while in prison		0.888
Yes	0	
No	-0.16 (-2.47, 2.14)	
Previous incarceration		0.193
Yes	0	
No	-2.56 (-6.43, 1.3)	
Vigorous intensity activity		0.262
Yes	0	
No	1.52 (-1.14, 4.19)	
moderate intensity activity		0.728
Yes	0	
No	0.32 (-1.48, 2.12)	
Recreational activity		0.659
Yes	0	
No	0.57 (-1.96, 3.1)	
sedentary		0.368
Yes	0	
No	-0.82 (-2.62, 0.97)	
Food Insecurity Status		**<0.001**
Secure	0	
Mild	0.32 (-3.82, 4.47)	
Moderate	3.05 (-2.62, 8.71)	
Severe	10.02 (7.3, 12.73)	
Diet Diversity		0.824
Low	0	
Medium	-0.25 (-2.48, 1.97)	
Alcohol intake		0.319
Yes	0	
No	0.91 (-0.89, 2.72)	
Smoking		**0.015**
Yes	0	
no	-2.23 (-4.02, -0.44)	

Table 4.21: Association of Characteristics of Prisoners on coping strategies index.

	Adjusted Linear Regression	
Variable	**β**	**P-value**
Prison category		**0.005**
maximum security prison	0	
medium security prison	-1.19 (-3.12, 0.73)	
minimum security prison	-4.57 (-7.5, -1.64)	
low security prison	3.72 (-0.68, 8.13)	
In overcrowded prison		**0.006**
No	0	
Yes	4.03 (1.14, 6.92)	
Marital Status		0.564
Single	0	
Married	-1.05 (-3.74, 1.64)	
Formerly married	-1.48 (-4.23, 1.26)	
Age		0.664
18-29 years	0	
30-39 years	-0.58 (-2.93, 1.76)	
40-49 years	-0.44 (-3.44, 2.57)	
>=50 years	0.89 (-2.31, 4.1)	
Duration of imprisonment in months		0.314
4-12 months	0	
13-24 months	1.11 (-1.38, 3.6)	
25-60 months	1.03 (-1.18, 3.23)	
61-120 months	2.51 (0.09, 4.92)	
>= 121 months	2.37 (-0.76, 5.5)	
Sex		0.221
Male	0	
Female	-3.72 (-9.69, 2.25)	
Crime type		0.148
Serious offenses (felonies)	0	
Misdemeanours	1.7 (-0.61, 4.01)	
Received Support		0.579
Yes	0	
No	-0.47 (-2.13, 1.19)	
Educational Level		0.104
No education	0	
Primary education	1.78 (-0.8, 4.36)	
Junior high	-0.4 (-2.82, 2.03)	
Senior high	1.58 (-1.11, 4.26)	
Tertiary	3.81 (-0.7, 8.32)	
Employment before prison		0.1503

Formal employment	0	
Informal employment	2.4 (-0.37, 5.18)	
Not employed	0.63 (-3.22, 4.48)	
Working while in prison		0.516
Yes	0	
No	0.69 (-1.4, 2.78)	
Previous incarceration		0.305
Yes	0	
No	-1.77 (-5.16, 1.62)	
Vigorous intensity activity		0.645
Yes	0	
No	0.57 (-1.87, 3.01)	
moderate intensity activity		0.755
Yes	0	
No	-0.25 (-1.84, 1.33)	
Recreational activity		0.672
Yes	0	
No	0.49 (-1.78, 2.75)	
low Recreational		0.925
Yes	0	
No	0.08 (-1.52, 1.67)	
Food Insecurity Status		**<0.001**
Secure	0	
Mild	-0.24 (-4.48, 4)	
Moderate	3.51 (-2.31, 9.33)	
Severe	9.03 (6.27, 11.79)	
Diet Diversity Score		0.562
Low	0	
Medium	-0.58 (-2.55, 1.39)	
Alcohol intake		0.57
Yes	0	
No	0.48 (-1.17, 2.12)	
Smoking		**0.044**
Yes	0	
No	-1.77 (-3.5, -0.05)	

4.8.2 Coping Strategies of Prison Officers as Food Providers in the Prisons

The major coping strategies according to other prison officers and OICs were: relying on produce from prison farms and appealing for donations.

Prisons farming as a coping strategy of OICs

Findings from the survey conducted with prison officers and IDIs with OICs revealed that prisons engaged in farming. All the prisons engaged in some form of farming activity. While some prisons were into larger scale farming, others engaged in backyard gardening where they produced vegetables such as garden eggs, green leaves, pepper and okro. The prisons that engage in large scale farming included Nsawam Mediun Security Prison, Amanfrom Camp and Duayaw Nkwanta Camp Prisons. These prisons produce food in large quantities and supply to other prisons in their respective regions.

Food Donations

The OICs expressed mixed feelings about food donation and its impact on food security of the prisoners. They reported that food donations were received in rather small quantities, especially for prisons with large numbers of prisoners. They reported that irrespective of the quantities they received, these donations always help to improve the quality and quantity of prisoners' food and contributed to peace and calm among prisoners in the yard.

The narratives below describe the coping strategies of OICs as reported:

> *During food hardship, we appeal for food donations (An OIC);* and:
>
> *Donations affect prisoners in a positive way. We use the donations to supplement their ration because the feeding rate is 1.80p and is not enough. (An OIC).*
>
> *Whether there is donation or not, the prisoners will eat their regular food, but donations help to improve the quality of the meals. Prisoners are always happy when they receive*

donations and it brings calmness in the prison yard thereby helping us to maintain a peaceful environment (An OIC).

Normally we appeal for some donations and people also come to donate on their own. They don't bring enough so we have to gather them till we have enough to cook for them. For instance, we need about 20 bags of rice before we can cook a meal but people come to donate like two bags so we gather the donations until we have enough before we can cook for them (An OIC).

4.8.3 Prison Officers' Perspectives on Importance of Prison Agriculture to Food and Nutrition Security of Prisoners

Both the OICs and other officers expressed their views on prison agricultural activity and how it contributed to food security (availability and quality), served as a skills training programme for prisoners and contributed to closing the funding gap in the face of dwindling government subvention to the Prisons Service. It was revealed that about a quarter of prisoners' total consumption requirement for starchy staples per annum was supplied by prison farms at subsidized prices (50% less of market price). Additionally, officers reported that about half of prisoners' total vegetable (pepper, garden eggs) consumption per annum was supplied by prison farms. For example, it was revealed during one of the IDIs that, for the 2019 production year, a total revenue of GHC 1,594,824.43 was realized from prison farms nationwide. Officers revealed that part of the profits realized from farms was ploughed back into farming and also used to support the Prisons Service Administration for general administration of the prisons. The main problem of the farming activities as reported by the agricultural officers was inadequate farming equipment and the resultant lack of expansion of agricultural activities in the prisons. Tables 4.18 and 4.19 give the breakdowns of farming activities undertaken in the prisons selected and revenue and expenditure

on farming activities in the prisons. Officers reported that the major challenges of their farming activities was lack of farming inputs such as machinery and capital. Some of the responses include:

> *As I said earlier, the money is small but we in our small way try as much as possible to supplement with farming. We cultivate vegetables to supplement their feeding. We also make sure we have enough buffer stock. Had it not been for the farming activities, it would have been extremely difficult (an OIC of the medium security prison).*
>
> *The Service has thousands of acres of viable land for farming. We can be self-sufficient in food production if we embark on mechanized farming with support from government, other relevant stakeholders and benevolent organizations in terms of support with farm machinery and other farming inputs. For instance, the Prison Service is endowed with thousands of acres of viable land but only a small proportion is cultivated due to lack of farming inputs. (Agricultural officer)*

Table 4.22: Agricultural activities undertaken in the prisons selected

Prison establishment	Agriculture activities undertaken				
	Starchy staples	**Animal husbandry**	**Cash crops**	**Legumes and nuts**	**Vegetables**
Nsawam medium security prison	maize	Poultry Piggery Rabbit rearing	Palm plantation	Beans	Cabbage Pepper lettuce
Ankaful maximum security prison	Nil	Nil	Nil	Nil	Okro Green-leafy vegetables Garden eggs
Kumasi central prison	Nil	Nil	Nil	Nil	Garden eggs Okro Green leaves
Tamale central	Nil	Nil	Nil	beans	Garden eggs, okro, pepper
Obuasi local prison	maize	Nil	Palm plantation	Nil	Garden eggs, pepper
Winneba Local prison	Nil	Nil	Nil	Nil	garden eggs, okro
Yendi Local prison	Maize	Nil	Nil	Beans, groundnuts	Pepper, garden eggs Onions okro
Amanfrom camp prison	Maize Cassava	Rabbit rearing Piggery Poultry	Palm plantation	Beans	Pepper, garden eggs Cabbage Lettuce
Duayaw-Nkwanta camp prison	Maize Cassava	Piggery Poultry	Palm plantation Teak Acacia Cashew	Beans	Pepper Garden eggs Okro Green leaves Moringa
Nsawam female prison	maize	Rabbits rearing	Nil	Nil	Pepper Garden eggs Okro Green leaves
Tamale female prison	Nil	Nil	Nil	Nil	Green leaves Okro Garden eggs

Table 4.23: Farming activities, revenues, and percentage of annual total consumption met from 2018-2020

Year	Total Revenue (GHC)	Total Expenditure (GHC)	Profit (GHC)	% of total prison consumption requirement met
2018	1,277,671.41	900,748.41	376,922.81	15
2019	1,594,824.43	930,377.33	664,447.10	26
2020 (Projected)	2,334,906.90	1,343,913.30	1,342,913.30	27.3

Table: 4.24: Matrix of key findings and line of discussions

Objective	Key findings	Discussion points
5.1 To determine food insecurity status of prisoners (this objective measured the access component of food insecurity)	• Only 8.9% of inmates were found to be food secure with 91.1% being food insecure while 83.3% of the food insecure were severely food insecure. • The quality domain of food insecurity was found to be the most predominant in the prisons, followed by the quantity domain of food insecurity.	• The discussion was be based on comparison of finding to other findings reported previously. • Expected and new findings in relation to existing conceptual framework guiding the study. • Implications of the findings to prisoner health. • Implications of findings for prisoner management.
5.2 Determination of adequacy of diets of prisoners	• Dietary diversity scores (DDS) reduced across three days of food recalls from 3.19 ± 1.06 to 2.73 ± 1.14. • Average DDS for the three days was low (2.90±0.7). • More than two-thirds of prisoners (79.4%) had low dietary diversity and only 20.6% had moderate diet diversity. • Working while still in prison and receiving support from family and friends from outside the prison had significantly positive associations with moderate diet diversity.	

	• With regard to nutrient intakes of prisoners, carbohydrate was the only nutrient met by more than 50% of prisoners. • There was a significant positive correlation between diet diversity score and nutrient intake ($p<0.0001$), that is as diet diversity increased, mean nutrient intakes also increased.	• Policy call/action and direction.
5.3 Nutritional status of prisoners	• 67% of prisoners had normal nutritional status (BMI $\geq 18.5 Kg/m^2 – 25 Kg/m^2$) and 6% of prisoners were underweight ($BMI<18.5 Kgm^2$). • Also, 95% of prisoners had normal MUAC ($\geq$22cm for women and $\geq$23cm for men) • There was a significant positive correlation between BMI and MUAC of inmates ($r = 0.33$, $p<0.05$)	

5.4 Factors affecting food and nutrition insecurity of prison inmates	• There was no statistical association between background characteristics of prisoners and food insecurity.
	• Qualitatively, the major themes that emerged from interviews with prison inmates and prison officers as factors affecting food insecurity status of inmates include:
	  ○ The feeding grant for prisoners
	  ○ Poor food quality
	  ○ Family visits and support
	  ○ Health status (disease states of prisoners)
	  ○ Anxiety and depression
	  ○ Drug use among prisoners
	  ○ Poor cooking and lack of storage facilities in the prisons for prisoners
	• With regard to nutritional status, food insecurity was found to be a statistically significant predictor of nutritional status using BMI.
	• Additionally, prison category, previous incarceration and recreational activity were	

	found to be significant predictors of nutritional status of prisoners when MUAC was used.	
5.5 Coping strategies of prisoners in times of food hardship	• Relying on less preferred foods as a coping strategy was employed often or always by 53.5% of prisoners and this was employed most by prisoners from the maximum-security prison category • Borrowing or seeking help from family and friends was also employed often or always by about 26.5% of inmates. • Relying on produce from prison farms and appealing for food donations were the major coping strategies employed by prison officers. • Prison category, overcrowding, food insecurity, and smoking status were significantly associated with coping strategies indexes of prisoners in Ghana's prisons.	

CHAPTER FIVE

5.0 DISCUSSIONS

This chapter discusses the results of the study and compares them to previously reported findings by other researchers on the issues under study. The discussion is based on the objectives of the study including food insecurity prevalence among prisoners; nutrition status of prisoners; adequacy of diets of prisoners; the factors driving food insecurity and nutrition status of prisoners and the coping strategies adopted by prisoners in times of food hardship in Ghana's prisons. The chapter also gives the strengths and limitations of the study and ends with the study's contribution to knowledge.

5.1 Food Insecurity Status of Prisoners in Ghana's Prisons

The first objective of the study was to determine the food insecurity status of prisoners. The finding of this study with regard to food insecurity prevalence among inmates mirrors the high prevalence of food insecurity in African prisons as reported by several authors in previous studies (Dong, et al. 2018; Gould et al. 2013; Moloko et al. 2018; Moloko et al. 2017; Moloko and Kamkwamba 2018; Todrys and Amon 2011; Topp et al. 2016). For example, in Malawi, Moloko et al (2017) & Topp et al., (2016) reported 95% and 85% severe food insecurity prevalence among participants in their studies which aimed to assess the socioeconomic characteristics of prisoners and food insecurity, and drivers of health of prisoners respectively. In Dong et al (2018), the authors found insufficient access and availability of quality food to be a major challenge for 73% of their study participants.

The finding of this study is also consistent with reports of the UN Special Rapporteur on Prisons and Places of Detention to 13 prisons in Malawi; reports of Amnesty International on prisons in Ghana and Chad; the Office of the High Commissioner for Human Rights (OHCHR) as well as

the United Nations Integrated Peace missions in Sierra Leone (UNIPSIL). These reports revealed serious food insecurity conditions in all the prisons visited by officials of these human rights advocacy institutions (Amnesty International, 2012; Chirwa, 2001; OHCHR & UNIPSIL, 2012). The authors revealed that monotonous and less preferred diets that were deficient in quality and quantity were major common characteristics of diets in all prisons visited. Additionally, they found food shortage in some prisons including those in the Congo and Sierra Leone (OHCHR & UNIPSIL, 2012; Refugee Documentaion Centre, 2002). The result on proportion of food insecure and food secure prisoners (91.1% vs 8.9%) is also similar to what was reported (96% vs 4%) among Afghan refugees in Pakistan (Khakpour, Iqbal, GhulamHussain, et al., 2019).

Food has also been found to be one important commodity that strengthens and fosters peaceful inmate relationships in the prisons (Godderis., 2006; Wilson, 2008). Thus, it has been suggested that the chronic existence of food insecurity in the prisons has a tendency to undermine prison security because it fuels aggression and destabilizes mental states of prison inmates (Bulten, 2010; Graaf & Kilty, 2016). The authors therefore suggest that if left unresolved, the presence of chronic food insecurity in prisons could be a recipe for unrest among inmates.

It has also been noted that adequate dietary intake has a positive impact on good behaviour (Gesch, 2013). A case control study that was done in a young adult prison in the UK found that when nutrients (vitamin D, minerals and essential fatty acids) that were low in inmates' diets were increased for the treatment group through food supplements, there was a significant reduction (26%) in prisoner offences compared to the control group while those consuming real supplements recorded 37% less of the most serious offenses committed in the prisons (Gesch, 2013). Optimal diets may be a game changer in the reformation of inmates and subsequently reduction in recidivism. It also has tendency towards enhancement of public safety because it stands as a

commodity that can keep inmates calm and happy while also helping to stabilise their mental states and generates good behaviour. Hence, the time is ripe for all relevant stakeholders including Ghana Prison Service, private sector; other Ministries Departments and Agencies (MDAs), for example, the Ministry of Agric to come together for concerted efforts at improving the diets of prisoners

The chronic existence of food insecurity in Ghanaian prisons is a public health concern expressed by both prison inmates and prison officers. The reason is that food insecurity leads to sub-optimal diets and subsequently malnutrition and impaired health status (Afshin et al., 2019; Global Panel on Agriculture and Food Systems Nutrition, 2017). This then means that it could be putting a huge burden on the prison healthcare delivery system which has already been found by Sarpong et al (2015) to be inadequate. Thus, the need for government and prison authorities to devise workable public health interventions such as providing adequate budgetary allocation for food and reducing overcrowding to address the food insecurity problem among this group of vulnerable people cannot be overemphasized (Dong et al., 2018; Gould et al., 2013; Jones, 2017).

Food insecurity has also been found to present numerous implications for disease treatment uptakes including HIV/AIDS and health outcomes among inmates (Dara et al., 2013; Wang et al., 2013). For example, Wang et al (2013) found a positive significant association between food insecurity and HIV risk behaviours such as engaging in unprotected sex among persons recently released from prison. In Kenya and Namibia, food insecurity was identified as a major barrier to uptake of HIV/AIDS treatment among prisoners (Rachel, Kigaru, & Nyamota, 2018; Shalihu et al, 2014). It is worthy of mention that in the Ghana Prisons Service, there is an intervention for HIV prevention and control among prisoners (Ghana Prisons Service, 2011). It is not known how this finding of high food insecurity in the prisons could be impacting on HIV treatment uptakes and

outcomes in Ghana's prisons and the consequences for society's health since prison health is a major component of the health of the entire public. The high prevalence of food insecurity in the prisons reported in this study may suggest the need for further research to assess the impact of food insecurity on transmission of HIV and communicable diseases and their treatment in Ghana's prisons.

It is suggested, therefore, that any strategy that may be directed at addressing the problem of food insecurity among prisoners needs to be targeted so that prisoners who are most vulnerable to food security could be reached.

5.3 Adequacy of diets of prisoners

5.3.1 The use of dietary diversity scores in assessing diet adequacy

Generally, the diversity in diets of prisoners is low (Table 4.5); a higher proportion (79%) of prisoners have low dietary diversity. Additionally, the result did not show significant variations in DDS across various prison categories, and average DDS for prisoners from the low security prison category also falls within the low DDS category. The low security prison category is made up of open prisons that are meant for agricultural production, and as reported in other studies (Fagan, 2019; Food Tank.Com, 2018; Moloko et al., 2018), one may expect an enhanced food access and variety in the diets of prisoners from these prisons. The low DDS among prisoners from these farming prisons may suggest that agricultural activities in the prisons are currently not having the expected impact on quality and variety in diets of prisoners. This may be because, the foods being purchased by the Prisons Service (cereals and palm fruits) are also the ones mainly grown on prison farms. Meanwhile, one of the major objectives of prison agriculture is to enhance food availability as well as nutritional provisions for prison inmates (Ghana Prisons Service, 2013a).

The low diversity of diets in farming prisons also brings to the fore the need to highlight nutrition sensitive agriculture in order to make the needed impact on the quality of diets of prisoners. According to the Food and Agriculture Organization of the United Nations, one way of making agriculture nutrition sensitive is to ensure the cultivation of diversified crops in sustainable ways to enhance availability of nutrient-rich foods such as vegetables, legumes and pulses and green leafy vegetables (FAO, 2015). Nutrition sensitive agriculture also makes nutrition promotion and education a priority (Dufour, 2015).

Another challenge with the diet of prison inmates is the monotony of foods served, as the meals of inmates have been the same for all days of the week. The monotony of diets has a tendency to compromise prison security as it may not only bring disgruntling among inmates but may also cause waste because prisoners may prefer consuming food from other sources including family and friends rather than the prison food provided with taxpayers' 'money. In their attempt to increase nutritional quality of their food, prisoners smuggle all kinds of prohibited items through food from outside into the prison.

The low diet diversity and inadequate nutritional content of diets of Ghanaian prisoners as reported in this study are not surprising because poor quality nutrition and low adequate daily food provisions for prisoners were found in prisons in Uganda, Mozambique, Malawi, Nigeria, Mali, South Africa, Benin, Zimbabwe, Zambia and Cameroon (Hout & Mhlanga-gunda, 2018). The inadequacy of prison food in terms of quality and quantity was reported by both prison inmates 76 (96%) out of the 79, and prison officers interviewed in Zambian prisons (Topp, Moonga, Luo, et al., 2016). It was revealed that inmates were served with inadequate food including unsalted maize porridge for breakfast and cooked corn meal and beans with herrings for lunch and supper which

were served together (Topp, Moonga, Luo, et al., 2016). Additionally, Moloko et al (2017) reported that in Malawi, prisoners were served only one meal a day. The meal was made up of maize meal (Nshima) and sauce made from beans, and the diets did not meat dietary requirements (Amnesty International, 2012b).

It is not surprising to find low intakes of micronutrients among Ghanaian prisoners. Micronutrient consumption has been found to be generally low in developing countries (Govender et al., 2017). The author argues that this trend is attributable to the consumption of inadequate diets. Additionally, the finding is not surprising, given the amount of money allocated for feeding of prisoners in Ghanaian prisons. One of the major drivers of poor nutrition among vulnerable populations has been found to be low purchasing power (Global Panel on Agriculture and Food systems Nutrition, 2017). The low nutritional intakes of prisoners found in this study is inconsistent with what has been reported in Georgia, Australia and England (Cook et al., 2015; Edwards, Hartwell, Reeve, et al., 2007; Hannan-jones & Capra, 2017) but it is however not surprising. The authors noted that inmates in those high-income countries were served with adequate meals including fruits and vegetables, with special meals for the sick and other inmates on special diets that meet nutritional requirements including energy and micronutrients. Surprisingly, another study in Kenya found that while inmates' nutritional provisions met recommended dietary intakes for most essential micronutrients (including B-vitamins, zinc, vitamin A), none of the participants met requirements for energy, fat and polyunsaturated fatty acids (Rachel et al., 2018). It has been noted that, prisons food provision is more complex is usually thought of. (Edwards, Hartwell, & Schafheitle, 2007b). The authors argue that what may seem good food for one prisoner may not be considered so by another prisoner due to differences in

acceptability and preference. Hence, it is important to consider all these issues when designing prison menus in addition to ensuring a balance of nutrients and variety in the menus.

The mean DDS (2.7± 1.2) reported in this study, though of a different vulnerable group, is lower than what was reported (4.0 ±1.6) by Zereyesus et al (2014) in their baseline study conducted among women of reproductive age in the Northern region of Ghana (Zereyesus et al., 2014) and mean DDS of 5.1±1.7 reported among women with children below five years in a Sahelian rural area in Burkina Faso (Sawadogo et al., 2005). Though one may argue that these are different populations and therefore may not be comparable, it is important to note that the groups are similarly vulnerable to food insecurity and when it comes to suboptimal diets, they are also affected in similar ways; they are unable to avoid the condition due to limitations in their economic power and in their ability and freedom to choose (WHO, 2005). It is also worthy of note that those studies used higher numbers of food groups ranging from 12 to 14 and that may have accounted for the better mean DDS(s) reported.

The low diversity in the diets of prisoners has also reflected in inadequate intakes of both macro and micronutrients as has been consistently reported in several other studies (Ellie & Rolfes, 2008; Falciglia, et al., 2009; Kennedy, 2009; Mirmiran et al ., 2004; Wright, Bentley, Mendez, & Adair, 2016). For example, Ellie & Rolfes (2008) noted that adequate diets are achieved when a variety of foods are selected for each day's meals. Other studies have also reported a positive correlation between dietary diversity score and micronutrient adequacy of the diets of individuals and households (Falciglia et al., 2009; Kennedy, 2009; Mirmiran P et al., 2004; Wright et al., 2016). Diet diversification has been recommended as a useful approach to alleviating problems emanating from low nutritional intake due to inadequate food access.

There is no single food that contains all essential nutrients in adequate amounts for a healthy and active life (Kennedy, 2009). In a study conducted to assess the use of DDS as an indicator for measuring micronutrient intake in children between 24-71 months old, a positive correlation between probability mean adequacy (MPA) and DDS was found, and DDS was found to have contributed to the achievement of the majority of selected micronutrients (Kennedy et al., 2007).Though their population of interest was different from that used for this study, the authors found that a DDS of five or more helped to achieve an MPA between 50% to 70%. In another study to assess the use of DDs as a good indicator of micronutrient intake in 24-71 months old children breastfeeding it was found that intake of individual micronutrients was correlated with the Pearson correlation co-efficient between PMA and DDS (0.36, $p < 0.001$) and intake of individual micronutrients was correlated to DDS for most nutrients. The study concluded that DDS of at least 5 may help to achieve MPA of 50% to 70% (Kennedy et al., 2007). Furthermore, Nti (2011) and Sawadogo et al., 2005) also found a positive linear relationship between DDS and nutrient intakes among study participants, using a similar study design, with the aim to assess the association between DDS and nutrient intakes and nutritional status of children in Ghana. The author (Nti, 2011) found that as DDS increased, nutritional status also improved and nutrient intakes also increased.

Food provisioning affects all aspects of prison life including daily routines, access and utilization of food, and strict time schedules etc. (Godderis., 2006). It was observed that inmates were expected to wake by 6:30 GMT and prepare for early morning security checks (morning unlock[22]). After the roll call, they have about an hour at their disposal to clean, exercise, or execute other

[22] Opening and counting of prisoners first thing in the morning before any other activities begin to ensure that the number of prisoners in custody is intact.

personal hygiene activities. Serving of breakfast then begins at about 7:30 GMT. After the early morning rituals, there was what was usually called "deployment of inmate" to various schedules, programmes and activities based on their existing circumstances. These deployments may include groups that go out to work, those who work in prison workshops and farms. Some go to court if they are needed there, while others go to hospitals, schools, offices etc. All these activities occur daily and usually end in the afternoon (3:00 GMT).

When all prisoners return from their various schedules, they assemble again for lunch/supper, after which they undergo afternoon lock-up procedure for roll call which usually happens at 5.00 GMT (afternoon lock-up[23]). For prison authorities, safe custody of prisoners is a core component of their mandate and they work round the clock to ensure this is carried out to the letter. It must be noted that, these strict daily procedures and the challenge of food insecurity in the prisons may cause prisoners to adopt all kinds of coping strategies to be able to survive prison life.

5.3.2 Association between prisoners' characteristics and diet diversity

Receiving support in the form of food or money from family relations and friends and working while in prison were positively associated with the diet diversity score of prisoners. This finding is not unusual among prisoners. Receiving monetary support increases prisoners' purchasing power and enhances their ability to acquire other food items to supplement what they are given by prison authorities.

Additionally, direct food support from prisoners' relations enhances their intake of diverse foods since those kinds of foods may be preferred to prison food. This finding confirms what Moloko et al (2017); Ravaoarisoa et al (2019) & Topp et al (2016) reported in their respective studies in

[23] A time in late afternoon usually between 4:00hours-5:00hours when prisoners after all day's routines are locked up in their cells for roll call and they remain locked up till the next morning.

Malawi, Madagascar and Zambia. For example, in Madagascar, it was reported that prisoners who received food and monetary assistance from family visits had improved intakes for energy and other nutrients (Ravaoarisoa et al., 2019). Additionally, Moloko et al., (2017) found that the number of meals per week received from prisoners' relatives which was also dependent on proximity of prisoners' homes to the prison in which they were kept; education and socio economic status of prisoners were predictive factors for increased intake of diverse foods.

The above discussions also suggest that receiving support from outside while in prison is a protective predictor of food security and subsequent intake of diverse foods in prison. Efforts must therefore be made to enhance family support in ways that are sustainable. It must be re-emphasized that not all prisoners receive support from relations, and prison authorities still have the duty to ensure adequate diets for all inmates at all times. Furthermore, given that most prohibited items (82%), especially illicit drugs found the in prisons, came in through food items brought to inmates by family and friends (Omane-Addo, 2016), it is important for prison authorities to ensure vigilance at the entry points to the prisons. This will help to ensure that no prohibited items get into the prisons through food from outside, thereby promoting prison security and ultimately, public safety.

5.4 Nutrition status of Ghanaian prison inmates

The third objective of the study was to determine the nutritional status of prison inmates. The majority (67%) and (99.5%) of inmates have normal BMI and MUAC respectively. The proportion of prisoners with underweight is 6% and 27% of inmates were overweight or obese.

It is surprising to find that the majority of prisoners fall within normal range for BMI and MUAC, given the high prevalence of food insecurity reported in this study. Nevertheless, there may be

some underlying explanations to this finding. One key thing that may explain this finding is that many prisoners (85.6%) get enough carbohydrates from their diets as found in their nutrient intakes (Table 4.8). Additionally, the observed livelihood routines of prisoners that is, waking up and being counted by prison authorities at 6:00hours as well as having very limited time for "personal administration"[24] after which the majority are locked up back in their cells till it is time to be countered in the evening may also account for this. Again, the overcrowding situation in the prisons coupled with lack of infrastructure for physical activity for prisoners, renders many of them inactive and these could have had a bearing on their weight. Another issue that may explain this finding is the support prisoners receive from outside which could have impacted their feeding positively. Finally, it could be that prisoners came into prison already well-nourished, and the pre-prison weight may have influenced their weights. These attributes which are still subject to further investigations may have influenced the nutritional status of prisoners reported in this study.

The proportion (67%) of inmates with normal nutritional status in this study is higher than the finding (63.5%) reported in a recent, similar study among prisoners in Bangladesh Tangail prison and the (38.4%) reported in another recent similar study among women prisoners in Antanimora prison in Madagascar (Pingali et al., 2017; Ravaoarisoa et al., 2019). Additionally, the proportion of underweight inmates (6%) reported in this study is lower than the 14.2% reported in a similar study among prisoners in Iran (Khodabakhshifard et al., 2014).

The finding in this study on proportion of underweight inmates is also lower compared to that reported in a case control study among prison inmates in Cote d'voire (Alonso et al., 2018). Furthermore, the proportions of overweight (22%) is similar to a previous finding reported among

[24] Activities undertaken by prisoners from morning till evening. These include waking up, personal hygiene activities, appearing in the sun, food service and other livelihood strategies.

prisoners in the Ashanti region of Ghana by Agyapong et al (2018). But the proportion of overweight (22%) and obese (5%) inmates reported in this study are higher than the 4.8% and 1% respectively, reported in a similar study among Iranian prisoners (Khodabakhshifard et al., 2014). Moreover, the result is also lower compared to a similar study recently conducted among prisoners in Italy (Nucci, et al, 2019).

Again, it is not surprising that even though there is a high prevalence of perceived food insecurity and sub-optimal diets in the prisons, 27% of inmates were found to be either overweight or obese. It has been found that prison environments tend to be obesogenic due to low physical activity, high calorie diets and limited opportunities available to keep prisoners engaged in other meaningful activities during the day (Johnson et al., 2018). For example, the lack of space and inadequacy of rehabilitation facilities found in most prisons in Ghana could further explain the overweight-obesity result found among prisoners. Another explanation may be body composition, as it has been noted that obesity does not differentiate between fat and fat-free mass and so BMI may not be indicative of fat accumulation (Tang et al., 2016). However, the current study is unable to attribute the weight gain reported among inmates to their imprisonment since it is a cross-sectional study with no baseline data to compare the result with.

The result also suggests that, as the Prison Service advocates for support from relevant stakeholders to enable it to fulfil its mandate of providing adequate diets for inmates, it must also take measures to address the overweight and obesity epidemic occurring among inmates in Ghana's prisons as this has far-reaching effects on the health of prisoners (Agyapong et al, 2018). Proper meal planning, adequate nutrition and lifestyle education for inmates in addition to adequate physical activity and rehabilitation programmes, may help to address the challenge of weight gain among prisoners.

5.5 Factors affecting food security and nutritional status of prisoners

The current study did not find evidence of any statistical associations with characteristics of prisoners and their food insecurity status.

This result is inconsistent with that of Moloko and colleagues who studied the socio economic characteristics of prisoners and their effect on food insecurity status of prisoners in Malawi (Moloko et al., 2017). The authors found the age and economic status, budgetary allocation for prisoner food and educational status among others, to be significant predictors of food insecurity. Additionally, distance of the prison from home of prisoner and size of prison farmland under cultivation were also significant predictors of food insecurity in Malawian prisons (Moloko et al., 2017). The result is also in contrast to what was reported in a study by Wang and colleagues with the aim to determine the prevalence of HIV risk factors among food insecure ex-prisoners (Wang et al., 2013). The authors found substance abuse to be a significant risk factor for food insecure inmates, and also, ex-prisoners who were food insecure indulged in the use of substances more than the food secure.

The lack of significant associations between prisoner characteristics and food insecurity may be because prisoners provided information that might be expected; they have similar characteristics, and are exposed to the same prison conditions. Hence, the measured characteristics did not differ significantly among them. However, when this was further explored from prisoners and prison officers' perspectives, resource constraints; control of resources among prisoners, external support, health status, and prisoner population emerged as determinant factors of food insecurity in the prisons. For example, prison officers revealed that they faced challenges feeding prisoners adequately in highly populated prisons. These issues do not only affect quality and quantity of

food but also the general feeding conditions including food storage facilities. The finding on resource constraints and resource control as major influencers of food insecurity among prisoners is not unique to this study. For instance, Frayne et al (2014 cited in Escort-Stamp, 2015), noted that low financial resource is a major influencer of food and nutrition insecurity among vulnerable populations.

With regard to resource control and power dynamics, inmates who held positions in the prisons were also better off with access to food and the freedom to choose which form their food (cooked or uncooked) should be served. It is worth mentioning that being an inmate leader does not come easily. Inmate leaders are appointed based on good behaviour and hard work and sometimes number of years served. They play different roles to help prison officials in the management of prisoners including ensuring discipline, counting of prisoners, leading gangs (groups that go to work outside the prison) etc. Again, this finding is not unique to this study. It has been reported in Zambia for instance, where a research found a five-age hierarchical system ranging from cell captains, to arbitrators, 'policemen' etc. among inmates (Topp, Moonga, Luo, et al., 2016).

The use of qualitative methods to explore factors affecting food insecurity of prisoners has been previously reported by many researchers (Abbott et al., 2018; Davison et al., 2019; Huberland et al., 2019; Rachel et al., 2018). For example, in a recent qualitative study done by Rachel and colleagues on dietary intakes and factors affecting food service of male prisoners in four prisons in Kenya, low quality of prison food, low budgetary allocation for food, prisoner population, food preparation and hygiene systems, among other things, were found to be the major food insecurity themes that emerged from prisoners and prison officials. These factors mostly influenced food service decisions for prisoners (Huberland et al., 2019; Rachel et al., 2018). Prisoners' health

status, family and friends' visits and prisoners' economic status (money issues) identified in this study also concur with what Abbott et al (2018); Davison et al (2019) and Huberland et al (2019) reported in their various studies. However, using a qualitative method to explore factors affecting food insecurity of prisoners in Ghanaian prisons is unique to this study because it has given a deeper understanding and insight into the issues affecting food security which could not be unearthed through the quantitative measures employed.

Food insecurity has been identified in this study as the single, most negative, significant predictor of BMI, while prison category, previous incarceration and recreational activity were also significant predictors of MUAC of prisoners.

Surprisingly, mean MUAC of inmates in the low security prison was reduced compared to prison inmates from the maximum prison category (ß: -0.28, 95% CI: -3.14, 2.26). The low security prison category comprises prisons that are more spacious and have resources for farming. Additionally, inmates in these prisons have better interactions among one another and this may have reflected in their food consumption and subsequently, their nutritional status. The higher MUAC status of prisoners in the maximum-security prison could also be due to the generally observed trends in these prisons where most of the prisoners are high profile criminals like the "die-hard" armed robbers and drug barons, some of whom even have financiers sponsoring them in prison. These attributes may have influenced their access to better diets and this may explain their better MUAC status. Also, because of the high security risk posed by most of the inmates in these prisons, they are not allowed to go out to work and even within the prison, they are also restricted in many areas and this may have heightened their levels of inactivity. Nevertheless, there is a need for prison authorities to work towards nutrition-sensitive agriculture if the stated

objective of improving prisoners' nutrition is to be achieved. The above finding confirms the widely known evidence that nutrition status goes beyond food production and consumption. It also involves adequate production, access and consumption of diverse diets by a healthy body in a healthy environment (Brinkman & Hendrix, 2011; Cheng et al., 2017; Global Panel on Agriculture and Food Systems Nutrition, 2017; WHO & FAO, 2003).

Also, engaging in recreational activity was found to be significantly associated with higher MUAC among prison inmates (ß: -2.04, 95% CI: -3.51, -0.58). The finding on the positive association between nutritional status and recreational activity is not surprising. Recreational activity is a form of physical activity (PA) and evidence of the protective effect of PA on health outcome, including overall health status, nutritional status, energy metabolism, etc. has been well documented (Ocansey et al, 2014; Aryeetey et al 2017; Australian Institute of Health and Welfare, 2019).

Also, the positive effect of previous incarceration on nutritional status of prisoners reported in this study is not surprising. Prisoners with a history of incarceration tend to have better adaptation to life in prison than their counterparts who have never had any previous incarceration. They are able to interact better with other inmates through already established networks; are more conversant with prison culture and they are also able to cope better in many situations (Liebling & Arnold, 2012). These attributes of previously incarcerated prisoners may have helped them to acquire food and be able to overcome their emotional challenges easily.

The positive association of previous incarceration with nutritional status, however, is inconsistent with what has been reported in similar studies conducted in prison settings in the UK, Ethiopia, Australia, Florida and Maryland. The authors found previous incarceration and substance abuse (Abera & Adane, 2017; Rhea Partyka, 2001) and duration of incarceration (Choudhry et al., 2019;

Gates & Bradford, 2015; Gebremariam et al., 2018; Houle., 2014) to be negatively associated with nutritional status. Also in Maryland, a recent study that was conducted to assess the link between incarceration and nutrition hardship among prisoners found a negative association between previous incarceration and nutritional status (Testa, 2018).

Family support and previous occupation were found to be positively associated with nutritional status of prisoners as reported in other studies (Abera & Adane, 2017). The finding is also not consistent with reports of several authors who found older age (Depa et al., 2018; Paula et al., 2012); female sex (Depa et al., 2018; Paula et al., 2012; Tsiboe et al., 2018), and lower income (Aidoo & Tuffour, 2015; Khakpour, Iqbal, Ghulamhussain, et al., 2019) to be negative significant predictors of nutritional status. The factors identified in this study could be considered by policy makers in any intervention that would be aimed at improving food and nutrition security of inmates in Ghanaian prisons.

5.6 Coping strategies of prisoners

Another issue the study sought to address was the knowledge gap regarding the kind of coping strategies that prison inmates in Ghana employ during times of food hardship. This was achieved using an adapted version of the coping strategies questions and computed coping strategies indexes for all participants. Coping strategies give early warning signs of food insecurity (Campbell, 1990; Maxwell & Caldwell, 2008; Ballard et al., 2013; Olaoye et al., 2014). The findings revealed that during times of food hardship, the coping strategies employed by prisoners most of the time or always are: relying on less preferred food followed by reducing the amount of food eaten during mealtimes and also, reducing the number of times eaten in a day. Specifically, prisoners have to

modify the prison food given them, or eat “gari-soakings” (Cassava grits mixed with water and sugar or sometimes without sugar); ration their food and reserve part of it for later use; or choose to eat only once a day. Other coping strategies identified among inmates include stealing food from cell mates, defrauding outsiders, using drugs and causing commotion in the prison yard. It must be mentioned that the latter set of coping strategies are seriously prohibited in the prisons, but the activities are not new in the prisons. In the case of prison officials, the major food providers in the prisons, relying on produce from prison farms and appealing for food donations were the coping strategies they mostly employ.

5.6.1 Association between characteristics of prisoners and coping strategies index

The statistical models fitted to measure association between prisoner characteristics and coping strategies index found prison category, overcrowding, food insecurity and smoking to have significant influence on the coping strategies index of prisoners. These findings are similar to others that have been reported previously (Aidoo & Tuffour, 2015; Badake et al., 2014; GAC & WFP, 2019; Lombe et al., 2017; Sikwela, 2008). Prison overcrowding occurs when the number of prisoners housed in a particular prison exceeds the original number of prisoners the prison was built for. As the number of people increases in the face of limited resources, so do the the struggles for survival in the prison, and so it is not surprising that overcrowding has an inverse relationship with CSI for food insecurity. For example, a study that was conducted to assess food insecurity and vulnerability risks among HIV affected households in selected regions in Ghana reported an inverse relationship between large household size and food insecurity and subsequently coping strategies employed by respondents (GAC & WFP, 2019). Also, prison overcrowding being identified as a risk in this study is a major and chronic public health challenge facing many prisons around the globe. For example, in California, it has been reported that between 2017 and 2019, 13

out of 35 state operated prisons were housing prisoners beyond their original capacities (Harris et al., 2019) and this affected all aspects of prison management including food and nutrition provisions for prison inmates.

Also, taking to the habit of abusing drugs as a coping strategy has been previously reported among both prisoners and ex-prisoners in previous studies done in other countries (Abera & Adane, 2017; Dong, Must, Tang, Beckwith, et al., 2018; Wang et al., 2013). For example, it was reported among ex- prisoners who indicated that they go back into drug use as a coping strategy during food insecurity (Dong, Must, Tang, Beckwith, et al., 2018). Additionally, in a similar study conducted among prisoners in Ethiopia, inmates explained that the use of illicit drugs makes them feel 'high' thereby suppressing their feelings of hunger (Abera & Adane, 2017).

It is however worrying that prisoners who are supposed to be kept in safe custody, to be reformed and equipped with better life skills so that they will leave prison as better people than they came in, would be engaging in these damaging habits because of their vulnerability and experience of food insecurity. Another issue of great concern is how prohibited items such as marijuana and other hard drugs are trafficked into the prison yard, since most prisoners do not go out and those who must go out, always do so under escort. This suggest that some prison officers may be involved and aiding these kinds of unacceptable practices in the prisons. Even though routine and periodic searches and checks ('operations'[25]) are done in all prisons, non-law-abiding prisoners and prison officers may choose to undermine prison security by trying to outwit the system sometimes. Prison authorities may therefore need to tighten up security by ensuring vigilance at the points of entry into the prisons. The overarching issue, however, is that duty bearers including

[25] Operations are routine searches done in the prisons to retrieve prohibited items that may find their way into prisons that could undermine security of prisons.

the government and prison authorities must endeavour to ensure food security of prisoners and this may contribute to enhancing prison security and public safety.

5.6.2 The use of prison farm produce and food donations as a coping strategy

Relying on produce from prison farms and appealing for food donations are the main coping strategies employed by prison officers who are the major food providers for prisoners. This finding is not peculiar to this study. The use of prison agriculture in the feeding of inmates is done in many prisons around the world in both low and high income countries (Fagan 2019; Moore, Freer, and Samuel 2015; Segura, 2020). Prison agriculture, apart from contributing to food and nutrition security of prisoners, is also used as a method of rehabilitation of prisoners and to get prisoners engaged in order to prevent idleness and boredom (Ghana Prisons Serivece, 2013; Fagan 2019; Moore, Freer, and Samuel 2015). For example, in Mississippi and Zimbabwe, prisoners were taken through agricultural production where they cultivated squash, broccoli, green leafy vegetables etc. as a means of ensuring food availability, preventing idleness and equipping them with skills. This was also aimed at enhancing inmates' survival after discharge from prison (Segura, 2020). It has also been reported that in the US, in Philadelphia, among others, prison authorities make use of inmates' labour to cultivate vast acres of land for vegetables, livestock and processing of dairy products to supplement the feeding of prison inmates (Fagan, 2019; Moore et al., 2015). Also, in Malawi, in a study conducted to assess the contribution of prison agriculture to food security, it was revealed that most of the food secure prisoners were those from prisons with farms. Conversely, conditions of food insecurity were reported more by prisoners from prisons without farms (Moloko. et al., 2018). In spite of the well documented benefits of prison farms to food security in prisons, prison officials complained of inadequate availability of farming inputs such as machinery, post-harvest management of farm produce, among others, to expand agricultural

production in the prisons. The need to feature agriculture and in this case, prison agriculture in national policies as an intervention to ensure food security in prisons has also been documented enormously (Hilderink et al., 2012; Kelly et al., 2013; Ruel & Quisumbing, 2017; Warren et al., 2015) Warren and colleagues, in a systematic review to assess the association between agriculture, food security and diet diversity, also found a significant positive relationship between agriculture, DDS and food consumption (Warren et al., 2015). There is also a growing interest in the need to make agriculture nutrition sensitive in order to get the needed impact on food and nutrition. This, according to FOA and others, can be achieved through well planned interventions that are multisectoral in enabling environments at all levels (Ruel and Quisumbing 2017; FAO, 2015).

The involvement of the CSOs, NGOs, faith based and other charitable organizations, which collectively are known in other jurisdictions such as the UK as "Voluntary or third sector", as well as the private sector in the provision of welfare and other services for prison populations is also not a new phenomenon. It has been in existence in both developed and developing nations for some time (Boadu., 2014; Government of Scotland, 2011; Rosie et al., 2010; Senior, 2011). In Ghana's prisons, these organizations have played a significant role towards ensuring the welfare of prison inmates including the provision of food and other needs (Boadu., 2014). The Prisons Service could take advantage of the good relationship with these organizations and plan targeted interventions for enahcement of food security in the prisons.

5.6.3 Strengths and limitations of the study

5.6.4 Strengths of the study

The study has a number of strengths which have been listed as follows:

- The study is the first of its kind in the prisons to determine the risk and protective factors of food and nutrition security among adult prisoners, a group that is hardly involved in research. This can be replicated in prisons in similar settings. Also, the findings can inform advocacy efforts for changes in prison welfare in Ghana.
- The use of both qualitative and quantitative approaches to answer the research questions is a strength of the study. This is because each of the methods when used individually has its weaknesses and strengths and they complement each when they are used together in a single study. An example is the use of in-depth interviews to unearth factors associated with food insecurity in this study which could not have been found using quantitative tests and this is a major strength.
- The qualitative methods delved deeper into the issues from the respondents' own perspectives and lived experiences thereby giving a better insight into the issues. Moreover, the quantitative aspect addresses the randomization challenge that usually comes with qualitative studies. This makes the study unique given that it is the first of its kind to assess food insecurity in the Ghana Prison Service.
- The random sampling designs employed in the selection of study sites and participants as well as the use of different categories of study participants including different classes of prison inmates and prison officers is also a major strength of the study. It enhances the

validity of the findings and makes them more representative and generalizable to the entire prisoner population in Ghana.

5.7 Limitations of the study

- Since the study is cross sectional in nature, some of the factors of food and nutrition security identified including smoking and receiving support from outside may not indicate causality since it is unable to determine whether or not the exposure occurred first, and this could be addressed through an experimental longitudinal study.
- That result of food insecurity experience does not include frequency of occurrence of food insecurity conditions and this may make it difficult to plan tailored interventions based on frequency of occurrence food insecurity conditions. Also, because this is a cross sectional study changes in food insecurity over time cannot be tracked.
- The potential recall biases on the diets and food security assessment due to inmates' inability to recall all foods they may have consumed and the fact that they may be looking forward for better situation may have caused them to report a worse situation than it is and these are also acknowledged. Recall bias has been noted as a major challenge with the use of qualitative dietary recalls such as the one used in this study (Falciglia et al., 2009). However, food models were used to help respondents with the recalls. The three day 24 hour recall used was also a way to reduce the potential recalls biases further.
- The use of manual analysis methods for the qualitative data is also a limitation of the study due to the widely known drawback of researcher bias. However, the accuracy and reliability of the results were enhanced through validation processes such as double checking by an independent assistant, re-reading of scripts several times in order to make meaning of the texts.

5.7.1 Contribution to knowledge

The study has made some unique contributions to knowledge and has also helped to re-organize existing knowledge on the topic in the following areas:

- The study is the first of its kind to properly document the extent of food insecurity across all categories of prisons in Ghana using multiple methods including but not limited to quality of diets (DDS) and coping strategies. This will help policy makers to target interventions to address the problem.
- The study has also added to the literature by identifying the factors associated with food and nutrition insecurity in Ghana's prisons. For example, apart from the meagre food budget which has been found as a major risk factor for food insecurity (Amnesty International, 2012; Boadu, 2014), this study has also found that drug use, power dynamics among prisoners, family and community support, employment while serving prison sentence, security level of the prison where prisoner is serving his/her sentence to be significant factors associated with food and nutrition in/security of prison inmates. For example, the study found that prisoners in low security prisons have better diversity in their diets compared to their maximum and low security prison counterparts. This will give direction to policymakers and interested advocates of the prisons to target interventions to ensure duty of care and address the human rights lapses in the prisons.
- The widely cited evidence of food insecurity as a negative predictor of nutritional status has been confirmed in this study thereby strengthening the evidence from previous research in Ghana and elsewhere around the globe.
- The study has also contributed to knowledge by documenting the coping strategies of Ghanaian prison inmates during times of food hardship including engagement in prohibited activities like

smoking, stealing form colleagues, refusing to engage in rehabilitation programmes. This serves as a wake-up call for Prison Authorities, policy makers and other stakeholders to ensure urgent interventions in order to maintain prison security and public safety.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the findings under four broad themes including food and nutrition insecurity status of inmates in Ghanaian prisons, level of adequacy of diets of prisoners, factors affecting food and nutrition security of prison inmates, and coping strategies of prison inmates and prison officers in times of food hardship in the prisons. The conclusions to be drawn from the study and recommendations the candidate makes to relevant stakeholders including the government, the criminal justice system players and private and third sector organizations will also be covered in this chapter. Finally, suggestions for future research are made.

6.1. Sociodemographic characteristics of respondents

The study was carried out among prisoners (majority were males) with mean a age of 37.04 years and an average of five years imprisonment. Most of them were never married or self-employed (80%). Also, most were religious (Christians and Muslims) and in prison for the first time (94.3%).

6.1.2 Food and nutrition security status of prisoners

Almost all inmates surveyed (91.1%) were food insecure; 83.3% of the food insecure were severely food insecure and were likely to consume diets that they perceive as less preferred, monotonous and unhealthy About two thirds (67% and 99.5%) of inmates had normal nutritional status (BMI >18.5kg/m^2 and <25kg/m^2) while 27% were either overweight or obese. There were no significant differences in food insecurity prevalence among inmates across the different prison categories and food insecure prisoners were more at risk of becoming underweight compared to their food secured counterparts.

6.1.3 Quality of diets of prisoners

The quality of diet of prisoners was low. The majority (79.4%) had low diet diversity (≤3 food groups); 20.6% had moderate diet diversity (4-5 food groups). Dietary diversity scores were not different across sub-groups of prisoners. Maize and rice, fruits and vegetables group, mainly pepper, onions, garden eggs were the most frequently reported (>80%) food commodities included in diets of prisoners. Fresh fruits, fish and meat group were consumed less frequently (≤50%); milk and milk products, organ meat, eggs and dark green leafy vegetables consumption was reported by less than 10% of prisoners. Prisoners who did not report support from family and friends were less likely to have moderate diet diversity (consumption of 4-5 food groups). Also, prisoners who do not work while serving imprisonment terms had lower likelihood of achieving moderate diet diversity (consumption of 4-5 food groups) out of the 9 food groups used.

6.1.3 Factors affecting food security and nutritional status of prisoners

There was no statistical association between characteristics of prisoners and their food insecurity status. The main reasons linked with food insecurity by prisoners and prison officers in qualitative interviews were low feeding fee allocation, overcrowding, and late payment of food contractors. Other reasons reported include: limited support from family and friends, lack of storage facilities, sickness and anxiety, limited ability to earn income while in prison, unfavourable timing of food service (too early morning), use of narcotic drugs and limited power or control in the prison environment.

Mean BMI and MUAC were inversely associated with food insecurity, overcrowding and more secured prison settings; mean MUAC was also associated with history of previous incarceration and engagement in recreational activity.

6.1.4 Coping strategies of prisoners and prison officers during food hardship in the prisons

Prisoners' main coping strategies included relying on less preferred foods and borrowing or relying on friends for food and money. Prohibited activities such as defrauding outsiders, causing commotion, and instigating others against the prison system sometimes were other coping strategies.

The main coping strategies reported by prison officers included relying on produce from prison farms and food donations from individuals, private and third sector organizations. Although prison agriculture has great potential to improve food and nutrition security of the prisons, prison officers reported that inadequate investment into the programme is a major factor preventing it from having the needed impact on prison food security. Coping strategies index was higher among prisoners in more secured and overcrowded prisons. Smoking and food insecurity were associated with coping strategies index of prisoners.

6.2 Conclusions

The study comprehensively assesses food and nutrition insecurity in Ghana's prisons. The study found high levels of food insecurity among prisoners who reported consuming low-quality diets. This notwithstanding, most prisoners had normal nutritional status. These findings suggest a need for welfare interventions to improve food provision for prisoners.

The study reported drivers of food and nutrition security including lack of family and community support, working while serving a prison sentence, previous incarceration, higher secured prisons, overcrowding, the use of narcotic drugs and power dynamics among prisoners. Successful interventions to address food and nutrition challenges of prison inmates must be geared towards enhancing the protective factors and mitigating the harmful ones identified.

Finally, the study is most relevant to the Ghana Prisons Service because it has provided baseline information which could be used for advocacy and the design of future food and nutrition security interventions for prisoners.

6.3 Recommendations

Based on the findings of the study, and the conclusions drawn, the following recommendations are being made for consideration and action by relevant stakeholders for improvement in the food and nutrition security and the general welfare of inmates in Ghana's prisons. The recommendations have also been categorised into short, medium and long term actions since these have cost implications, require massive stakeholder engagements among many other actions that could be resource-heavy.

6.3.1 Government of Ghana

Short Term Actions:

Government should ensure food security in Ghana's prisons through:

i. ***An upward review of feeding fee for prisoners:*** To help address the prevalence of food insecurity in the prisons in terms of low quality, low diversity and low quantity which came up as a major finding in this study, there is need for the government to increase the budgetary allocation for feeding of inmates to reflect current market trends and also to show adherence to international human rights laws and development goals to which Ghana has signed on. This has become necessary as it was reported by all inmates and prison officials, that the current feeding grant of GHC 1.80 (about $0.30) per prisoner a day is woefully inadequate to provide meals of adequate quality and quantity for an adult prison inmate.

The high prevalence of food and nutrition insecurity in the prisons needs urgent attention through appropriate budgetary allocation due to the following reasons:

- Diets that do not show diversity highly expose people to diet related diseases (GBD Collaborators, 2019). Hence the high prevalence of food and nutrition insecurity and the low diet diversity in the prisons is a major health risk which could be costlier for the Prisons Service to manage.
- Food and nutrition insecurity of prisons has serious negative implications for prison security considering the reported prohibited activities prisoners engage in as coping mechanisms to manage food hardship in the prisons. The findings of this study suggest that the majority of prison inmates rely on families and friends for food and also use it as a coping strategy to deal with food hardship. By doing so, prisoners take advantage of this situation to transport all kinds of prohibited items including hard drugs such as marijuana, into the prisons. While support from family and friends is seen as a major protective factor towards food security, it has its own challenges. For example, it had been previously reported that over 80% of illicit drugs found in the prisons got in through food items from prisoners' relatives and friends (Omane-Addo, 2016). This situation undermines prison security and public safety and needs to be addressed.

ii. ***Support for prison agriculture***: There is need for the government to support the Prison Service with more farm machinery and other inputs to expand their agricultural activities through mechanized farming to supplement inmates feeding and consequently reduce food insecurity. Mechanized, commercial farming in the prisons has a huge potential to generate revenue for the Prisons Service and ultimately contribute towards food security of the nation. This is

necessary, given the agricultural production potential of the Prisons Service in terms of availability of arable land, adequate agricultural personnel and labour, which the Prisons Service is endowed with. For example, giving the Prisons Service a priority in all national agricultural interventions such as 'Planting for Food and Jobs' which is one of the flagship agricultural interventions being implemented by the current government could go a long way to help the Service to be self-sufficient in agricultural production.

Enhanced prison agriculture can also contribute to constant availability of sufficient, diverse foods for prisoners' feeding and internal revenue generation for the service which would be beneficial towards other administrative costs, given the dwindling annual budgetary allocation to the Service observed over the years. Ultimately it would provide employable skills for inmates which may be useful to them when they are released from prison.

Medium to Long Term actions

iii. ***Decongestion of prisons***: Decongestion of the prisons is also one of the sure ways to address food and nutrition security problems. The study found prison overcrowding to be a major predictive factor that is driving food insecurity and coping strategies of prisoners. To decongest the prisons, the following strategies are recommended:

- Firstly, there is a need for the government to ensure the completion of all ongoing prison expansion projects, as observed during this study. For example, completion of the second phase (accommodation and workshop facilities) of the Ankaful maximum security prison, a 2000 capacity facility which is currently housing only about 800 inmates due to lack of accommodation for prison officials and also lack of rehabilitation facilities for inmates. There

is also a need for the completion of the remand prison that is under construction in Nsawam which is under the Eastern regional command of the Ghana Prisons Service.

- Secondly, the government, through the Attorney General should work towards the speedy passage of the non-custodial sentencing policy which allows offenders to serve their sentences in forms of community services**,** paroles etc. It was revealed that the bill for non-custodial sentencing had been before parliament for several years. This needs to be urgently addressed.
- Thirdly, the government should revisit the "relocation of prisons" project which came to the fore during the fieldwork for this study. For example, it was observed that there are prisons situated in towns and cities where expansion would not be possible due to lack of space. A typical example is the Kumasi Central Prison which is one of the overcrowded ones visited. The prison has no space available for any expansion work to take place. A relocation of such prison to a more spacious place where a purpose built one with workshops and other treatment facilities could be made possible, stands to ensure the welfare of inmates, staff and the Prison Service as a whole.
- Last, the government through the judiciary should take a second look at the sentencing policy for the entire nation by reducing the number of years that people have to serve in prison for some of the offenses. It must be stated that the country's prisoner population as found in this study is relatively young. Additionally, some of these young, able bodied men are serving very long sentences. This situation, coupled with the inadequate rehabilitation and reformation programmes to turn these people into useful citizens on their release from prison, suggests that prisoners could be spending most of their active working years idling and wasting in prison.

This then may mean that imposing on offenders many years of imprisonment may not be ethically right as it may be flouting the "do no harm" principle for social interventions ,

It has been argued that "a criminal justice system that imprisons offenders and fails to reform them is not worth operating (Shajobi-Ibikunle, 2013). The prison system in Ghana needs more attention from the government to help derive the intended benefit of contributing towards public safety and the internal security of the nation.

6.3.2 The Ghana Prisons Service

Medium to long term actions

As the Prisons Service strives to execute its welfare mandate for prisoners in a humane manner by making the prison system more efficient and effective (GPS, 2013), the following recommendations could be considered by the Service:

- ***Ensuring Nutrition sensitive agriculture***: In the medium term, the Prisons Service must enhance its collaboration with relevant stakeholders including the Ministry of Agriculture, the Ministry of health, Food and research agencies and civil society organizations. for technical and material support to embark on nutrition sensitive agricultural activities. "Nutrition sensitive agriculture as defined by the FAO, is one that ensures the production of diverse, affordable, nutritious, culturally appropriate and safe foods and livestock in adequate quantity and quality to meet dietary requirements of populations" (FAO, 2015).

  Though the study found that the Prisons Service engages in some level of farming and it was working to expand production, it is not enough to simply expand production, but production must be nutrition sensitive. Apart from collaborating with relevant stakeholders as a major feature, other features of nutrition sensitive agriculture include a) targeting vulnerable inmates; b) cultivation of diverse nutrient rich crops and livestock and also working towards food

fortification, biofortification of cereals and grains; c) undertaking processing, storage and preservation to avoid nutrient drainage from foods, ensuring constant food availability, and preventing post-harvest losses; d) including in prison agricultural policies explicit nutrition education and promotion activities (FAO, 2015). These are also medium to long term interventions that can contribute to food security of prisons in Ghana.

- ***Nutrition and health promotion:*** Nutrition and health education is a well-known public health intervention. When people are aware of the benefits of the food they eat as well as the health effects of the lifestyle habits which they engage in, they are better positioned to make informed, healthy food choices. As observed during this study, the Prisons Service is making efforts to restructure its health system in order to provide holistic healthcare for its members. The creation of a unit responsible for public health which is responsible for health promotion, among other things which came to our knowledge during the study, is a step in the right direction. The unit, if well-resourced and supervised could contribute immensely towards achieving improved health status for prisoners.
- ***Pre-admission nutritional status assessment:*** There is a need for the Prisons Service to ensure pre-admission screening of prison inmates in order to ascertain their nutritional status at the point of entry into prison. This is necessary to generate baseline data that is needed to undertake routine monitoring of nutritional status of inmates. For example, the findings of this study revealed that 27% of inmates were overweight or obese with about 6% being underweight. However because of lack of baseline data, the researcher is unable to determine whether prisoners came in with these conditions or they developed them during their stay in prison. As contained in the WHO guidelines on prisons health (WHO, 2014), the pre-admission screening

is needed to provide information on current health conditions including malnutrition which may need immediate attention.

- ***Dealing with overcrowding in the prisons***: There is a need for the Prisons Service to enhance their collaboration with relevant stakeholders in the criminal justice system especially the police and judiciary, to address overcrowding in the prisons. Constant dialoguing among these players may further promote the speedy passage of legislations to regulate the rate of imprisonment of offenders. Apart from overcrowding being a significant public health challenge which negatively impacts nutritional status of prisoners as documented in this study, it could also militate against effective prevention and management of infectious diseases in the prisons. A typical scenario is the difficulty the Prisons Service encountered in the implementation of the prevention protocols like "social and physical distancing" during the COVID-19 pandemic.

  It was however refreshing to observe during this study that collaboration between the Service and Faith-Based Organizations (FBOs) is yielding some desired results. For example, during this study, it was observed that the Church of Pentecost (CoP) had commenced the construction of five new modern camp prisons with a total capacity of 2000 inmates at Ejura, Obuasi, Nsawam, Damongo, and kwamonso and these were at various stages of completion. This singular effort of the CoP will help reduce overcrowding in the prisons. This suggests that if the Service continues and extends the dialogue on decongestion of prisons to other corporate, private organizations with clear and needs-based guidelines, it would go a long way to address the overcrowding 'canker' that is plaguing the Prisons Service.

- ***Enhancing family and community support***: Family and community support for food or money as well as for other logistics support is major protective factor that can enhance food and

nutrition security of prisoners. The Prisons Service could enhance family and community support through public awareness creation and sensitization on the plight of prisoners and the need for unwavering support towards their welfare. This could be achieved through enhanced collaboration with the traditional media as well as a regulated and secured usage of social media. Additionally, periodic public and stakeholders' meetings could be initiated by the Prisons Service to educate the public on the importance of supporting prisoners' welfare as a way to increase the safety and peace of the public, and this could also contribute to enhanced family and community support.

6.3.3 Third sector, private organizations, researchers and the general public

The third sector, private organizations and the general public could play a major role towards the welfare of prisoners. The assertion that the government has the sole responsibility to ensure the welfare of prisoners cannot be disputed. However, the fact that Ghana as a middle-income nation has numerous and competing needs of public goods such as education, road infrastructure and health financing being by government, makes it difficult for the government alone to bear the cost of imprisonment of offenders. Hence the need for support from TSOs and the public cannot be underestimated. TSOs, the private sector and the public could be of support to the Prisons Service in the following ways:

- Being more sympathetic towards prisoners and ex-convicts by providing them with welfare support in all forms as a contribution towards prevention of recidivism. An example is the need for receptive attitude towards ex- prisoners who are released back to society.
- An enhanced involvement of third NGOs and CSOs, philanthropists etc. in the delivery of welfare provisions for prisoners. These could be in the form of advocacy; financial and

logistical support towards prison farming activities; health care delivery; rehabilitation and reformation programmes and general welfare of prisoners; effective design and implementation of other tailored nutrition sensitive programmes for vulnerable groups including the aged, the poor, and disease afflicted inmates, among others.

- The private sector should also see the welfare challenges of the Prisons Service as business opportunities and be willing to undertake public-private partnership initiatives in the areas of agricultural production, healthcare infrastructure, rehabilitation and reformation ventures that are not exploitative but would be mutually beneficial.

6.5 Direction for future research

- A research on the cost analysis for feeding of inmates will help the Prison Service to address the funding shortfall using empirical evidence.
- A longitudinal intervention study to establish a cause-and-effect relationship of reported predictors of food and nutrition insecurity of inmates is needed. This will help policy makers prioritize interventions for addressing specific risks given the resource constrained nature of the Prison environment.
- A research on factors associated with nutritional parameters of prisoners may be helpful to prison authorities in planning interventions to address the issue of overweight and obesity among prisoners.

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APPENDICES

APPENDIX I: QUESTIONNAIRE FOR PRISONERS

Title: "Food and Nutrition Insecurity in Prisons in Ghana"	
PARTICIPANT CODE ……	
STARTING TIME:	ENDING TIME:
NAME OF PRISON	DATE (DD/MM/YY)

……	……..
Name of interviewer:	Signature of Interviewer
……..	……

SECTION 1: NUTRITIONAL STATUS DETERMINATION	
ANTHROPOMETRY	
1.1 Current Weight and height (I will now check your weight and height).	Weight ……..... (Kg); Height……. (m); BMI ……. (Kg/m2)
1.2.1 Waist Circumference. I will measure your waist Circumference 1.2.2 I would also measure your hip circumference.	…….. cm ...……...cm **WHR** ……..……
1.3 Mid Upper Arm Circumference (MUAC). I will like to measure and record your MUAC	…… … (cm)

SECTION 2: ASSESSMENT OF FOOD INSECURITY STATUS USING THE FAO FOOD INSECURITY ACCESS SCALE (FIES), ADAPTED AND MODIFIED.

Now I would like to ask you some questions about your food consumption in the last 30 days. Answer Yes = 1 and No = 2.

During the last 30 days, was there a time when:

2.1 You were worried the food provided to you would run out because of lack of money or other resources?	Yes……1 No……... 2
2.2 You ate foods that you did not prefer because of lack of resources?	Yes……1 No…… 2

2.3 You were unable to eat healthy and nutritious food because there was not enough provided to you?	Yes……1 No…….... 2
2.4 You ate only a few kinds of foods because there were not different kinds of food available?	Yes……1 No……...2
2.5 You had to skip a meal because there was not food at the time you needed it?	Yes……1 No……...2
2.6 You ate less than you thought you needed because there was not enough food to feel satisfied?	Yes……1 No……...2
2.7 You and your friends in this prison ran out of food because there was limited supply?	Yes……1 No……...2
2.8 You were hungry but did not eat because you could not get access to food?	Yes……1 No……...2
2.9 You went without eating for a whole day because there was no food for you?	Yes……1 No……...2

SECTION 3: COPING STRATEGIES OF PRISONERS FACING FOOD INSECURITY, USING THE COPING STRATEGIES INDEX (ADAPTED FROM MAXWELL AND CALDWELL, 2008).

Now l would like to ask you some questions about the things you did when you did not have enough food or money to buy food and how many times you did them. **Once again you are assured of utmost confidentiality of the information you will provide.**

In the past 7 days, if there have been times when you did not have enough food to eat, how often did you have to:

3.1 Rely on less preferred foods?	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2 often ……...4 All the time, every day ……...…….5
3.2 Borrow food, or rely on help from a friend or relative?	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2

	often ……...4 All the time, every day ……...……5
3.3 Obtain food in exchange for another resource you had or expected to have in the future?	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2 often ……...4 All the time, every day ……...……5
3.4 Harvest immature crops where possible?	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2 often ……...4 All the time, every day ……...……5
3.5 Eat less amount of food at mealtimes?	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2 often ……...4 All the time, every day ……...……5
3.6 Reduce number of meals eaten in a day?	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2 often ……...4 All the time, every day ……...……5
3.7 Spend an entire day without eating?	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2

	often ……...4 All the time, every day ……...…….5
3.8 Attempt to illegally send food or other prohibited items into the yard	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2 often ……...4 All the time, every day ……...…….5
3.9 Take and eat food meant for other inmates without their consent	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2 often ……...4 All the time, every day ……...…….5
3.10 Refuse to participate in reformation activities i.e. learning skills or getting formal education?	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2 often ……...4 All the time, every day ……...…….5
3.11 Instigate other inmates to cause commotion or make noise in the prison?	Never ……....0 Hardly, less than once per week ……...1 Once in a while, (once or twice per week) ……...….2 often ……...4 All the time, every day …….. .5
3.12 what other coping strategies did you adopt during times of food hardship?	…… …… …….. …… …….

SECTION 4: ASSESSMENT OF DIET DIVERSITY AND NUTRIENT ADEQUACY OF PRISONERS' DIETS USING 3-DAY 24 HOUR RECALLS.

Now I will ask you some questions about your food intakes within the last 24 hours.

24 HOUR FOOD RECALL – WEEK-DAY 1

Menu/Time	**Food**	**Handy Measure**	**Weight (g)**	**Raw food items**
Breakfast	1. 2. 3. 4.			
Mid-morning snack	1. 2. 3.			
Lunch	1. 2. 3.			
Mid-afternoon snack	1. 2. 3.			
Supper	1. 2. 3.			

	4.			
Bed-time snack	1. 2.			

24 HOUR FOOD RECALL - WEEK DAY 2

Now I will ask you some questions about your food intakes within the last 24 hours.

Menu/Time	**Food**	**Handy Measure**	**Weight (g)**	**Raw food items**
Breakfast	1. 2. 3. 4.			
Mid-morning snack	1. 2. 3.			
Lunch	1. 2. 3.			
Mid-afternoon snack	1. 2. 3.			
Supper	1.			

	2. 3. 4.			

24 HOUR FOOD RECALL – WEEKEND

Menu/Time	Food	Handy Measure	Weight (g)	Food items
Breakfast	1. 2. 3. 4.			
Mid-morning snack	1. 2. 3.			
Lunch	1. 2. 3. 4.			
Mid-afternoon snack	1. 2. 3.			
Supper	1. 2. 3.			

Bed time **snack**	1 2			

SECTION 5: OTHER FACTORS AFFECTING FOOD INSECURITY AND NUTRITIONAL STATUS OF PRISONERS

5.1 What are some of the things that affect your food access and food intakes in the prison?	…….. .. …… . …… ……
5.2a In the past 30 days have you received support (e.g. food, cash etc.) from any persons (friends, family members etc.) outside the prison?	……1 ……....2
5.2b If yes, what kind of foods have you received from these people? 5.2c if cash, how much have you received?	…… …….. …….. GHC……..

SECTION 6: SOCIODEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

6.1 Sex	Male……1 Female……...……2
6.2 Age in completed years	……
6.3 Ethnic affiliation	Akan .....1 Ewe .....2 Guan ……..……3 Ga/Dangbe .....4 Northern (NR/UE/UW).....5 Others, [specify]… ……....88
6.4 Marital status	Married .....1 Separated.....2 Divorced .....3 Widowed.....4 Single.....5

6.5 Do you have children?	Yes.....1 No.....2 If yes, specify no of children .....
6.6 What is the level of education you have completed?	.....
EMPLOYMENT HISTORY **6.7** What was your last employment before you came to prison?	.....
6.8 Do you work while in the prison?	Yes ..... 1 No 2
If yes, what work do you do while in prison?	Unskilled labourer ……1 Construction ……2 Farming …….....3 Tradesperson ……...4 If tradesperson, specify trade……... Office assistant ……...5 Nursing/ Teaching ……6 Others, specify.....88
If you work while in prison, how much money is allocated to you within a month?	GHC.....
6.9 Religion	Christianity ……..…..1 Islam …….2 African Traditional Religion.....3 Others, [specify] ……...88
IMPRISONMENT HISTORY	
6.10 For how long have you been imprisoned?	…….. years …….. months
6.11 Which class of prisoner are you?	Convict……1 Remand……2 Condemned……...3 Lifer……4 Other, specify……88
6.12 What issue (crime) brought you to prison?	……

6.13 Have you ever been imprisoned prior to this time?	Yes ……...……1 No ……...……2

SECTION 7: HEALTH AND LIFESTYLE HABITS OF PRISONERS

7.1 Have you been diagnosed to have any of these diseases?	**Hypertension** Yes ……...1 No…….2 **Diabetes** Yes……1 No…….2 **Stroke** Yes……1 No……...2 **Heart Attack** Yes……1 No…….2 **Heart Failure** Yes……1 No…….2 **Kidney Failure** Yes……1 No…….2 Others. ……88 Specify ……
7.2 Has any other family member (parents, direct aunt, uncle, grandmother, grandfather) had any of the health conditions mentioned in **question 2.1 above?**	Yes……...1 No……....2
7.3 What other health conditions do you have now?	……... …….. ……...

7.4 Please we will check your blood pressure.
Arm selected: (right)

Readings	**First**	**Second**	**Third**

Systolic BP			
Diastolic BP			
Heart Rate			

7.5 I will now take your blood sample to test your malaria status and blood hemoglobin level.	
Please you will now answer some questions about certain health behaviours such as smoking, alcohol intake, physical activity and other health conditions. The information provided will be held in strict confidentiality.	
Alcohol Intake **7.6** Have you ever drunk alcohol (such as beer, wine, spirits, fermented cider, akpeteshie, pito, palm wine or bitters)? If yes, how old were you when you started drinking?	 Yes……1 No……..2 _____ years
SMOKING STATUS 2.7 Have you ever been engaged in smoking? If yes which type of smoking?	Yes……...1 No……2

We will now ask you about the time you spend doing different types of physical activity in a week. Please answer the questions even if you think you are not physically active. You First, think about the time you spend doing work. Consider work as the things that you have to do such as paid or unpaid work, study/training, chores in your yard or cell, farming and harvesting food/crops.

In answering the questions that follow, 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.

PHYSICAL ACTIVITY **7.8** In the past one week, did you do any work /activity that made you experience large increases in breathing or heart rate (E.g. lifting or carrying heavy loads, digging, or	Yes ……...1 No……...2 **If No, go to question 2.13**

construction work) for at least 10 minutes continuously?	
	If yes, please answer the following questions.
	Number of days…….
	Hours……... Mins ……
7.9 In the past one week, did you do any work /activity that made you experience small increases in breathing or heart rate (brisk walking or carrying light load) for at least 10 minutes continuously?	Yes…….1 No……...2 If **yes, please answer following questions.**
	Number of Days.....
	Hours……... Mins ……
RECREATIONAL ACTIVITY	
In the past one week, did you do any recreational work /activity that made you experience large increases in breathing or heart rate (running, football playing, aerobics, etc.) for at least 10 minutes continuously?	Yes……1 No……...2
	If yes, Number of days……... Hours……. Minutes ……...
In the past one week, did you do any recreational work /activity that made you experience small increases in breathing or heart rate (brisk walking, stretching, sit-ups etc.) for at least 10 minutes continuously?	Yes……1 No……...2
	If yes, Number of days……... Hours……... minutes ……
SEDENTARY BEHAVIOUR **7.10** How much time did you spend sitting or reclining on a typical day in the past 1 week? (For example, time spent reading, watching television, knitting or resting etc).	Hours……... Mins ……

THANK YOU FOR YOUR TIME

APPENDIX II: QUESTIONNAIRE FOR PRISON OFFICERS (STAFF)

PARTICIPANT CODE …….

SECTION 1: SOCIODEMOGRAPHIC CHARACTERISTICS

1.1 Gender [1] Female [2] Male

1.2 Age in completed years: ……

1.3 Ethnic affiliation

[1] Akan

[2] Ewe

[5] Guan

[3] Ga/Dangbe

[6] Northern (Northen, Upper East, Upper West Region)

[7] Others, [specify]…….

1.4 Marital status

[1] Married

[2] Separated

[3] Divorced

[4] Widowed

[5] Never married

1.5 Employment History

1.7.1 For how long have you been working in the Prison Service? ……..years

1.7.2 What is your role at the prison?
.....
.....

1.7.3 What is your rank?
.....

1.7.4 Since you started working with the Service have you received in-service training in subjects related to your role? .....

1.7.5 If yes, what were the subjects learnt and what benefits have you obtained from them?
……
……
……
……
……

SECTION 2: FACTORS AFFECTING NUTRITIONAL STATUS OF PRISONERS

2.1 What kind(s) of food do you usually serve prisoners for breakfast?

.....; …….

……...; …….

2.1 What ingredients does the prison procure to prepare the above meals?

2.2 What kind(s) of food do you serve prisoners for lunch?

....., ……..;

……....; …….

2.3 What ingredients does the prison procure to prepare the above meals?

……

……

2.4 What kind(s) of foods are prisoners served for supper?

.....……

……

What ingredients does the prison procure to prepare the above meals?

……

……

……....

2.5 How much is allocated for feeding a prisoner in a day? GH₵……...

2.6 What other factors affect the food security and nutritional status of prisoners in the prison?

……

……..

2.7 Does the prison engage in agricultural activities? ……

2.8 If yes, what specific agricultural activities are undertaken?.....

.....

2.9 How do these activities contribute to food security and nutrition of prisoners?.....

.....

.....

2.10 What challenges do you face with regard to the other welfare provisions (health, accommodation, etc.) for prisoners in the prison?

……

……

……

……

……

……

……

Thank You for your time.

APPENDIX III: INTERVIEW GUIDE FOR HEADS OF PRISON (OICs)

RESEARCH TOPIC: FOOD AND NUTRITION INSECURITY OF PRISONS IN GHANA

PARTICIPANT'S CODE: …… Age: …… Rank: …… Ethnic affiliation…….

Religion: ……. Years served…… Min …… Max……...

SECTION I: ASEESSMENT OF FOOD AND NUTRITION INSECURITY OF INMATES IN PRISONS

1. How is the welfare of prisoners defined in prison standards in terms of feeding?
2. What is the welfare situation of inmates in this prison?
3. What is the feeding situation of inmates?
   a) Describe the kinds of foods prisoners are usually given for breakfast, lunch and supper.
   b) What is your opinion of the quality of food given to prisoners?
   c) What about the quantity, is it enough, explain?
4. What are the challenges with food availability and access?
5. Where does prisoners' food come from?
6. What are the key barriers/challenges to optimal food availability and access in this prison?
7. What innovative solutions have been implemented to improve food availability and access?
8. How does the prison cope with the food needs of prison inmates?
9. What is the effect of seasonality on your food service to inmates?

SECTION II: FAMILY AND COMMUNITY SUPPORT TOWARDS FOOD AND NUTRITION SECURITY OF PRISONS

10. Apart from the government, where do prison inmates receive food from?
11. What percentage of the food given to prisoners comes from donations?
12. How frequently do you receive food donations?
13. What types of foods are donated and by who?

SECTION III: ASSESSING DIETARY ADEQUACY USING THE HOUSEHOLD DIETARY DIVERSITY SCALE (HDDS) QUESTIONNAIRE

Now I would like to ask you about the types of food that you procured or provided for prisoners in this prison during the last 30 days. I will read the list of foods to you from the table below. I would like you to answer yes if you procured or provided the food in question to your prisoners and no if none of items from the food group in question was procured or provided to prisoners. I would also like to take the menu charts and your food procurement records used to prepare food for the inmates within the reference period, after the interview.

Codes	**Food group**	**Food items/ingredients/dishes (add sub-codes for each item)**	**Specific Food items Used**
1	Whole grain cereals	Whole grain bread (seeded), whole brown bread, whole grain breakfast cereal (e.g. muesli cereals, Weetabix), maize (boiled, roasted), sorghum, local brown rice, millet, couscous, boiled corn meal, wheat porridge, sorghum porridge, millet porridge, other (text will be inserted)	
2	Refined cereals	White bread (sugar bread, butter bread, tea bread), ekuegbemi, breakfast cereals (e.g. cornflakes), maize porridge, rice porridge, Hausa koko, tombrown, fula, kaafa, white rice, tapioca, oats, pasta, noodles, macaroni, other (text will be inserted)	
3	Fresh juices	Fruit juices (unsweetened), vegetable juices (unsweetened), coconut juice, other (text will be inserted)	
4	Dairy products	Milk, Plain yoghurt, flavoured yoghurt, cheese, waagashi cheese, Burkina drink, sweetened condensed milk, powdered milk, evaporated milk, Soya milk, coconut milk, cream, sour cream, whipped cream, other (text will be inserted)	
5	Fruits	Orange, tangerine, kiwi, watermelon, mango, pawpaw, pineapple, banana, plum, peach, apricot, nectarine, flat peach, apple, pear, strawberries, cherries, berries, grapes, stewed fruit, dried fruits, tamarind fruit,	

		mandarin, cantaloupe, aluguntungui, avocado, other (text will be inserted)	
6	Nuts and seeds	melon seeds (agushi), tigernuts, kolanuts, groundnuts, cashew nuts, other nuts and seeds (text will be inserted)	
7	Roots, tubers, plantain and potatoes (not fried)	Plantain (roasted/boiled), cassava (boiled), tapioca, gaari, cocoyam, yam, fufu, potatoes (roasted/boiled), sweet potatoes (roasted/boiled), konkonte, other (text will be inserted)	
8	Roots, tubers, plantain and potatoes (fried/deep fried)	Plantain, cassava, potatoes, sweet potatoes, yam, other (text will be inserted)	
9	Fermented maize products	Banku, kenkey (Ga and Fante), mashed kenkey, Aboloo, T.Z, other (text will be inserted)	
10	Non-Fermented maize products	T.Z unfermented (Tuo Zaafi), Akple unfermented, other (text will be inserted)	
11	Vegetables	Green leaves, spinach, lettuce, cabbage, tomatoes, peppers, carrots, cucumber, eggplant, green beans, onions and garlic, mushrooms, pumpkin, bottle gourd, okro, other (text will be inserted)	
12	Legumes	Soya beans, baked beans, bambara beans, red beans, kidney beans, chickpeas, lentils, other legumes (text will be inserted).	
13	Soups	Palm nut soup, nkontomire soup, groundnut soup, okro soup, vegetable soup, light soup, other (text will be inserted)	
14	Stews	Nkontomire stew, okro stew, garden egg stew, egg stew, tomato sauce and stew, bean stew, shito, pepper sauce, other stew (text will be inserted)	
15	Egg	Scrambled egg, poached egg, fried egg, omelet, boiled egg, other (text will be inserted)	
16	Red meat	Grilled red meat (beef, goat, pork, bush meat, cat meat), boiled red meat (beef, goat, pork, bush meat, cat meat), fried red meat (beef, goat, pork, bush meat, cat meat), wele (cow skin and cow feet), other (text will be inserted)	

17	Poultry	Grilled chicken, fried chicken, roasted chicken, boiled chicken, Guinea fowl, turkey, duck, other (text will be inserted)	
18	Offals and giblets	Liver, intestines, gizzards, hearts and neck	
19	Fish (not fried)	Fish (e.g tuna, tilapia, salmon, cassava fish), dried fish (e.g. anchovies), salted fish (e.g. koobi,momoni), canned fish, shellfish (Snail, clams (adodi), crab, oysters), other (text will be inserted)	
20	Fish (fried)	Fish (Kenam (fried fish), Salmon fish, mackerel fish, Tilapia fish, cassava fish, tuna) and shell fish, octopus, shrimps, other (text will be inserted)	
21	Mixed dishes *(vegetarian, meaty)	Waakye, jollof rice, red red, Apapransa, kpokpoi, tofu (soya bean dish), mpotompoto, Lasagna, pizza, eto, stir fried rice, stir fried noodles, burger, vegetable sandwiches, meat sandwiches, hot dog, other (text will be inserted)	
22	Savoury pies	Meat pie, fish pie, other (text will be inserted)	
23	Processed meat	Meatballs, fried sausage, boiled sausage, dry and cured meat, ham, corned beef, liver paté, other (text will be inserted)	
24	Sugar and sweet spreads	Marmalade, jam, sugary jelly, honey, sugar, chocolate spread, syrup, other (text will be inserted)	
25	Cakes and sweets	Sweet pie or tart, cake (e.g. sponge; yeast), pastries, cream pie, cheesecake, biscuits(imported/local) chocolate, sweets and toffee, groundnut cake, ice cream, pancakes, doughnuts, bofrot, other (text will be inserted)	
26	Oils	Palm oil, coconut oil, groundnut oil, palm kennel oil, other oils (text will be inserted)	
27	Snacks (savoury or sweet)	Savoury crackers, crisps, sweetened popcorn, salted popcorn, cassava crips, plantain crips, chips (snack made from bread flour dough fried), koose, other (text will be inserted)	
28	Spreading fats	Regular margarine, butter, groundnut paste, other (text will be inserted)	
29	Cooking fats	Lard, sheabutter, other form of animal fat (text will be inserted)	

30	Sodas and sweetened beverages	Non-alcoholic beer, minerals/soft drinks, fruit-based drinks, fruit nectars, cocoa milk drink (Milo, chocolim, richoco), fruit milk drink (smoothie), sobolo, zonkom, other (text will be inserted)	
31	Tea and coffee	Unsweetened tea, sweetened tea, unsweetened coffee, sweetened coffee, other (text will be inserted)	
32	Alcoholic beverages	Beer, wine, spirits, local wine (akpeteshi), other (text will be inserted)	
33	Condiments	Tomato sauce (ketchup), tomato paste, mayonnaise, sauces, stock cubes, vinegar, salt, other (text will be inserted)	
34	Other	Specify	

SECTION IV: COPING STRATEGIES ADOPTED BY PRISON MANAGERS IN TIMES OF FOOD INSECURITY

Now l would like to ask you some questions about the things you did when you did not have enough food in the prison or money to buy food to feed prisoners and how many times you did that. You can use the options as follows: **never, Hardly or less than once per week, Once in a while or once or twice per week, quite often, All the time or every day.**

In the past 7 days, if there have been times when you did not have enough food or money to buy food for prisoners, how often have you had to:

6.1. Rely on less preferred and less expensive foods? .....

6.3 Purchase food on credit for prisoners? .....

6.4 Gather wild foods or harvest immature crops for prisoners' meals? ……

6.5 Limit portion size at mealtimes for prisoners? ……

6.7 Reduce number of meals served to prisoners in a day? .....

7.0 What other strategies did you adopt to cope with food insecurity in this prison? ……

……

……

Thank you for your time.

APPENDIX IV: OTHER FACTORS AFFECTING FOOD AND NUTRITION INSECURITY STATUS OF PRISONERS.

IN-DEPTH INTERVIEW GUIDE FOR PRISONERS

Participant Code…….
Name of Prison …….....
Name of interviewer……..
Starting Time…….……
End time……..

1. Being in prison is a difficult challenge. From your particular individual experience, what is the biggest challenge you have had during the time you have been here?

……
……
……
……
……

Probe: what challenges have you experienced obtaining food to eat?

……
……
……
……
……

What challenges have you experienced regarding quantity of food you eat?

……
……
……
……

What challenges have you experienced regarding quality (type) of food you eat?

……
……
……
……

What challenges have you experienced regarding how frequently/how many times you eat?

……
……
……
……

2. From where do you usually obtain the food you eat from?

……
……
……
……....

Probe: how often do you get food from prison canteen/food service?

……
……
……....

How often do you get food from family?

……
……
……

How often do you get food from friends?

……
……
……

How often do you get food from other sources? What are these other sources?

……
……
……
……

How often do you buy food to eat?

……
……....
.....

3. What food do you usually eat here in prison (all foods including prison food and others)?

……
……....
.....
.....
.....

Probe: breakfast foods? (Including the food, you are given by the Prisons Service).

……
……
……

Lunch foods?

……
……
……

Dinner foods?

……
……
……
……

Other foods?

……
……
……

4. Tell me about any period you experienced hunger and did not get food to eat.

……
……
……

Probe: why were you hungry?

……
……

What times were you most hungry?

……
……
……

5. What did you do to get food when you were hungry?

……
……
……

Probe: what did you exchange in order to get food when you were hungry?

……
……
……

Who did you rely on in order to get food when you were hungry?

……
……
……

APPENDIX V: NMIMR-IRB CONSENT FORM FOR PRISON INMATES

Title: Food and Nutrition Insecurity in Prisons in Ghana.

Principal Investigator: Augustina Ama Boadu (PhD Candidate)

Address: University of Ghana School of Public Health, Post office Box LG 1, Legon, Accra, Ghana, Email: boaduama@hotmail.co.uk, aaboadu001@st.ug.edu.gh.

General Information about Research

The Ghana Prisons Service is mandated to ensure safe custody, welfare, rehabilitation and reformation of prisoners in Ghana. However, the Service has constantly been confronted with many challenges as it strives to execute this legal mandate. One of the major challenges facing the Service is inadequate food provisioning for prison inmates (Ghana Prisons Service, 2013). For example, annual reports of the Prisons Service as well as reports of the UN Special Rapporteur on prisons show the existence of food insecurity in Ghana's prisons. Therefore, facts that are based on research, on food insecurity and nutritional status of prisoners and factors driving these within the prison system need to be well documented. Policy makers, the Prison Service Management and other advocates may need this information to gain a deeper understanding that can help them come up with needed actions to address the situation and assure duty of care for prisoners.

The aim of this study is to determine food and nutrition insecurity status of prisoners and the factors that drive it in the Ghana Prisons Service. This interview guide forms part of the research and it is meant to solicit your views and experiences of all other factors affecting your food access and food intakes in this prison. You have been selected because you are an inmate of this prison, 18 years old or more, a leader in charge of inmates or food service or ordinary prisoner in your cell and capable of giving objective answers to our questions. The guide is made up of questions you would have to answer directly. We will audio record your responses and also write them in our note books. The exercise will take about forty-five minutes.

Risks and Discomforts

Participating in this study will involve very minimal risk. An inconvenience of this study is the time needed to participate in this study where we engage you in this interview. You may also

experience some emotional stress when you talk about your experiences of food insecurity in the prison. You are free to withdraw at any time if you are uncomfortable.

Possible Benefits

There will be no direct benefit from this study to you. The study is purely an academic exercise. However, you may gain some satisfaction that you are contributing to knowledge about food insecurity of prisons in Ghana and how this knowledge may help in advocating for improvement in feeding conditions for inmates in Ghana's prisons.

Confidentiality

To protect your information, your identity will not be collected in this study. You will be given a code to link your records book. The data collected will be stored on safe hard external drives and will be entered into password protected computers and only the research team will have access to the data.

Compensation

We appreciate your participation and your time. There will not be any compensation in cash or kind to you. However, you will receive a parcel containing food items.

Voluntary Participation and Right to Leave the Research

Your participation in this study is voluntary and you are free to withdraw your consent at any time. Withdrawal will not affect you. There will be no penalty for withdrawing. You may be withdrawn from this study if the research team feel it is not in your best interest to continue participating.

Contacts for Additional Information

If you have any questions about this study, you may contact the student's Principal Supervisor, Dr. Richmond Aryeetey, Phone: +233244129669; Email: raryeetey@ug.edu.gh

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR-IRB). If you have any questions about your rights as a research participant, you can contact the IRB Office the officer in charge of the prison

between the hours of 8am-5pm through the landline 0302916438 or email addresses: nirb@noguchi.ug.edu.gh

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research titled "Food and Nutrition Insecurity of Prisons in Ghana" has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

_____ _____

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name and Signature of Person Who Obtained consent

APPENDIX VI: NMIMR-IRB CONSENT FORM FOR PRISON OFFICERS OICs)

Title: Food and Nutrition Insecurity of Prisons in Ghana.

Principal Investigator: Augustina Ama Boadu (PhD Candidate)

Address: University of Ghana, School of Public Health, Department of Population, Family and Reproductive Health, Post Office Box LG 13, Legon, Accra-Ghana.

General Information about Research

The Ghana Prisons Service is mandated to ensure safe custody, welfare, rehabilitation and reformation of prisoners in Ghana. However, the Service has constantly been confronted with many challenges as it strives to execute this legal mandate. One of the major challenges facing the Service is inadequate food provisioning for prison inmates (GPS, 2013). For example, annual reports of the Prison Service as well as that of the UN Special Rapporteur on prisons show the existence of food insecurity in Ghana's prisons.

Therefore, facts that are based on research, on the extent of food inadequacy in the prisons, and nutritional status of prisoners and factors driving these within the prison system need to be well documented. Policy makers, the Prison Service Management and other advocates may need this information to gain a deeper understanding that can help them come up with the needed actions to address the situation and assure duty of care for prisoners.

The aim of this study is to determine food and nutrition inadequacy status of prisoners and the factors that drive it in the Ghana Prisons Service. This questionnaire forms part of the research and it is meant to solicit your views and experiences of food and nutrition inadequacy in the prisons, factors affecting nutritional status of prisoners, ways by which you and prisoners manage the situation of food inadequacy in the prisons etc.

You have been selected because you are the head of this prison and you are responsible for providing food for prisoners. The exercise will take about 30 to 45 minutes.

Risks and Discomforts

Participating in this study will involve very minimal risk. An inconvenience of this study is the time needed to participate in this study where we administer a questionnaire to you and also the emotional stress you may have when you talk about your knowledge of food insecurity in the prison. You are free to withdraw at any time if you are uncomfortable.

Possible Benefits

There will be no direct benefit from this study to you. The study is purely an academic exercise. However, you may gain some satisfaction that you are contributing to knowledge about food insecurity of prisons in Ghana and how this knowledge could help in advocating for prisons.

Confidentiality

To protect your information, your identity will not be collected in this study. You will be given a code to help in the processing of our data in the prisons which will be linked with your questionnaire. The data will be stored on safe external hard drive and a USB, and will be entered into a password protected computer. The data will be kept under lock and key in a cabinet in researcher's residence. Only the researcher and principal supervisor will have access to the data. The data will be kept for at least Ten years when all possible publications and disseminations are done, before it will be destroyed.

Compensation

We appreciate your participation and your time. There will not be any compensation in cash or kind to you.

Voluntary Participation and Right to Leave the Research

Your participation in this study is voluntary and you are free to withdraw your consent at any time. Withdrawal will not affect you. There will be no penalty for withdrawing.

Contacts for Additional Information

If you have any questions about this study, you may contact the student Principal Supervisor, Dr. Richmond Aryeetey, Phone: +233244129669; Email: raryeetey@ug.edu.gh. Or the researcher,

Augustina Ama Boadu, Phone: +233247583392; Email: amawayo40@gmail.com/boaduama@hotmail.co.uk.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR-IRB). If you have any questions about your rights as a research participant, you can contact the IRB Office between the hours of 8am-5pm through the landline 0302916438 or email addresses: nirb@noguchi.ug.edu.gh

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title "Food and Nutrition Insecurity of Prisons in Ghana" has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

_____ _____

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person who Obtained Consent

APPEDIX VII: NMIMR-IRB CONSENT FORM FOR PRISON OFFICERS (STAFF)

Title: Food and Nutrition Insecurity of Prisons in Ghana.

Principal Investigator: Augustina Ama Boadu (PhD Candidate)

Address: Ghana Prisons Service, Box 129, Accra, Tel: 760093/760094, Mobile: 0247583392; University of Ghana School of Public Health, Department of Population, Family and Reproductive Health, Legon, Accra, Ghana.

General Information about Research

The Ghana Prisons Service is mandated to ensure safe custody, welfare, rehabilitation and reformation of prisoners in Ghana. However, the Service has constantly been confronted with many challenges as it strives to execute this legal mandate. One of the major challenges facing the Service is inadequate food provisioning for prison inmates (GPS, 2013). For example, annual reports of the Prisons Service as well as a report of the UN Special Rapporteur on prisons show the existence of food insecurity in Ghana's prisons. Therefore facts, based on research in the prisons, on the insecurity and nutritional status of prisoners and factors driving these within the prison system need to be well documented. Policy makers, the Prison Service Management and other advocates may need this information them gain a deeper understanding that can help them come up with the needed actions to address the situation and assure duty of care for prisoners.

The aim of this study is to determine food nutrition inadequacy status of prisoners and the factors that drive it in the Ghana Prison Service. This questionnaire forms part of the research and it is meant to solicit your views and experiences of inadequate food availability and access in the prisons; factors affecting nutritional status of prisoners; ways by which prisoners manage and survive situations of food hardship in the prisons etc.

You have been selected because you are a prison officer and have been working for two years or more in the prisons. The exercise will take about 30 minutes.

Risks and Discomforts

Participating in this study will involve very minimal risk. An inconvenience of this study is the time needed to participate in this study where we administer a questionnaire to you and also the

emotional stress you may have when you talk about your knowledge of food insecurity in the prison. You are free to withdraw at any time if you are uncomfortable.

Possible Benefits

There will be no direct benefit from this study to you. The study is purely an academic exercise. However, you may gain some satisfaction that you are contributing to knowledge about food insecurity of prisons in Ghana and how this knowledge could help in advocating for prisons.

Confidentiality

To protect your information, your identity will not be collected in this study. You will be given a code to help in the processing of our data in the prisons which will be linked with your questionnaire. The data will be stored on safe external hard drive and a USB, and will be entered into a password protected computer. The data will be kept under lock and key in a cabinet in researcher's residence. Only the researcher and principal supervisor will have access to the data. The data will be kept for at least Ten years when all possible publications and disseminations are done, before it will be destroyed.

Compensation

Your participation and your time are much appreciated. There will not be any compensation in cash or kind to you.

Voluntary Participation and Right to Leave the Research

Your participation in this study is voluntary and you are free to withdraw your consent at any time. Withdrawal will not affect you. There will be no penalty for withdrawing.

Contacts for Additional Information

If you have any questions about this study, you may contact the student's Principal Supervisor, Dr. Richmond Aryeetey, Phone: +233244129669; Email: raryeetey@ug.edu.gh. Or the researcher, Augustina Ama Boadu, Phone: +233247583392; Email: amawayo40@gmail.com/boaduama@hotmail.co.uk.

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I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

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Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person who Obtained Consent

APPENDIX VIII

RELIABILITY TEST FOR ADAPTED HOUSEHOLD FOOD INSECURITY ACCESS SCALE (HFIAS) AND COPING STRATEGIES MEASUREMENT TOOL

FOOD INSECURITY MEASUREMENT TOOL

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.842[26]	**.844**	**9**

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
You were worried the food provided to you would run out because of lack of money or other resources?	10.75	5.912	.425	.217	.841
You were not able to eat the kinds of foods you preferred because of a lack of resources?	10.86	5.735	.569	.372	.824
You ate only a few kinds of foods because there were not different kinds of food available?	10.86	5.794	.535	.318	.828
You were unable to eat healthy and nutritious food because there was not enough provided to you?	10.81	5.635	.584	.386	.822
You ate less than you thought you needed because there was no enough food to feel satisfied?	10.89	5.618	.662	.500	.814
You ate fewer meals because there was not food at the time you needed it?	10.88	5.635	.643	.455	.816
You and your friends in this prison ran out of food because there was limited supply?	10.77	5.517	.620	.421	.818

[26] The Cronbach's Alpha of 0.84 shows the tool is reliable.

You were hungry but did not eat because you could not get access to food?	10.97	5.728	.704	.529	.813
You went without eating for a whole day and night because there was no food for you?	10.36	6.379	.295	.117	.851

COPING STRATEGIES INDEX MEASUREMENT TOOL

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.748[27]	.748	11

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
coping strategies question1	17.26	28.951	.467	.288	.721
coping strategies question2	18.18	30.535	.395	.176	.732
coping strategies question3	18.80	31.524	.460	.299	.721
coping strategies question4	19.27	35.342	.276	.192	.743
coping strategies question5	17.72	27.318	.598	.680	.696
coping strategies question6	17.78	27.959	.574	.653	.701
coping strategies question7	19.17	34.799	.353	.186	.736
coping strategies question8	19.25	35.357	.279	.155	.743
coping strategies question9	19.37	36.211	.285	.180	.744
coping strategies question10	19.15	34.389	.355	.199	.735
coping strategies question11	19.23	34.582	.310	.172	.740

[27] The Cronbach Alpha value is in range and shows the tool is reliable

APPENDIX IX

Table 4.2: Demographic characteristics of prison Officers (Officers-in Charge and Other Officers)

variable	Frequency	Percentage	Frequency	Percentage
	Officers-in-charge		Other prison Officers	
Sex				
Male	9	81.8	54	70.1
Female	2	18.2	23	29.9
Religious Affiliation				
Christianity	11	100	71	92.2
Islam	nil		6	7.8
Ethnic Affiliation				
Akan	7		36	46.8
Ewe	4		12	15.6
Ga/Damgbe	nil		12	15.6
Northern	nil		17	22.1
Marital status				
Married	11	100	67	87
Widowed	nil		1	1.3
Never married	nil		9	11.7
Ranks				
Junior ranks[28]	N/A		44	57.1
Senior ranks[29]	N/A		33	42.9
DSP-CSP	4	36.3	N/A	
ADP-DDP	7	63.7	N/A	

[28] All other prison officers of ranks below Assistant Superintendent of Prisons.
[29] For the purpose of classification for this study, senior ranks included all other officers of ranks of Assistant Superintendent of Prisons up to Superintendent of Prisons.

APPENDIX X

Table 4.3: Derived, self-reported health conditions and lifestyle habits of prison inmates

Health condition	Frequency (n=437)	Percent
Hypertension		
yes	62	14.2
no	375	85.8
Diabetes		
yes	7	1.6
no	430	98.4
Stroke		
yes	13	3.0
no	424	97.0
Heart attack		
yes	23	5.3
no	414	94.7
Kidney failure		
yes	7	1.6
no	430	98.4
Hemoglobin level		
[30]normal	263	60.2
[31]Low	174	39.8
Malaria status		
positive	15	3.4
Negative	422	96.6
Family history of CVD		
Yes	175	40.0
No	262	60.0
Alcohol intake	238	54.5
Currently smoking	219	50.1
Engage in vigorous for the past 30 days	57	13.0
Days of vigorous intensity activity per week		
≥ 5 days	30	52.6
< 5 days	27	47.4
Engage in moderate intensity activity	210	48.1
Days of moderate intensity activity per week		
≥ 5 days	154	73.3
< 5 days		
Engage in recreational activity in past one week	65	14.9

[30] Hemoglobin of ≥12g/dl for women and ≥13g/dl for men
[31] Hemoglobin value <12g/dl for women and <13g/dl for men