UNIVERSITY OF CAPE COAST

NUTRITIONAL STATUS OF ILLEGAL DRUG USERS IN GREATER ACCRA

BY

JACOB SETORGLO

THESIS SUBMITTED TO THE DEPARTMENT OF POPULATION AND HEALTH OF THE FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF CAPE COAST COLLEGE OF HUMANITIES AND LEGAL STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF DOCTOR OF PHILOSOPHY IN POPULATION AND HEALTH

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Name: Jacob Setorglo

Signature.....Date.....11th June 2016.....

Supervisor's Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with guidelines on supervision of thesis laid down by the University of Cape Coast.

Supervisor's Name: Professor Kofi Awusabo-Asare

Signature.....Date.....11/06/2016.....

Co-Supervisor's Name: Professor Ahmed Adu-Oppong

Signature .....Date .....11th June 2016

ABSTRACT

Illegal drugs continue to be used in Ghana particularly in the urban centres such as Greater Accra. Illegal drug use can negatively affect health behaviour, body composition and metabolism. This thesis assessed the socio-ecological influences that shape illegal drug use initiation, continuation and termination and the associated nutritional health in Greater Accra Region of Ghana. Snowball sampling was used to recruit 141 respondents (123 males and 18 females). Data on background characteristics, personal, interpersonal, societal and institutional influences on illegal drug use habits were collected using semi-structured questionnaire. Body composition and blood was collected on each respondent using standard procedure. Descriptive statistics were presented for background characteristics, frequency of illegal drug use and socio-ecological influences on illegal drug use habits. Predictors of illegal drug use was determined using Logistic and Poisson regressions. Results indicated that hallucinogen was the main drug used. The likelihood of using illegal drugs was found to be associated with age and marital status. Personal and societal factors were associated with illegal drug use continuation, interpersonal and societal factors were associated with initiation of drug use, societal and institutional factors were associated with illegal drug use termination. There were differences in the biochemical and enzymatic characteristics observed between male and female illegal drug users who used the same illegal drugs at the same frequency. Tailored advocacy, as part of illegal drug use control-policy, and establishment of treatment and rehabilitation may help mitigate illegal drug use.

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DEDICATION

To Selasie and Senyo and Maa Abla

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LIST OF ACRONYMS

ALP	Alkaline Phosphatase
ALT	Alanine Aminotransfarase
AST	Aspartate Aminotransferase
BMI	Body Mass Index
BW	Body Weight
CCTH	Cape Coast Teaching Hospital
CEPS	Customs Excise and Preventive Service
CHPS	Community-based Health Planning and Services
CI	Confidence Interval
CID	Criminal Investigative Department
EDTA	Ethylene Diamine Tetra Acetic Acid
GDHS	Ghana Demographic and Health Survey
GHS	Ghana Health Service
GNA	Ghana News Agency
GoG	Government of Ghana
GPS	Ghana Police Service
HBM	Health Belief Model
HC	Hip Circumference
HDL	High density Lipoprotein
HIV	Human Immunodeficiency Virus
IBPM	Integrated behaviour Prediction Theory
IBW	Ideal Body Weight

ICO	Index of Central Adiposity
IRR	Incident Risk ratio
KIA	Kotoka International Airport
LBM	Lean Body Mass
LDA	Gamma Glutamic Transpeptidase
LDL	Low Density Lipoprotein
NACOB	Narcotic Control Board
NHIS	National Health Insurance Scheme
NSBT	Normative Social behavioural Theory
PHC	Population and Housing Census
PMT	Protection Motivation Theory
PNDC	Provisional National Defence Council
ROA	Route of Administration
SA	Serum Albumin
SCT	Social Cognitive Theory
SEM	Socio-Economic Model
SG	Serum Globulin
TC	Total Cholesterol
UCCIRB	University of Cape Coast Institutional Review Board
UNICEF	United Nations Children's Fund
UNODC	United Nations Office on Drugs and Crime
VLDL	Very Low Density Lipoprotein

WBC	White Blood Cell
WC	Waist Circumference
WHO	World Health Organization
WHR	Waist-to-Hip ratio
WtHR	Waist–to-Height Ratio
% BF	Per Cent Body Fat

CHAPTER ONE

INTRODUCTION

Background to the Study

Illegal drug use is a global phenomenon. In 2011, four to seven per cent of the adult population worldwide were estimated to have used an illicit drug (United Nations Office on Drugs and Crime [UNODC, 2013]. In Africa, the prevalence of marijuana use was eight per cent which was nearly double the global average. West and Central Africa was estimated to have 1.6 million cocaine users (UNODC, 2013). According to the 2007 World Drug Report, 22 per cent of Ghanaians, aged 15 to 64 years, smoked marijuana or used cannabis the year before (UNODC, 2007). Illegal drug use has been observed among adults and teenagers with the minimum age of usage at ten years (Brown-Acquaye et al., 2000).

Use of illicit drugs has been found in Junior and Senior Schools (Dennis-Antwi et al., 2000), communities (Arthur, 2008) and formal places of employment (Arthur, 2008; Sokro, 2010). In a study in selected Junior Secondary Schools in Ghana, Senah et al. (1998) observed that out of 1,917, students 19 per cent used illegal drugs.

Ghana ranked third in the world on marijuana use in 2007 (UNODC, 2008). Findings revealed by Peace FM in 2014 coupled with the Narcotics Control Board (NACOB) estimated that, in 2014, 50, 000 people used and abused drugs. According to the report, about 35,000 of the users were students in Senior high schools and tertiary institutions, aged between 12 and 35 years (Peace FM news, 2014).

The period after the Second World War (1939-1945) was the first time illegal drug was used in Ghana, and this was by soldiers who had returned from combat (Akyeampong, 2005). The period between 1960 and 1980 saw the introduction and expansion of marijuana cultivation into other areas beyond Accra (Ohene, 2008). Illegal drug consumption was initially by those who were unemployed or employed in low-paying wage jobs with very little economic security (Akyeampong, 2005). With the expansion in cultivation and distribution usage expanded into those with well paying and secured jobs (Shehu, 2009). There was also a shift in the type of drugs used, from marijuana grown locally to imported drugs such as cocaine (UNODC, 2013). Currently, the country serves as a route for drug trafficking (Ellis, 2009; Shehu, 2009).

Illegal drugs refers to drugs that some nations in the world prohibit their production, market or consumption (UNODC, 2007). Such drugs tend to be sold illegally, taken recreationally, and/or manufactured unprofessionally (UNODC, 2013). Newer drugs are being synthesised and these are not specified. Unspecified drugs are synthetic drugs which are equal to an existing drug but with minor modification. These drugs affect the functioning of the brain and can lead to changes in behaviour, perception, mood and consciousness of users (van Leeuwen et al., 2014). The length of time it takes users to metabolize a drug depends on type of drug, age and frequency of use.

In Ghana, The Provisional National Defence Council (PNDC) Law 263 (1990) prohibits the production, distribution and consumption of drugs such as cocaine, heroin and marijuana (Affinnih, 1999; Akyeampong, 2005). Four

main institutions namely the Narcotics Control Board (NACOB), the Ghana Police Service (GPS), the Customs Excise and Preventive Service (CEPS) and the Judiciary have the responsibility, to ensure that, laws on illegal drugs are enforced. NACOB was to be the main coordinating institution while other state agencies such as the Ghana Immigration Service (Ghana Immigration Service) and the Ghana Navy were to prevent the entry of drugs into the country. Over the years a number of arrests and seizures have been made at various entry points into the country. For example, between 2005 and 2007 183 arrests and seizures of substances later confirmed as illegal drugs (Nkyi, 2014) were made.

Varying reasons have been found to account for use of illegal drugs among secondary school students. Among the reasons, peer pressure, family influences such as parental smoking habits and emulating lifestyle of illegal drug users in the media (Brown-Acquaye et al., 2000; Senah, 1980). For instance, 61 per cent of students got introduced to illegal drug use by their families, friends and peers (Brown- Acquaye et al., 2000). Users were generally from homes headed by a single parent and were likely to be males.

Use of illegal drugs has been found to start earlier for males than females (Brown-Acquaye et al., 2000), and cuts across socio-economic groupings (Akyeampong, 2005; Carter et al., 2013). In Ghana, illegal drug use was found in the adult population (Akyeampong, 2005) before expanding into the younger population (Brown-Acquaye et al., 2000; Dennis-Antwi J., 2000). Outside Ghana, teenagers used most of the illegal drugs compared with older segments of the population (McCabe et al., 2014).

Illegal drug use has also been found to be associated with genetic makeup and socio-ecological factors (Barnes et al., 2012; de Koenig, 2007). Therefore males and females would be expected to have different development efficacies and effectiveness with the use of illegal drugs (Agrawal et al., 2014), and may use drugs for different motivational reasons (Araya et al., 2013; Denoth et al., 2011) as illegal drug uses between the sexes have cultural normative values. While illegal drug use, although, is not acceptable among males this is not only frowned upon but discouraged as much as among females (Denoth et al., 2011). Among males, illegal drug use was found to be for identity and in some communities it signifies masculinity (Denoth et al., 2011). For, females, illegal drugs may be used to lose weight while among males it may be used in order to undertake stressful manual work (Denoth et al., 2011).

Socio-economic background such as educational status and cultural values has been found to be associated with use of illegal drugs (Alves et al., 2011). For instance, educational status is expected to influence risk perception and health behaviour such as illegal drug use. Marijuana users were found to have lower educational level (Shrier et al., 2012). The cultures of ethnic groups are associated with illegal drug use (Stoddard, 2012). Cultural values influenced the start of illegal drug use and its termination (Flores et al., 2014).

Religious norms and values may be associated with the use or non-use of illegal drugs (de Koenig et al., 2007; Neumark, & Lopez-Quintero, 2010). For instance, Wray-Lake et al. (2012) found religiosity to be independently and negatively associated with the use of marijuana as a recreational drug.

Influence of spouse, individual knowledge, beliefs (Gutierrez & Long, 2011) and efficacy have been found to play roles in illegal drug use (Connor et al., 2013; Kendler et al., 2014; Ventura et al., 2013).

Nutritional status has been found to be associated with use of illegal drugs (Rosseel, 2012). Inadequate dietary intake, for example, may be due to intakes which are less in energy and nutrient to meet daily requirements or the avoidance of dietary intake before or after episodes of illegal drug use. Illegal drugs may either reduce or increase appetite and will shift the balance of nutritional status either to over-nutrition or under-nutrition. Underlying cause of malnutrition is the lack of access to nutritious food. This may result from lack of funds to buy food or illegal drug users may use money on drug habits and therefore have very little or none left for food.

Basic causes of nutritional status such as the background characteristics occur at the societal level. It is expected that higher level of education will reflect in nutritious food selection for adequate nutritional status. The same goes for occupation. A good occupation with more than adequate wages will translate to food security for the individual. However this logic does not occur in reality.

Use of illegal drug can affect body composition, metabolism, dietary behaviour in the form of eating patterns and food choices (Anema et al., 2013; Baptiste et al., 2009; McIlwraith et al., 2014). Factors, such as dietary intake, access to food and the ability of the body to metabolize nutrients affect nutritional status. Certain behaviours such as avoidance or taking too much food during episodes of illegal drug use may also affect energy intake and

hence nutritional status. For instance, illicit drugs such as marijuana (Anema et al., 2013; Frost et al., 2013), stimulants (Bavarian et al., 2013), heroin (Neale et al., 2014), and cocaine (Kirkam, 2005) are known to be associated with varying degrees of disordered eating as well as changes in specific nutrient status and metabolism. Heroin use, for instance, may lead to hyperkalemia and use of morphine can result in inhibition of calcium absorption (Islam et al., 2002). Nutrition-related physiological aspects, such as impaired gastrin release, hypercholesterolemia, serum nutrient imbalance, and hyperthermia, are also considered to be associated with the use of certain illegal drugs (Barry & Petry, 2009).

Use of stimulants and amphetamines (Hall & Degenhardt, 2009) are associated with reduction of body weight partly because users are known to reduce dietary energy intake (Himmelgreen et al., 1998; Krug et al., 2008). Wasting and weight-loss patterns due to use of illegal drugs are sex-specific as well (McIlwraith et al., 2014): Males who use illegal drugs tend to have normal anthropometric values than females who use the same illegal drugs. Lower body mass index (BMI) values were reported for males who used illegal drugs compared with males who did not use illegal drugs (Barry et al., 2009; Nolan, 2012).

Dyslipidaemia has an association with use of illegal drugs and is widely established as an independent risk factor for cardiovascular disease (Vidot et al., 2013). Low levels of high density lipoprotein (HDL) cholesterol and hypertriglyceridaemia have been found to be independently and significantly related to lipid oxidation, oxidative stress, myocardial infarction/stroke among cannabis users (Casier et al., 2014; Mak et al., 2011; Muniyappa et al., 2013).

It is characterized by increased flux of free fatty acids; raised triglyceride (TG) values; low HDL cholesterol values and increased small, dense low density lipoprotein (LDL). Those who used illegal drugs once in a lifetime are more likely to have heightened heart and abnormal metabolic risk than those who did not (Vidot et al., 2013).

The use of an illegal drug such as cocaine may lead to reduction in body weight while use of marijuana has the potential of leading to increase in weight. However the influence of these illegal drugs on the nutritional health depended on the frequency of use and modes of administration (Barnes et al., 2012). Given that there were no underlying medical conditions of illegal drug users, then the amount of metabolites and certain biochemical markers such as cholesterol and aspartate amino transferase (AST) in serum can serve as benchmark for nutritional status determination.

Nutrient deficiencies and imbalances may cause wide health problems related to the individual and the environment (Blüml et al., 2011). Cofrancesco (2007) found that protein and calorie malnourishment was associated with gender, frequency of use of illegal drugs, anorexia, poor dietary and energy intake, and no family ties. Islam et al. (2002) followed 253 male drug users and found vitamin deficiencies in users compared with controls.

Illicit drug use has been found to impair metabolism and thus compromise the amounts of nutrients and enzymatic catalytic processes needed for health (Degenhardt & Hall, 2008). Nolan and Stolze (2012) found that users of illegal drugs reported a higher consumption of sweets, shows a higher eagerness to consume sweet foods, and a wish to consume quantities larger than was desired by controls. The findings from the study itself suggest that

certain types of drugs stimulate appetite for certain food substances and this have implications for energy balance and micronutrient status. While these earlier studies focussed on the food habit of the illegal drug user the studies were silent on the nutritional status and metabolic integrity of the drug user. Neale et al. (2012) studied the eating patterns of 77 heroin users, and observed dysfunctional eating patterns among participants.

In another study, Rosseel (2012) found illegal drug users to be deficient in iron or in vitamins. They were of the view that the prevalence of malnutrition was likely to have been underestimated because oral multivitamin supplementation and parenteral thiamine were administered as part of established practices upon admission (Neale et al., 2013). These authors reinforced the belief that early nutritional assessment and intervention will have the potential to benefit patients undergoing long-term clinical treatment. Running through the results is that there is loss of nutrient when one engages in illegal drug intake. The severity and type of nutrient loss is associated with the type of illegal drug used.

Earlier studies have documented the existence and use of illegal drugs in Ghana (Table 1). Nkyi (2014) and Ntobea (2010) have indentified illegal drug use among senior and junior high school students. Senah (1980) also conducted prevalence study in an educational setting which included teachers and sample of parents of students. It was found that teachers were not aware of the use of illegal drugs by students. The essence of including parents was to see if drug use habits among students had any association with parental habits. One observation was that students who used illegal drugs were from homes

headed by single parents. Sokro (2010) established that use of illegal drugs occurred at work places.

Other studies were on indentified the background characteristics of illegal drug users and the types of drugs that were used. For example, Affinnih (1999) associated illegal drug use with mental health in a pilot study in Tudu, Accra known for illegal drug activities (Table 1). He found that those with no formal education were likely to use illegal drugs. Dennis-Antwi et al. (2000) found that illegal drug use was prominent among secondary school students; lack of parental control accounted for the use of illegal drugs among the students. Results also showed that the students associated illegal drug use with improved academic performance. These studies established that illegal drugs existed in communities and schools.

The study by Senah (1980) highlighted the need to include behavioural elements in the study of illegal drug use. That was because it explains the motivations and social contexts of use of illegal drugs. This recommendation was found to be useful since influence on illegal drug use does not depend on the individual alone but also on influence of peers, family, societal norms and belief as well as the community. For instance, students were motivated to use illegal drugs because they perceived it helped them in their academic pursuit. Lack of formal education would likely influence illegal drug use harm perception and lack of parental control could also lead to illegal drug use. Lack of knowledge of teachers to detect illegal drug use and counsel students that use illegal drugs could be part of the reason why illegal drug use was prevalent in schools.

Table 1: Empirical Studies on Use of Illegal Drugs in Ghana

Authors	Type of study	Title	Participants	Outcome measure	Main findings
Nkyi, 2014	Non-experimental	Substance abuse among Senior High School students in Ghana	244 students	Prevalence of substance use in Senior High School	Presence of substance use among students
Sokro, 2010	Survey	Perception of substance abuse on Employees' Performance in Ghana Airport Company	150 employees of Ghana Airport Company	Effect of substance abuse on work performance	Alcohol was main substance abused and substance use was associated with lower work performance
Ntobea, 2010	Cross-sectional	Prevalence of substance use among JHS pupils in Dangme West District	366 students	Prevalence of substance use and age at first use	Prevalence was 17 per cent; age at first use was 11 years
Lamptey, 2005	Longitudinal comparative study	Socio-demographic characteristics of substance abusers and non-abusers	87 substance users and 87 non-users	Background characteristics	Background characteristics of drug abusers are associated with use of illegal drugs compared with non-users
Affinnih,	Cross-	A preliminary study of	117 former and	Types of drugs	Illegal drugs abused were

1999	sectional	drug abuse and its mental health consequences among addicts in Greater Accra	current illegal drug users	use and health consequences	identified and association with health issues determined.
Afinnih, 1999	Exploratory	Drug use in Greater Accra, Ghana: pilot study.	117 former and current illegal drug users	Portrait of a typical drug user	Nature of illegal drug use was identified and classified based on background characteristics.
Senah, 1980	Cross sectional	Drug abuse and drug education in Ghana	4216 Students, 250 Teachers and 150 Parents	Identification of illegal and legal drugs being used and attitudes	Drugs used by each category of respondents were identified. Behavioural factors to use were recommended as part of education messages

Source: Field data, (2014)

Problem Statement

A number of studies on illegal drugs use have established that illegal drugs were used in secondary schools and workplaces (Sokro, 2010; Ntobea, 2010). Affinnih (1999) conducted a study in Tudu, a suburb of Accra, and found an association between types of illegal drugs and background characteristics. Table 1 has information on some of the studies conducted on illegal drug in Ghana. The previous studies done on illegal drug use in Ghana documented background characteristics of users, the prevalence of illegal drugs used and the types of illegal drugs used.

Of the six nutrition policies adopted since Ghana's independence, none has targeted illegal drug users. The period immediately after independence (1957–1966), the emphasis was on food demonstration and nutrition education. Between 1966 to1974, the next nutrition action plan was on the continuation of food demonstration, nutrition education and transition into identifying attitude and behaviour change requirements in nutrition. Weaning foods, supplementary food and malnourished children were the focus from 1974 to 1987. The fifth focus was between 1987 and 1990 where the priority action was on addressing micronutrient requirements particularly salt iodization. The decade after this (1990 to 2000) saw the continuation of intervention on hidden hunger and the start of action on exclusive breastfeeding.

This study sought to assess the socio-ecological underpinnings in the use of illegal drugs. It examined personal habits and the influences of peers, family, society, institutions and the policies on illegal drug use and factors associated with initiation, continuation and termination of use of illegal drugs. It also

documents the types of illegal drugs that are used, frequency of intake and indicators for metabolic changes between males and females. Nutritional status determinations are accurate when assessed on healthy individuals such as in the communities and not on those who have health problems (Lamptey, 2005) and are receiving treatment at facilities. In Ghana, because theses drugs are outlawed, users may not seek early medical help for fear of being identified, reported and arrested. As a result there are no institutional data on use of drug and its implication on nutrition in Ghana.

Objective

The main objective of this study was to assess the nutritional status of illegal drug users in Greater Accra.

Specific Objectives

The specific objectives of the research were to:

1. Assess the background characteristics of illegal drug users;
2. Analyse socio-ecological influences on illegal drug use habits;
3. Examine the association between use of different illegal drugs and nutritional status markers; and
4. Analyse serum nutrients among users of different illegal drugs.

Hypotheses of the Study

1. There is no difference in the background characteristics of male and female illegal drug users. The expectation background characteristics will influence

illegal drug use. The difference if any will be in the use of different illegal drugs.

2. There is no difference in socio-ecological factors that influence illegal drug use habits of males and females. The expectation is that illegal drug use initiation, continuation and termination will be associated with background characteristics. The difference if any will be in the use of different illegal drugs.

3. There is no difference in the nutritional status indicators of male and female illegal drug users. The expectation is that illegal drug use will influence nutritional status.

4. There is no difference in the biochemical measures of metabolic integrity between male and female illegal drug users. The expectation is that illegal drug use will influence biochemical measures of metabolic integrity.

Rationale of the Study

National policy on nutrition, since inception, provides information on food fortification with nutrients, improving under-five nutrition through exclusive breastfeeding and vitamin A supplementation. Nutrition information from Ghana Health Service (GHS) and Ghana Demographic and Health Survey (GDHS) which provide information on key nutrition policy focused on 'normal' populations (GDHS, 2008). Few studies conducted in Ghana have provided information on the prevalence, use of illegal drugs but lack information on nutritional implications of management during treatment and

rehabilitation. Access to health is a right for every citizen of Ghana including illegal drug users. Data from the study will provide information on illegal drug use habits of females and males as well as the association between specific illegal drug and its influence on anthropometric characteristics between males and females. Understanding illegal drug use initiation, continuation and termination factors would be key in eliminating illegal drug use. Data generated by this study therefore will inform harm reduction efforts such as rehabilitation and reduction of amount and types of drugs that are used and distributed. This study also covers the whole of Greater Accra compared with that of Affinnih (1999) which was localised at Tudu. Another rationale is that previous studies did not identify places that drugs were bought and used. This study will identify spatial aspects of illegal drug use. This will aid allocation of resources in terms of education and reduction efforts in the region.

Chapter Organization

This thesis is organized into eight chapters. The first chapter introduces the general orientation of the thesis. It mentions the prevalence of and use of illegal drugs. It explores the association of background characteristics and illegal drugs use. Furthermore, the chapter explains the factors that influence illegal drug use habits. The possible alterations in nutritional and metabolic effects due to illegal drug use are stated. It summarizes studies on illegal drug use studies conducted in Ghana.

Related literature on illegal drug use in the world and Ghana were reviewed in Chapter Two. It focused on types of drugs used in the world and Ghana and models used to explain the behaviour of users. The chapter also

discusses issues on anthropometrics as well as serum nutrients and enzymes as they relate to drug users.

The third chapter is on the methods of data collection and analysis. It describes the design of the study, sample size and sampling issues, fieldwork preparation, data collection methods and procedures, data entry and cleaning, validity and reliability as well as analytical methods.

The fourth chapter is on background characteristics of respondents such as age, marital status, occupational and educational levels, and types of drugs and frequency of use. In the chapter, background characteristics of respondents were related to the types of illegal drugs used. Chapter five presents information on the habits and socio-ecology of the respondents.

Chapter six explores associations between illegal drug use and body composition measurements. Chapter seven presents the interrelationships between serum markers of metabolic integrity (albumin, bilirubin, aspartate aminotransferase) and illegal drug types. Chapter eight contains summary, conclusions, policy implications and recommendations.

CHAPTER TWO

THEORETICAL AND CONCEPTUAL PERSPECTIVES ON ILLEGAL DRUG USE AND NUTRITIONAL HEALTH STUDIES

Introduction

This chapter reviews literature on theoretical and conceptual perspectives on illegal drug use and nutritional health in two sections. The initial part discusses theories and models on illegal drug use behaviour and includes Health Belief Model (HBM), Social Cognitive Theory (SCT), Normative Behaviour Theory (NBT), Protection Motivation Theory (PMT), Integrative Behaviour Prediction Model (IBPM) and Socio-Ecological Model (SEM).

The second component of this chapter is on use of illegal drugs and nutritional health. It has been found that use of illegal drugs has both direct and indirect causal relationship with nutritional status (Vidot et al., 2013; Blüml et al., 2011; Tang et al., 2010). The use of illegal drug is expected to influence nutritional health, change dietary behaviour and food choices (McIlwraith et al., 2014; Anema et al., 2013; Nolan & Stolze, 2012). Drugs such as marijuana (Anema et al., 2013; Kurth et al., 2012), stimulants (Zhang et al., 2007), heroin (Neale et al., 2014), and cocaine (Farhat et al., 2011) have been associated with varying degrees of disordered eating with consequences on nutritional health.

Several frameworks and theories exist to understand and explain behaviours that have implications on health (Petraitis et al., 1995; Sociology guide.com,

2011). Theoretical models which have been applied in researches dealing with food choice and food intake, as well as food and nutrition education are the Health Belief Model (Bonar & Rosenberg, 2011; Buckner et al., 2012; Webb et al., 2010), the Theory of Reasoned Action (Ajzen & Fishbein, 1980) and its extension the Theory of Planned Behaviour (Ajzen & Fishbein, 2000), Social Cognitive Theory (Bandura, 2000), Transtheoretical theory (Armitage, 2010). The psychological and sociological models do not take into account the environmental associations on behaviour (Malmberg et al., 2012; Ogden, 2007). Psychological theories and models are limited in their ability to direct investigations into underlying causes and rationales for food preferences and behaviours. Sociological theories explore collective behaviours, try to find evidence of group-specific practice. The central variables of analysis are usually age, gender, education, class, ethnicity and locality. Socio-ecological model provides a framework for exploration of interaction and integration of factors that directly and indirectly influence the nutritional status of the individual (Brofenbrenner, 1979; Stokols, 1996; Stokols, 2000).

Health Belief Model

The Health Belief Model (HBM) was developed to explain and predict preventive behaviours associated with health (Figure 1) (Kim et al., 2012; Embleton et al., 2013). It has six constructs; perceived susceptibility, perceived severity, perceived benefits, and perceived barriers, cues to action, and health motivation that are used to explain health behaviour (Fleary et al., 2010).

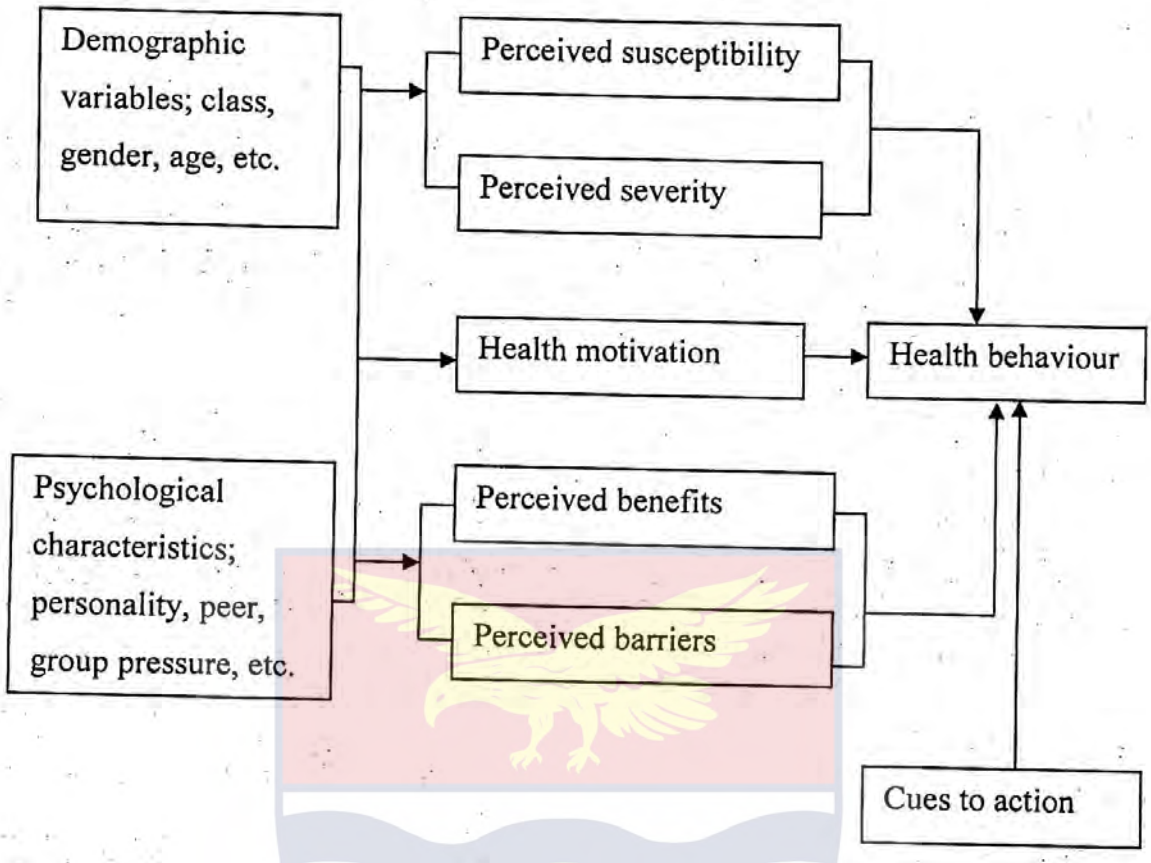


Figure 1: Health Belief Model

Source: Becker & Maiman, (1975)

According to the model, when an individual perceives his health to be threatened and believes in the effectiveness of the proposed preventive behaviour, then there is the likelihood that preventive action will be taken (Jackson et al., 2013; Rosenstock et al., 1994). If the individual sees the perceived threat and perceived susceptibility as personal threats the choice of behaviour will be influenced by perceived benefits (Kim et al., 2012). Background, demographic variables (age, gender, religion, ethnicity etc) and

psychological variables (peer, group pressure) are modifying factors that affect individuals' perception of beliefs (Asci & Sahin, 2011).

Cues to action are prompts to take actions consistent with an intention, ranging from advertising to personal communications from health professionals, family members and/or peers while motivation may be seen as indicative of the extent to which the individual takes a given action (Asci & Sahin (2011; Jason et al., 2014). The model describes a mixture of a personal risk analysis, followed by an evaluation of the anticipated solution and its use. It offers a functional structure for a wider range of belief-change situations. The likelihood and impact are common dimensions of risk in health behaviour.

The model has been used to predict preventable health behaviours including human immunodeficiency virus (HIV)-related risk behaviours (Gu et al., 2010), dietary behaviours (Becker & Maiman, 1975), breastfeeding behaviours (Asci & Sahin, 2011), injecting drug use intention (Bonar and Rosenberg, 2011), college students' health behaviour (Kim et al., 2012), exercise and fruit intake (Becker & Maiman, 1975), health promotion (Asci & Sahin, 2011; Becker & Maiman, 1975).

Strengths of HBM

The model shows that health choices are based not only on rational thought but also on emotions, habits, social conditioning and personal preference (Bonar & Rosenberg, 2011; Kim et al., 2012). Thus, it is an effective tool in studying behaviours.

Weaknesses in HBM

Despite its wide use in health sector for predicting behaviours the model has inherent weaknesses in that it does not consider the influence of environmental factors such as peer and community influences. The construct of the 'perceived threat' element serving as a central indicator of behavioural motivation of the model has been questioned (Fleary et al., 2010). So has the phenomenological orientation of its design. Components like perceived barriers and demographic and socio-economic descriptors, as normally applied this model assumed that people are rational actors, driven by their conscious perceptions of the world (Fleary et al., 2010). This may suggest that health behaviours can best be understood as being under volitional control, rather than in a large part determined by combinations of circumstantial reality and individuals' habitual, emotional, unconscious and/or otherwise non-rational reactions to the external world. The model assumes that everyone has access to equal amounts of information on their health situation. Inclusion of cues to action in the model suggests that health reasons are the main goal in the decision-making process.

Social Cognition Theory

Social Cognition Theory (SCT) (Figure 2) is based on the view that people learn by observing the actions of others and the results of those actions (Bandura, 1986). Key features of the theory relevant to health behaviour are observational learning, reinforcement, self-control and self-efficacy. Outcome expectations are concerned with individuals' belief about possible consequences of their actions. Positive and negative outcome expectations influence the decision to change one's behaviour. Socio-

structural intentions are seen as direct and sometimes sufficient predictor of behaviours.

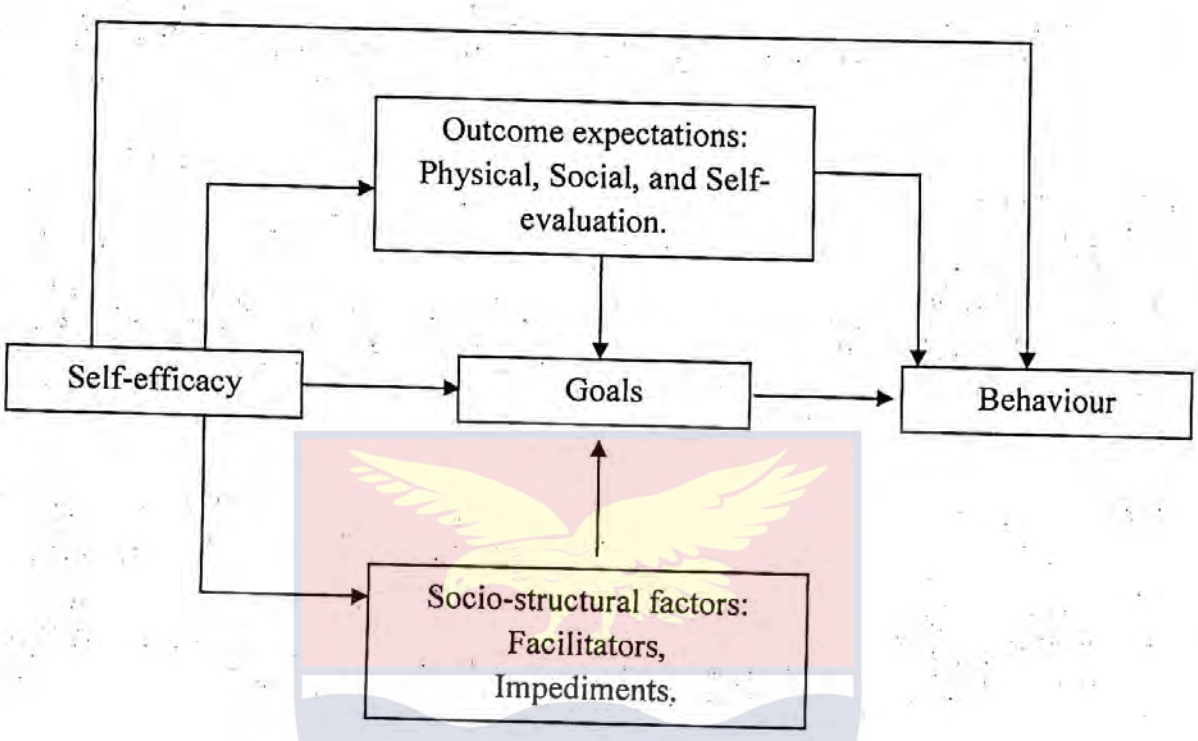


Figure 2: Social Cognition Theory
Source: Pajares, (2002)

The theory has been applied to studies on health behaviours such as physical activity prediction (Bailey et al., 2013; Mayet et al., 2012), alcohol consumption (Scull et al., 2010), illicit drug use (Traube et al., 2013), proximal influences on drug use (Piontek et al., 2013).

Strengths of SCT

The theory is relevant to health communication. The theory deals with cognitive, emotional aspects and aspects of behaviour for understanding behavioural change. The concepts of the SCT provide ways for behavioural research in health education and communication.

Weaknesses in SCT

The theory assumes that changes in socio-cultural factors and outcome will automatically lead to changes in the health behaviour of the individual (Bandura, 2000). Societal norms and interpersonal relationships do influence behaviour considerably. The theory relies on social learning as a process and in doing so disregards biological predispositions that influence behaviours as well as policies, laws and institutional influences (Glanz et al., 2007). The theory does not focus on emotion or motivation, other than through reference to past experience.

Normative Social Behaviour Theory

The normative social behaviour theory (NSBT) postulates that the influence of society leads people to conform in order to be accepted. It becomes a social obligation to fit in and continue to do what others are doing. The people who are influenced the most by this concept have low self-esteem (Dieterich et al., 2013). This theory focuses specifically on the effects of one type of social norm - descriptive norms (i.e., the perceived prevalence of others' behaviour). Descriptive norms occur through interactions with moderators which may exert a direct influence on behaviour, their primary role is to heighten the influence that descriptive norms have on behaviour. The potential moderators proposed include injunctive norms, outcome expectations, and group identity. A fourth moderator, ego-involvement was added to the model after the theory was initially proposed (Fishbein, & Ajzen, 2010). The model has been used to study men and women with childbearing intentions (Iacovou & Tavares, 2011), injection drug use initiation (Kolajova

et al., 2013), eating disorders (Krug et al., 2009), actual versus perceived peer sexual risk (Black et al., 2013), body weight perception (Perkins et al., 2014).

Strengths of the Theory

The theory distinguishes descriptive from injunctive norms and focuses on factors that moderate the influence of descriptive norms on behaviours. These moderators include injunctive norms, outcome expectations, and group identity.

Weaknesses of the Theory

One limitation of the theory is that it does not address the ways in which normative information is communicated or the ways in which communication might be used to augment normative perceptions. It also does not address the moderating role of ego involvement on the descriptive norm–behaviour relationship. Norms are represented as equilibria and as such, are supported by cluster of self-fulfilling expectations.

Protection Motivation Theory

Protection Motivation Theory (PMT) is a social cognition model used to predict health behaviour (Conner & Norman, 2007). The PMT (Figure 3) proposes that an individuals' intention to engage in health behaviour, or protection motivation results from the two processes: threat appraisal which includes perceived severity, perceived vulnerability and perceived rewards associated with maladaptive behaviour and coping appraisal which includes

self-efficacy, response efficacy, and attitudes towards the potential cost associated with performing adaptive behaviour (Roger, 1983).

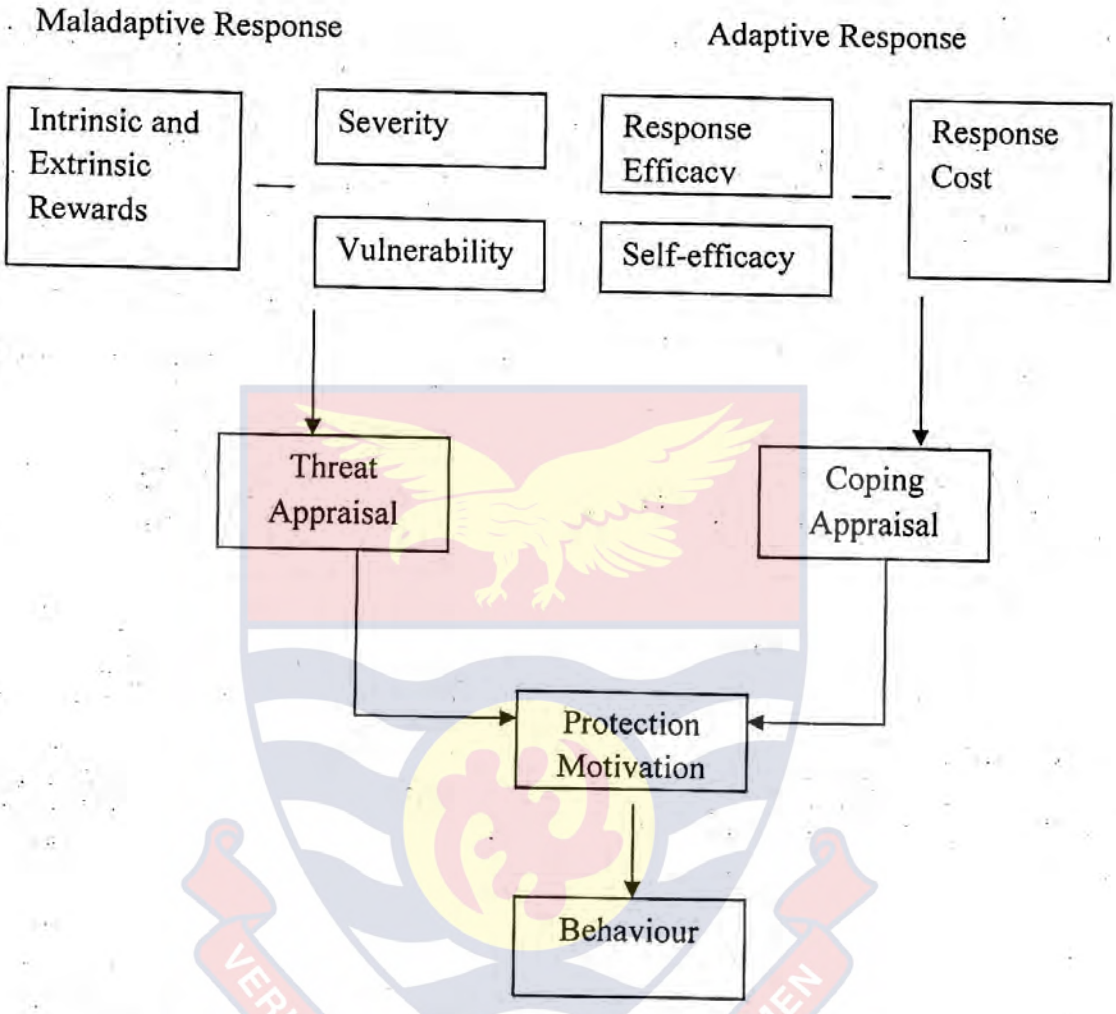


Figure 3: Protection Motivation Theory
Source: Rogers, (1975)

The protection motivation is a positive function of individuals' perceptions of severity, vulnerability, response efficacy, and self-efficacy, and includes a negative function of individuals' perceptions of rewards associated with maladaptive processes and response costs of adaptive behaviour.

Protection motivation and self-efficacy are useful predictors of health behaviour in PMT (Conner & Norman, 2007; Hukkelberg et al., 2014). The model includes many of the key social cognitive determinants of health. For example, like HBM it includes perceived vulnerability and severity, as well as the perceived benefits of, and barriers to performing health behaviour. Protection motivation theory has been used extensively to study safe sun exposure (Armitage, 2010; Grunfeld, 2004), aerobic exercise (Plotnikoff et al., 2009), predictors of dietary intake (McGee et al., 2008).

Strengths of the PMT

The advantages of the model are in recognition of self-efficacy and the possibility of maladaptive response, why this happen and how it can be changed. PMT specifies what information is needed to contain (threat and advice how to avoid this danger) in order to be effective.

Weaknesses of the PMT

PMT assumes that individuals process information consciously and so do not account for habitual behaviour, nor does the model recognize social factors that predict health behaviour (Ogden, 2007). The theory does not account for the environmental influences on health behaviours such as those observed by the socio-ecological model.

Integrative Behaviour Prediction Model

The integrative behaviour prediction model (IBPM) accounts for any health behaviour, regardless of whether the behaviour is deemed logical or not (Figure 4). The IBPM assumes that people act on their intentions when they

have the skills to perform those actions which are not impeded by environmental factors. In addition to the possession of skills, it indicates that there are wide ranges of societal contextual factors that can either facilitate or impede behaviour (Kabir et al., 2013; Richards, 2014).

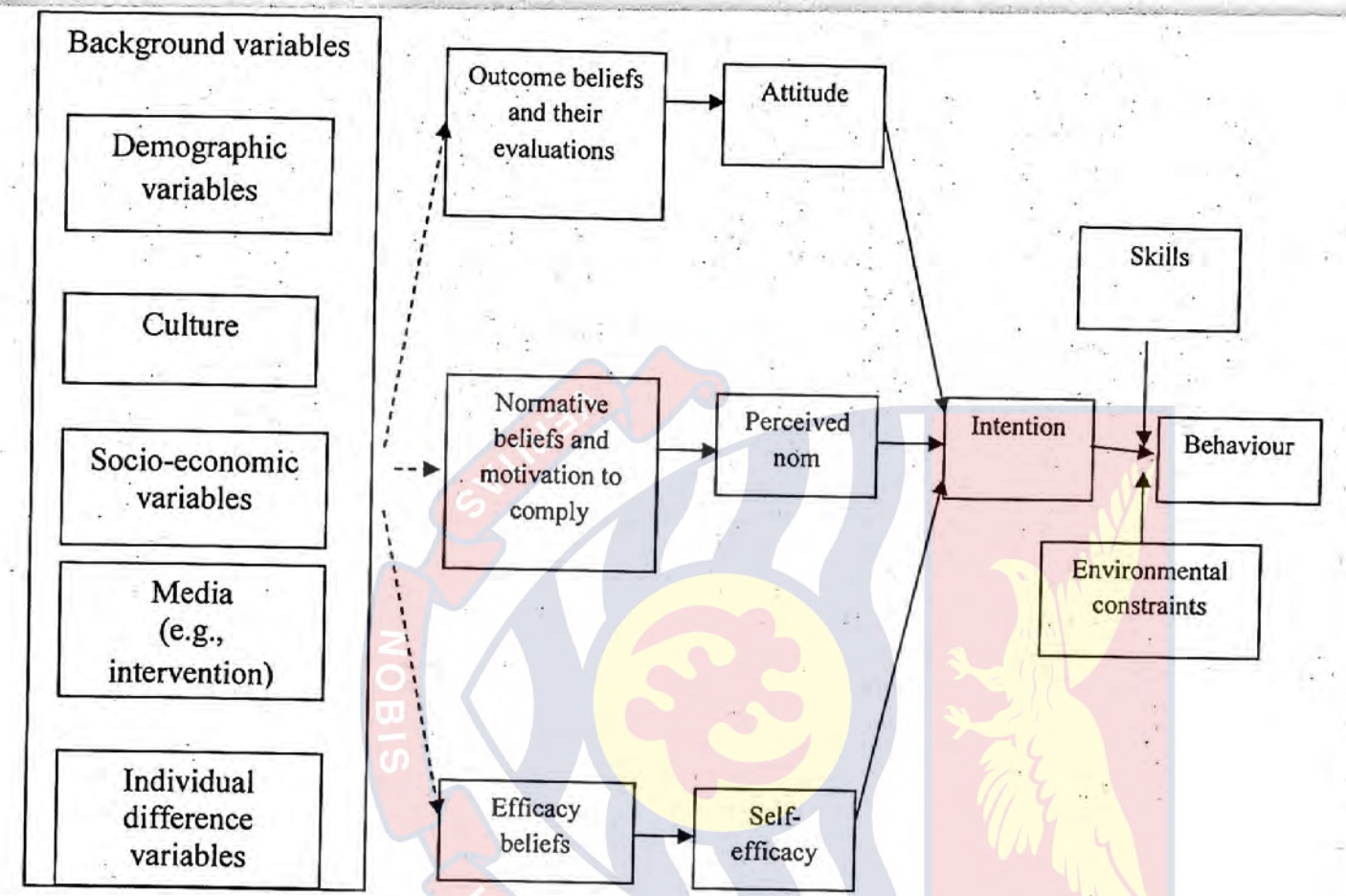


Figure 4: Integrative Behaviour Prediction Model

Source: Fishbein & Ajzen, 2010

The IBPM additionally postulates that intention is a function of three types of perceptions: attitude, perceived norm, and self-efficacy. Attitude is a person's evaluation of how favourable or unfavourable s/his performing a particular action. Perceived norm (Eisenberg et al., 2013; Hye et al., 2013), which is the social pressure one expects regarding performing the behaviour, has two aspects, namely an injunctive and a descriptive norm (Connor et al., 2013). An injunctive norm is the extent to which important social networks are expected to be supportive of the person performing the action (Stoddard et al., 2012) while descriptive norm is the extent to which members of those networks perform the action themselves. Perceived norm (Armitage & Connor, 2001; Dieterich et al., 2013) is the totality of these two normative perceptions.

Competence refers to actual skills, whereas self-efficacy refers to perceived capability (Scott-Sheldon et al., 2012). Self-efficacy according to Choi et al., (2013) is one's perceived capability to successfully perform an action, although it has been demonstrated that the skills one perceives oneself to possess do not necessarily or always match the skills one in fact possesses (Kadden & Litt, 2011; Shell et al., 2010; Stoddard et al., 2012).

Strengths of the Integrative Behaviour Predictive Model

As one of its strengths the theory puts together small number of variables that together can explain a substantial proportion of the variance in behaviour in any population. The integrative model accommodates two routes

to behaviour change; one, use messages to change those beliefs that are most strongly related to intention to perform the behaviour, and two, use messages to reinforce beliefs in favour of the recommended behaviour that are already held by most members of the population. The model thus accounts for any behaviour, regardless of whether behaviour is deemed rational or irrational. The theory can help identify the beliefs that the message should address.

Weaknesses of the Integrative Behaviour Predictive Model

The model assumes a person has acquired the opportunities and resources to be successful in performing the desired health behaviour, regardless of the intention. It does not account for behavioural intention and motivation factors, such as threat and mood (Fishbein & Ajzen, 2010; Johnston et al., 2012). IBPM fails to explain the environmental or economic factors that may influence a person's intention to execute any behaviour. It inherently assumes that behaviour is the result of a linear decision-making process, and does not consider that behaviour is dynamic and can change over time (Eitle et al., 2014). The time frame between "intent" and "behavioural action" is not addressed by this model.

Socio-ecological Theory

Bronfenbrenner's (1979) ecology of human development theory posits that humans are affected by their social contexts and the relationships that these contexts exert on each other (Figure 5). Bronfenbrenner suggests that individuals should be viewed from a person-in environment framework. Individual factors which influence behaviour includes knowledge, attitudes, beliefs, perceived barriers, motivation, enjoyment, skills (including

fundamental motor skills and sports specific skills), abilities, disabilities or injuries (Dew & Koenig, 2014). Additional personal attributes are age, gender, level of education, socioeconomic status, employment status and self-efficacy (Can & Ünlütürk, 2013; Islam et al., 2000).

There are four systems that affect the individual: Personal, interpersonal, societal, and institutional and policies. The interpersonal comprised the principal and immediate socialization contexts. These include family, peer, and school contexts. These processes take place between two or more settings in which the person becomes an active participant. This emphasizes the idea that functions in different contexts are not mutually exclusive. For example, there are interconnections between family and school contexts that affect the development of an individual.

The societal level consists of social environmental factors in which a person may not frequently interact, but which still affect his/her development. This includes the neighbourhood. The institutional is the largest system and affects a person through the laws and the cultural values of the society. Accordingly, human development takes place within these systems and the relations between these systems shape behaviours that include health. He argued that, active engagement or even exposure to what others are doing inspires the individual to utilize similar activities (Bronfenbrenner, 1979; Traube et al., 2013).

The socio-ecological model has been used in community violence exposure to HIV-related risk behaviours (Van Ryzin et al., 2012), permissive norms in marijuana use (Lisha et al., 2012), substance use outcomes in the

context of parental and peer substance use (Sussman et al., 2012), behavioural skills moderate the effects of relationship type and substance use on HIV risk behaviours (Krug et al., 2009), and adoption of healthy behaviours (Hargreaves et al., 2013).

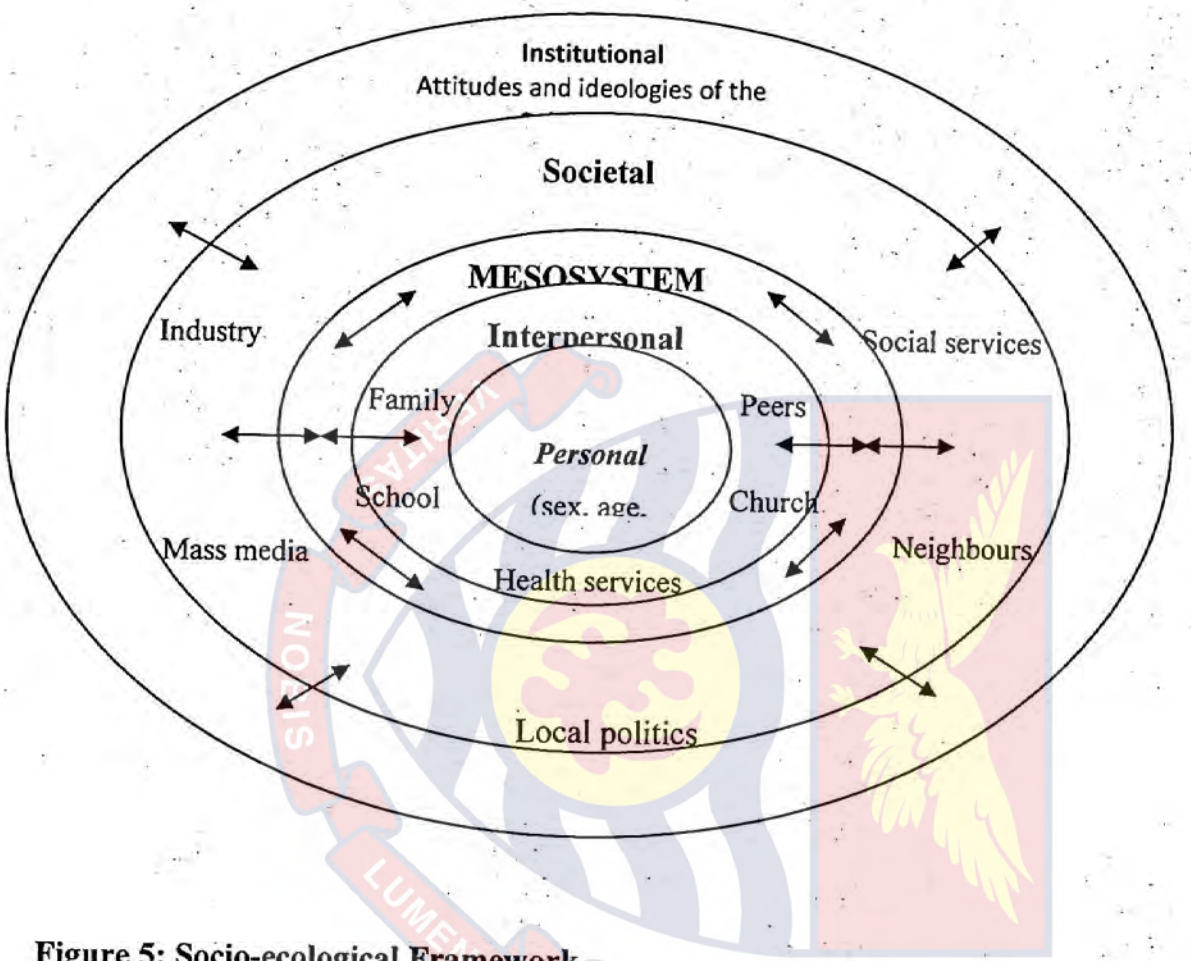


Figure 5: Socio-ecological Framework

Source: Bronfenbrenner, 1979

Strengths of the Socio-Ecological Model

The model takes into account the complexities and interdependences between the person and his environment and biological determinants of behaviour. It recognises that whereas individuals are responsible for instituting and maintaining behaviour necessary to reduce risk and improve health, individual behaviour is being influenced by factors at different levels. The model represents a comprehensive approach to designing, implementing and evaluating interventions which target the multiple influences on behaviour

Weaknesses of the Socio-Ecological Model

The incorporation of multiple layers of influences on behaviour is complex and analyses of variables for possible intervention may be difficult. The levels of influence overlap and are not distinct as the model suggests. For instance the processes that take place in two or more setting such as the school, church and the home where the individual is an active participant.

Multiple Illegal Drug (Poly Drug) Use

Mayet et al., (2012) found use of poly drug in a sample of 14 and 15 year olds. Sixty eight per cent used cannabis together with tobacco and/or alcohol whereas three per cent used cannabis together with tobacco and/or alcohol, and cocaine). Poly drug use suggests a possible specificity of the association between the early use of tobacco and later cannabis use and a biologically plausible account of the processes by which this association arises (Chassin et al., 2010; Rácz et al., 2014).

Modes of Use of Illegal Drugs

Modes of illegal drug intake vary and some are peculiar to some drugs. Routes of administration varies from smoking e.g. (marijuana) drinking (e.g. cocaine) snorting (e.g. cocaine and heroin) inhaling (e.g. glue). Agrawal and Lynskey, (2009) hypothesize on shared route of administration (ROA) of illegal drugs. They argued that individuals who learn to smoke tobacco are more likely to use other substances that involve inhalation due to aero-respiratory changes and adaptations, as well as changes in cognitive processes which may facilitate the use of other inhaled drugs, particularly cannabis. Agrawal and Lynskey (2009) found that smoking and tobacco craving are strongly associated with the use of and craving for cocaine and heroin.

Data suggest that tobacco and cocaine may each increase craving for (and likelihood of continued use of) themselves and each other. Moss et al. (2014) found the similar associations and suggests the poly drug use behaviour starts prior to age 16 years. Attitudes toward drug use strongly determine whether an individual initiates use. Poly drug users have different correlates and understanding of this trajectory is important for intervention purposes (Baggio et al., 2014; Semple et al., 2013).

Nutritional Status and Illegal Drug Use

Nutritional status is the condition of the body as a result of the intake, absorption and use of nutrition and the influence of disease-related factors. There is no one single parameter that serves as the only and best parameter to nutritional risk assessment. Nutritional status of drug users is a predictor of survival and has been used to predict survival and identify individual who can

benefit from intervention. Nutritional status influences the well-being and survival of individual drug users (Quick et al., 2013). Drug use may alter dietary intake among drug users in complex ways that may produce malnutrition via multiple mechanisms (Botros et al., 2012; Le Foll et al., 2013). Use of illicit drugs may interfere with nutrient absorption or alter appetite or metabolism (Schulenberg et al., 2014). Chronic drug use may lower nutritional status through impaired access to food, food selection and social support (Kim et al., 2012; Noble & McCombie, 1999).

Independent links between severe malnutrition and mortality among illegal drug users have been established. This occurs in the form of changes in body composition and serum nutrients (Cornish & O'Brien, 1999). Death occurred, on average, when body weight fell below 66 percent of the ideal body weight (IBW) or when lean body mass (LBM) fell below 54 percent of the normal value (Despres, 2001). One study found that a drop of 5 to 10 percent from initial body weight quadrupled his or her risk of death (Tang et al., 2010). .

Issues on Nutritional Status

Body Mass Index (BMI)

Body Mass Index (BMI) assesses the nutritional status of the individual. BMI index has the highest correlation with independent measures of the body fat for adult humans (Kurth et al., 2012). Values of BMI are most accurate in assessing degrees of obesity and are less useful for evaluating non-obese body fatness (WHO, 2008). BMI categorizes individuals as

underweight (<18.5 kg/m2), normal weight (18.5 to 24.9 kg/m2), overweight (25.0 to 29.9 kg/m2) and obese (≥ 30.0 kg/m2) (WHO, 2008). BMI of 20 to 25 kg/m2 is associated with the least risk of early deaths. Blüml et al. (2011) found that higher BMI was associated with lower illicit drug use in a sample of 1,902 18-year-old males in a cross-sectional setting of young adult males. Positive associations have been found between BMI and marijuana use (Farhat et al. 2010; Kurth et al., 2012; Warren et al., 2005). These findings contradicted those found by Baek and So among 72,399 Korean adolescents (Baek & So, 2012). BMI did not have any significant association among illegal drug users.

Cross-sectional research from Farhat et al. (2010) found frequent smoking more prevalent among younger overweight and obese girls (age <15) and older obese girls (age ≥15), than similar aged healthy weight counterparts. Marijuana use was also shown to be more common among younger overweight girls than healthy weight girls (Farhat et al., 2010). Males with higher self-reported BMIs were more likely to smoke as young adults, but the same relationship was not found among females (Duff et al., 2014). McIlwraith et al. (2014) found low BMI to be associated with specific drug use among 781 illegal drug users in a cross sectional study. Heroin users were 3.4 times at risk of being underweight compared with amphetamine users, and amphetamine users were at almost twice the odds of being obese compared with lower level morphine users. A higher BMI was associated with lower illicit drug use among adult males. As BMI increases rates of use of illicit drug increase (Blüml et al., 2011).

Waist and Hip Circumferences

Waist circumference (WC) refers to the minimal abdominal circumference located midway between the lower rib margin and the iliac crest (WHO, 2008). Waist circumference measurement assesses central adiposity. Cut-off points normally used were a waist circumference <88 cm, that indicated a normal adiposity and ≥88 cm, that indicated a high central adiposity (Seidell, 2010). Hip circumference is usually used as a denominator for adiposity index known as waist-to-hip ratio. Central adiposity was linked with an increased risk of death in individuals with normal BMI and in those with an overweight/obese BMI (de Koenig et al., 2007).

In 2007, a combined analysis of fifteen prospective cohort studies found that waist-to-hip ratio and waist circumference were both associated with cardiovascular risk and were no different from each other in predicting cardiovascular risk (de Koenig et al., 2007). WC and waist-to-hip ratio ((WHR) are strong predictors of metabolic integrity (Vazquez et al., 2007) and any cause (Zhang et al., 2008). Individuals with higher WC and WHR were at a significantly higher risk of death than individuals who had only an abnormal waist circumference (Qiao & Nyamdori, 2009). The indicator WHR was the significant predictor for all types of dyslipidaemia and all levels and higher values correlates positively with amounts of serum lipids.

Per Cent Body Fat (%BF)

Per cent body fat refers to the percentage of fat tissue in the body as measured by fat mass (kg) divided by total body weight (kg) of the individual. Fat percentages were categorized for males and females as 8-25 per cent and

20-35 per cent respectively (Despres, 2001). Values above these ranges were known to be detrimental for health. Fat mass serves as insulation and also cushion some body organs. Cocaine and heroin users with other drugs were found to have a two lower fat mass compared to those who were not users (Tang et al., 2010). In a separate assessment frequent drug users had lower body fat compared to those who did not use drugs (Forrester & Gorbach, 2003; Tang et al., 2010).

Waist-to-Height Ratio

Waist-to-height ratio (WtHR) is an Index of Central Obesity (ICO). WtHR cut-off value is derived by dividing the average standing height by the waist circumference values. It is believed that adding height into the equation accurately determines the distribution of fat. ICO is a more reliable measure of central obesity than waist circumference because it factors the differences in statures of people. ICO cut-offs range from 0.51 to 0.58 among males and 0.47 to 0.54 among females.

Aetiology of Wasting and Weight Loss Among Illegal Drug Users

Low weight-for-height also known as wasting or thinness indicates recent and severe process of weight loss which is often associated with acute starvation and/or severe disease condition. However, wasting may also be the result of a chronic unfavourable condition of poor dietary intake of nutrients and energy and physical activity (LeBlanc & Janssen, 2010). Aetiology of weight differentials is dependent on hygiene and dietary intake among others. Drug binges lasting for days at a time during which food, sleep, and basic hygiene are neglected are common among users of stimulant drugs in

particular and significantly affect nutritional health and dietary intake (Glasner-Edwards et al., 2011). Drug use has been shown to modify eating habits, often causing individuals to have irregular eating schedule, eating fewer meals per day/week, skipping meals, fasting to prolong the effects of drugs, eating late at night, and eating alone (Alves et al., 2011; Anema et al., 2013). Socio-economic factors do play a role in poor food quality intake.

The limited finances of illegal drug users hinder access to nutritious foods and foods selection (Anema et al., 2013; Himmelgreen et al., 1998). As a result illegal drug users have been found to have lower dietary intakes of fruits, vegetables, grain and dairy products, while consuming more high-fat sweets and salty snack foods (Islam et al. 2002; Zulu et al., 2011). Fast, cheap, and easy-to-prepare foods are the primary components of drug users' diets, contributing to poor nutrient intake (Zulu et al., 2011). These foods may be bought at convenient stores ('chop bars'). Because the diets are poor they lack micronutrients needed for metabolism and health. These may lead to deficiencies and observable emaciation, lower body mass index (BMI), gastrointestinal distress and decreased appetite than non-drug users (Zulu et al., 2011).

Cocaine users appear to be thinner by body size compared with non-users as the drug alters metabolism due to its appetite-suppressing properties (Mollen et al., 2013). But a new study that compared 35 men who were cocaine dependent with 30 healthy men suggests it may also alter the way the body responds to fat intake. There is increasing evidence that disruption of energy homeostasis can affect the reward circuitry and that overconsumption

of rewarding food can lead to changes in the reward circuitry that result in compulsive food intake akin to the phenotype seen with illegal drug use (Agrawal & Lynskey, 2009).

Illegal drug use research hints at commonalities between the neural substrates and some forms of obesity (Agrawal & Lynskey, 2009). Nolan (2013) investigated the links between drugs of abuse, eating, and body weight and found that there are common mechanisms in the brain responsible for the reinforcement of eating and drug use by food and drugs respectively and for the cue incentives associated with them. There is some evidence that dependence in one modality may influence the other (Caria et al., 2009; Goldman et al., 1999).

Marijuana use has been linked to increased appetite leading to over-consumption of calories (Kirkham, 2005). It therefore appears that users of marijuana will have adequate BMI as well as good amounts of serum nutrients such as proteins and lipids. The use of marijuana may dull the incentive to be physically active. Youth who engage in illegal drug use at an early age may be at heightened risk for also engaging in obesity-related behaviours later in adolescence (Hall & Degenhardt, 2009; Lundahl et al., 2014). Similarly, work from Lytle. (2009), found that smoking, poor food choices, and lower activity patterns clustered together among teenagers; prevalence rates for weekly smoking among 12th grade males were nine times higher among males reporting poor eating and activity levels as compared to males reporting healthy eating and activity (Lytle, 2009; Magoc et al., 2011; Tripp et al., 2013). Nutritional health risk and lifestyle behaviours may be related (Mollen et al., 2013; Nolan, 2013). Their study explores the bi-directional longitudinal

relationships between substance use and body composition. Drug use was associated with desire to eat but not pleasantness ratings of the foods (Nolan, 2012). A causal link between illegal drug use and dietary intake has been established (Pasch et al., 2011). Illegal drug use contributed to subsequent body composition; however, body composition does not contribute to subsequent illegal drug use (Sadosky et al., 2014). Heroin users have dysfunctional eating patterns that are amenable to change (Neale et al., 2012).

Cholesterol

Total blood cholesterol is a measure of the cholesterol and comprises low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and very low-density lipoprotein (VLDL), which is the triglyceride-carrying component of lipids. Cholesterol is an essential component of cell membrane and is produced by the liver. There are pathways for transporting Very Low Density Lipoprotein (VLDL) and Low Density Lipoprotein (LDL).

There are receptor and scavenger pathways for cholesterol uptake. Scavenger white blood cells (WBC) remove (oxidized) LDL from circulation and prevent oxidized LDL from returning to circulation. Anti-oxidants reduce oxidation and slows LDL uptake into scavenger cells. When this is not done, LDL can build in serum and leads to cardiovascular health consequences. HDL removes cholesterol from the blood stream and may also block oxidation of LDL thereby reduce the risk of cardiovascular disease. HDL transfers cholesterol to other lipoproteins for transport to the liver for excretion. High serum cholesterol values are often seen among illegal drug users (Zhang et al.,

2008). Prevalence of low density lipoprotein was generally significantly higher in obese drug users than obese non-drug users (Zhang et al., 2008).

Enzymes of Metabolic Integrity

These include Aspartate Aminotransferase (AST) and Alanine transaminase (ALT), Gamma Glutamyl transpeptidase (LDA), Alkaline phosphates (ALP). They are excellent markers of hepatocellular injury. Illegal drug use exerts extra metabolic demands on the liver and therefore sometimes deranges its function (Grundy et al., 2005). The functional limitation may be due to injury to the cells. The injury may affect other liver enzymes such GGT, the level of which is high during illegal drug use.

Total Serum Protein

These proteins are produced by the liver. Albumin level in blood is affected by factors other than nutrition intake. Amounts in serum decreases when protein nutrition falls and levels can be affected by renal and hepatic disease, wounds and burns, infections, zinc and energy deficiency, cancer, inflammation, hydration status and stress. Values are increased during dehydration, in marasmus and after blood transfusion. Serum albumin values were decreased during overhydration and eclampsia, Inflammation/infection/metabolic stress or diseases with the kidney (Don and Kaysen, 2004). It is measure of mortality and morbidity status. Albumin levels correlates strongly correlation with morbidity and mortality (Don & Kaysen , 2004). In order for albumin to be an effective nutrition marker, it should not only be sensitive to changes in nutrition intake, but should not be altered by other factors.

Albumin and Globulin

Albumin is the most widely used indicator of nutritional status. With progressive liver disease serum albumin (SA) levels fall, reflecting decreased synthesis. Albumin levels are dependent on a number of other factors such as the nutritional status, catabolism, hormonal factors, and urinary and gastrointestinal losses. These should be taken into account when interpreting low albumin levels. Albumin concentration does correlate with the prognosis in chronic liver disease. Globulin (SG) which is another major fraction of serum protein is derived by subtracting albumin values from total protein values. Values reduce when protein nutrition is low and vice versa.

Liver plays a major role in metabolism of nutrient and drugs. Its functional capacity can be determined through screening and using certain markers as for evaluation (Daubenmier et al., 2014). The markers often used are bilirubin, aspartate transaminase (AST), alanine transaminase (ALT), Gamma-glutamyl-transpeptidase (LDA), Alkaline phosphatise (ALP). Only LDA is liver specific and so elevated levels or otherwise can be directly attributed to the liver (Table: 2). The LDA level is too sensitive, frequently elevated when no liver disease is apparent.

Table 2: Sources of Biological Markers of Metabolic Integrity

Marker	Source
Bilirubin	Red blood cells (e.g., haemolysis, intra-abdominal bleed, haematoma)
AST	Skeletal muscle, cardiac muscle, red blood cells
ALT	Skeletal muscle, cardiac muscle, kidneys

ALP	Bone, Kidneys, intestines
LDA	Liver, cardiac

ALT, alanine aminotransaminase; AST, aspartate transaminase; ALP. Alkaline phosphatise, LDA: Gamma-glutamyl-transpeptidase

Source: Hadigan, C., Meigs, J.B., & Corcoran, C. (2001)

Liver injuries can be categorized into three. Hepatocellular, in which primary injury is to the hepatocytes; cholestatic, in which primary injury is to the bile ducts; and infiltrative, in which the liver is invaded or replaced by non-hepatic substances, such as neoplasm or amyloid. The AST, ALT, and ALP tests are most useful to make the distinction between hepatocellular and cholestatic liver disease.

Bilirubin

Bilirubin is unconjugated when it is not combined with certain sugars. By subtracting the direct bilirubin from the amount of total bilirubin, an estimate of unconjugated bilirubin, called indirect, is obtained. Higher than normal levels of direct or indirect bilirubin is indicative of different types of liver problems. Occasionally, higher bilirubin levels may indicate an increased rate of destruction of red blood cells (haemolysis). Higher than normal levels of direct bilirubin may indicate liver problems such as blocked bile duct. Elevated levels of indirect bilirubin may indicate deficiency in an enzyme that helps break down bilirubin. Cut-off values used in determining abnormality are laboratory specific.

Drug Induced liver Damage

Drug induced hepatotoxicity is usually acute hepatic necrosis. Initially, serum aminotransferase is markedly elevated with minimal increase in alkaline phosphatase. The serum bilirubin begins to rise after two to three days. The most frequent patterns of drug induced liver damage are hepatocellular injury, cholestatic injury and a combination of the two. Drug-induced cholestasis occurs secondary to the inhibition of bile salt transport. It can be divided into two broad categories. Frost. (2013) followed marijuana use and long-term mortality among survivors of acute myocardial infarction. Compared with non-users, the mortality rate was 29 per cent higher among those reporting any marijuana use. Habitual marijuana use among patients presenting with acute myocardial infarction was associated with an apparent increased mortality rate. Marijuana use can lead to severe cardiovascular problems (Casier et al., 2014). Mégarbane & Chevillard (2013) found pulmonary consequences of illicit drugs are various, resulting in both acute life-threatening conditions and long-term functional respiratory sequel. Less efficient pulmonary exchange and lower heart functions can lead to lower metabolic integrity (Degenhardt & Hall, 2013).

Nutritional Status and Socio-Ecological Factors

Individual characteristics (Li et al., 2012) do influence illegal drug use through knowledge, attitude and beliefs that these can compromise nutritional status. Brain reward processes tend to exert their influence on illegal drug use risk by the development of relatively stable personality traits associated with use and addictive behaviours (Curcio & Amanda, 2012;

Kendler et al., 2014). Gender differences in the self-administration of illegal drug use were investigated (Lee et al., 2012). Findings indicated that gender and gonadal hormones may account for individual differences in susceptibility to the reinforcing effects of illegal drugs, and that differences in vulnerability to illegal drug use may be sex linked. The use of illegal drugs may also follow trajectories determined by self-control (Pickering et al., 2011; Pokhrel et al., 2013). Deficits in self-control in adolescence constitute a significant risk for maladjustment over time.

Self-control was negatively related to illegal drug use and recidivism. Lower self-control predicted increases in illegal drug use and dependence (Gullo et al., 2010; Litt et al., 2013; Marc, 2013). Socio-economic disadvantage is an individual risk factor in multiple illegal drug use (Darke & Torok, 2014; Prado et al., 2012). Acculturation may influence adolescents' self-control characteristics related to interpersonal functioning, which may in turn influence their affiliation with illegal drug-using friends (Huang et al., 2011; Pasch et al., 2012). Dieterich et al. (2013) found ambivalence to moderate the association of friend norms and subsequent teenage marijuana use. Friend norms were better predictors of marijuana intentions and subsequent use when teenagers were attitudinally ambivalent about marijuana use (Mollen et al., 2013; Morse et al., 2013).

Preventive programs that affect the certainty with which adolescents holds pro- or anti-marijuana attitudes may influence the likelihood of their resistance to, initiation, or continuance of marijuana use. Uncertainty, discrepancy and outcome expectancy social support on information seeking

had significant impacts on the efficacy judgments made by individuals with their social networks about their stimulant drug use (Hargreaves et al., 2013; Mustanski et al., 2013).

Systemic influences and processes exist and these shape illegal drug use. Interpersonal processes show effect through the drug users' primary groups that include family, friends and peers (Gorka et al., 2011). These groups provide social identity, support and role definition for the illegal drug user. Parents' recency of (lifetime) marijuana use mediated teenage attitude and initiation (Miller et al., 2013; Zeiger et al., 2010). Immediate antecedents of marijuana use were examined by (Shrier et al., 2012). Marijuana use occurred when others were also using marijuana (McCabe et al., 2014). This occurrence may be due to perceptions and peer use (Bennett & Holloway, 2014; Ramchand et al., 2013).

Neighbourhood characteristics (Gutierrez & Long, 2011) positively influence illegal drug use (Duff et al., 2014). A cross-sectional exploration of smoking status and social interaction reported significantly fewer social interactions in the past week and had fewer people outside the home that they could depend on. Men and women current smokers attended 24 per cent and 31 per cent fewer social group meetings on average than non-smokers (ter Bogt et al., 2010). Data supported the findings that illegal drug users are less socially connected and belonged to small groups in society with their own norms (Tull et al., 2013). Song and Wenzel (2014) found social avoidance was positively correlated with marijuana use problems and only social avoidance (not social fear) was uniquely related to marijuana problems. Therefore social

cohesion and not social control predicts illegal drug use. Avoidance of social situations appears robustly associated with marijuana-related problems. The community level influence involves social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations (Eisenberg et al., 2013).

Normalization in terms of norms is useful for understanding the contextual aspects of illegal use (Sznitman et al., 2013; Taylor & Grossberg, 2012). Ramchand et al. (2013) documented illegal drug use among gay and bisexual men at weekend dance parties and found normative beliefs predict illegal drug use. Organizational rules, regulation, policies, and informal structures, may constrain or promote recommended behaviours that may influence drug and nutrient intakes. Public policy, the fourth influence, involves local, municipal and national policies and laws that regulate or support healthy actions and practices for illegal drug use and dietary intake. These levels of influence on the individual are not lateral but horizontal as well (Stone & Morash, 2014).

Culture influences nutrition and is reflected in the socio-ecological model at the community level. Social determinants of diet that explore personal, societal, and cultural factors associated with food, food and agricultural policies and prices are important factors in the consumption of food varieties by any group of people at any life stage (Harrop & Marlatt, 2010). Glanz et al. (2005) studied eating patterns in nutrition environment which includes the "type, location, and accessibility of food outlets"; while the organizational nutrition environment includes home, school, work, and other such

environments. Available healthy eating options and price of foods are factors that showed effect in nutrition environment.

The information environment consists of media and advertising. Individual factors are the socio-demographics, psychosocial factors, and individuals' perceptions about their nutrition environment. Ecological factors do influence nutrition but in a form of a web. Laws are part of institutional processes that regulate the distribution, possession and use of illegal drugs. This environment is useful in the study of illegal drug use behaviour.

Laws and Agencies on Illegal Drug Use

Laws on Illegal Drug

Ghana has obligations to fight illegal drugs use, distribution and trafficking since it has signed the four United Nations conventions and protocols. Ghana is party to the 1961 single convention on narcotic drugs as amended by the 1971 convention on psychotropic substances, the 1972 protocol amending the 1961 single convention and the 1988 convention against illicit traffic in narcotic drugs and psychotropic substances. Ghana has formed partnerships with some countries to fight illegal drug use. Operation Westbridge at Kotoka International Airport was collaboration between Narcotics control Board of Ghana and the government of the United Kingdom. The drug enforcement administration of the United States of America has conducted courses on 'anti-narcotics' for officers from Ghana. Two trace itemisers, polygraph machines and vehicle mounted surveillance equipments were also installed at the Kotoka International Airport by the government of the United States of America. These same laws apply to the possession,

distribution and use of illegal drugs in the Greater Accra. The law courts do not apply measures of treatment, education, after-care, rehabilitation or social reintegration for drug-related offences. In addition to these international treaties there are national bodies.

The Government of Ghana (GoG) as part of its efforts at curtailing illegal drug use has established organizations to deal with issues of drug possession and distribution. The Ghana Police Service (GPS), the Military, Navy, Immigration Service, the Customs Excise and Preventive Service (CEPS) Narcotics Control Board (NACOB) are some of the institutions that collaborate with each other. They prevent drug from entering the country and when the drug does slip through security into the country they act to stop its distribution and use.

Institutions that Enforce Drug Laws in Ghana

Ghana Police Service

The Ghana Police Service, has a primary mandate specified in the Police Force Act 350 (1970). They are to protect life and property, detects crime, apprehends and prosecutes offenders and promotes peace and order. Under (Act 30) of Criminal and other Offence Act of 1960, the police can arrest and search any person, premises and vessels entering and leaving the shores of Ghana for any goods including illegal drugs without arrant. The Ghana Police assumes the role of the Customs Excise and Preventive Service and Ghana Immigration Service in locations where these two organizations are not stationed. It has established a Narcotics Unit within the Criminal

Investigations Department (CID). There is also a Drug Law Enforcement Unit (DLEU) that supports in tracking illegal drug users. This department is responsible for arresting and prosecution of people for possession and use of illegal drugs. It has established the marine unit that patrol territorial waters to ensure that illegal drugs do not leave and also are not brought into the country. This activity is carried out together with the Ghana Navy. These agencies have information on electronic surveillance and are able to track activities of suspected illegal traffickers.

Customs Division of the Ghana Revenue Authority

The Customs Division of the Ghana Revenue Authority, formally Customs Excise and Preventive Service, was established under the Civil Service in 1839. It, however, became an independent body in 1986 and operated under the CEPS Management Law, PNDCL 330, 1993 (WIPO, 2007). Officers are stationed at the country's entry points to check the import and export of goods. The preventive aspect ensures that they physically patrol the nation's borders and other strategic points to prevent smuggling. In performing their preventive functions, they examine goods on vehicles, ship and aircraft either manually or automatically and look out for smuggled goods, contraband goods, (which include illegal drugs), arms and ammunition.

The Tema Harbour, which is the largest port in Ghana, has an autonomous organization, the Joint Port Control Unit (JPCU). This organization works in collaboration with the CEPS. Together, they track container movements on the seas to check for drugs, counterfeit products and

other illegal goods. Their activities are supported by foreign counterparts that supplied them with surveillance information.

The Narcotics Control Board

The Narcotics Control Board (NACOB) was established under the Narcotic Drugs (Control, Enforcement and Sanctions) Act1990/PNDC Law 236 (Ministry of Interior, 2015). NACOB is the central coordinating body that deals with the drug problem. NACOB officers are stationed at entry points into the country. NACOB collaborates with other security agencies in enforcing the law on illegal drugs. NACOB is responsible for collating and collecting information on drug for use by the government, it receives and refers for investigations of cases and complaints of allegations, or suspension of any prohibited drug activity, liaise with international bodies on narcotic issues, educate the public on the dangers of drug use or involvement. NACOB, as part of its mandate, visits public places such as churches, mosques, schools and the media houses to educate the public on the dangers associated with illicit drugs. NACOB officers are stationed at every entry point in Ghana and works with the Ghana Police Service (GPS) and Customs Excise and Preventive Service (CEPS).

The Judicial Service

The Judicial service in Ghana interprets the law on illegal drugs possession, distribution and use. With regard to distribution, any person who imports or exports any narcotic drug without a licence commits an offence and shall on conviction be liable to imprisonment for a term of not less than ten year. The same penalty is suffered by anyone found using and trading in

illegal drugs although the merits of the case may differ. It dispense justice on all issues on illegal drugs by ensuring that the due process of the law is followed and the appropriate sentence given if convicted. Drug possession and use can attract sentences that range from 10 to 15 years and confiscation of assets. The judicial service also offered enquiries into illegal drug cases that involved the Ghana Police Service (GPS). For example the case of cocaine turning into washing soda while in Police custody.

The Ghana Immigration Service

The Ghana Immigration service (GIS), as known today, originated from a number of state institutions. In colonial days it was part of the police service and known as the passport unit of the Gold Coast Police Force and later separated as the Border Guard Service. With its current identity, it operates under the Immigration Service Law of 1989 (PNDC Law 226) and the Immigration Service Act of (2000). It has the statutory mandate to regulate and monitor the entry, residence, employment and exit of foreigners in the country. The immigration Service collaborates with Narcotics Control Board, Bureau of National Investigation (BNI) and other security agencies at the Ghana's entry points and within Ghana to check illegal drug trafficking. It monitors activities of foreigners in Ghana. It has officers stationed at all entry points and acts as first line of defence against illicit drugs.

Summary

The chapter highlighted literature that supports this thesis in three broad areas. These were theories and models that have been used to study human behaviour, possible associations of illegal drug use with body

composition and metabolic integrity between males and females, laws on illegal drug use and law enforcement agencies.

Human behaviour was conceptualized as an outcome of competing influences between individuals and the environment in which they lived. However, balance of health behaviour is maintained and decided upon by the individual. This explains why approaches to human behaviour studies isolate key individual controlling factors such as socio-demographic characteristics. These behaviours can be in the continuum, or at a discrete stage. Continuum theories can be used to predict how many times a person conducts a behaviour, such as using illegal drugs, the frequency of use and the modes of administration of the illegal drugs. The normative behaviour theory and integrative behaviour prediction theories are examples of continuum theories. When behaviour is considered as discrete and guided by stage models, they are useful for understanding the different factors that may influence individual choice and behaviour. Examples of these are the social cognition theory, protection motivation theory and health belief model.

Individually-focused theories of behaviour tend to underestimate the impact of social contexts and have weaknesses by not addressing social influences on behaviour e.g. Health Belief Model. There is a tendency to treat society and its norms as an externality and that social issues have little influence on the individual's decision-making process. Probably, that is why the law prohibiting illegal drug use in Ghana focuses on punitive measures on the individual but silent on the external influences on the individual.

Social contexts such as norms play roles in determining behaviour and so should be considered in tackling the use of illegal drugs. Whether conceptualised as a pressure felt and processed by an individual decision maker, or as a context which unconsciously structures and determines individuals' actions, society does have an impact on human behaviour (Holm et al., 2013). The socio-ecological model recognizes the illegal drug user as being part of society and there are interactions between the environments which partly consist of peers, family members. One may use illegal drugs because he/she has seen close relations or friends use it or were introduced to the use of illegal drugs. The integrative behaviour model suggests that societal norms and economic disparities account for illegal drug use. Multiple foci are required for the understanding of behaviour and promoting sustainable healthy behaviours. It is within this context that several models from cognitive through psychological to ecological were used to explain and predict illegal drug use behaviour.

Understanding the different facets of health behaviour means that nutritional health can be explained. This was captured by the World Health Organization when it declared that health is 'a complete state of physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO, 1946). Malnutrition as a result of use of illegal drug could be look at as a social issue and efforts should be made to document existent or otherwise of possible associations of illegal drug use with nutritional status. This approach is central to the Ghana Health Service (GHS) policy of preventing disease by focussing on healthy social lifestyles.

Laws on illegal drug use will serve purposes for which they were enacted when these laws are situated in person and environmental frames. At the moment, the law appears to tackle personal factors (which are use, possession, distribution, incarceration, confiscation of assets) and neglect environment influences such societal norms and availability of the drugs in communities that make these drugs easily available. The next chapter discusses the methods of data collection and analysis.

CHAPTER THREE

METHODS OF DATA COLLECTION AND ANALYSIS

Introduction

This chapter describes the methods employed in data gathering and analysis. It contains the study design, sampling and sample size and data collection approaches. The chapter further explored how the exposure and outcome variables were analysed to test the study hypothesis. It also contained the assessment of the normality of the exposure variables. Chi-squared and multivariate regression techniques were employed to determine which explanatory variables predicted the outcome variables.

Profile of Study Area

The study area is the Greater Accra of Ghana. The region covers an area of 3,245 square kilometres and has a population density of 1,236 which makes it the most populated region in the country (GSS, 2010). It has 16.3 per cent of the total population of Ghana. This translated into a total of 4,010,054 comprised 1,938,225 males and 2,071,829 females. The region has five municipalities of which Accra metropolis is the largest (Figure 7). The metropolis are Ga east and west, Adenta, Ledzokuku krowor and Accra.

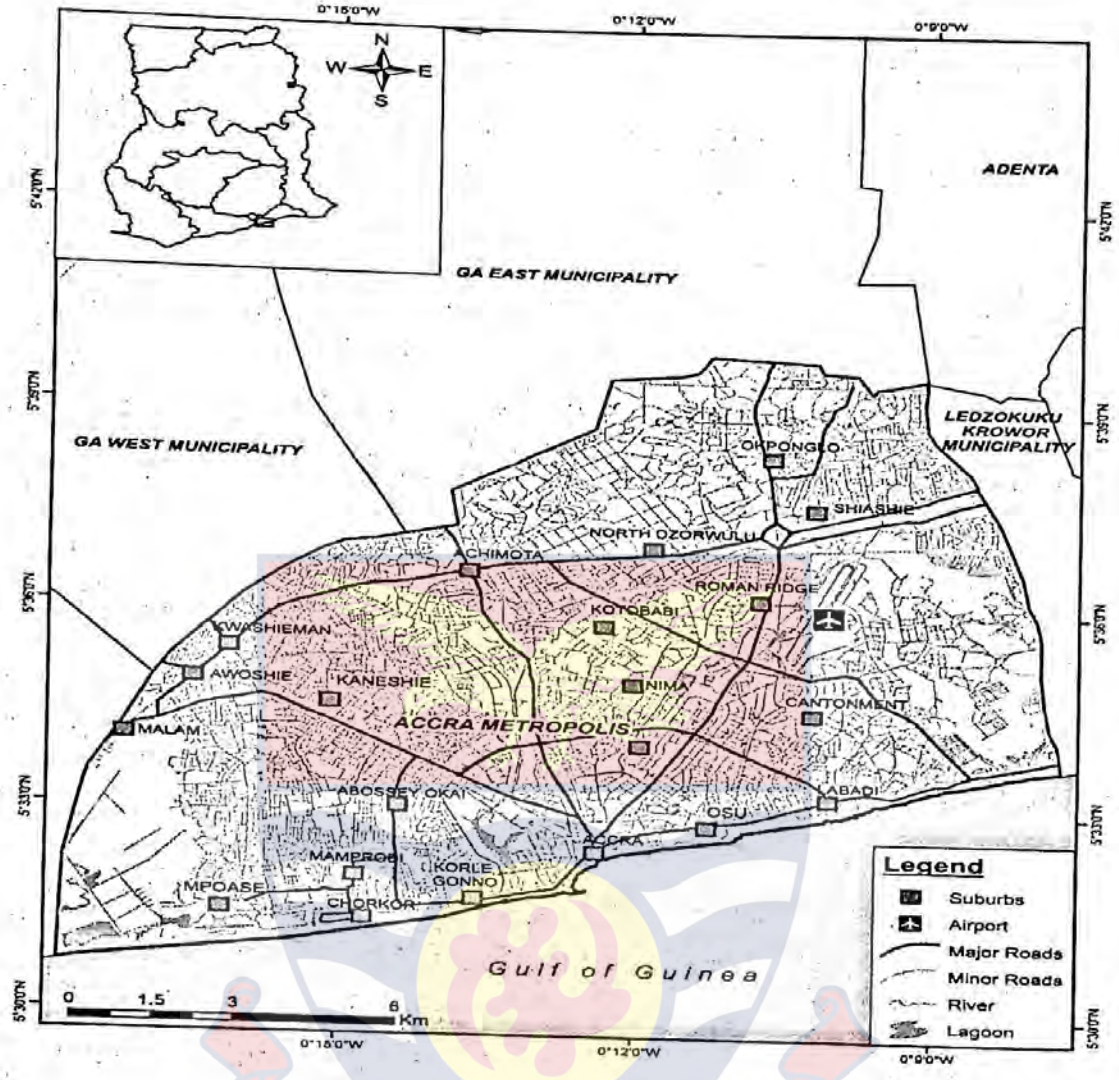


Figure 6: Metropolitan Districts in the Greater Accra Region

Source: CHF, (2010)

Research Design

A quantitative, descriptive cross-sectional research design was used in this study to assess the use of illegal drugs on nutritional health. It involved the use of semi-structured questions which provided information on background and drug use habits (Polit & Hungler 2013).

A quantitative research design was used to collect data on anthropometry, selected blood chemistry variables which are quantitative in nature (Burns & Grove, 2009; Creswell, 2007). Data on nutritional status and associated socio-ecological factors were collected during a single contact with the respondent (Polit & Hungler 2013).

Research Philosophy

The research philosophy adopted to guide the construction of this thesis was the positivist one. Positivist formed the basis of quantitative data analysis in social sciences (Liamputtong, 2013). This is because variables such as, per cent body fat, waist-to-hip ratio, body mass index, enzymatic markers, such as serum levels of protein and aspartate aminotransferase (AST) are quantitative in nature. As such with the adoption of this approach nutritional health could be assessed using statistical methods. Descriptive statistics were used to describe the proportions of each nutritional status indicator with type, methods and frequency of illegal drug used. In spite of the criticism of the positivist approach it was found to be appropriate for the study since it made it possible to propose hypothesis, make deductions and generalisations through statistical technique (Collins, 2010).

Data Sources and Study Population

Data for the study were collected through one-on-one interviews with respondents. The information collected were on background characteristics, illegal drug use habits, nutritional status and biochemical variables. The study population comprised all drug users in Greater Accra Region who met an inclusion criterion. An illegal drug user was defined as an individual that has used any drug that was outlawed by PNDC law 236 for recreational purpose.

Inclusion Criteria

Anybody that uses illegal drug per PNDC law 236 was identified and volunteered to be part of the study. The individual should also be living in the Greater Accra Region. He should be known to other illegal drug users.

Sample Size

For the study, a sample size of 200 was estimated based on an earlier study (Adu-Oppong & Setorglo, 2011). In the study carried out in the Greater Accra and Central Regions, over 300 illegal drug users were identified. Of the number two-thirds were from the Greater Accra Region. The number of respondents recruited in the earlier study informed the selection of the area and the estimated size of respondents for the presented study.

Sampling Method

Leaders of illegal drug users were identified through the earlier study and recruited. They were asked to recruit members for the study. They then approached illegal drug users known to them. When potential illegal drug

users agreed to be part, they came to a pre-arranged venue. Their identities as illegal drug users were confirmed by the leaders after which their consent were sought and made to go through the study process. This snowball sampling was used because the population could not be strictly delimited (Liamputtong, 2013). The point of theoretical saturation was used to define the sample size. A total of 141 illegal drug users comprising 123 males and 18 females agreed to be part of the study and were recruited. Not being able to determine the chains and the number of respondents which were recruited through each chain is a weakness in the study.

Data Collection Instruments

Instruments used were questionnaire (Appendix: A), anthropometric and blood collection tools. Interview questionnaire contained questions on illegal drug use, background characteristics, anthropometry and blood biochemistry. The sequence of items on the questionnaires was in sections:

Section A: Items on drug use. The initial questions were on the type(s) of drug used, the frequency(ies) and mode(s) of administration over a three day period; whether the same drug was used over the period. Respondents provided names of locations where they acquired and used the drugs, whether they took the drugs alone or shared; whether these drugs were taken as a single substance or combined with another drug; whether the drugs were combined when acquired or combined by the respondents before use. There were items on socio-ecological factors in drug use habit; personal, interpersonal, societal and policy issues on drug use initiation, its continuation and termination.

Section B: Background characteristics had 7 items. These were on age, gender, educational and occupational statuses, ethnicity, religious affiliation and marital status of respondents.

Section C: Anthropometrical and biochemical information had items ranging from serum nutrients to serum enzymes that are indicative of nutritional status and metabolic integrity. The anthropometric variables were waist and hip circumferences, body weight, standing height, per cent body fat. Body mass index, waist-to-height ratio and waist–to-hip circumference indices were derived from weight, standing height and the girth measurements. Biochemical indices were serum total protein and its fractions, total cholesterol and its fractions, total bilirubin and its fractions, alanine aminotransaminase (ALT), aspartate transaminase (AST), Alkaline phosphatise (ALP) and Gamma glutamyl transpeptidase (LDA).

Training of Data Collectors

Potential fieldworkers (eight) were recruited from the Nutrition and Food Science Department of University of Ghana, Legon where they were working either as research assistants or national service persons. Prior to the data collection, a two-day training session was held at the Staff Resource Centre at the University of Ghana, Legon. Their experiences in administering questionnaire in nutrition and related procedures such as anthropometrics were discussed. Each assistant was handed a sample of the field questionnaire and asked to complete the questionnaire in his/her possession. Additionally, they were asked about interpretations of words, phrases on the questionnaire and any difficulties they may have encountered performing the required tasks.

They were then taken through each question and the issues involved clarified. There were also role plays to ensure that each assistant was comfortable with each item on the questionnaire.

The anthropometric instruments (Omron HBH-500) fat analyzer, stadiometer and non-stretch tape were studied for least counts on each and used to take measurements in order to ensure accuracy on the day of data collection. Each participant took repeated measurements with each instrument until there was no difference in three consecutive measurements. The essence of this practice was to reduce measurement error and associated biases.

Pretesting of Data Collection Instruments

Pretesting of data collection instruments was done at Ankaful maximum security prison on inmates who were incarcerated for illegal drug offences. As part of the process a letter was written to the Prison Authorities (Appendix B) with a copy of the study protocol and a provisional Institutional Review Board Clearance (Appendix C). The pretesting of the questionnaire was done on 24th February, 2014 after the consent of the inmates was sought. The pretesting was necessary to ensure that potential respondents understood the words, terms and concepts used in the questionnaire as intended.

On the part of the research assistants the pretesting was to ensure that they can pronounce all words with no difficulty and read questions coherently. It was also to modify any wording in the questions in ways that will bring out the intended response and probe further in a neutral manner during the interviews. The adherence to skip patterns and other instructions correctly as indicated on the questionnaire was another reason for their training.

Ten inmates were interviewed and each process took on the average 30 minutes to complete. The anthropometrics was done with inmates in prescribed attire. Each activity took place in the presence of an assigned Prison Officer. The section on drawing of venous blood was not executed since feedback was not going to be given to them. They were each compensated with Ten Ghana Cedis just as the participants in the main study. Results of the BMI and waist-to-hip ratios and interpretations were given to each participant as additional incentive.

During the pretesting it was noticed that, a section on 'skip' to next section when you did not take any drugs three days ago was omitted and this was inserted. The study protocol was amended to reflect this change before the main study was rolled out in Accra. One participant was suspicious of the pretesting exercise. In the middle of the interview he requested another clarification on the purpose of the study. He said his time in prison confinement will end in two weeks and wondered whether the interview was not being sponsored by the Prison or the Police services to find out whether he was still doing illegal drugs. Probably, information from the pretest will be used as new evidence against him. His fears were allayed by emphasising confidentiality of this study which was purely for academic purpose and the ethics enjoined that research participants be protected. .

Preliminary Contacts

As part of the study, contacts were made with the Regional Coordinating Council at Accra (Appendix D) and the Cape Coast Teaching Hospital laboratory (Appendix E) to request for access into the region and gain

laboratory space to analyse blood samples when collected. Additional contacts were made with the leaders of illegal drug users, requested and gained their assurance to inform potential participants about the study. This was necessary since users of illegal drugs were known to them and not the investigator.

Data Collection

Data collection began on 1st March, 2014 and ended on 22nd March, 2014. Each interview took on the average 30 minutes to complete. Blood collection and anthropometric measurements took additional ten minutes. These exercises were performed in two enclosed areas that accommodated one participant at a time. Three weeks after data collection, biochemical results on haemoglobin and lipid fraction were given to the participants and interpreted by the principal investigator as an additional incentive on 15th April, 22nd April, 29th April, 2014 and 5th May, 2014.

The study targeted 200 respondents in Accra and Tema, however 141 respondents were interviewed from Accra. The targeted sample size was not achieved because potential participants from Tema refused to participate in the study. This was because on 24th and 31st December, 2013 Police arrested some group members at Ashiaman. Some potential respondents felt the study was a gambit to arrest the rest of them. As a result of that experience, on each day, the team were taken to the location where they arranged the day's work. Three assistants collected anthropometric information while the rest did the interviews far apart from each other such that respondents were unable to listen to each other's responses. Respondents had their anthropometric data

taken first before the interview. This procedure was short and once their blood samples were taken they waited for their turn for the interview.

This sequence of data collection also ensured that by the time respondents completed interviews, feedback on anthropometry was ready. Interpretation on their BMI and waist-to-hip ratio were calculated and given to them instantly. Each participant received Ten Ghana Cedis (GH₵10.00) after completing the data collection processes.

Anthropometric Measurements

All anthropometric measurements were performed in duplicates by four trained data collection assistants. These four collected anthropometric data throughout the period of data collection. Measuring instruments were calibrated before use each day and also after taking twenty measurements.

Body Weight and Per Cent Body Fat

Body weights for all participants were measured using an electronic scale (Omron fat analyser). The measurement scale was placed on a flat surface. Participants were asked to stand on the scale with minimal clothing and readings were taken to the nearest 0.1kg in duplicates. This same instrument generated per cent body fat (% BF) of each respondent. The duration for this exercise on average took four minutes.

Standing Height

Standing height was measured using a wall-mounted stadiometer (Invicta, 1465, UK) with a least count of 0.1cm. Participants were measured

standing in an erect position and with the head in a frankfurt horizontal plane. Measurements were done in duplicate and the process took on average two minutes to complete.

Waist Circumference

Waist circumference (WC) was measured in duplicates at the narrowest area below the rib cage and above the umbilicus with the participant standing in the anatomical position. An inelastic but flexible tape was used to measure across the waist at the end of normal expiration. Duplicate measurements were recorded to the nearest 0.1centimetre. The measurement process took on average three minutes to complete.

Hip Circumference

Hip circumference (HC) was measured at the point of greatest circumference around the buttocks with the participant standing in the anatomical position. An inelastic but flexible tape was used to measure across the buttocks. Duplicate measurements which took on average a minute to generate were recorded to the nearest 0.1centimetre.

Derived Indices

Body Mass Index (BMI)

Body mass index was calculated as the recorded weight (kg) divided by height (meters) squared from the mean of the duplicate measures in standing height and body weight. BMI values correlate with nutritional status and therefore associated with under-nutrition or obesity.

Waist-to-Hip Ratio (WHR)

This index was derived from the ratio of the measurement of the waist circumference (cm) over the hip circumference (cm). This indicates visceral fatness and has classifications above which disease risks increase although BMI values may be normal. That is because BMI does not discriminate between muscularity and overweight except at high BMIs (WHO, 2008).

Waist-to-Height Ratio (WtHR)

This index was generated by dividing the measured waist circumference (cm) measured by the measured height (cm). This is a proxy for measuring central adiposity and to monitor disease risk. The specific classification is applicable to all races (WHO, 2008).

Blood Sample

Five millilitres of blood was drawn from the vena cephalica of each participant with sterile equipment (Johnson & Johnson, 21G 19 mm needles and syringes) with minimum stasis by a trained phlebotomist. These were then put into two containers. One had an anticoagulant while the other did not. To obtain serum, a portion of the whole blood collected from each participant was left to clot. This was centrifuged at the University of Ghana Hospital laboratory after close of data collection to separate the serum from the cells using (Universal 16R™ Hettich centrifuge, Tuttlingen, Germany). In the same way anti-coagulated blood role of ethylenediamine tetraacetic acid (EDTA) which was put on ice immediately after collection was centrifuged to obtain a separation between plasma and the blood cells.

The plasma was then collected into a container and labelled. Samples were then sent to the Cape Coast Teaching Hospital laboratory at Cape Coast and stored at -30°C until laboratory space was provided for the analysis within a month. All samples were analysed at the Cape Coast Teaching Hospital using Biotecnica 3000 autoanalyser resulting in the variables that were indicative of nutritional health. The blood samples are in storage at the Cape Coast Teaching Hospital Laboratory and will be disposed of safely after two years as directed by ethical provision.

Challenges Encountered During Fieldwork

Few challenges were faced during the data collection. Fieldwork data were collected at different locations (Adabraka, Odorna and Sahara Park). This required set up of data collection point every day. About 7 hours was spent each day for data collection on 1st, 7th, 14th, 15th and 20th and 22nd March, 2014 with eight Assistants.

Late Arrival at Meeting Points by Data Collectors and Venues for Data Collection

Some of the data collectors were always late for that day's activity. This was because they lived at different parts of Accra and early morning vehicular traffic prevented them from getting to designated point early. Therefore on some days, data collection started at about 10.30 a.m. On such days, data collection continued into the evening. Tents and anthropometric equipments were fixed each day due to changes in location for data collection. Reporting times for data collection were scheduled earlier than initially agreed to ensure that assistants reported on time for data collection.

Participant Numbers and their Behaviour

During the start of data collection in the morning, participants that turned up were more than the interviewers so we asked some to come back in the afternoon for their turn since we would collect data throughout the day. We then asked those who lived not far from the data collection point to come later in the day. We asked the leaders to inform potential respondents that data collection will take place in the afternoon as well so they all did not have to come in the morning. This was communicated to potential respondents and so on subsequent days we had respondents in manageable numbers coming to the data collection centre throughout the day.

Demand for Compensation and Suspicion of the Process

Some respondents demanded food, milk, egg and money for taking part in the study. Each time that request came up, the type of incentive due them was repeated. This delayed the data collection procedure considerably when it happened. Some of the respondents were suspicious of the data collection process since they felt it was a scheme by the law enforcement agencies to identify them for arrest and prosecution. Especially, since their counterparts in Tema were swooped on by the Ghana Police couple of weeks before data collection for this thesis started. Some did not feel comfortable answering questions such as where they bought the drug and where they used it. They had to be constantly reminded of the purpose of the data collection. Overall, respondents cooperated with the study team especially their leaders who managed the group during data collection. All recruited participants completed the study protocol.

Data Analyses

Each questionnaire was coded before entering for cross checking purposes. Some indices were generated after data entry. These included transformation of height and weight measurements into BMI by squaring the height in metres over weight in kilogramme, waist and hip circumference measurements into waist-to-hip ratio, waist and height to generate waist-to-height ratio. Cut-off values were generated for anthropometric and biochemical variables based on literature (WHO, 1998) and laboratory values of Cape Coast Teaching Hospital (CCTH), 2015). Cut-offs used for serum nutrients and enzymes were indicated in Table 3.

Unit of Analysis and Software

The unit of analysis is the individual drug user. Illegal drug user populations have different drug preferences and as such use diverse drugs, frequency and methods of taking drugs also contrast. However, this approach was the best given the circumstances under which they operated and the challenges of meeting them for the interview. The data were analysed using Stata (Corp. 2 Stata/IC Version 13 for Windows).

Table 3: Cut-Off Values Use for Anthropometric and Biochemical Indices

Variable	Cut-off (Male)	Cut-off (Female)
Anthropometry		
BMI (kg/m^2)		
Underweight	<18.49	<18.49
Normal	18.5-24.9	18.5-24.9
Overweight/obese	≥25.0	≥25.0
Waist circumference (cm)		
Normal	<94.0	<80.0

High	94.0	80.0
Waist-to-Hip Ratio		
Normal	<0.9-1.0	<0.8 0.9
High	>1.0	>0.9
Percent body fat		
Normal	≤20%	≤30
Above normal	>20	>30
Waist-to-height ratio		
Normal	0.4-<0.6	0.4-<0.6
Above	≥0.6	≥0.6
Biochemical		
Total protein	6.2-8.5	6.2-8.5
Albumin	3.4-5.0	3.4-5.0
Globulin	2.0-4.8	2.0-4.8
Albumin/Globulin Ratio	0.6-2.2	0.6-2.2
ALP	53.0-128.0	53.0-128.0
ALT	10.0-36.0	10.0-36.0
AST	5.0-34.0	5.0-34.0
LDA	12.0-64.0	12.0-64.0
Total bilirubin	0.0-1.5	0.0-1.5
Direct bilirubin	0.0-0.6	0.0-0.6
Indirect bilirubin	0.1-1.0	0.1-1.0
Cholesterol	140.0-200.0	140.0-200.0
HDL	30.0-100.0	30.0-100.0
LDL	0.0-150.0	0.0-150.0
VLDL	0.0-50.0	0.0-50.0

Source: Cape Coast Teaching Hospital laboratory

Statistical Techniques

Each variable was tested for normality using Kolmogorov-Smirnov method. For all outcome and exposure variables, various statistical test were used appropriately to assess changes and differences within and between groups that were compared. Means, standard deviations and statistical significance (P-value) set at $P<0.05$ were presented on socio-ecological, frequency of illegal drug intake and nutritional status variables. Chi-square statistics was used to test the association between categorical values.

For chapter four, percentages were presented for background characteristics based on male and female respondents. Proportions were presented for illegal drugs taken the day of the interview, the day before the interview and two days before the interview. The proportions of seven illegal drugs used based on multiple response were presented for each day and the total for the three-day period computed. Cocaine and crack were grouped as stimulants. heroin, thai, and rock were grouped as narcotics. Marijuana was the only hallucinogen used over the period while aggregates of mixed drugs and those not classified were referred to as unspecified drugs. Proportions were presented for the four categorized illegal drugs based on the background characteristics.

Those who used narcotics, hallucinogen, stimulants and unspecified drugs on any of the three days were coded '1' and those who did not use illegal drugs over the same period were coded '0'. Three binary logistic regression models were used to determine which socio-demographic variable predicted illegal drug use. In model 1, the independent predictor variables (background characteristics) were regressed over the outcome variables (stimulants, sand unspecified drug). In Model 2, hallucinogen was introduced as an independent predictor of illegal drug use while in Model 3, narcotics was introduced into the model. For all three model statistical significance was determined at $P< 0.05$ and $P<0.01$. The odd ratios, confidence interval at 95% were reported for each model.

Regarding chapter five, the explanatory variables were the background characteristics, gender, age in years, marital status, educational status,

occupational status, religious affiliation and ethnicity. These were re-coded. Age was grouped into categories that matched the standard used in Ghana Demographic and Health Survey data (GDHS, 2008). These were 15-19, 20-24, 25-30, 31-34, 35-40, 41-44 and greater than 44 years. Religious affiliation was coded into Orthodox Christians for those who said they were Catholics, Methodists, Presbyterians and Anglicans. Charismatics and Pentecostals were merged into one category, Pentecostal, considering the similarities in their observance of Christian doctrines. Traditionalists and no religious affiliation were merged into 'Others'. Regarding ethnicity, responses were grouped into the five ethnic groupings of Akan, Ewe, Mole-Dagbani and Ga-Dangme. Smaller ethnic groupings such as Guans, Gruma, etc were amalgamated and named 'Others'. Occupational status was grouped into four as Professionals, managers, artisans and others. Educational status was also characterized into none, primary and tertiary from the initial five groupings. Tertiary was formed from those who attended Senior High Schools and Universities/ Polytechnics or higher. Marital status was re-coded into ever married, never married and co-habiting. The outcome variables were the socio-ecological variables namely, personal, interpersonal, societal, community and institutional. Proportions were presented for sources of acquisition and consumption of illegal drugs over the three day period, methods and frequencies of illegal drug use. Independent socio-demographic characteristics were used to explain the influences of socio-ecological variables associated with illegal drug initiation, continuation and termination. Chi-square ($\chi 2$) and Fishers exact test were used to test for statistical significant test ($p<0.05$) between the socio-ecological variable and the socio-demographic variables.

In chapter six, means of categorized anthropometric variables were presented for males and female based on the four categorized illegal drugs. After this, means of the anthropometric characteristics were presented for males and females based on each illegal drug used. Comparison was then made on the means of anthropometric characteristics between males and females who took the same illegal drugs at the same frequency.

Those who used narcotics, hallucinogen, stimulants and unspecified drugs on each day was coded '1' and those who did not were coded '0'. Those who used illegal drugs and those who did not use illegal drugs were pooled together. Three poisson regression models were used to determine incident risk ratios of the explanatory variables since the data were count and also not dispersed. In model 1, the independent predictor variables (background characteristics) were regressed over the outcome variables (stimulants and unspecified drugs). In Model 2, hallucinogen was introduced as an independent predictor of illegal drug use while in Model 3, narcotics was introduced. The incident risk ratios (IRRs) were presented for BMI, per cent body fat and waist-to-height ratio. For all three model statistical significance was determined at $P< 0.05$ and $P<0.01$.

The analytical procedure for chapter six was adopted for chapter seven, Here, the serum biological values that were used as proxies for metabolic integrity were: total protein, serum albumin, serum globulin, aspartate aminotransferase, alanine transaminase, alkaline phosphates, gamma glutamyl transpeptidase, total bilirubin, indirect bilirubin, total cholesterol, high density lipoprotein and very low density lipoprotein. For the poisson regression the

outcome variables were protein-to-albumin ratio, aspartate aminotransferase and total cholesterol.

Although, the sampling methodology was non-probability, once a sampling frame of those who used illegal drugs and those who did not use illegal drugs were determined probability statistical approaches were used to analyse data (Domnich et al., 2013). Interpretation could also be given to such analyses and this is good statistical analytical practice (Naing et al., 2012). The only drawback is that results cannot be generalized to represent the entire illegal drug user population.

Ethical Considerations

Ethical clearance for the study was provided by the University of Cape Coast Institutional Review Board (UCCIRB) prior to the commencement of the study (Appendix C). Upon receipt of the certificate, permission was sought from the Prison Service and the Greater Accra Metropolitan Authority. Consent was also sought from each participant before enrolment into the study. In compliance with the ethical norms, full information on the study procedure as well as objectives were provided and explained to the respondents in either Akan or Ga and each participant was then made to sign/thumbprint consent form. Each consent form is kept and this will also be destroyed after two years. Participants received an amount of Ten Ghana Cedis for transportation. A tablespoonful of venous blood will then be drawn for mineral, nutrient and vitamin analysis.

Possible Risk(s) and Benefit(s)

Venous blood was drawn by a certified phlebotomist to reduce the health risk of the participants. After the interview, interpretations of nutritional status indices such as the waist-to-hip-ratio, BMI were disclosed to the respondents immediately and at no cost. Dietary advice was given to those who needed it based on the anthropometric results while others were referred to health care facilities for further care depending on severity.

Confidentiality

Information gathered through the study was not disclosed to anybody else. Data were coded at source and stripped of all participants' identifiers. No name or participant identifier was used in any discussion or publication.

Volunteerism and Alternatives to Participation

It was made known to the respondents that participation in the research was out of their free will and so strictly voluntary. They were informed that they could decide not to participate in the study and also refused to participate, any further, at any stage of the study, for whatever reason.

Withdrawal from Research

It was also made clear to respondents that they may choose to withdraw from the interview at any stage without having to give reason(s) for their decision. They may also choose not to answer any question(s) they were uncomfortable with or/and find personal/private. In addition they were at liberty to refuse to donate the tablespoonful of blood at the end of the interview.

Limitations of the Study

A number of limitations were identified with this study. The proportion of male to female respondents was skewed in favour of the former. The views of male respondents dominated the findings of this thesis. This was due to the purposive nature of the sampling procedure adopted for the study. There was no previous sample frame from which the number of males and females could be estimated. Recruitment of respondents by seeds does not give equal chance for potential drug users to be recruited. Therefore results of the study should be interpreted with caution. There is the probability that different locations rather than where the drugs were bought and used were mentioned. Means of verification of the locations were beyond the scope of this study.

A cross-sectional study provided one contact opportunity with respondents and in a study such as this, the estimation of the association of illegal drug use with nutritional status and background variables would have been more precise if the study was longitudinal. Multiple responses and measurements over time would have provided more precise epidemiological data since behaviour do change and drug effects on nutritional status also do change over time. But this was not possible due to the design of this study which had a limited time frame. Did not include non-users, because the focus was on illegal drug users.

Data Quality

Data quality depended on reliability and validity of the tool used in data collection. When the tool measures what it was designed to measure the reading from the tool is said to be valid. Reliability occurs when tool regularly

yields the same results upon several measurements by different persons (Imms and Greaves, 2013). Section of the questions on background characteristics were derived from the 2008 Ghana Demographic and Health Survey (GDHS, 2008) and are standardized. Reliability of the questionnaire was checked by re-interviewing some of the respondents again, after every interview, by a different data collection assistant at every interviewing day. Responses tally with the previous one collected indicative of the reliability of the assistants. Regarding the test instruments (non-stretched tape, Omron fat analyzer, stadiometer) different assistants were asked to take measurements on respondents. The two results generated were matched to ensure the readings by the two measurers were the same. Supervision of the data collection process, checking for inconsistencies in the interview questionnaire, and editing questionnaire for logic to ensure that the data collected were of high quality. The processing of blood samples used standard protocols, high grade reagents and precise auto analyser for accuracy and quality of the biochemical data.

Summary

This chapter described the study methods and analytical procedures that were used to achieve the study objectives. The quantitative method made it possible to generalize the findings of this study to other rare populations. Using quantitative methodology ensured that systemic biases due to measurement errors were reduced and the study can easily be reproduced. The anthropometric tools such as Omron fat analyser and stretch tapes used for girth measurements would yield valid results when used according to standard

procedure. Reproducibility of this study suggests robustness of the approach albeit with relatively small number of participants.

The count nature of the variables made the quantitative approach the best option. Socio-demographic data were counted just as the anthropometric and biochemical variables. The relationship between behaviours and how widespread behaviour is can only be studied through quantitative means. This allowed for the analysis of frequency of illegal drug use among males and females over a period of three days. In the same vein modes of illegal drug administration were quantified.

Each illegal drug user was the unit of analysis and more males than females served as units. Statistical techniques used for the data analysis ranged from descriptive statistics to multivariate techniques. Frequencies were presented for illegal drug use habits, types of drugs used over three-day period, methods and frequencies of use. Means and standard deviations were presented for anthropometric and biochemical variables. Binary logistics and Poisson regression techniques were used to determine predictors of illegal drug use habits, nutritional and metabolic risks. These approaches were relevant depending on the research question being answered and the nature of the data involved.

Quality guided the data collected and this was possible through the observance of standard procedures in interviewing of respondents (probing for responses, another enumerator interviewing a respondent to see if the same responses would be given), calibration of test instruments such as the Omron

fat analyser, of the data collected was analysed using highly specific equipments that were used to analyse clinical samples in duplicate.

One approach to the method used in this thesis was that socio-demographic information, biochemical and anthropometric data were all recorded on the same questionnaire, although data were collected using different approaches. This ensured that information on each participant was readily available for entry, cross checking and analysis. The biochemical data when analysed at the laboratory was also recorded on the questionnaire with a matching identification. Where there was the need to cross-check data entered with the questionnaire it was also easy and this contributed to ease of data handling and its quality.

Purposeful sampling where users of illegal drugs identified other users for recruitment was the main method employed for recruitment. This method was preferred because respondents were not easy to identify and recruit (Polit and Hungler, 2013). One advantage of this method was that it was easy to recruit and less time was spent on recruitment. The drawback, however, was that only individuals in a certain catchment area were likely to be part. Other likely illegal drug users may not have the chance of equally being selected. The next chapter discussed the background characteristics of respondents and the association with drug use habits.

CHAPTER FOUR

BACKGROUND CHARACTERISTICS OF RESPONDENTS AND TYPES OF DRUGS USED

Introduction

It was estimated, in 2010 that between 167 and 315 million people aged 15 to 64 years have used an illicit drug in the world. This figure represented four to seven per cent of the adult population (UNODC, 2013). On the African continent, seven per cent of the adult population used illegal drugs within the same period. The proportion that used marijuana was seven percent, which was twice the average amount consumed in the world. Within the same period, the prevalence of cocaine use in West and Central Africa was estimated at a per cent, higher than the global average (UNODC, 2013). One-in-five Ghanaians, aged 15 to 64 years was reported to have, smoked marijuana or used marijuana product in 2006 (UNODC, 2007), which was five times the world average, making Ghana the first in Africa and third in the world in use of marijuana (UNODC,2007).

The period of the Second World War (1939-1945) represents the first time drug production and usage, especially marijuana, was introduced into Ghana by soldiers who returned from the Second World War (Akyeampong, 2005). Its use was initially, limited to the unemployed or people employed in low-paying wage jobs with very little economic security but later caught up with the people in highly paid and secured jobs (Klein, 1994). There was also a shift in the type of illegal drug used from initial marijuana to cocaine and then to heroin (GNA, 2014).

Despite the criminalization of illegal drugs use through legislation (Provisional National Defence Council (PNDC) law 236) and the enforcement of drug laws by the Narcotics Control Board (NACOB), illegal drug possession and use continued. Socio-economic characteristics have been shown to influence illegal drug use but literature is not consistent on the association between background and the types of drugs used (Akyeampong, 2005; Agrawal et al., 2014). In every community the types of illegal drugs used may be peculiar with environmental influences.

Illegal drugs are substances, which once introduced into the body modifies one or several of the functions of the body (WHO, 1998). The most frequently reported illegal drugs in the literature are amphetamines (Piontek et al., 2013; UNODC, 2012), cocaine (Cornish & O'Brien, 1999; Piontek et al., 2013), sedatives (Neale et al., 2012), and marijuana (van Zyl, 2013). This chapter discusses the socio-demographic characteristics of illegal drug users in Greater Accra Region. The background of the people involved is important for the determination of the categories of people who used drugs and the types of drugs used.

Socio-Demographic Characteristics of Respondents

The socio-demographic variables were re-coded in some cases. For instance, age was grouped into standard five-year age groups: 15-19, 20-24, 25-30, 31-34, 35-40, 41-44 and greater than 44 years. Religious affiliation was coded into Orthodox Christians for those who said they were Catholics, Methodists, Presbyterians and Anglicans. Charismatics and Pentecostals were merged into one category, Pentecostal, considering the similarities in their

observance of Christian doctrines. Traditionalists and those with no religious affiliation were merged into 'Others'. Regarding ethnicity, responses were grouped into the five ethnic groupings of Akan, Ewe, Mole-Dagbani and Ga-Dangme. Smaller ethnic groupings such as Guans, Gruma, etc were amalgamated and named 'Others'. Occupational status was grouped into four as professionals, managers, artisans and others. Educational status was also characterized into none, primary and tertiary from the initial five groupings. Tertiary was formed from those who attended Senior High Schools and Universities/ Polytechnics or higher. Marital status was re-coded into ever married, never married and co-habiting.

The respondents were made up of 123 males and 18 females (Table 4). Studies conducted on illegal drug use in Ghana have recorded higher proportion of male users than females. This phenomenon may be attributed to cultural acceptance of males smoking as opposed to females (Dennis-Antwi et al., 2000; Ganu, 2013; Lamptey, 2005; Choi et al., 2013). The age of respondents ranged from 15 years to 45 years and above. The highest proportion of males (28 per cent) and females (28 per cent) were found in the 45+ and 40-44 years category respectively.

Sixty per cent of males and fifty per cent of the females were above 35 years. Findings of some earlier studies in Ghana showed illegal drug users to be mainly teenagers (Affinnih, 1999; Senah et al., 1998). Illegal drugs were used by those aged 16 years (Brown-Acquaye et al., 2000; Dennis-Antwi et al., 2000). In those studies, students were sampled and that may account for

the lower ages recorded. Educational status can influence decisions and perception to use of illegal drugs.

About equal proportions (five and six per cent) of male and females respectively, had no formal education. Higher proportion of males (34 per cent) had tertiary education while higher proportion of females 67 per cent had primary education. However, for both males and females, the higher proportion of illegal drug users had up to primary level education (Table 4). Fifty-three and 61 per cent of males and females, respectively of, illegal drug users were Akans. Among the females there were no Mole-Dagbani illegal drug users.

Norms of religious beliefs were supposed to shape behaviour and morality. Forty-seven per cent and 61 per cent respectively, of males and females reported being Pentecostal. Thirteen per cent and 17 per cent were males and females, respectively, professed no religious affiliations. Six per cent of male illegal drug users were professionals and that there was no female in this category (Table 4). Artisans represented more than half of illegal drug users among males (53 per cent) and females (61 per cent). One in two of illegal drug users among males and females were never married while 45 per cent of males compared with 33 per cent of females were ever married.

Table 4: Socio-Demographic Background of Respondents

Background characteristics Age category (years)	Male (n=123) (%)	Female (n=18) (%)
*15-24	5.7	22.2
Table 4: continues		
25-29	17.1	11.1
30-34	15.5	16.7
35-39	22.0	5.6

40-44	12.2	27.8
45+	27.7	16.6
Educational status		
None	4.9	5.6
Primary	61.0	66.7
Tertiary	34.1	27.8
Ethnicity		
Akan	52.9	61.1
Ewe	24.5	26.2
Ga-Dangme	4.0	1.6
Mole-Dagbani	13.0	0.0
Others	5.6	11.1
Religious Affiliation		
Orthodox	21.1	16.7
Pentecostal	47.2	61.1
Muslim	18.7	5.6
Others	13.0	16.7
Occupational status		
Professional	5.7	0.0
Managers	12.1	11.1
Artisans	52.9	61.1
Others	29.3	27.8
Marital status		
Never Married	51.2	55.6
Ever married	44.7	33.3
Co-habiting	4.1	11.1

Source: Field data, 2014. Age category 15-19 merged with 20-24

Illegal Drug Types Used Over Three Day Period

To determine the illegal drug use habits of respondents, data on drug use were collected over a three-day period (the day of the interview, day before the interview and three days before the interview) (Table 5). Multiple response results showed that illegal drug use was highest on day two (n =183) then in day one (n =118) or day three (n =169). Marijuana was the illegal drug used in highest proportion by males and females on each of the three days.

The kinds of drug used can be categorized into four groups. These were hallucinogens, narcotics, stimulants and unspecified drugs (Table 5). On each

of the three days hallucinogen was the drug that was used the highest by males and females. Among the stimulants cocaine was the highest used by both males and females. The three drugs constituted the narcotics group (rock, thai, heroin) was used the highest over the three day period. Proportions of rock used were 20 per cent, 17 per cent and 22 per cent on days one, two, and three respectively. Proportions of cocaine used over the period were higher than that of rock (Table 5). These were 30 percent, 28 per cent and 27 per cent for days one, two and three respectively. The proportions that reported cocaine use was higher than rock. Proportions who used hallucinogen were 33 per cent, 28 per cent and 30 per cent for days one, two and three respectively.

Table 5: Illegal Drug Use Over Three Day Period by Type of Drugs

Type of Drug	Day 1			Day 2			Day 3		
	Male (110)	Female (8)	Total (118)	Male (170)	Female (13)	Total (183)	Male (156)	Female (13)	Total (169)
Cocaine	29.1	37.5	29.7	27.7	30.8	27.9	26.3	38.5	27.2
Crack	0.9	0.0	0.9	1.2	0.0	1.1	1.3	0.0	1.2
[a]Stimulant	30.0	37.5	30.5	28.8	30.8	29.0	27.7	38.5	28.4
Heroin	4.6	0.0	4.2	10.6	7.7	10.4	9.0	7.7	8.9
Thai	10.9	0.0	10.2	11.2	15.4	11.5	8.3	7.7	8.3
Rock	20.0	25.0	20.3	16.5	23.1	16.9	21.2	30.8	21.9
[b]Narcotics	35.5	25.0	34.8	38.2	46.2	38.8	38.5	46.2	39.1
Marijuana	32.7	37.5	33.1	28.2	23.1	27.9	31.4	15.4	30.2
[c]Hallucinogen	32.7	37.5	33.1	28.2	23.1	27.9	31.4	15.4	30.2
[d]Unspecified Drugs	1.8	0.0	1.7	4.7	0.0	4.4	2.6	0.0	2.4

Source: Field data, 2014. Percentages were based on multiple responses. a= crack and cocaine; b=rock, thai and heroin; c=marijuana; d=mixture of illegal drugs or drugs that were unspecified

Socio-Demographic Characteristics and Types of Drugs Used

Table 6 shows the proportions of illegal drugs used based on socio-demographic characteristics by gender. For males, hallucinogen was the illegal drug used in the highest proportion by all age categories with the age 15 to 24 recording the highest (86 per cent). Hallucinogen was the drug used most by each age category of females apart from 40 to 44 age group that used 60 per cent of narcotics. In total, hallucinogen use accounted for 46 per cent and 45 per cent by males and females respectively among the age categories. In terms of educational status, 50 per cent of males with no education used marijuana compared with all females. Marijuana used accounted for 46 per cent of illegal drugs used by males compared with 44 per cent in females.

Among the marital categories 45 per cent of males used marijuana compared with 44 per cent of females. For the rest of marital status category marijuana was the most illegal drug used. In terms of ethnicity (Table 6), 46 per cent of Akan and 42 per cent Ewe males used marijuana compared with 55 per cent Akan and 40 per cent Ewe females. More males (46 per cent) compared with 44 per cent females used marijuana over the three day period based on ethnicity (Table 6). Hallucinogen was used by 62 per cent and 67 per cent of males and females respectively who professed orthodox christianity. Forty-five per cent of males and 44 per cent of females in the religious category used marijuana. Of the male professionals and artisans, 47 per cent and 48 per cent respectively, used hallucinogens. For females, 36 per cent of artisans used hallucinogens and narcotics while 40 per cent used hallucinogens.

Table 6: Socio-Demographic Characteristics and Drugs Used Over a Three-Day Period

	Males				Females			
Age Category	Hallucin Ogens (%)	Stimulants (%)	Narcotics (%)	Unspecified drugs (%)	Hallucin Ogens (%)	Stimulants (%)	Narcotics (%)	Unspecified drugs (%)
15-24	85.7	0.0	14.3	0.0	75.0	0.0	0.0	25.0
25-29	52.4	28.5	19.1	0.0	0.0	0.0	50.0	50.0
30-34	31.6	26.3	31.6	10.5	33.3	33.4	0.0	33.3
35-39	29.6	33.4	25.9	11.1	100.0	0.0	0.0	0.0
40-44	40.0	20.0	20.0	20.0	0.0	20.0	60.0	20.0
45+	55.5	14.7	8.82	20.6	100.0	0.0	0.0	0.0
Total	45.5	22.8	19.5	12.2	44.5	11.1	22.2	22.2
Educational Status								
None	50.0	33.3	16.7	0.0	100.0	0.0	0.0	0.0
Primary	45.3	21.3	21.4	12.0	50.0	8.4	25.0	16.6
Tertiary	45.2	23.8	16.7	14.3	20.0	20.0	20.0	40.0
Total	45.5	22.8	19.5	12.2	44.4	11.2	22.2	22.2

Table 6 continues

Marital Status								
Never Married	42.9	25.4	19.1	12.6	50.0	0.0	10.0	40.0
Ever Married	43.1	21.4	21.4	12.1	33.3	16.7	50.0	0.0
Cohabiting	100.0	0.0	0.0	0.0	50.0	50.0	0.0	0.0
Total	45.5	22.8	19.5	12.2	44.4	11.2	22.2	22.2
Ethnicity								
Akan	46.2	23.1	21.5	9.2	54.5	9.1	27.3	9.1
Ewe	42.9	28.6	11.4	17.1	40.0	20.0	20.0	20.0
Mole-Dagbani	43.8	12.5	31.2	12.5	0.0	0.0	0.0	0.0
Ga-Dangme	21.1	7.1	10.2	9.6	0.0	0.0	0.0	0.0
Others	36.1	7.2	4.2	4.5	0.0	0.0	0.0	100.0
Total	45.5	22.8	19.5	12.2	44.4	11.2	22.2	22.2
Religious Affiliation								
Orthodox	61.5	15.4	23.1	0.0	66.7	0.0	33.3	0.0

Table 6 continues

Pentecostal	36.2	32.8	15.5	15.5	36.3	18.2	18.2	27.3
Muslim	52.2	13.1	17.3	17.4	100.0	0.0	0.0	0.0
Others	43.8	12.5	31.2	12.5	33.3	0.0	33.4	33.3
Total	45.5	22.8	19.5	12.2	44.4	11.2	22.2	22.2
Occupational Level								
Professionals	46.7	33.3	13.3	6.7	0.0	0.0	0.0	0.0
Managers	42.3	42.6	14.3	0.0	100.0	0.0	0.0	0.0
Artisans	47.7	21.5	15.4	15.4	36.4	9.1	36.4	18.1
Others	41.7	16.7	30.5	11.1	40.0	20.0	0.0	40.0
Total	45.5	22.8	19.5	12.2	44.4	11.2	22.2	22.2

Source: Field data, 2014 . a= crack and cocaine; b=rock, thai and heroin; c=marijuana; d=mixture of illegal drugs or drugs that were unspecified. Row totals in table add up to 100%. These totals were not included since values will crowd the table.

Predictors of Illegal Drug Use

Further statistical analysis was performed to assess the likelihood of independent socio-demographic characteristics that predicted illegal drugs use. A multivariate logistic regression technique was used determine which socio-demographic characteristics predicted illegal drug use over the three day period (Table 7). Those who used illegal drugs on each of the three days were coded '1' and those who did not were coded '0'. All those who used illegal drugs were pooled together as well as those who did not. The first model involved those who used and did not use stimulants and unspecified drugs. Model 2 involved hallucinogen as an independent predictor of drug use and in model 3 narcotics was introduced as an independent predictor. For each of the model, the reference categories were as follows: age group (15-24 years); ethnicity (Akan); occupational status (professionals); marital status (never married); religious affiliation (orthodox) and educational status (none).

In Model 1, age and marital status statistically predicted the odds of using illegal drugs (Table 7). There are 82.5 per cent decrease (OR=0.18; P<0.05) in using illegal drugs for those aged from 30 to 34 years were less compared with those aged from 15 to 24 years. There is 35.9 per cent decrease (OR=0.64; P<0.05) in using illegal drugs were less for ever married compared with never married. When hallucinogen drug was introduced as an independent predictor (Model 2), the odds of using illegal drugs were decrease for ages 30-34 years by 80.6 per cent (OR=0.19; P<0.05); 35-39 years by 81.9 per cent (OR=0.18; P<0.01) and 40-44 years by 83.4 per cent (OR=0.17; P<0.01) compared with 15-24 years (Table 7). When narcotics drug was introduced as

an independent predictor (Model 3) none of the odds were statistically significant (Table 7).

Table 7: Multivariate Logistic Regression Results on Predictors of Illegal Drug Use

	Model 1		Model 2		Model 3	
	OR	95%CI	OR	95%CI	OR	95%CI
Socio-demographic Characteristics						
Gender						
Male (Ref)						
Female	0.76	(0.28, 2.12)	0.87	(0.31, 2.45)	2.91	(0.82, 10.38)
Age Group (Years)						
#15-24 (Ref)						
25-29	0.34	(0.07, 1.63)	0.35	(0.07, 1.67)	0.46	(0.03, 8.02)
30-34	0.18*	(0.04, 0.87)	0.19*	(0.04, 0.98)	1.58	(0.15, 17.22)
35-39	0.18	(0.04, 0.83)	0.18*	(0.04, 0.85)	1.20	(0.11, 12.95)
40-44	0.16	(0.03, 0.83)	0.17**	(0.03, 0.86)	1.77	(0.16, 19.34)
45+	0.49	(0.11, 2.16)	0.54	(0.12, 2.39)	1.21	(0.12, 12.12)
Ethnicity						
Akan (Ref)						
Ga-Dangme	0.98	(0.37, 2.55)	0.98	(0.38, 2.57)	1.18	(0.20, 6.93)
Ewe	0.69	(0.22, 2.17)	0.65	(0.21, 2.05)	1.86	(0.31, 1.20)
Mole-Dagbani	0.90	(0.29, 2.75)	0.92	(0.30, 2.83)	1.86	(0.31, 11.20)
Others	1.15	(0.07, 9.38)	1.00	(0.06, 7.27)		
Occupation						
Professionals (Ref)						
Managers	0.67	(0.03, 18.06)	0.55	(0.02, 15.38)		
Artisans	0.67	(0.03, 14.03)	0.55	(0.03, 11.94)		
Others	1.33	(0.06, 10.12)	1.03	(0.04, 25.08)		

Table 7 continues

Marital status						
Never Married(Ref)						
Ever married	0.64*	(1.28, 1.47)	0.67	(0.29, 1.54)	0.33	(0.07, 1.58)
Co-Habiting	7.69	(0.88, 7.12)	8.07	(0.92, 7.80)		
Religious Affiliation						
Orthodox (Ref)						
Anglican						
Pentecostal	0.87	(0.12, 6.48)	0.88	(0.12, 6.24)		
Muslim	0.66	(0.14, 3.09)	0.77	(0.17, 3.46)		
Others	0.39	(0.07, 2.04)	0.47	(0.09, 2.41)		
Educational status						
None (Ref)						
Primary	0.52	(0.08, 3.44)	0.46	(0.07, 3.11)		
Tertiary	0.52	(0.08, 3.39)	0.48	(0.07, 3.14)		
Did not use hallucinogen (Ref)						
Hallucinogen			0.77**	(0.68, 0.91)		
Did not use narcotics (Ref)						
Narcotics					0.44	(0.74,3.41)

Source: Field data, 2014. *P<0.05; **P<0.01. Ref= reference category

Hypothesis 1 Testing

The results of the multinomial logistic regression model results were used to test hypothesis (1) as follows:

Hypothesis 1: The expectation is that background characteristics will influence illegal drug use.

Model 1: Certain age categories and marital status categories statistically significantly predicted the odds of using stimulants and unspecified drugs

Model 2: Certain age categories and marital status categories statistically predicted the odds of using hallucinogen drug.

Model 3: None of the background characteristics predicted narcotics drug use.

Discussion

This chapter examined the socio-demographic background of illegal drug users in Greater Accra. To test the null hypothesis of no difference in the socio-demographic characteristics of users a multinomial logistic regression was conducted.

There were more male illegal drug users than females (Table 5). Traditionally in Ghana, smoking which is antecedent to illegal use by females, is frowned upon by society and this may explain the observation. Choi et al. (2013) found that normative structures in society maintain traditional difference in the roles of males and females and smoking is one of these roles. Smoking by females is frowned upon by society and deemed as deviant behaviour (Eisenberg et al., 2013; Connor et al., 2013) and this includes use of

illegal drug. This finding is consistent with previous studies on illegal drug use in Ghana (Sokro, 2010; Affinnih, 1999).

The highest users of illegal drugs were males aged 35 years and above while for females it was those aged between 40 and 44 years. These age groups have developed the efficacy of using illegal drugs. It can also suggests that respondents started illegal drug use early. Evidence is that when illegal drug starts early, it increases rapidly from early to late teenage years, peaks during transition to adulthood (Baggio et al., 2014; Heron et al., 2013). This is consistent with the pattern seen in this thesis. Males used marijuana whilst females used either marijuana or cocaine as their drug of preference. Multiple illegal drug use, such as observed in females, occurs if there were antecedents for illegal drug use (Huang et al., 2011; Klimas, 2014).

The gender difference that exists in the choice of drug use may be due to influence in body composition and differences in motivations for engaging in illegal drug use habits and gonadal hormones (Cofrancesco et al., 2007). Multiple illegal drug use among females is partly due to outcome satisfaction derived from different types of drugs. Illegal drug users were found in all educational levels (Table 6). It is possible that illegal drug use trajectory exists where the initial use of certain drugs will lead to different drug use later in life (Carter et al., 2013) as competencies and motivation are developed for those drugs. In earlier studies (Brown-Acquaye et al., 1982; Dennis-Antwi et al., 2000) marijuana (a hallucinogen) was commonly used in schools.

Sources of regular income are particularly important for illegal drugs since it helps them maintain the habit. High earning jobs lead to financial

ability to purchase and use illegal drugs (Huang et al., 2011). For craft and related workers and other drug users the drugs could be used to counter the physical nature of the job (Szitman et al., 2013; Ramchand et al., 2013). Religious affiliation is expected to provide protection motivation to illegal drug use (Ganu, 2013; Gmel et al., 2013). Hence the expectation is that those who are affiliated to any religious denomination will not use illegal drugs. However in the study members of other Christian religious denomination recorded the highest use of illegal drugs among both males and females. Studies on religion and illegal drug use have been inconsistent since apart from church affiliation, attendance and personal commitment would have different influences (Gmel et al., 2013). This is also an area for further interrogation. Having a spouse could have a moderation effect on illegal drug use habit and lack of bonding from spouse may account for higher use of drugs by those who were single, divorced and not married (Piontek et al., 2013; Bailey et al., 2013; Bavarian et al., 2013).

Marijuana use was most common among the illegal drug users probably because these are grown in some parts of the country and also cheaper to acquire (UNODC, 2007; UNODC, 2013). This may partly be due to the fact that marijuana used started in Ghana after the Second World War and may become pervasive. Main mode of drug use was smoking and supports the shared route of inhalation by Agrawal and Lynskey (2009). People develop adaptations and changes in the aero-respiratory system to be able to use other drugs through similar means which explains the polydrug use among some females.

Illegal drug users were found across all the educational levels (Table 7). Education plays no role in harm perception contrary to findings of some studies (Black et al., 2013; Islam et al., 2002; Brown-Acquaye et al., 2000). Educational level positively and independently influences cues to action in health behaviour which also directly influences action. Low socio-economic status may also account for this observation (Huang et al., 2011). Females who used illegal drugs were more likely to be in Primary and JHS levels compared to male illegal drug user who had completed JHS (Table 6). Illegal drug use trajectory exists in the schools where the initial use of certain drugs will lead to a different drug use later in life (Carter et al., 2013) as competencies and motivation are developed for those drugs.

Illegal drug use cut across all educational background suggesting that the drug habit is either acquired in schools to support academic purpose or peer influence encouraged its initiation at school. In earlier studies (Brown-Acquaye et al., 2000, Dennis-Antwi et al., 2000) marijuana (a hallucinogen) was found to be commonly used in schools which is different from the present observation. Senah (1980) and Brown-Acquaye et al. (2000) found illegal drug use among these students. The drugs were to aid academic work/studies. Within communities, the availability of drugs and ease of access contributes to drug use (Affinnih, 1999).The trajectory in drug use may be a new phenomenon among drug users in Ghana.

Occupations are particularly important for illegal drug users to maintain their habits. High earning jobs as a result of good occupations will lead to financial ability to purchase and use illegal drugs (Huang et al., 2011).

Craft & related trades workers and others used drugs mostly. The drugs were used to support the physical nature of their jobs and the norms that are associated with this job (Sznitman et al., 2013;Ramchand et al. 2013). As such the dominant occupations among males were plant and machinery compared with others for females.

Socio-demographic predictors of illegal drug use were age (years), ever married and hallucinogen drug (Table 7). Younger people were more likely to use illegal drugs compared with older individuals suggests peer pressure and identity pull factors among younger individuals. Having ever married before or having been in any relationship tends to reduce risk of drug use probably through development of attachment to the individual instead of the illegal drugs. The spouse may provide the emotional satisfaction and outcome expectancy that the illegal drug would otherwise have provided. Availability of hallucinogen in the community is a risk factor to illegal drug use. The implication is that measures have to be taken to reduce availability of illegal drugs and education intensified about the possible adverse health effects. The next chapter examines socio-ecological influences on illegal drug use

CHAPTER FIVE

ILLEGAL DRUG USE HABITS AND SOURCES OF SOCIO-ECOLOGICAL INFLUENCES

Introduction

Use of illegal drugs started in Ghana by soldiers who returned from fighting in the Second World War. At the time, marijuana was the only drug used. Now the types of drugs used ranged from marijuana to more addictive drugs such as cocaine, heroin and unspecified drugs United Nations Office on Drug and Crime (UNODC, 2014). According to UNODC (2011) a range of illegal drugs are used in Ghana and the people using these drugs have changed due to population dynamics. Understanding the range of drugs used is important for its management and instituting harm reduction. This chapter assesses the types of illegal drugs used over a three-day period among the respondents. It profiled the types of illegal drugs used, modes of use, frequency of use, personal and non-personal influences on the habits.

Illegal drug use habits depend on personal characteristics of the user and the socio-ecological environment. Some of these factors are proximal (intra- and interpersonal) while others are distal (community and rules and regulations) (Wray-Lake et al., 2012). Interpersonal processes show effect through the primary groups of the user that includes family and friends/peers. Expression of this effect is through the provision of social identity, support from members and role definition for the illegal drug user. Friends/peers provide the opportunity for first drug use (Baggio et al., 2014; Embleton et al., 2013; Piontek et al., 2013), and could also serve as norm and/or search for

identity (Dennis-Antwi et al., 2000; Holm et al., 2013). Societal norms could also account for individual drug use habits (Dieterich et al., 2013; Eisenberg et al., 2013). Unlike illegal drug use initiation, its continuation depends on personal factors including the motivation and enjoyment derived from use (Connor et al., 2011; Ramchand et al., 2013), the development of effectiveness for drug use after first contact (Choi et al., 2013) and belief about the effect of the drug (Bylund et al., 2011). The social environment could also influence illegal drug use. For example, having a peer, family member or work colleague use illegal drugs can lead to illegal drug use behaviour (Fotopoulou, 2014).

Physical environments are likely to influence the amount and type of drugs used. This influence can either be positive or negative. The presence of illegal drug in a community increases the odds of using (Verweij et al., 2010). Duff et al. (2014) stated that the environment contributes to drug use through its availability, organizational rules, regulation, policies and informal structures. These levels of influence on the individual are both lateral and horizontal. Routes of administration also vary from smoking e.g. (marijuana) drinking (e.g. cocaine), snorting (e.g. cocaine and heroin) to inhaling (e.g. glue). Multiple drugs can be used by the same user and through different routes of administration (Agrawal & Lynskey, 2009).

Illegal Drug Use Habits

Frequencies of illegal drug types and habits over a three-day period are shown in Table 8. These habits were whether drugs were used alone or shared and whether combination drugs were used. Over the three-day period less than

13 per cent of males used different drugs compared with 17 per cent of females over the same period. Seventeen per cent of males used different drugs the day before the survey while 17 per cent of females used different drugs on the day of the survey. Less than a per cent of females used different drugs two days before the survey.

In terms of the proportions that used illegal drugs alone (Table 8), 77 per cent used drug alone on the day of the interview and 81 per cent on the day before the survey. For females, 60 per cent used illegal drugs alone over the three day period with the highest proportion of 83 per cent occurring on the day before the interview. Eighty per cent of males reported using combined drugs and seven per cent used combined. None of the females reported ever using combined drugs.

Table 8: Illegal Drug Use Habits by Gender

Drug use habits	Male N=(123) (Yes) (%)	Female (N=18) (Yes) (%)	Total (%)
Type of illegal drug			
Used different drugs 2 days before the survey	12.3	0.1	13.0
Used different drugs the day before the survey	17.1	11.1	19.5
Used different drugs on the day of the survey	9.7	16.7	13.0

Whether used alone			
Used drug alone on the day of survey	77.2	83.3	92.7
Used drug alone the day before the survey	80.5	61.1	91.5
Used drug alone 2 days before the survey	75.6	72.2	85.4
Combination drug intake			
Ever combined drugs before taken	6.5	0.0	6.5
Ever taken drugs already combined	8.1	0.0	8.1

Source: Field data, 2014. Columns were not created for those who responded 'no' since responses are mirror images of 'yes'. 'Total percentages for males and females were calculated by adding the absolute numbers of yes responses for males and females and dividing by number of respondents and then multiplied by 100.

Sources of Acquisition and Consumption of Illegal Drugs

Since drug use is outlawed in Ghana and as part of ethics which enjoins confidentiality in research, generic designations were used to represent specific locations where reported drugs were acquired and used (Table 9). Frequencies were presented for males and females separately. The places where illegal drugs were acquired varied greatly from homes through to hideouts in the city centre. Two days before the survey, 76 per cent of males compared with 89 percent of females, acquired illegal drugs at the market and about equal proportions (85 per cent) used it at the same place. On the rest of the days, city centre remained the main place of acquisition of illegal drugs for both males and females (Table 9). Two days before the survey, 86 per cent of

males and 85 per cent of females used illegal drugs at the place of acquisition. On the day before the survey, 76 per cent and 88 per cent of males and females, respectively used drugs at the place of acquisition. The places of acquisition are not hard-to-reach places. For instance, in a market place where the drugs are sold was accessible but drugs are not displayed so a casual shopper would not know that drugs are also for sale.

Table 9: Sources of Acquisition and Consumption of Illegal Drugs by Gender

Source/day	Location	Male (N=123) Yes (%)	Female (N=18) Yes (%)	Total (%)
Sources of drug used 2 days before the interview	City centre	76.4	88.9	80.9
	Market	1.6	0.0	1.4
	Saloon	19.5	11.1	19.1
	Beach	0.8	0.0	0.7
	Home	1.6	0.0	1.4
	Total	100.0	100.0	
Place of consumption of 2 days ago's drug	Same place as bought	85.9	85.0	89.4
Source of yesterday's drug	City centre	83.7	94.4	88.7
	Market	1.6	0.0	1.4
	Beach	0.8	5.6	1.4
	Home	0.8	0.0	0.7
	Saloon	0.8	0.0	0.7
	*Ghetto	12.2	0.0	10.6
	Total	100.0	100.0	
Place of consumption of yesterday's drug	Same place as bought	76.2	88.3	80.9
Sources of today's drug	City centre	88.9	66.7	

	Market	5.6	28.6	
	Beach	5.5	0.8	5.7
	Saloon	0.0	1.6	1.4
	Home	0.0	1.6	1.4
	Total	100.0	100.0	
Place of consumption of today's drug	Same place as bought	88.9	90.3	92.2

Source: Field data, 2014 *= illegal drug use hideout. Columns were not created for those who responded 'no' since responses are mirror images of 'yes'. ''Total percentages for males and females were calculated by adding the absolute numbers of yes responses for males and females and dividing by 123 and then multiplied by 100.

Methods of Administration

Illegal drugs used over three-day period were categorized into five modes of use based on responses reported. These are smoking, chasing, drinking, injection and others (Table 10). Smoking was the main method used in taking stimulants with 25 per cent using that method over the three day period. On the third day, 28 per cent administered drugs through smoking. For narcotics, eight per cent reported smoking and two per cent chasing. Thirty-one per cent administered hallucinogen through smoking. On days one, two and three 30 per cent, 31 per cent and 32 per cent respectively smoked marijuana. Other modes of administration were reported for hallucinogens and these were through drinking (one per cent) and others (one per cent). According to UNODC (2011), smoking was the medium through which drugs were administered. However, injection of drugs as a new phenomenon is emerging as captured among narcotics users in this study.

Table 10: Illegal Drug Use Methods

Drug	Methods	Day One (141)	Day Two (141)	Day Three (141)	Total (423)
Stimulant	Smoking	0.7	1.4	0.7	0.9
	Chasing	0.7	0.0	0.0	0.2
Narcotics	Smoking	5.7	12.1	6.4	8.0
	Chasing	0.7	2.1	3.5	2.1
	Injection	0.0	0.7	0.7	0.5
Hallucinogen	Smoking	29.8	31.2	31.9	31.0
	Chasing	2.8	2.1	2.1	2.4
	Drinking	0.0	0.7	1.4	0.7
	&Others	0.7	1.4	0.7	0.9
Unspecified drug	Smoking	4.3	4.3	0.7	3.1
	Chasing	0.0	0.7	0.0	0.2
	Drinking	0.7	1.4	1.4	1.2
	&Others	0.7	0.7	0.7	0.7

Source: Field data, 2014. &Others= adding to foods, inhaling, chewing

Frequency of Illegal Drug Use

Frequencies of use of classified drug categories were compared over the three-day period. All the four categories of drugs were used a number of times over the period (Table 11). The frequency of 1-3/day has the highest proportion of use for all drug categories. Thirty-two per cent reported using stimulant 1-3 times per day. A total of 26 per cent used hallucinogen 1-3

times per day. On day two, 14 per cent used hallucinogen at a frequency of 4-6/day. Ninety-seven per cent used unspecified drug over six times per day.

Table 11: Frequency of Illegal Drug Use

Drug category	Freq/day.	Day One	Day Two	Day Three	Average Percentage
Stimulants	0	99.3	98.6	98.6	98.6
	1-3	0.7	0.7	0.7	1.4
	4-6	0.0	0.7	0.7	0.0
Narcotics	0	84.4	79.4	73.8	0.0
	1-3	0.7	1.4	5.7	85.8
	4-6	9.9	7.8	14.2	14.2
	>6	5.0	11.3	6.4	9.8
Hallucinogen	0	73.0	63.8	63.8	53.2
	1-3	6.4	9.2	15.6	25.5
	4-6	12.1	14.2	12.8	19.1
	>6	8.5	12.8	7.8	2.1
Unspecified Drugs	0	2.1	92.9	97.2	95.7
	1-3	0.7	1.4	0.7	0.7
	4-6	0.0	1.4	0.7	2.1
	>6	97.2	4.3	1.4	97.2

Source: Field data, 2014.

Background Characteristics and Socio-Ecological Factors on Illegal Drug Use Initiation

Background characteristics were used as independent factors to explain the influences of socio-ecological variables associated with illegal drug

initiation. Chi-square ($\chi 2$) and Fishers exact test were used to test for statistical significant difference between the influences and the background characteristics (Table 12). Initiation was as a result of interpersonal factors such as peers, school mates, family members. For each of the background characteristics, interpersonal factors accounted for over 60 per cent. Regarding gender, 66 per cent of illegal drug use initiation was due to interpersonal factors. There was statistical difference ($\chi 2$=11.476; P<0.009) in the illegal drug use initiation factors between males and females. Eighty-two per cent of interpersonal factors were responsible for drug initiation among those aged 30-34. For those who had no formal education and those cohabiting among the marital status category 71 per cent of them started illegal drug use due to interpersonal reasons. Sixty-five per cent of occupational category started using illegal drugs due to interpersonal factors and there was statistical significant difference ($\chi 2$ =17.916; P< 0.036) in the interpersonal factors within the group. Personal factors contributed over 20 per cent to illegal drug use initiation in all background categories. Twenty-three per cent of males and 28 per cent of females started using illegal drugs for personal reasons. Among the ethnic category 44 per cent of others group initiated illegal drug use due to personal reasons. For those co-habiting 71.4 per cent and 14.3 per cent used illegal drugs due to personal and institutional influences respectively.

Table 12: Background Characteristics Against Socio-Ecological Factors on Drug Initiation

	Personal (%)	Interpersonal (%)	Institutional (%)	Societal %	Total %

*Gender					
Male	22.8	69.1	3.3	4.9	100.0
Female	27.8	38.9	16.7	16.7	100.0
Total	23.4	65.5	5.0	6.4	100.0
Age Category					
15-24	36.3	63.6	0.0	0.0	100.0
25-29	30.4	60.9	4.4	4.4	100.0
30-34	9.0	81.8	4.6	4.6	100.0
35-39	35.7	53.5	0.0	10.7	100.0
40-44	25.0	65.0	0.0	10.0	100.0
45+	13.5	67.5	13.5	5.4	100.0
Total	23.4	65.2	5.0	6.4	100.0
Educational Status					
None	14.2	71.4	14.3	0.0	100.0
Primary	24.1	66.6	3.5	5.8	100.0
Tertiary	23.4	61.7	6.4	8.5	100.0
Total	23.	65.2	4.9	6.4	100.0
Marital Status					
Never Married	26.0	64.3	1.4	8.2	100.0
Ever Married	21.3	65.5	8.2	4.9	100.0
Cohabiting	14.2	71.4	14.3	0.0	100.0
Total	23.4	65.2	4.9	6.4	100.0
Ethnicity					
Akan	21.0	71.0	3.9	4.0	100.0
Ewe	27.5	55.0	7.5	10.0	100.0
Ga-Dangme					
Mole-Dagbani	12.5	75.0	6.3	6.3	100.0
Others	44.4	44.4	0.0	11.1	100.0
Total	23.4	65.2	4.9	6.4	100.0
Religious Affiliation					
Orthodox	27.5	62.0	3.5	6.9	100.0
Pentecostal	20.2	66.6	4.4	8.7	100.0
Muslim	16.6	75.0	8.3	0.0	100.0
Others	36.8	52.6	5.3	5.3	100.0
Total	23.4	65.2	5.0	6.4	100.0
*Occupational status					
Professionals	42.8	57.1	0.0	0.0	100.0
Managers	47.0	35.2	11.8	5.9	100.0

Artisans	21.0	63.1	6.6	9.2	100.0
Others	14.6	82.9	0.0	2.4	100.0
Total	23.4	65.3	4.9	6.4	100.0

Source: Field data, 2014. Personal= gender, age etc; interpersonal=family, peers etc; societal=neighbours, social services etc; institutional=laws, attitudes etc; * denotes statistical significance at P<0.05

Background Characteristics and Socio-Ecological Factors on Drug Continuation

Factors associated with illegal drug use continuation are shown in Table 13. Continuation factors are due to personal influences. The perpetuation of illegal drug use habit depends on the age, gender, attitude, belief and motivation of the user. For each of the background categories personal reasons accounted for over 80 per cent. Eighty-six per cent and 72 per cent of males and females respectively would continue to use illegal drugs due to personal reasons. Within the age category, 90 per cent of those aged 15-24 years as well as those with tertiary education respectively used illegal drugs for personal reasons. Among the marital status and ethnicity categories, all those who are cohabiting and in the others category, continue to use illegal drugs for personal reasons.

Interpersonal factors also contributed to illegal drug use continuation. For all category of background characteristics over 10 per cent of influences were due to interpersonal factors. Among the educational category, 29 per cent of those who did not have any formal education used illegal drugs for interpersonal reasons. Twenty-two per cent of females used drugs for interpersonal reasons.

Table 13: Background Characteristics Against Socio-Ecological Factors on Illegal Drug Use Continuation

	Personal (%)	Interpersonal %	Institutional %	Societal %	Total %
Gender					
Male	86.2	11.4	0.8	1.6	100.0
Female	72.2	22.2	5.6	0.0	100.0
Total	84.4	12.8	1.4	1.4	100.0
Age Category					
15-24	90.9	9.1	0.0	0.0	100.0
25-29	86.9	13.0	0.0	0.0	100.0
30-34	77.3	18.2	4.6	0.0	100.0
35-39	82.1	14.3	0.0	3.6	100.0
40-44	85.0	10.0	5.0	0.0	100.0
45+	86.5	10.8	0.0	2.7	100.0
Total	84.4	12.8	1.4	1.4	100.0
Educational Status					
None	71.4	28.6	0.0	0.0	100.0
Primary	80.5	14.9	2.3	2.3	100.0
Tertiary	93.6	6.4	0.0	0.0	100.0
Total	84.4	12.8	1.4	1.4	100.0
Never Married	84.9	12.3	1.4	1.4	100.0
Ever Married	81.9	14.8	1.6	1.6	100.0
Cohabiting	100.0	0.0	0.0	0.0	100.0
Total	84.4	12.8	1.4	1.4	100.0

Ethnicity					
Akan	82.9	14.5	1.3	1.3	100.0
Ewe	82.5	12.5	2.5	2.5	100.0
Mole-Dagbani	87.5	12.5	0.0	0.0	100.0
Ga-Dangme					
Others	100.0	0.0	0.0	0.0	100.0
Total	84.4	12.8	1.4	1.4	100.0
Religious Affiliation					
Orthodox	82.8	13.9	0.0	3.5	100.0
Pentecostal	79.7	15.9	2.9	1.5	100.0
Muslim	87.5	12.5	0.0	0.0	100.0
Others	100.0	0.0	0.0	0.0	100.0
Total	84.4	12.8	1.4	1.4	100.0
Occupational Status					
Professionals	71.4	14.3	0.0	14.3	100.0
Managers	94.1	0.0	5.9	0.0	100.0
Artisans	81.6	15.8	1.3	1.3	100.0
Others	87.8	12.2	0.0	0.0	100.0
Total	84.4	12.8	1.4	1.4	100.0

Source: Field data, 2014. Personal= gender, age etc; interpersonal=family, peers etc; societal=neighbours, social services etc; institutional=laws, attitudes etc;

Background Characteristics and Socio-Ecological Factors on Illegal Drug Use Termination

When it comes to stopping using illegal drugs, proportion of institutional considerations was highest compared with other factors (Table 14). For males

and females, 45 per cent and 24 per cent respectively gave reasons associated with institutions for stopping illegal drug use. Sixty-four per cent and 60 per cent for age categories 15-24 and 40-44 years respectively would stop for institutional reasons. Those with no education and never married, 57 per cent and 42 per cent respectively gave institutional considerations as responsible for decision to stop illegal drug use.

For ethnicity and religion, 68 per cent and 56 per cent respectively reported societal factors as reasons to stop illegal drug use. Religious affiliations as for stoppage was found to be statistically significant ($\chi2=17.06$; $P = 0.05$) between the group. This suggests that roles of attitudes, ideologies and laws which are institutional factors in illegal drug use termination were different among the religious categories.

Table 14: Background Characteristics Against Socio-Ecological Factors on Drug Use Termination

	Personal (%)	Interpersonal %	Institutional %	Societal %	Total %
Gender					
Male	17.1	17.9	45.5	19.5	100.0
Female	11.8	23.5	23.5	41.3	100.0
Total	16.4	18.6	42.8	22.1	100.0
Age category					
15-24	0.0	9.1	63.6	27.3	100.0
25-29	13.0	21.7	43.5	21.7	100.0
30-34	27.3	13.6	40.9	18.2	100.0
35-39	17.9	17.9	39.9	25.0	100.0
40-44	15.0	10.0	60.0	15.0	100.0
45+	16.7	27.8	30.6	25.0	100.0
Total	16.4	18.6	42.9	22.1	100.0

Educational Status					
None	14.3	14.3	57.1	14.3	100.0
Primary	12.8	20.9	45.5	20.9	100.0
Tertiary	23.4	14.9	36.0	25.5	100.0
Total	16.4	18.6	42.8	22.1	100.0
Marital Status					
Never Married	12.3	19.2	42.7	26.0	100.0
Ever Married	23.0	19.7	37.7	19.7	100.0
Cohabiting	0.0	0.0	100.0	0.0	100.0
Total	16.4	18.6	42.9	22.1	100.0
Ethnicity					
Akan	20.0	16.0	45.3	18.7	100.0
Ewe	17.5	25.0	30.0	27.5	100.0
Mole-Dagbani	0.0	18.8	68.8	12.5	100.0
Ga-Dangme					
Others	11.1	11.1	33.3	44.4	100.0
Total	16.4	18.	42.9	22.1	100.0
*Religious Affiliation					
Orthodox	0.0	17.2	48.3	34.5	100.0
Pentecostal	27.5	18.8	33.3	20.3	100.0
Muslim	8.7	17.4	56.5	17.4	100.0
Others	10.5	21.1	52.6	15.9	100.0
Total	16.4	18.6	42.7	22.1	100.0
Occupational Status					
Professionals	0.0	14.3	57.1	28.6	100.0
Managers	23.5	11.8	29.4	35.3	100.0

Artisans	13.3	20.0	38.7	28.0	100.0
Others	21.9	19.5	53.7	4.9	100.0
Total	16.4	18.6	42.9	22.1	100.0

Source: Field data, 2014; Personal= gender, age etc; interpersonal=family, peers etc; societal=neighbours, social services etc; institutional=laws, attitudes etc. *P< 0.05 denotes statistical significance.

Estimated Period of Stopping Illegal Drug Use by Background Characteristics

The period within which respondents envisaged stopping use of illegal drugs by background characteristics were shown in Table 15. For all categories of background characteristics, illegal drug use would stop a month after taking the decision. Fifty-six per cent of males and 40 per cent of females will stop illegal drug use a month after making the decision. Among the age category 85 per cent of those aged 15-24 years will stop within a month. Among the Akan and Ga-Dangme the proportion of those who will stop in a month were 58 per cent and 47 per cent respectively. Regarding occupational status, 67 per cent of managers and 50 per cent of artisans said they would stop within a month. Within the same period 67 per cent of those with tertiary education reportedly said they would stop using illegal drugs. All who belong to the following groups, professionals, others group in ethnicity category, co-habiting in marital status category, orthodox and others in religious status category would stop illegal drug use after a month of taking the decision to stop. Thirty-seven per cent and 40 per cent of those aged over 45 years and Ga-Dangme respectively would stop use of illegal drugs within a month of taking decision to stop.

Table 15: Estimated Period of Stopping Illegal Drug Use by Background Characteristics

Background characteristics	Will stop illegal drug use			
	Immediately	Within a month	More than a month	Total
	%	%	%	%
Gender				
Male	21.2	22.2	56.3	100.0
Female	20.0	40.0	40.0	100.0
Age Group				
15-24	0.0	12.5	87.5	100.0
25-29	16.7	27.8	55.6	100.0
30-34	33.3	16.7	50.0	100.0
35-39	23.8	23.8	52.4	100.0
40-44	7.6	11.0	70.6	100.0
45+	22.2	37.0	40.7	100.0
Ethnicity				
Akan	28.0	13.0	58.7	100.0
Ga-Dangme	13.3	40.0	46.7	100.0
Ewe	23.5	35.	41.2	100.0
Mole-Dagbane	25.0	33.3	41.7	100.0
Others	0.0	0.00	100.0	100.0
Occupational status				
Professionals	0.0	0.00	100.0	100.0
Managers	0.0	33.3	66.7	100.0
Artisans	37.5	12.5	50.0	100.0
Others	33.3	33.3	33.3	100.0

Never Married	16.7	25.9	57.4	100.0
Ever Married	36.7	23.3	40.0	100.0
Co-Habiting	0.0	0.00	100.0	100.0
Catholic	000	25.0	75.0	100.0
Religious Affiliation				
Orthodox	0.0	0.0	100.0	100.0
Pentecostal	40.0	0.0	60.0	100.0
Muslim	10.5	21.1	68.4	100.0
Others	0.0	0.00	100.0	100.0
None	20.0	20.0	60.0	100.0
Educational Status				
None	13.3	16.7	70.0	100.0
Primary	30.4	26.	43.5	100.0
Tertiary	33.3	0.0	66.67	100.0

Source: Field data, 2014

Hypothesis 2 Testing:

The result of the Chi Square tests of association on illegal drug use initiation, continuation and termination was used to test the hypothesis of no difference in socio-ecological factors and background characteristics. The expectation is that illegal drug use initiation, continuation and termination will be associated with background characteristics.

There was statistical difference ($\chi 2=11.476$; $P<0.009$) in the illegal drug use initiation factors between males and females. There is statistical significant

difference ($\chi 2$ =17.916; P< 0.036) in the interpersonal factors that contributed to illegal drug use initiation.

There is no statistical significant difference in illegal drug use continuation factors between males and females.

There is no statistical significant difference in illegal drug use termination factors between males and females. Religious affiliations was found to be statistically significant ($\chi 2$=17.06; P = 0.05) to stoppage of illegal drug use termination.

Discussion

The objectives of this chapter were to assess the illegal drug use habits and the socio-ecological factors that influence drug initiation, its continuation and termination. Females tended to use drugs alone while males did that in groups (Table 9). The tendency of females to take illegal drugs alone could be due to personal motivation and outcome satisfaction (Traube et al., 2013). The use of drug in groups by males could be for identity (Holm et al 2013; Hohman et al., 2014).

The culture of a community could be that to be counted among boys you have to be seen to belong. This may explain why places for obtaining illegal drugs were also the point of consumption. The drugs are sold at places that are known to members who sometimes share their use. Illegal drugs possession and use exist when there are low social control and cohesion (Duff et al., 2014) ease of access (Dieterich et al., 2013). This suggests that society has role to play in eliminating illegal drug use (Denoth et al., 2011; Embleton et

al., 2013). Interpersonal factors were the main reason for initiation of illegal drug use for both males and females (Table 12). This study found that factors outside self precipitated initiation of illegal drug use: peers, family and friends may have provided the opportunity for first drug experimentation (Embleton et al., 2013; Piontek et al., 2013; Baggio et al., 2014).

Continuous use of illegal drugs depended on motivation and enjoyment derived upon use and these are personal characteristics (Connor et al., 2013; Ramchand et al., 2013), the development of effectiveness for drug use after first contact (Choi et al., 2013) and false sense of positive belief about the effect of the drug (Shrier et al., 2012) accounted for this observation (Table 13). Personal attitudes and perceptions are strongly associated with illegal drug use. Attitudes lead to self-efficacy and perception influence behaviour. Therefore illegal drug use was also likely to cease for personal reasons such as when outcome expectancies were low and the perception of health risk is high (Shrier et al., 2012). General good health is valued by drug users since it gave them self-esteem which they did not want to lose (Neale et al., 2013).

Illegal drug users consider quitting the habit with the desire to restore aspects of identities that were deemed to be spoiled coupled with memories of their drug-free selves (Fotopoulou, 2014). When one uses illegal drug which can be addictive such as heroin and cocaine the personal satisfaction derive from use probably outweigh other influences such as family identity and value as well as societal norms. Laws on use of illegal drug did not influence decisions by individuals during drug initiation (Sznitman et al., 2013). As a result of the different foci of influence of illegal drug use emphasis on

sustainable drug combat has to be multifaceted. Different interventions could target different habits and behavioural patterns. Illegal drugs are usually addictive. That probably explains why illegal drug users cannot stop the habits on their own. That may also be why most of the respondents will stop the illegal drug use habit after a month of taking the decision. In addition, the laws prohibiting illegal drug use may also be a factor since users stated institutional factors as reasons to stop illegal drug use (Table 14).

In a day the highest frequency of smoking was 1-3 times per day. This may tie with the times of eating the three main meals in a day. That is the drugs may be used either before or after food intake. The physiological effects of drug use reduce after a certain period hence the need to use additional ones within the day. Frequency of drug use was associated with group member's self-efficacy (Song & Wenzel, 2014). Frequency of use may also tie with withdrawal symptoms where the user had to use drugs to relieve discomfort. The implications of the findings are that stringent laws alone cannot prevent drug use. That is because factors that were associated with initiation were not the same as those for sustenance and termination. Target policies should be available for each category. For example locating points of illegal drug acquisition could lead to the provisions of intervention in the area. The next chapter profiles the anthropometric characteristics that serve as proxies for nutritional status.

CHAPTER SIX

ANTHROPOMETRCAL CHARACTERISTICS AND ILLEGAL DRUG USE CATEGORIES

Introduction

Nutritional status is the condition of health of a person which is influenced by the intake and utilisation of nutrients. It is influenced by dietary practices, state of metabolism and absorption of and excretion of nutrients. Changes in body composition can be a reflection of dietary intake and physiological processes of nutritional status (Pasch et al., 2012; Pasch et al., 2011; Kirkham, 2005). One of the methods used in determining nutritional status is anthropometric measurements. Characteristics of anthropometry yield indicators of nutritional status that have been associated with health outcomes. These indicators independently predict health and risk of contracting a disease.

Active illegal drug use is associated with changes in body weight which can be chronic and/or acute (Nolan, 2013). The wasting and weight-loss patterns seen in illegal drug use is sex-specific (McIlwraith et al., 2014). Men tended to have near to normal anthropometric values than females who use the same illegal drugs (Tang et al., 2010). Females tend to lose more body fat and less lean body mass than their male counterparts (Perkins et al., 2014). The resultant body composition changes differ based on the type of illegal drug used and the frequency of use (Neale et al., 2014; Kurth et al., 2012).

The literature is not unanimous in the observed changes in body composition. Denoth et al. (2011) and Farhat et al. (2010) found

contradicting associations between higher BMI (obesity) and illegal drug use. Denoth et al. (2011) found illegal drugs use was more frequent in overweight and underweight adolescents who are females and the level of overweight related to the type of illegal drugs used (Huang et al., 2013) However, Baek and So (2012) found no association at all between obesity status and illegal drug use. The objective is to profile the anthropometric characteristics based on the types of illegal drugs and to assess the associations between frequencies of illegal drug use on anthropometric features and related disease risk development.

Anthropometric Characteristics Categories by Type of Drug Use

Anthropometric measures in nutritional studies are per cent body fat (% BF), waist circumference (WC) and body mass index (BMI). Per cent body fat (% BF) describes the total amount of internal and visceral fat depots; WC and BMI describe the external subcutaneous fat depots.

Abdominal obesity determined by waist circumference (WC), Hip Circumference (HC) and Waist-to-Hip Ratio (WHR) have been found to be associated with lipid metabolism (Vazquez et al., 2007; Vera-Villarroel et al., 2014). WC is an indicator of nutritional status for determining potential adverse effects of obesity and overweight leading to metabolic syndrome (Zhang, 2007).

Anthropometric characteristics were classified as below normal, normal and above normal and mean values for males were compared with those of females (Table 16). Due to the small numbers of females compared with males in each drug category comparison was made between the totals of males and

females rather than the drug categories. For instance, among hallucinogen users there were 56 males compared with eight females. For narcotics there were 24 males compared to four females.

For both males and females higher proportions have normal values for the anthropometric characteristics compared with either below normal or above normal values. Eighty-seven per cent of males and 55 per cent of females, respectively, had normal BMI values. All females and 99 per cent of males had normal WC values. Ninety-five per cent of males and 89 per cent of females had normal HC measurements (Table 16). Concerning the WHR index which is a better measurement of disease risk than WC and HC, 97 per cent and 94 per cent of males and females respectively, had normal values. Males (92 per cent) and 56 per cent of females had below normal values of % BF. All females and 99 per cent of males had above normal waist to height ratios.

Table 16: Anthropometric Characteristics by Type of Illegal Drug Used and Gender

Characteristics		Drug categories: Hallucinogens (N=64) Male (N=56) %	Hallucinogens (N=64) Female (N=8) %	Stimulants (N=30) Male (N=28) %	Stimulants (N=30) Female (N=2) %	Narcotics (N=28) Male(N=24) %	Narcotics (N=28) Female(N=4) %	Total (N=141) Male (N=123) %	Total (N=141) Female (N=18) %
BMI (Kg/m^2)	Underweight	7.1	25.0	21.4	0.0	8.3	25.0	9.8	16.7
	Normal	85.7	50.0	78.6	50.0	91.7	75.0	86.9	55.6
	Pre-obese	3.6	12.5	0.0	50.0	0.00	0.00	1.6	16.7
	Obese	3.6	12.5	0.0	0.00	0.00	0.00	1.6	11.1
WC (cm)	Normal	98.2	100.0	100.0	100.0	100.0	100.0	99.2	100.0
	Above normal	1.8	0.0	0.0	0.00	0.00	0.00	0.8	0.00
WHR	Normal	98.2	87.5	96.4	100.0	95.8	100.0	96.8	94.4
	Above normal	1.8	12.5	3.6	0.0	4.17	0.0	3.3	5.6
HC (cm)	Below	91.1	100.0	100.0	100.0	95.8	100.0	95.1	88.9
	Normal	8.9	0.0	0.0	0.00	4.2	0.00	4.9	11.1
%BF	Below	91.1	62.5	96.4	50.0	87.5	75.0	92.7	55.6
	Normal	0.0	0.0	0.0	50.0	4.2	25.0	0.8	27.8

Table 16 continues	Above normal	7.1	25.0	3.6	0.0	8.3	0.0	5.7	11.1
WtHR (kg/cm)	Below normal	1.8	0.0	0.0	0.0	0.0	0.0	0.8	0.0
	Above normal	98.2	100.0	100.0	100.0	100.0	100.0	99.2	100.0

Source: Field data, 2014. Unspecified drug was not analysed due to low frequency.
Body mass Index (BMI) categories=: Underweight (<18.5 kg/m2), normal BMI (18.5 to 24.9 kg/m2), overweight (25.0 to 29.9 kg/m2) and obese (≥ 30.0 kg/m2). Waist circumference (WC) categories males:= Normal (<94), above normal (94). WC categories females:= normal (<80), above normal (80). WHR categories=: males, normal (<0.95), above normal (0.95). Waist-to-Hip Ratio) WHR categories females=, normal (<0.85), above normal (0.85). Per cent body fat (%BF) Males =: males below normal (< 8%), normal (8 to 25%), above normal > 25% %BF females: = below normal (<20%), normal (20 to 35%), above normal (>35%). Waist-to-height ratio (WtHR) females:= below normal (< 0.51), normal (0.51 to 0.58), above normal (>0.58). WtHR males :=Below normal (<0.47), normal (0.47 to 0.54), above normal(>0.54)

Anthropometric Characteristics by Average Frequency of Cocaine Intake

Anthropometric characteristics were analysed at different frequencies of use of illegal drugs and tested using Chi-square. The frequencies were 1-3 times/day, 4-6 times/day and >6 times/day and other drugs that were used (Table 17). Cocaine intake at any frequency is associated with weight changes and fat deposition. These associations are sex specific. For cocaine users statistical significant difference in anthropometric characteristics were observed in the BMI (P=0.03) between males and females who used illegal drug at a frequency of 1-3 times daily. For those who took the drug between 4-6 times daily statistical significant differences existed in the amount of % BF (P<0.000) and HC (P=0.014) between male and female users. At the highest frequency of use (>6 times per day) the observed differences between males and females were in BMI (P= 0.002) and % BF (P=0.002).

Table 17 Anthropometric Characteristics by Frequency of Cocaine Use

Characteristics / Frequency	0 (N=75)		1-3 (N=33)		4-6 (N=19)		>6 (N=14)	
	Male(N=65)	Female(N=10)	Male (N=28)	Female (N=5)	Male (N= 17	Female (N=2)	Male (N=13)	Female (N=1)
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean
BMI(Kg/m^2)	20.65±4.0	22.39±3.7	21.37±2.3	34.53±30.7 (0.030)	20.42±1.4	22.30±5.9	19.98±1.5	(0.002)
%BF	16.12±13.8	21.93±11.8	12.94±3.6	16.46±10.7	11.59±2.9	24.95±6.1 (0.000)	10.44±3.5	25.0 (0.002)
WC (cm)	75.75±6.6	74.35±7.6	75.46±4.5	73.31±1.9	73.47±4.	75.75±2.3	69.14±19.1	74.0
HC (cm)	87.13±7.8	85.25±5.6	88.61±5.5	88.19±8.4	85.25±3.8	93.95±8.6 (0.014)	87.02±4.3	83.4
WHR	0.86±0.1	0.87±0.1	0.83±0.1	0.82±0.1	0.87±.1	0.81±.1	0.79±.2	0.9
WtHR (kg/cm)	0.87±.1	0.86±0.1	0.86±0.1	0.84±0.1	0.88±.1	0.81±.1	0.81±.2	0.9

Source: Field data, 2014

Anthropometric Characteristics By Average Frequency Of Heroin Intake

Anthropometric characteristics were analysed for heroin users at frequencies of 1-3/day and >6 times per day and non-users (Table 18). Generally, the means of anthropometric variables fluctuate between males and females and there is no observable pattern. For instance, the BMI of males were lower (21.7kg/m^2) than that of females (93kg/m^2) at a frequency of >6 per day. At the same frequency of >6 per day mean waist circumference value of males (77.0 cm) was higher than females (74.0 cm) (Table 18). Statistical significant difference exists in the BMI ($P< 0.001$) between males and females at a frequency of >6/day. For males and females who did not use heroin within the three day period, there was statistical significant difference in the % BF ($P=0.033$) between males and females.

Table 18: Anthropometric Characteristics by Average Frequency of Heroin Intake

Frequencies	0 (N=120)			1-3 (N=12)	* >6 (N=9)		
Characteristics	Male(N=103) Mean±SD	Female (N=17) Mean±SD	*P-Value	**Male(N=12) Mean±SD	Male(N=5) Mean±SD	Female (N=4) Mean±SD	P-Value
BMI(Kg/m^2)	20.6±3.3	22.0±3.6	0.11	21.4±3.0	21.7±1.3	93.0±1.9	0.00
%BF	14.3±11.1	20.6±10.8	0.03	12.5±5.7	16.8±8.1	26.7±2.1	0.33
WC (cm)	74.5±8.8	74.2±5.8	0.91	75.6±5.5	77.6±5.0	74.0±5.2	0.55
HC (cm)	86.9±6.7	86.6±6.7	0.84	88.7±6.5	88.4±6.6	93.2±3.6	0.54
WHR	0.9±.1	0.9±0.1	0.77	0.8±0.1	0.9±0.1	0.8±0.9	0.39
WtHR (kg/cm)	0.9±.1	0.9±0.1	0.73	0.9±0.1	0.9±0.1	0.8±0.5	0.37

Source: Field data, 2014 *Derived from chi-squared statistics. P<0.05 denotes statistical significance.

**Means presented for only males

Anthropometric Characteristics by Average Frequency of Rock Intake

Mean anthropometric values at frequency of 1-3/day were presented for heroin intake. The mean values of anthropometric characteristics were compared with those who did not take heroin (Table 19). No statistical significant differences were observed between males and females who used rock over the 3-day period and those who did not at frequency of 1-3/day when compared as (a) verses (c). Non-users of rock had statistical significant differences in BMI (P=0.003) and % BF composition (P=0.008) between males and females (Table 19).

Table 19: Anthropometric Characteristics by Frequency of Rock Intake

Frequencies	0 (N=117)		1-3 (N=10) (N=12)		#4-6		>6 (N=2)			
Characteristics	Male (N=101) a Mean±SD	Female(N=16) Mean±SD	Male(N=9) b Mean±SD	Female(N=1) Mean	Male(N=12) c Mean±SD	Male(N=1) d Mean	Female(N=1) Mean	*a vrs b P-Value	*a vrs c P-Value
BMI (Kg/m^2)	20.7±3.0	*26.6±18.1 0.003	22.4±3.8	20.7	19.6±3.7	19.00	21.1	0.236	0.320
%BF	14.4±11.3	*22.4±10.2 0.008	13.4±5.3	9.8	13.6±6.1	9.40	7.8	0.636	0.709
WC (cm)	74.8±8.9	74.2±6.0	73.7±4.7	74.6	74.7±0.5	76.10	73.9	0.570	0.955
HC (cm)	87.4±6.7	87.4±6.9	86.4±6.5	82.8	85.8±5.2	91.25	83.5	0.666	0.359
WHR	0.9±0.1	0.9±0.1	0.8±.1	0.9	0.9±0.1	0.83	0.9	0.633	0.681
WtHR (kg/cm)	0.86±.1	0.84±.1	0.87±.1	0.9	0.9±0.1	0.84	0.9	0.677	0.729

Source: Field data, 2014 *Derived from chi-squared statistics. P<0.05 denotes statistical significance. #= no female in category

Anthropometric Characteristics by Average Frequency of Thai Intake

Reports were not presented on anthropometric changes at certain frequencies due to small frequencies in those cells and also for frequencies that females did not take illegal drugs. At a frequency of 1-3 times per day of Thai intake females had higher statistical significant mean values than males in BMI (P= 0.002) and %BF (P= 0.006) between males and females (Table 20). Statistical significant differences (P <0.001) were also observed in WtHR between males and females at a frequency of 4-6 per day.

Table 20: Anthropometric Characteristics by Frequency of Thai Intake and Gender

	##(N=105)	1-3 (N=121)		4-6 (N=20)	
	Male	Female (N=16)		Male (N=18)	Female (N=2)	
Characteristics	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
BMI(Kg/m^2)	20.6±3.2	*26.6±18.1	0.002	21.2±2.7	20.9±.3	
%BF	14.2±10.9	*22.4±10.1	0.006	13.9±7.1	8.8±1.4	
WC (cm)	74.8±8.8	74.2±6.1		73.7±4.4	74.3±.5	
HC (cm)	87.3±6.9	87.4±6.9		86.6±3.3	83.1±0.5	
WHR	0.9±0.1	0.9±0.1		0.8±.1	0.9±0.0	
WtHR (kg/cm)	0.9±0.1	0.8±0.1		0.8±.1	*0.9±0.0	0.001

Source: Field data, 2014 *Derived from chi-squared statistics. P<0.05 denotes statistical significance. ##= No respondents in the 0 and >6 intake frequency categories.

Anthropometric Characteristics by Average Frequency of Marijuana Intake

Generally, marijuana was the main illegal drug used by the respondents. The anthropometric characteristics of users at frequencies of 1-3/day, 4-6/day and greater than 6 times per day were presented in Table 21. Means of anthropometric characteristics between males and females at each frequency was compared. There was statistical significant change in BMI (P=0.002) between those who took marijuana at 1-3 times per day and those who did not take marijuana. The mean BMI of males who took marijuana at 1-3/day were higher 22.2 kg/m^2 compared with males who did not use marijuana ($20.3kg/m^2$). However, females who used marijuana at a frequency of 1-3/day had lower mean BMI value ($21.8kg/m^2$) compared with that of females ($27.1kg/m^2$) who did not use marijuana. Males who used marijuana at a frequency of 4-6 per day had higher mean ($17.6kg/m^2$) in % BF values compared with the means ($14.3kg/m^2$) and ($16.8kg/m^2$) of those who used marijuana at 1-3/day and >6 times per day respectively. Mean Waist-to-Hip Ratio (WHR) of males who used marijuana at a frequency of 1-3/day was higher for females (0.87) compared with means (0.86) and (0.60) of males who used marijuana at frequencies of 4-6/day and >6/day respectively. Similarly those who took marijuana at a frequency of 1-3/day had higher mean (0.88kg/cm) in WtHR compared with means (0.86 kg/cm) and (0.67kg/cm) of males who took marijuana at frequencies of 4-6/day and >6 times per day respectively.

Table 21: Anthropometric Characteristics by Frequency of Marijuana Intake and Gender

Frequency	0 (N=75)		1-3 (N=36)		4-6 (N=27)	>6 (N=3)			
Characteristics	Male (N=61) a Mean±SD	Female(N=14) Mean±SD	Male (N=32) b Mean±SD	Female (N=4) Mean±SD	#Male (N=27) c Mean±SD	#Male (N=3) Male(N=3)	P-value *a vrs b	p-value *a vrs c	p-value *bvrs c
BMI(Kg/m^2)	20.3±1.7	27.1±19.3	22.2±3.1	21.8±3.6	19.9±5	20.5±2.7	0.00	0.76	0.90
%BF	12.5±5.2	22.0±10.8	14.3±5.5	17.1±3.9	17.6±14.6	16.8±12.4	0.13	0.19	0.61
WC (cm)	74.5±4.3	74.8±6.2	76.6±8	71.9±3.0	75.1±4.9	55.2±30.4	0.18	0.59	0.51
HC (cm)	86.5±4.9	87.1±6.1	87.3±9.4	86.5±9.4	88.3±5.9	90.3±4.5	0.64	0.17	0.28
WHR	0.85±.1	0.85±0.1	0.87±0.1	0.86±0.1	0.85±0.1	0.60±0.5	0.43	0.99	0.43
WtHR (kg/cm)	0.86±.1	0.85±0.1	0.88±0.1	0.83±0.1	0.86±0.1	0.67±0.5	0.339	0.97	0.63

Source: Field data, 2014 *Derived from chi-squared statistics. P<0.05 denotes statistical significance. #= no female in frequency category.

Predictors of Body Mass Index (BMI)

Poisson regression technique was used to analyse the independent factors that predicted anthropometric characteristics since data were not normally distributed. Three anthropometric variables namely per cent body fat, waist-to-height ratio and body mass index (BMI) were selected among the seven anthropometric variables. These variables showed association with illegal drugs at the bivariate analysis stage. For each of these three anthropometric variables the independent factors and the reference categories (in bracket) were gender (male), age category (15-24 years), educational status (none), marital status (never married), occupational status (professional), ethnicity (Akan) and religious affiliation Orthodox).

Three Poisson regression models were fitted for each anthropometric variable. Those who used illegal drugs over the three day period were coded '1' and those who did not were coded '0'. In the first model, the body mass index was assessed among those who used or did not use unspecified drugs and stimulants over the three day period. In the second and third models hallucinogen and narcotics were introduced as independent variables to determine its predictability of nutritional status. Predictors of nutritional status (BMI) were gender and ethnicity (Table 22). Regarding gender, females had 16.4 per cent decrease in BMI (IRR=0.84; P< 0.01) compared with males. When hallucinogen and narcotic drugs were introduced into Models 2 and 3 the incident risk ratios (IRR) of females were still statistically significantly less 13.1 percent (IRR=0.84; P< 0.01) and (IRR=0.84; P<0.01) respectively than that of males This suggests that the differences were not due to the use of illegal drugs.

Ewes had 16.2 per cent decrease (IRR=0.67; P<0.01); Mole-Dagbani 28.1 per cent decrease (IRR=0.72; P<0.01) and Others 18.2 per cent decrease (IRR=0.82; P<0.05) in BMI compared with Akan. When hallucinogen was introduced into the model (Model 2) and narcotics (Model 3) the incident risk ratios were statistically significant among the ethnic groups. Hallucinogen use had 32.5 per cent decrease (IRR= 0.68; P<0.01); Mole-Dagbani 27.5 per cent decrease (IRR=0.73; P<0.01) and Others 10.9 per cent decreases (0.89; P<0.05) in BMI compared to Akan. For narcotic drugs, Ewe have 32.4 per cent decrease (IRR=0.68; P<0.01); Mole-Dagbani 28.0 per cent decrease (IRR= 0.72; P<0.01) and Others 17.5 per cent decrease (IRR=0.83; P<0.05) in BMI compared with Akan.

Others in religious affiliation category have 13.9 per cent decrease (IRR= 0.86; P<0.05) in BMI compared with orthodox Christians. This incident risk ratios of others category was 14.3 per cent less in BMI (IRR=0.86; P<0.05) compared with orthodox Christians. These incident risk ratios were statistically significant

Table 22: Poisson Regression of BMI Against Background Characteristics

	Model 1		Model 2		Model 3	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Gender						
Male(Ref)						
Female	**0.84	(0.75, 0.93)	**0 .84	(0.75,0.93)	**0.84	(0.75,0.93)
Age category						
15-24 (ref)						
25-29	1.09	(0.94,1.28)	1.09	(0.94,1.27)	1.09	(0.94, 1.27)
30-34	1.02	(0.90,1.15)	1.02	(0.90,1.16)	1.02	(0.90,1.16)
35-39	1.11	(0.98,1.25)	1.11	(0.99,1.26)	1.12	(0.99,1.26)
40-44	0.97	(0.87,1.09)	0.98	(0.87,1.10)	0.979	(0.87, 1.10)
45+	0.91	(0.80,1.04)	0.92	(0.81,1.04)	0.92	(0.81, 1.05)
Educational status						
None (ref)						
Primary	1.03	(0.86,1.22)	1.03	(0.87,1.23)	1.02	(0 .86,1.22)
Tertiary	0.95	(0.87,1.04)	0.95	(0.87,1.04)	0.95	(0.87, 1.04)
Marital status						

Table 22 continues

Never married (ref)						
Ever married	0.91	(0.76,1.09)	0.912	(0.76,1.09)	0.92	(0.77, 1.10)
Cohabiting	0.88	(0.73,1.06)	0.88	(0.74,1.05)	0.89	(0.74, 1.07)
Ethnicity						
Akan (ref)						
Ewe	**0.67	(0.58,0.78)	** 0.68	(0.58,0.76)	**0.68	(0.58,0.79)
Mole-Dagbani	**0 .72	(0.62, 0.84)	**0.72	(0.62,0.84)	**0.72	(0.62, 0.84)
Ga-Dangme	0.71	(0.65, 1.05)	0.71	(0.66, 1.06)	0.72	(0.66, 1.06)
Others	* 0.82	(0.68,0.98)	* 0.82	(0.69,0.98)	*0.83	(0.69, 0.99)
Religious affiliation						
Orthodox (ref)						
Pentecostal	0.96	(0.84,1.10)	0.96	(0.84, 1.10)	0.97	(0.84, 1.10)
Muslim	1.01	(0.90,1.13)	1.01	(0.90, 1.14)	1.00	(0.89,1.13)
Others	*0.86	(0.74,1.00)	0.86	(0 .74, 1.00)	*0.86	0.74,0 .10)
Occupational status						
Professional (ref)						
Managers	0.93	(0.77,1.13)	0.94	(0.77,1.14)	0.93	(0.76, 1.13)

Table 22 continues

Artisans	*0.99*	(0.87,1.14)	0.10	(0.87,1.14)	0.99	(0.86, 1.13)
Others	1.05	(0.96,1.14)	1.05	(0.96,1.14)	1.04	(0.95,1.14)
Did not use hallucinogen (Ref)						
Hallucinogen			1.00	(0.92, 1.08)		
Did not use narcotics (Ref)						
Narcotics					0.97	(0.88,1.07)

Source: Field data, 2014 *=statistical significance at P< 0.05; ** denotes statistical significance at P< 0.01. Ref denotes reference category

Poisson regression of Waist-to-Height Ratio

The approach adopted in the analysis involving BMI was repeated for Waist-to- height ratio (WtHR) characteristics. This index predicts adiposity and therefore risk of cardiovascular disease. It is specific in detecting adiposity that is why it was chosen over circumference measurements. Table 23 presents the incident risk ratios (IRRs) of the independent background characteristics against stimulant and unspecified drug (Model 1), hallucinogen drug (Model 2) and narcotics drug (Model 3) of WtHR ratio. None of the background characteristics, hallucinogen and narcotics drugs used statistically significantly predicted waist-to-height incident risk ratios. This could mean that this index was not sensitive to background characteristics in predicting adiposity.

Table 23: Results of Poisson Regression of Waist-to-Height Ratio

	Waist-o height ratio					
	Model 1		Model 2		Model 3	
	IRR	95%CI	IRR	95%CI	IRR	95%CI
Gender						
Male(Ref)						
Female	0.10	(0.56, 1.77)	0.10	(0.56, 1.77)	0.10	(0.56, 1.78)
Age category						
15-24 (ref)						
25-29	0.97	(0.45, 2.09)	0.97	(0.44, 2.10)	0.97	(0.45, 2.09)
30-34	0.96	(0.52, 1.74)	0.96	(0.52, 1.74)	0.95	(0.52, 1.74)
35-39	0.94	(0.52, 1.72)	0.94	(0.51, 1.73)	0.94	(0.51, 1.73)
40-44	0.96	(0.55, 1.68)	0.96	(0.55, 1.68)	0.96	(0.54, 1.68)
45+	0.90	(0.48, 1.68)	0.90	(0.48, 1.70)	0.90	(0.47, 1.70)
Educational status						
None (ref)						
Primary	1.04	(0.43, 2.53)	1.04	(0.43, 2.55)	1.05	(0.43, 2.55)
Tertiary	1.00	(0.65, 1.55)	1.00	(0.65, 1.55)	1.00	(0.65,1.55)
Marital status						
Never married						

(ref)

Table 23 continues

Ever married	*1.13*	(0.44, 2.92)	1.130	(0.429, 2.977)	1.124	(0.432, 2.927)
Cohabiting	*1.14*	(0.44, 2.95)	1.138	(0.428, 3.025)	1.129	(0.428, 2.976)
Ethnicity						
Akan (ref)						
Ewe	0.99	(0.43, 2.26)	0.99	(0.43, 2.26)	0.98	(0.43, 2.26)
Mole-Dagbani	1.00	(0.43, 2.33)	1.02	(0.39, 2.69)	1.00	(0.43, 2.33)
Ga-Dangme	1.14	(0.98, 1.41)	1.15	(0.98, 1.41)	1.16	(0.99, 1.42)
Others	1.02	(0.39, 2.68)			1.02	(0.38, 2.69)
Religious affiliation						
Orthodox (ref)						
Pentecostal	1.02	(0.53, 1.99)	1.02	(0.53, 1.99)	1.02	(0.53, 1.98)
Muslim	1.02	(0.58, 1.82)	1.02	(0.58,1.82)	1.03	(0.58, 1.83)
Others	0.10	(0.48, 2.09)	0.10	(0.476, 2.089)	1.00	(0.48, 2.10)
Occupational status						
Professional						

(ref)

Table 23 continues

Managers	*0.95*	(0.37, 2.42)	0.95	(0.49,1.83)	0.95	(0.37, 2.43)
Artisans	0.95	(0.49, 1.83)			0.95	(0.49, 1.85)
Others	1.02	(0.66,1.57)	1.02	(0.66, 1.57)	1.02	(0.66,1.58)
Did not use hallucinogen (Ref)						
Hallucinogen			0.10	(0.67, 1.48)		
Did not use narcotics (Ref)						
Narcotics					1.03	(0.63,1.67)

Source: Field data, 2014. *P< 0.05; ** P<0.01; Ref denotes reference category

Predictors of Per Cent Body Fat (% BF)

This index shows the amount of fat in the body in relation to muscle. Per cent body fat predicts cardiovascular risk. Independent predictors of % BF are gender, age, educational status, ethnicity, religious affiliation, occupational status, hallucinogen and narcotics use (Table 24). In model 1 females have 38.1 per cent decrease in per cent body fat compared with males (IRR=0.65; P<0.01) compared with males. Those aged 35-39 years, 40-44 years, 45+ years have lower incident risk ratios 28.8 per cent decrease (IRR= 0.74; P<0.01), 31.8 per cent decrease (IRR=0.68; P,< 0.01), 30.3 per cent decrease (IRR=0.70; P<0.01) respectively in per cent body fat compared with those aged 15-24 years. Those who have tertiary education have 25.0 per cent less (IRR=0.75; P<0.01) per cent body fat compared with those who received no education. Among the ethnic groups, the Mole-Dagbani have 17.6 per cent decrease (IRR=0.82; P<0.05) and Others 34.4 per cent decrease (IRR=0.66; P<0.01) in per cent body fat compared with Akan. However, Other in the religious category were higher (IRR=1.43; P<0.01) compared with orthodox Christians. Managers and artisans have 22.2 per cent decrease (IRR=0.78; P<0.05) and 19.9 per cent decrease (IRR=0.80; P<0.01) in per cent body fat respectively compared with professional.

In Model 2, hallucinogen drug was introduced as an independent predictor of incident risk ratio. Females have 36.4 per cent decrease (IRR=0.64; P<0.01) in per cent body fat compared with males. Those aged 35-39 years and 40-44 years have 21.1 per cent decrease (IRR= 0.79; P<0.01), 28.3 per cent decrease (IRR=0.72; P,< 0.01), in per cent body fat respectively

compared with those aged 15-24 years. Those who have primary education have 25.9 per cent decrease (IRR=0.74; P<0.01) in per cent body fat compared with those who received no education. Having ever married has a higher incident risk ratio in per cent body fat (IRR=1.27; P<0.05) compared with never married. Among the ethnic groups, Mole-Dagbani have 16.7 per cent decrease (IRR=0.833; P<0.05) and Others 16.7 per cent decrease (IRR=0.68; P<0.01) in per cent body fat compared with Akan. However, the incident risk ratio in per cent body fat of Other religious group in the religious category were higher (IRR=1.38; P<0.01) compared with orthodox Christians. Managers, artisans and others have 25.0 per cent decrease (IRR=0.75; P<0.05) 20.8 per cent decrease (IRR=0.79; P<0.01), 10.1 per cent decrease (IRR=0.90; P< 0.05) respectively in per cent body fat compared with professional. Hallucinogen users have 12.2 per cent increase (IRR=1.22; P<0.01) in per cent body fat compared with other illegal drug users.

In Model 3 narcotics drug was introduced into the model but its prediction of incident risk ratio was not statistically significant. Females have 35.2 per cent decrease (IRR=0.65; P<0.05) in per cent body fat compared with males. Those aged 35-39 years, 40-44 years, 45+ years have 25.6 per cent decrease (IRR= 0.74; P<0.01), 31.6 per cent decrease (IRR=0.68; P,< 0.01), 30.1 per cent decrease (IRR=0.70; P<0.01) in per cent body fat respectively compared with those aged 15-24 years. Those who have tertiary education have 25.0 per cent decrease in per cent body fat (IRR=0.75; P<0.01) compared with those who received no formal education. Regarding ethnicity, Mole-Dagbani have 31.0 per cent decrease (IRR=0.69; P<0.05) and Others have 34.1 decrease in per cent body fat (IRR=0.66; P<0.01) compared with Akan.

Other in the religious category have 14.2 percent in per cent body fat (IRR=1.42; P<0.01) compared with orthodox Christians. Managers and artisans have 22.4 per cent decrease (IRR=0.78; P<0.05) and 20.2 per cent decrease (IRR=0.80; P<0.01) in per cent body fat respectively compared with professional.

Table 24: Poisson Regression Results on Per Cent Body Fat (%BF)

	Model 1		Model 2		Model 3	
	OR	95%CI	OR	95%CI	OR	95%CI
Gender						
Male(Ref)						
Female	**0.65	(0.58, 0.73)	**0.64	(0.56, 0.72)	*0.65	(0.57, 0.73)
Age category						
15-24 (ref)						
25-29	0.89	(0.75, 1.06)	0.89	(0.73, 1.02)	0.89	(0.75, 1.06)
30-34	0.95	(0.83, 1.09)	0.97	(0.84, 1.12)	0.95	(0.83, 1.10)
35-39	**0.74	(0.64, 0.86)	**0.79	(0.68, 0.91)	**0.74	(0.64,0.86)
40-44	**0.68	(0.59, 0.79)	**0.72	(0.62, 0.83)	**0.68	(0.59, 0.79)
45+	**0.70	(0.60, 0.81)			**0.70	(0.60, 0.82)
Educational status						
None (ref)						
Primary	1.08	(0.89, 1.31)	**0.74	(0.64, 0.86)	1.08	(0.89, 1.31)
Tertiary	**0.750	(0.68, 0.83)	1.02	(0.84, 1.24)	**0.75	(0.68, 0.83)
Marital status						
Never married (ref)						

Table 24 continues

Ever married	*1.18*	*(0.94, 1.468)*	*1.27	(1.02, 1.59)	1.18	(0.95, 1.48)
Cohabiting	*1.09*	*(0.87, 1.360)*	1.21	(0.96, 1.51)	1.10	(0.87, 1.37)
Ethnicity						
Akan (ref)						
Ewe	0.88	(0.74, 1.04)	0.89	(0.74, 1.06)	0.88	(0.74, 1.05)
Mole-Dagbani	* 0.82	(0.69, 0.99)	*0.83	(0.70, 0.10)	*0.69	(0.70,0.99)
Ga-Dangme	0.94	(0.88, 1.01)	0.97	(0.89, 1.10)	0.98	(0.89, 1.10)
Others	**0.66	(0.53, 0.81)	**0.68	(0.55, 0.84)	**0.66	(0.53, 0.82)
Religious affiliation						
Orthodox (ref)						
Pentecostal	0.96	(0.82, 1.13)	0.94	(0.80, 1.10)	0.96	(0.82, 1.13)
Muslim	0.95	(0.83, 1.09)	0.96	(0.83, 1.10)	0.95	(0.83, 1.09)
Others	**1.43	(1.21, 1.69)	** 1.38	(1.17, 1.64)	*1.42	(1.20, 1.69)
Occupational status						
Professional (ref)						
Managers	*0.78	(0.62, 0.98)	*0.75	(0.59, 0.95)	*0.78	(0.61, 0.98)

Table 24 continues

Artisans	***0.80*	*(0.68, 0.94)*	**0.79	(0.68, 0.93)	**0.80	(0.68, 0.94)
Others	*0.91*	*(0.82,1.01)*	*0.90	(0.81, 0.10)	0.91	(0.82, 1.01)
Did not use hallucinogen (Ref)						
Hallucinogen			**1.22	(1.11, 1.34)		
Did not use narcotics (Ref)						
Narcotics					0.99	(0.87, 1.11)

Source: Field data, 2014. *P< 0.05; ** P<0.01; Ref denotes reference category.

Hypothesis 3 Testing:

Per cent body fat was used as a proxy for nutritional status. The results of the Poisson regression was used to test the hypothesis that illegal drug use will influence nutritional status.

Poisson regression results on waist-to-height ratio showed that illegal drug use did not have any statistical significant association with nutritional status.

Poisson regression results on per cent body fat, showed that:

In Model 2: Hallucinogen drug use was statistically significantly associated with per cent body fat (nutritional status).

In Model 3 narcotics drug use was not associated with (per cent body fat) nutritional status.

Poisson regression results on BMI illegal drug the results indicated that:

In Model 2: Hallucinogen drug use was not statistically significantly associated with BMI (nutritional status).

In Model 3 narcotics drug use was not associated with (BMI) nutritional status.

Discussion

This chapter assessed the anthropometric characteristics that served as indicators of nutritional status and its association with different illegal drugs used at diverse frequencies. The observed anthropometrical measures are per cent body fat (%BF) and body mass index (BMI) which are proxies for adiposity and nutritional status assessment respectively. It was expected that

males and females who took the same drugs at the same frequency should have the same level of the effect of the drug but this was not the case. For instance, at the same intake of narcotics and stimulants, there were significant statistical differences in body mass index between males and females (Table 17). It could suggest that males and females metabolized the same drugs used differently which can lead to differences in nutritional status (Joanne et al., 2014).This is because males have more muscles than females and therefore metabolize and use more energy than females who tended to have more adiposity than men. These gender differences could account for the observation (McIlwraith et al., 2014; Pasch et al., 2012). Gender specific influence on body composition by illegal drugs use has been established (Barry et al., 2009; McIlwraith et al., 2014) but what is not certain is the direction of the change in body composition. This is difficult to establish since individuals enter illegal drug use with different nutritional status and other parameters such as age, physical activity levels, dietary assessments were not made as part of this study. This could be explored later in another study.

Results indicated that the use of hallucinogen and narcotics were associated with nutritional status and these were significant at $P< 0.05$ and $P< 0.001$. The differences in BMI may be due to the actions of certain drugs such as cocaine which is known to lead to reduction in body weight when used. For instance, heroin intake has been observed to yield statistical significant body composition ($P< 0.00$) change at high frequencies of intake compared with cocaine which has change in BMI at a frequency at 1-3 per day (Table 18). Thai and marijuana intake were associated with changes in BMI at a frequency of 1-3/day and WtHR at frequency of 4-6/day (Tables 21 and 23). Therefore

when used, these drugs may result in either under nutrition or over nutrition due to the influence of these drugs on metabolism and dietary intakes.

Significant statistical differences were observed in BMI by gender, ethnicity, religious affiliation among those who used hallucinogen and narcotic drugs. The incident risk ratio of per cent body fat was inversely associated with educational and occupational statuses (Table 24). Formal education influences perception of harm. It is expected that higher level of education should lead to harm awareness and less motivation to use illegal drug. The next chapter assesses changes at the cellular level of illegal drug users.

CHAPTER SEVEN

BIOCHEMICAL AND ENZYMATIC MARKERS OF ILLEGAL DRUG USERS

Introduction

It is estimated that in 2012, between four per cent and seven per cent of the world's population aged 15-64, had used an illegal drug (UNODC, 2014). In Ghana, about fifty thousand people used illegal drugs (Peace FM news, 2014). The use of these illegal drugs can lead to malnutrition with alterations in the values of biochemical and enzymatic markers which serve as proxies for health.

Specific biochemical markers and enzymes serve as indicators of health (Grundy et al., 2005). These markers are in organs such as liver and heart values reflect the functional state of the liver and the heart; to excrete anions (bilirubin), hepatocellular integrity (transaminases), formation and the subsequent free flow of bile (bilirubin and ALP), and serum oncotic pressure (albumin, globulin). Total proteins (TP) are the most abundant compounds in the serum and made up of albumin (SA) and globulin (SG) (Harrop & Marlatt, 2010). These two function to maintain oncotic pressure and transport water soluble substances such as bilirubin in and out of the cells. Levels of these serum proteins decrease during liver injury, malabsorption and malnutrition. Low levels of SA have been associated with high mortality due to liver cell injury (Tang et al., 2010). Studies have shown changes in biological markers when individuals take different illegal drugs at various frequencies (Frost et al., 2013; Saeland et al., 2014).

The chapter assesses the possible metabolic changes in males and females using the same illegal drugs but at different frequencies. The hypothesis is that there will be no difference in the levels of biochemical changes between male and female illegal drug users. The chapter profiles the enzymatic and biochemical markers of individuals who used four categories of illegal drugs.

Categorized Biochemical and Enzymatic Markers of Health

Biochemical variables were categorized into below normal, normal and above normal values based on Cape Coast Teaching Hospital laboratory cut-offs and frequencies presented for males and females (Table 25). For all the categorized markers of health listed higher proportions of markers fell within the normal category. For instance, 90 per cent of males and 98 per cent of females had normal protein nutritional status. Albumin-globulin ratio (SA-to-SGR) gives a better indication of protein nutritional status than either albumin or globulin alone. Higher proportion of males (79 percent) had normal SA-to-SGR compared with 67 per cent of females. Elevated alanine transaminase (ALT) values were found for 67 per cent females and 50 per cent males. Higher than normal aspartate aminotransferase (AST) values were observed in 45 per cent of females compared with 43 per cent of males. More males (20 per cent) had higher total bilirubin values than six per cent of females. Difference was observed in the serum bilirubin values between males and females. Twenty per cent of males had higher than normal total bilirubin values compared with six per cent of females.

Table 25: Categorized Biochemical and Enzymatic Markers of Health by Gender

Biological marker	Male (N=123) (%)	Female (N=18) (%)
Low Total protein (g/L)	8.2	1.6
Normal Total protein (g/L)	90.2	98.4
Total	100.0	100.0
Low Albumin (g/L)	2.4	0.0
Normal Albumin (g/L)	91.1	88.9
High Albumin (g/L)	6.5	11.1
Total	100.0	100.0
Low Globulin (g/L)	18.7	22.2
Normal Globulin(g/L)	79.7	77.8
High Globulin (g/L)	1.6	0.0
Total	100.0	100.0
Normal SA-to-SGR	78.9	66.7
High SA-to-SGR	21.1	33.3
SA-to-SGR Total	100.0	100.0
ALP normal (U/L)	100.0	100.0
ALT normal (U/L)	55.3	33.3
ALT above(U/L)	44.7	66.7
Total	100.0	100.0
Normal AST (U/L)	56.9	50.0
High AST (U/L)	43.1	50.0
Total	100.0	100.0
Normal TB (umol/L)	80.5	94.4
High TB (umol/L)	19.5	5.6
Total	100.0	100.0
Below normal Cholesterol (mmol/L)	93.5	83.3
Normal Cholesterol(mmol/L)	6.5	16.7
Above normal	100.0	100.0

Cholesterol(mmol/L)		
Below HDL (mmol/L)	1.6	0.0
Normal HDL (mmol/L)	98.4	0.0
Total	100.0	100.0
Normal VLDL (mmol/L)	95.2	
Above VLDL (mmol/L)	4.8	
Total	100.0	100.0

Source: Field data, (2014)

TP=Total protein; SA=Serum albumin; SG=Serum Globulin; SAtoSGR= Albumin to Globulin ratio; AST= Aspartate Aminotransferase; ALT= Alanine transaminase; ALP= Alkaline phosphates; LDA= Gamma Glutamyl transpeptidase; TB=Total bilirubin. Total protein: Below normal= < 6.2; Normal=6.2-8.5; above normal = >6.2-8.5. Albumin: Below normal= <3.4; Normal= 3.4-5.0; Above normal= > 5.0. Globulin: Below normal= <2.0; Normal= 2.0-4.8; Above normal=> 4.8. Albumin to Globulin ratio: Below normal=<0.6 ; Normal= 0.6-2.2; Above normal= >2.2. AST: Below normal=<5; Normal=5-34; Above normal=>34; ALT: Below normal, Normal Above normal ALP: Below normal=<53, Normal=53-128 Above normal=>128 LDA: Below normal=<12, Normal=12-64 Above normal= >64 TB: Normal=0.0-1.5 Above normal=>1.5.HDL(mmol/L):below normal; < 30 normal 30-100; above normal> 100

VLDL(mmol/L): normal 0-50; above normal >50 TC: below normal: < 30; normal ;30; above normal; > 30.Biochemical characteristics by average frequency of Cocaine intake

Biochemical Characteristics by Average Frequency of Cocaine Intake

Mean values of serum biochemical markers of cocaine users were calculated for males and females (Table 26). This was based on frequency of intake at 1-3/day and 4-6/day. Frequency of use of cocaine at >6/day was not compared between males and females since female cell had no frequency. Serum Albumin (SA) increased for females who took cocaine at a frequency

of 1-3 per day compared with non-cocaine users. Intake of cocaine at frequency of 1-3 times per day yielded statistical significant changes in SA (P=0.019) and (Gamma Glutamyl transpeptidase) LDA (P= 0.015) between males and females. At intake frequency of 4-6/day there were no statistical difference in serum nutrients between males and females. There was no statistical significant difference in the mean serum nutrient values between males and females (N=75) who did not take cocaine. Females who did not take cocaine had higher mean LDA (19.6) values compared with those who did (13.5) at a frequency of 4-6 per day. For males, those who did not take cocaine had lower mean values of biochemical indices compared with those who did at a frequency of 4-6 per day.

Table 26: Biochemical Characteristics by Frequency of Cocaine Intake by Gender

	0 (N=75)		1-3 (N=33)		4-6 (N=19)	
	Male(N=65)	Female(N=10)	Male(N=28)	Female (N=5)	Male(N=17)	Female (N=2)
Variables	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
TP(g/L)	71.4±7	72.2±6.4	72.5±7.1	69.4±4.8	71.9±5.8	73.5±12.0
SA(g/L)	44.2±7.1	45.9±4.8	42.5±3.3	46.4±2.7	41.8±4.1	40.5±5.0
SG(g/L)	2.7±.9	2.6±.8	3.1±.8	2.2±.9	3.0±.8	3.3±.7
SAto SGR	2.3±2.1	1.9±.8	1.5±.5	2.2±.9	1.5±.7	1.2±.1
AST(U/L)	31.9±10.7	34.0±7.9	32.9±9.9	36.4±3.7	34.7±11.0	30.0±4.2
ALT(U/L)	36.3±12.5	40.9±13.5	33.1±13.1	36.6±8.5	32.8±13.1	38.0±5.6
ALP (U/L)	82.2±13.2	81.6±12.6	81.9±12.5	76.1±10.1	73.5±13.4	
LDA(U/L)	19.9±37.5	19.6±44.4	18.4±29.5	59.2±21.0	19.5±34.5	13.5±53
TB(umol/L)	21.7±5.7	21.2±2.9	23.1±9.5	22.9±8.3	22.4±6.5	19.7±3.6
DB(umol/L)	9.7±3.7	9.5±3.6	11.3±8.1	8.9±2.6	8.7±3.6	6.9±2.4
IB(umol/L)	3.1±18.9	0.75±.2	0.71±.4	0.8±.4	7.1±25.8	0.5±.4
LD	12.9±44.2	11.8±43.4	12.30±3.6	13.2±5.9	11.3±37.1	12.5±47.3
TC(mmol/L)	8.8±2.8	5.1±1.1	13.56±4.2	5.68±1.5	5.31±.6	5.3±1.4
VLDL(mmol/L)	20.44±5.9	19.7±6.1	21.74±11.5	25.2±10.9	21.4±4.9	18±1.4

Table 26 continues

HDL (mmol/L)	2.84±6.1	2.21±.2	3.89±9.2	2.18±.2	2.13±.2	2.1±0.3

Source: Field data, (2014)

*Derived from chi-squared statistics. P<0.05 denotes statistical significance. TP=Total protein; SA=Serum albumin; SG=Serum Globulin; AST= Aspartate Aminotransferase; ALT= Alanine transaminase; ALP= Alkaline phosphates; LDA= Gamma Glutamyl transpeptidase; TB=Total bilirubin ; IB=Indirect bilirubin; TC=Total cholesterol; HDL=High density lipoprotein ; VLDL=Very low density lipoprotein ; SA-to-SGR= Albumin to Globulin ratio

Biochemical Characteristics by Frequency of Heroin Intake

Heroin intake per day was categorized into intakes of 1-3/day (Table 27). Frequencies of 4-6/day and >6 per day were not compared due to small frequencies in cells of females. The mean values of biochemical variables were compared between males and females. Statistical significant differences were observed between males and females for some of the markers. This categorization was maintained and used for the other illegal drugs that were used. There was statistical significant difference in the level of LDA (p=0.011) between males and females who do not take heroin at all (N=120). There were no statistical associations between those who took heroin at frequencies of 1-3/day and those who did not use heroin (a vrs b).

Table 27: Biochemical Characteristics by Frequency of Heroin Intake and Gender

	0 (N=120) Male(N=103) a Mean±SD	Female(N=17) Mean±SD	1-3 (N=12) #Male(N=7) b Mean±SD	Female(N=5)	4-6 (N= Male(N=5) Mean±SD	*a vrs b P-Value
TP(g/L)	71.1±6.6	71.6±6.3	75.4±8.3	69.8±6.3	69.8±6.3	0.12
SA(g/L)	43.4±6.1	45.5±4.5	42.9±5.2	44±2.0	44±2	0.75
SG(g/L)	2.8±.8	2.7±.8	3.3±1.2	2.7±0.8	2.66±.8	0.19
SA-to-SGR	1.9±1.6	1.9±.8	1.9±2.3	1.9±0.8	1.86±.8	0.95
AST(U/L)	33.2±11.2	33.7±6.3	30.3±10.4	35.8±3.7	35.8±3.7	0.40
ALT(U/L)	35.7±12.1	40.0±11	31.7±12.6	37.4±20.8	37.4±20.8	0.37
ALK (U/L)	81.6±13.1	79.6±11.4	84.7±12.2	83.6±18.6	83.6±18.6	0.43
*LDA(U/L)	188.4±33.9	313±5.3	189.3±43.0	213.6±33.4	213.6±33.4	0.95
TB(umol/L)	22.1±7.0	21.6±4.8	22.5±6.2	21.9±6.5	21.9±6.5	0.84
DB(umol/L)	9.8±5.3	9.1±3.2	10.3±2.9	10.3±2.9	9.58±4.9	0.63
IB(umol/L)	3.2±18.2	0.8±.3	0.7±.4	0.72±.4	0.72±0.1	0.17
LDL (mmol/L)	121.1±43.3	127.4±40.8	121.5±37.5	121.5±37.5	127.4±41.7	0.97
TC(mmol/L)	9.8±3.7	5.4±1.1	5.3±1.0	5.31±1.0	5.42±1.1	0.16
HDL(mmol/L)	3.0±6.8	2.2±.2	2.3±.2.0	2.23±0.2	2.3±0.2	0.24
VLDL(mmol/L)	21.5±8.2	21.4±7.4	21.1±5.8	21.1±5.8	17.4±3.9	0.84

Source:Fielddata,(2014) *Derived from chi-squared statistics. P<0.05 denotes statistical significance. #= No female in category

TP=Total protein; SA=Serum albumin; SG=Serum Globulin; AST= Aspartate Aminotransferase; ALT= Alanine transaminase; ALP= Alkaline phosphates; LDA= Gamma Glutamyl transpeptidase; TB=Total bilirubin ; IB=Indirect bilirubin ; TC=Total cholesterol; HDL=High density lipoprotein ; VLDL=Very low density lipoprotein ; SAtoSGR= Albumin to Globulin ratio.

Biochemical Features of Respondents by Frequency of Rock Intake

Twenty-four respondents used rock in the 3-day period at frequencies of 1-3/day and 4-6/day. Comparison was therefore made between those who used rock at these frequencies and those who did not (Table 28). There was no difference in the biochemical values of bilirubin between users and non-users, however, at rock intake of 1-3 per day, there were statistical significant differences (P=0.004) in the amount of indirect bilirubin (IB) generated between males and females. There was no statistical difference between those who used rock at frequencies of 1-3/day and 4-6/day. One female compared with 13 males used rock at a frequency of 4-6/day. There was no statistical significant difference in the biochemical markers between males and females who used rock at a frequency of 4-6/day. Analysis was not done for Thai intake at any frequency due to small frequencies.

Table 28: Biochemical Features of Respondents by Frequency of Rock Intake and Gender

Variables	(a) 0 (N=117)		(b)1-3 (N=10)		(c) 4-6 (N=14)		*a vrs b	b vrs c
	Male(N=101)	Female(N=16)	Male (N=9)	Female (N=1)	Male(N=13)	Female (N=1)		
	Mean±SD	Mean±SD	Mean±SD	Mean	Mean±SD	Mean	P-Value	P-value
TP(g/L) (g/L)	71.5±6.5	71.8±6.3	69.9±7.5±	75.0	72.7±9.1	66.0	0.55	0.66
SA	43.1±6.1	45.2±4.5	43.1±4.1	44.0	45.3±4.8	49.0	0.99	0.15
SG(g/L)	2.8±.8	2.7±.8	2.8±1	3.7	2.7±1.2	1.70	0.91	0.81
AST(U/L)	32.5±10.9	33.9±6.8	35.2±11.5	38.0	28.0±8.2	33.0	0.58	
ALT(U/L)	34.2±13.1	39.6±11.7	39.9±10.5	42.0	36.3±7.1	38.0	0.15	0.07
ALK (U/L)	81.9±13.4	78.7±11.9	79.6±11.4	88.0	83.9±13.5	71.0	0.57	0.38
LDA(U/L)	19.5±36.6	18.8±46.5	19.2±21	20.0	18.7±39.5	22.0	0.48	0.63
TB(umol/L)	22.1±6.9	20.4±3.1	21.3±6.3	35.9	24.6±7.3	23.9	0.73	0.75
DB(umol/L)	9.9±5.2	8.8±3.1	9.9±5.6	10.3	8.4±3.6	12.0	0.96	0.32
IB(umol/L)	0.7±.3	0.7±.2	*0.7±.2	*1.5	2.5±5.1	0.7	0.58	0.21
TC(mmol/L)	9.8±3.0	5.3±1.3	5.267±1.3	5.5	5.8±0.9	5.1	0.16	0.17
LDL (mmol/L)	121.4±39.6	124.8±44.4	116.56±43.2	132.0	121.6±65.:	104.	0.75	0.21
HDL(mmol/L)	3.07±6.9	2.18±.4	2.11±.2	2.4	2.1±0.3	2.2	0.16	0.99
VLDL(mmol/L)	20.5±6.9	20.8±7.4	27.6±12.7	14.0	20.17±5.4	30.0	0.18	0.84

Source: Field data, 2014 ,(2014)

*Derived from chi-squared statistics. P<0.05 denotes statistical significance TP=Total protein; SA=Serum albumin; SG=Serum Globulin; AST= Aspartate Aminotransferase; ALT= Alanine transaminase; ALP= Alkaline phosphates; LDA= Gamma Glutamyl transpeptidase; TB=Total bilirubin; IB=Indirect bilirubin; TC=Total cholesterol; HDL=High density lipoprotein;VLDL= Very Low density Lipoprotein.

Biochemical Features of Respondents by Frequency of Marijuana Intake

Sixty-six people used marijuana at categorized frequencies. Comparisons were made between male and females marijuana users at these frequencies and also users and non-users. For frequencies of 4-6/day and >6/day the comparisons were for males only since female cells had less than 5 frequencies (Table 29). There was statistical significant difference in the level of Gamma Glutamyl transpeptidase (LDA) (P=0.049) between males and females who did not take marijuana (N=75). There was a statistical significant difference (P=0.026) in the serum total protein (TP) of those who did not take marijuana and those who did at a frequency greater than 6 times per day. Apart from LDA and TP, there were no statistical significant differences in the biological markers between males and female marijuana users at any other frequency and between marijuana users and non-users.

Table 29: Biochemical Features by Frequency of Marijuana Intake and Gender

Variables	0 (N=75)		1-3 (N=36)	4-6 (N=27)		6> (N=3)		
	Male (N=61) Mean±SD	Female(N=14) Mean±SD	Male(N=32) b Mean±SD	Female(N=4) Mean±SD	Male(N=27) c Mean±SD	Male (N=3) d Mean±SD	a vrs b P-Value	c vrs d P-Value
TP (g/L)	71.52±6.	71.86±5.9	71.91±6.7	70.75±8.1	71.78±7	65±2.7	0.80	0.88
Ab(g/L)	42.91±6.	45.29±4.8	42.78±3.3	45.5±3.0	44.52±5.1	47±9.1	0.91	0.23
Gb(g/L)	2.83±.	2.66±.7	2.97±.8	2.68±1.2	2.73±.9	1.8±1.2	0.43	0.61
AST(IU/L)	33.77±1	33.79±7.2	30.19±8.4	35.25±2.5	32.74±10.9	38±12.2	0.10	0.69
ALT(IU/L)	7.0	41.07±10.4	33.06±12.4	34.5±13	35.22±11.6	38.67±16.2	0.37	0.91
ALP(IU/L)	82.11±13.	78.86±12.9	80.38±11.8	78.5±6.5	84.70±14.3	73.67±14.4	0.52	0.43
LDA(IU/L)	196.15±36.	334.26±54.5	182.22±31.5	194.5±14.9	186.22±36.5	171.33±36.5	0.06	0.25
TB (umol/L)	22.20±6.	21.51±2.6	23.25±8.8	21.38±9.9	21.6±6.2	18.83±6.1	0.53	0.68
DB (umol/L)	9.56±4.	9.05±3.3	10.69±7.3	9±2.6	9.63±3.6	9.7±5.2	0.43	0.93
IB (umol/L)	4.95±23.	0.78±.2	0.76±.3	0.73±.5	0.7±.3	0.53±.2	0.17	0.16
LDL(mmol/L)	119.82±49.	121.21±45.5	129.63±35.6	133.75±30.6	113.70±36.2	123±17.8	0.27	0.52
TC(mmol/L)	12.93±4	5.21±1.2	5.40±.8	5.68±.9	5.07	5.13±.4	0.16	0.14
HDL(mmol/L)	3.75±8.	2.21±.2	2.04±.2	2.15±.3	2.12±.3	2±.2	0.13	0.15
VLDL(mmol/L)	20.49±8.	19.93±7.1	21.53±7.3	24.25±8.7	22.74±5.7	18.67±4.7	0.55	0.16

Table 29 continues

SAtoSGR	2.05±1.·	1.87±.7	1.56±.5	2.08±1.9	1.90±1	3.99±3.5	0.07	0.62

Source: Field data, 2014 *Derived from chi-squared statistics. P<0.05 denotes statistical significance. TP=Total protein; SA=Serum albumin; SG=Serum Globulin; AST= Aspartate Aminotransferase; ALT= Alanine transaminase; ALP= Alkaline phosphates; LDA= Gamma Glutamyl transpeptidase; TB=Total bilirubin ; IB=Indirect bilirubin ; TC=Total cholesterol ; HDL=High density lipoprotein ; VLDL=Very low density lipoprotein ; SAtoSGR= Albumin to Globulin ratio

Biochemical Characteristics of Respondents by Drug Category

The results of the means of biochemical values based on types of illegal drugs used by males and females were presented in (Table 30). Seven drugs were used and these were grouped into four namely, hallucinogens, narcotics, stimulants and those that are unspecified. Statistical significant differences (P = 0.020) existed in mean total protein (TP) values between male and female narcotic users. Among hallucinogen users there were statistical significant differences between males and females in Alanine transaminase (ALT) (P = 0.010) and High density lipoprotein (HDL) (P = 0.040) concentrations. Unspecified drug use yielded statistical significant differences between males and females in globulin (P =0.040) and ALT (P= 0.040).

Table 30: Biochemical Characteristics of Respondents by Drug Category and Gender

	Hallucinogens (N=64)		Stimulants (N=30)		Narcotics (N=28)		Unspecified drugs (N=19)	
Variables	*Male(N=56)* Mean±SD	*Female (N=8)* Mean±SD	Male(N=28) Mean±SD	Female(N=2) Mean±SD	Male(N=24) Mean±SD	Female (N=4) Mean±SD	Male(N=15) Mean±SD	Female (N=4) Mean±SD
TP (g/L)	71.4±6.8	69.5±3.3	72.3±6.7	75±2.8	*70.0±7.1	*79.3±6.5	72.7±6.9	66.5±3.9
Ab(g/L)	43.7±5.0	46.9±3.9	42.2±8.6	46.0±2.8	43.7±4.5	43.0±5.0	43.5±4	44.3±5.5
Gb(g/L)	2.8±.9	2.3±.1	2.9±.8	2.9±0.0	*2.7±0.9	*3.6±0.2	2.9±0.9	2.2±0.7
AST(IU/L)	30.3±10.8	34.9±9.0	34.1±9.3	34.0±2.8	34.9±11.7	32.5±1.3	35.7±10.8	34.5±6.2
ALT(IU/L)	*34.4±12.0	*46.3±10.4	32.8±12.5	42.5±3.5	37.6±13.7	32.3±11.3	36.4±12.2	32.3±5.9
ALP(IU/L)	84.2±13.4	78.9±14	78.2±11.5	87.5±.7	81.3±15.2	83.8±5.7	*82.7±11.5	*69.3±6.0
LDA(IU/L)	181.9±30.9	195.6±45	193.4±40.2	217.5±23.2	196.2±32.1	185.5±64.5	201.7±45.1	679±10.2
TB (umol/L)	22.6±7.1	22.5±5.9	20.4±5.3	22.2±2.4	23.8±7.7	20.9±3.8	22.1±6.7	19.7±4.5
DB (umol/L)	10.6±6.1	9.2±3.5	8.6±4.0	9.5±1.2	10.1±4.7	9.9±2.9	9.2±3.0	7.7±3.3
IB (umol/L)	3.4±20.4	0.9±.3	4.5±20	0.8±.1	0.8±.4	0.7±.2	0.8±.4	0.7±.2
LDL(mmol/L)	124.4±40.0	129.4±50.6	112.8±53.0	120.0±24	126.2±34.6	129.25±22.7	116.1±41.4	110±4.2

Table 30 continues

TC(mmol/L)	*5.4±.9*	*5.4±1.5*	21.7±18.0	5.4.4	5.4±1	5.5±.7	5.2±1.1	4.9±1.5
HDL(mmol/L)	*2.0±.3	*2.3±.2	5.6±12.8	2.3±.1	2.2±.2	2.2±.3	2.2±.2	2.1±.1
VLDL(mmol/L)	21.9±7.0	20.0±7.5	19.8±8.7	25.0±11.3	20.7±10.0	17.5±2.9	21.7±5.4	24.0±9.7
SAtoSGR	1.8±1.3	2.2±.1	2.1±2.4	1.5±1.0	2.0±1.5	1.2±.1	1.9±.7	2.2±.9

Source: Field data, 2014

*Derived from chi-squared statistics. P<0.05 denotes statistical significance. Female means not computed since frequency is 2 and 4 respectively. P=Total protein; SA=Serum albumin; SG=Serum Globulin; AST= Aspartate Aminotransferase; ALT= Alanine transaminase; ALP= Alkaline phosphates; LDA= Gamma Glutamyl transpeptidase; TB=Total bilirubin; IB=Indirect bilirubin; TC=Total cholesterol; HDL=High density lipoprotein; VLDL=Very low density lipoprotein; SAtoSGR= Albumin to Globulin ratio.

Predictors of Protein Nutritional Status

To determine protein nutritional status, the ratio of albumin-to-globulin was regressed against the background characteristics. This ratio was selected due to its sensitivity in determining protein nutrition as well as reflecting tissue stores compared to albumin or globulin alone; levels of predict risk of morbidity (Table 31). Three binary logistic regression models were used to determine the Incident Risk Ratio (IRR) of protein nutritional status. Those who used illegal drugs over the three day period were coded '1' and those who did not were coded '0'. In the first model, the protein nutrition was assessed among those who used or did not use unspecified drugs and stimulants over the three day period. In the second and third models hallucinogen and narcotics were introduced as independent variables to determine its predictability of nutritional status. In the first model (Model 1) managers were more likely 20.8 per cent likely (IRR=2.08; P<0.01) to have better protein nutrition compared with professionals (Table 35). When hallucinogen and narcotics were introduced in models two and three, the incident risk ratio for managers were 20.8 per cent (IRR=2.08; P<0.01) and 21.0 per cent (IRR=2.10; P<0.01) higher respectively. Total cholesterol (TC) and aspartate aminotransferase (AST) were regressed against the background characteristics to determine their incident risk ratios.

Table 31: Binary Logistic Regression Results of Protein-to-Albumin Ratio

Characteristics	IRR	(95% CI)	IRR	(95% CI)	IRR	(95%CI)
Gender						
Male (Ref)						
	1.02	(0.70,1.50)	1.03	(0.70, 1.51)	1.03	(0.70, 1.51)
Female						
Age Group (Years)						
#15-24 (Ref)						
25-29	1.05	(0.94, 1.17)	0.47	(0.09, 2.52)	0.73	(0.39, 1.38)
30-34	0.99	(0.89, 1.11)	0.26	(0.05, 1.46)	0.61	(0.30, 1.23)
35-39	0.99	(0.89, 1.10)	0.24	(0.05, 1.23)	0.72	(0.39, 1.35)
40-44	1.01	(0.91, 1.13)	0.19	(0.03, 1.12)	0.84	(0.43, 1.59)
45+	1.01	(0.91, 1.12)	0.81	(0.17, 3.95)	0.53	(0.29, 0.98)
Ethnicity						
Akan(Ref)						
Ewe	1.03	(0.96, 1.11)	0.73	(0.23, 2.25)	1.10	(0.60, 1.99)
Ga-Dangbe	0.95	(0.88, 1.03)	0.82	(0.29, 2.31)	1.24	0.75, 2.06)
Mole-Dagbani	0.92	(0.84, 1.01)	0.61	(0.18, 2.10)	1.15	(0.63, 2.13)
Others	0.98	(0.90, 1.07)	0.50	(0.14, 1.78)	1.90	(1.12, 3.22)
Occupation						
Professionals (ref)						
Manger	**2.08	(1.24, 3.48)	**2.09	(1.25, 3.49)	**2.10	(0.25, 3.53)
Artisan	1.09	(0.69,1.71)	1.09	(0.69,1.71)	1.09	(0.69, .718)
Others	1.22	(0 .91,1.65)	1.23	(0.91, 1.66)	1.23	(0.91,1.65)
Marital status						
Never						
Married(Ref)						
Ever married	0.91	(0.49,1.72)	0.90	(0.47, 1.71)	0.92	(0.49, 1.72)

Table 31 continues						
Co-habiting	*0.89*	*(0.47, 1.67)*	0.87	(0.45,1.66)	0.89	(0.47, 1.67)
Religious affiliation						
Orthodox (Ref)						
Pentecostal	0.87	(0.55,1.38)	0.88	(0.56,1.39)	0.87	(0.55,1.37)
Muslim	1.07	(0.73, 1.58)	1.07	(0.72, 1.58)	1.08	(0.73,1.60)
Others	0.93	(0.56,1.54)	0.93	(0.56,1.55)	0.93	(0.56,1.54)
Other						
Educational status						
None (ref)						
Primary	1.08	(0.591, 1.98)	1.09	(0.594,1.997)	1.084	(0.59, 1.98)
Tertiary	1.07	(0.80, 1.43)	1.07	(0.799, 1.436)	1.070	(0.80, 1.43)
Did not use hallucinogen (Ref)						
Hallucinogen			0.96	(0.740, 1.26)		
Did not use narcotics (Ref)						
Narcotics					0.97	(0.71, 1.32)

Source: Field data , 2014; *P< 0.05; ** P<0.01; Ref denotes statistical significance

Biochemical Predictors of Metabolic Integrity

For a view of metabolic integrity in different organs and tissues in the body Aspartate Aminotransferase (AST) was used as a marker (Table 32). Sources of AST are heart, red blood cells and skeletal muscles. From the results those aged 45+ years were more likely (IRR=1.10; P<0.05) to have better metabolic integrity compared with those aged 15-24 years. Regarding religious affiliation, Pentecostals, Muslims have 17.8 per cent (IRR=0.82; P< 0.01); 13.1 per cent (IRR=0.87; 0.01); 15.6 per cent (IRR=0.84; P<0.01) decrease respectively in AST compared with the orthodox Christians. Those who received tertiary education have 12.9 per cent decrease in AST (IRR=0.87; P<0.05) compared with those with no formal education. In Model 2, Ga-Dangbe ethnic group have 13.9 per cent decrease (IRR=0.86; P<0.05) in AST compared with Akan, while artisans have 11.2 per cent AST (IRR=1.13; P<0.05) compared to professionals. Considering religious affiliations, Pentecostals, Moslems have 16.2 per cent decrease (IRR=0.84; P<0.05); 13.5 per cent decrease (IRR=0.87; P<0.05); 13.8 per cent decrease (IRR=0.86; P<0.05) in AST compared with Orthodox Christians. Regarding hallucinogen drug users, Ga-Dagme have 13.9 per cent decrease in AST (IRR=0.86; P<0.05) compared with Akans and 11.2 per cent increase in AST (IRR=1.12; P<0.05) compared with professionals. The introduction of narcotics into the model (Model 3) did not lead to any changes in the effect of hallucinogen on AST as a marker of metabolic integrity (Table 32).

Table 32: Poisson Regression Results of AST

	Model 1		Model 2		Model 3	
Background	IRR	(95% CI)	IRR	(95% CI)	IRR	(95%CI)
Gender						
Male (Ref)						
Female	0 .10	(0 .91,1.09)	1.02	(0 .93, 1.11)	0.10	(0.91,1.09)
Age Group (Years)						
#15-24 (Ref)						
25-29	1.07	(0 .95, 1.21)	1.10	(0.97,1.25)	1.07	(0.95,1.21)
30-34	1.05	(0.95, 1.16)	1.04	(0.94,1.15)	1.04	(0.95,1.15)
35-39	0.97	(0.88,1.07)	0.93	(0.84,1.03)	0.96	(0.87,1.07)
40-44	1.01	(0 .92,1.11)	0 .98	(0.89, 1.07)	1.00	(0.91, 1.10)
45+	*1.10	(0 .10, 1.22)	1.06	(0.96, 1.17)	1.09	(0.99, 1.21)
Ethnicity						
Akan(Ref)						
Ewe	0.92	(0.79, 1.07)	0.96	(0.84, 1.10)	0.97	(0.84,1.11)
Ga-Dagme	1.05	(0.98,1.13)	*0 .86	(0 .75,0.99)	*0.87	(0.76,1.00)
Mole-Dagbani			0.98	(0.84,1.14)	0.99	(0.85, 1.16)
Others						
Occupation						
Professional(Ref)						
Manager	0.913	(0 .78, 1.07)	0.93	(0.79,1.09)	0.92	(0.78,1.08)
Artisans	1.11	(0.10, 1.23)	*1.12	(1.01,1.24)	*1.11	(1.00, 1.23)

Table 32 continues

Others	0.10	(0 .93, 1.07)	1.01	(0.94,1.08)	0.10	(0 .93,1.07)
Marital status						
Never Married(Ref)						
Ever Married	1.04	(0 .91, 1.20)	0.97	(0.84,1.12)	1.03	(0.90,1.19)
Co-Habiting	1.03	(0.89, 1.18)	0.94	(0.81, 1.09)	1.01	(0.87, 1.17)
Religious affiliation						
Orthodox (Ref)						
Pentecostal	**0 .82	(0 .74,0 .91)	**0.84	(0.75,0.93)	**0.82	(0.74,0.91)
Muslim	**0.87	(0 .80, 0.95)	**0.87	(0.79,0.95)	**0.87	(0.80, 0.95)
Others	**0.84	(0 .75, 0.95)	* 0.86	(0.77,0.97)	**0.85	(0.76, 0.95)
Educational status						
None (ref)						
Primary	0.97	(0 .85, 1.11)	0.95	(0.81, 1.11)	0.92	(0.79,1.08)
Tertiary	*0 .87	(0.76,1.00)	1.05	(0 .98, 1.13)	1.05	(0.98, 1.13)
	1.00	(0.86, 1.17)				
Did not use hallucinogen (Ref)						
Hallucinogen			**0.86	(0.81,0.92)		
Did not use narcotics (Ref)						
Narcotics					1.03	(0.95,1.12)

Source: Field data, 2014. *P< 0.05; ** P<0.01 ; Ref denotes reference category

Predictors of Total Cholesterol Levels

It was considered important to assess the background factors that were likely to be associated with higher cholesterol levels (Table 33). Total cholesterol (TC) indicates the amounts of high density lipoprotein (HDL) Very low density lipoprotein (VLDL) in the blood. Higher levels of the latter indicate cardiovascular risk. Those aged 25-29 years and 40-45 years have 19.3 per cent (IRR=1.93; P<0.01); 26.7 per cent (IRR=2.67; P< 0.01) increase respectively in total cholesterol concentrations than those aged 15-24 years. For all three models, respondents with tertiary level education were more likely (P< 0.01) to be associated with higher Incident Risk ratios (IRR) of cholesterol levels compared with those with no education. Ewe and Other ethnic groups were less likely (P< 0.01) to have lower incident risk ratios of cholesterol levels compared with Akan in all three models. When hallucinogen was introduced, the incident risk ratio was less for ever married compared with never married and when narcotics was introduced the odds were less for co-habiting compared with never married. Muslims and Other group were more likely (P=0.05; P<0.01) to have higher cholesterol levels compared with Orthodox Christians. Managers, artisans and Others were also more likely associated with higher cholesterol levels (p<0.05; P< 0.01) compared with professionals. Hallucinogen use has a 27.4 per cent (IRR=0.73; P<0.01) and narcotics 44.3 per cent (IRR=0.56; P< 0.01) decrease respectively in total cholesterol levels.

Table 33: Poisson Regression Results on Total Cholesterol

	Model 1		Model 2		Model 3	
Background	IRR	(95% CI)	IRR	(95% CI)	IRR	(95%CI)
Gender						
Male (Ref)						
Female	1.12	(0.89, 1.40)	1.17	(0.93, .48)	1.08	(0.86,1.36)
Age Group (Years)						
15-24(ref)						
25-29	** 1.93	(1.43, 2.60)	**2.00	(1.48, 0.77)	**1.88	(1.40,2.53)
30-34	1.11	(0.87,1.42)	1.06	(0.83, 1.35)	1.19	(0.93, 1.53)
35-39	1.08	(0.84, 1.38)	0 .97	(0.75, 0.24)	1.22	(0.95,1.57)
40-44	**2.67	(2.23, 3.20)	2.36	(1.96, 2.85)	**3.09	(2.57, 3.71)
45+	1.05	(0 .82, 1.34)	0 .93	(0 .72, 0.19)	1.14	(0.89,1.46)
Educational Status						
None(ref)						
Primary	1.25	(0 .86, 1.81)	1.28	(0 .89, 1.86)	*1.48	(1.02,2.14)
Tertiary	**2.88	(2.44, 0.41)	**2.86	(2.42, 3.38)	**2.72	(2.30, 3.23)
Marital Status						
Never Married(ref)						
Ever Married	0 .75	(0.52, 1.10)	*0 .65	(0 .44, 0.95)	1.30	(0.89,1.91)
Cohabiting	1.12	(0.77, 1.63	0.97	(0.66, 1.43)	*0.64	(0 .45, 0.90)
Ethnicity						

Table 33 continues
Akan (ref)

Ewe	** 0.55	(0.39 , 0.78)	**0.50	(0.35, 0 .71)	1.29	(0 .90, 1.83)
Ga-Dangme	0.61	(0.83, 1.07)	0.65	(0.89, 1.08)	0.65	(0.89, 1.07)
Mole-Dagbani	1.21	(0 .85, 1.73)	1.10	(0 .77, 1.56)	*0 .66	(0.44, 0.98)
Others	**0 .54	(0.36, 0.81)	**0.51	(0 .35, 0 .77)	*0 .83	(0 .57, 0.92)
Religious						
Affiliation						
Orthodox (ref)						
Pentecostal	* 1.26	(0 .98, 1.64)	*1.32	(1.02, 1.71)	*1.31	(1.01, 1.70)
Muslim	**2.55	(2.05 ,3.17)	**2.48	(1.99, 3.09)	**2.32	(1.86, 2.90)
Others	** 1.48	(1.11, 1.99)	*1.43	(1.06, 1.92)	** 1.48	(1.10, 1.97)
Occupational Level						
Professionals (ref)						
Managers	**3.33	(2.77, 4.00)	**3.31	(2.76, 3.98)	**3.11	(2.59, 3.73)
Artisans	** 0.52	(0 .42, 0 .66)	**0.53	(0 .42 , 0.66)	*0.47	(0.37, 0 .60)
Others	** 0.49	(0.43, 0.57)	**0.51	(0 .44,0 .59)	*0 .45	(0.39, 0.52)
Did not use hallucinogen (Ref)						
Used Hallucinogen			**0 .73	(0.63, 0.84)		
Did not use narcotics (Ref)						
Used Narcotics					**0.56	(0.46,0 .68)

Source: Field data, 2014. *P< 0.05; ** P<0.01

Hypothesis 4 Testing:

Results of the Poisson regression technique were used to test the hypothesis on the association between illegal drug use and metabolic integrity. When albumin-to-globulin ratio was used as a proxy for protein nutritional status hallucinogen and narcotics use independently in models 2 and 3 of the multivariate logistic regression, respectively, did not have any statistical significant difference on nutritional status.

When AST was used as a proxy for metabolic integrity, hallucinogen use had a statistically significant association with metabolic integrity but narcotics use did not.

Hallucinogen and narcotics use in models 2 and 3, respectively had statistically significant associations with total cholesterol.

Discussion

This chapter assessed the associations between illegal drugs and biological markers of metabolic integrity among males and females. The independent incident risk ratios (IRR) of protein nutritional status, AST and total cholesterol pointed to the rejection of the null hypothesis of no difference in the levels of biological markers between males and females due to the use of common specific illegal drugs. However, results indicated that illegal drug use was associated with changes in protein nutritional status (albumin-to-globulin levels) metabolic integrity (AST) and total cholesterol levels and these were different for males and females (Tables 31, 32 and 33). Protein nutrition based on serum albumin-to-globulin ratio was better in females than

males (Table 30). This may suggest that females were able to metabolize protein from dietary sources than males. Secondly, females had affinity for protein-rich foods compared with males (Harrop & Marlatt, 2010).

The observed gender differences in enzyme-catalysed metabolic reactions in cells suggests that cellular functions in females and males are altered to different degrees when they use the same illegal drugs at the same frequencies. Regarding bilirubin it may be due to differences in liver function due to enzyme that breaks down bilirubin. For the enzymes, it suggests differences in functioning of the liver, kidney skeletal muscles, red blood cells and cardiac muscles since illegal drug use had been found to alter the functioning of these organs (Tang et al., 2010; Megarbane & Chevillard, 2013; Casier et al., 2014). An altered cellular function of these organs led to differential levels seen in this study and is consistent with the finding of Tang et al. (2010).

Frequency of illegal drug use was found to be statistically significantly associated with serum protein, AST, indirect bilirubin, cholesterol fraction (very low density lipoprotein). The values of these markers reflect the differences in the functional capacity of organs in the body particularly the liver. Cells have structures that maintain metabolic integrity and it appears use of illegal drugs take away the protection offered by the cells (Tang et al., 2010; Anema et al., 2013). As a result, organ function is compromised. Cholesterol can be produced by the liver and also introduced through dietary sources. Assuming there were no differences in cholesterol intake between males and females then the differences observed

were attributable to illegal drug use. Some drugs alter endogenous synthesis or excretion of cholesterol (Muniyappa et al., 2013).

Socio-demographic factors such as age, occupational status were observed to play roles in metabolic integrity. Poor eating habits and skipping meals in favour of use of illegal drugs may contribute to metabolic imbalance. In such a situation, cellular functions are compromised as protein is deficient or destroyed in the cell (Saeland et. al., 2011). Hallucinogen had higher incident risk ratio suggesting it has direct influence in cellular function compared with the other categorized drugs.

Background characteristics were associated with metabolic integrity. This suggests that age, religious beliefs and norms are risk to illegal drug use which in turn is associated with metabolic risk (Eisenberg et al., 2014; Stokols, 2000).The observed associations were not robust enough so Poisson regression was performed to determine independent factors that predicted biochemical factors. Different socio-demographic factors predicted the incident risk ratios of albumin, AST and cholesterol levels.

AST levels were predicted by ethnicity, age, religious affiliation and educational status. These factors also predicted the incident risks for cholesterol. Occupational status predicted the incident risk of albumin to globulin ratio. The implications of socio-demographic factors suggest the environment in which people live and perform daily activities do influence their health status (Brofenbrenner, 1979). For instance cultural beliefs may not allow an individual to eat certain foods that are rich in protein and this can lead to cellular deficiency and hence loss of metabolic integrity. In the

same way, availability of illegal drugs in the community is a risk factor to engaging in illegal drug use habits. The next chapter contains summary, conclusions, policy implications and recommendations.

CHAPTER EIGHT

SUMMARY, CONCLUSIONS, POLICY IMPLICATIONS AND RECOMMENDATIONS

Introduction

Illegal drugs use was started in Ghana by soldiers who returned from the Second World War (Akyeampong, 2005). At the time, marijuana was the only illegal drug used. Recent data indicate that Ghanaians use a variety of different illegal drugs (UNODC, 2012, UNODC, 2007). This is in spite of PNDC law 236 which bans all possession, use and distribution of all forms of recreational drugs.

The study was undertaken to, (1) assess the background characteristics of the illegal drug users, (2) analyse the drug use habits and socio-ecological influences on illegal drug users, (3) assess the use of illegal drugs on body composition and (4) analyse the use of illegal drugs on biochemical and metabolic integrity, using a group of illegal drug users in Greater Accra. This chapter is a summary of main findings, conclusions, policy implications, evaluation of the adopted conceptual framework, reflections on contribution to knowledge and recommendations for future policy on illegal drug use and gaps that would need future research.

Summary of Main Findings

Results from the study showed that illegal drugs are used by both males and females. Of the 141 respondents interviewed, 121 were males and 18 were females. It was expected that religious affiliations will moderate illegal drug

use but this was not the case. This may be because respondents identified themselves with the religious denomination which they were either baptized into by parents and may not have been practicing the doctrines of such religions that forbid illegal drug use. The likelihood of using illegal drugs was found to be associated with background characteristics such as age and marital status. Males and females who were not married used more drugs than the ever married. It would appear that the use of illegal drugs provided the companionship a spouse would have given or the use of drugs did not allow users to start relationships. More people aged 30 years and over used illegal drugs compared with people younger than 30 years. Age at first use was observed to be 15 years.

The study found that seven types of illegal drugs were used among the study participants. These were; marijuana, cocaine, crack, heroin, thai, rock and unspecified drugs. The seven illegal drugs used were classified into four: hallucinogens, narcotics, stimulants and unspecified drugs. This classification takes into account the physiological effects the illegal drugs have on the central nervous system. Hallucinogen was the drug most used by males and was through smoking. For instance, 28 per cent of males preferred hallucinogens. For females stimulants were the most preferred. For instance, 31 per cent females preferred stimulants. Males used illegal drug as social events and for identity purpose since they tended to use drugs in groups.

Body composition characteristics of males and females were altered by frequency and type of illegal drugs used. For instance, use of cocaine was statistically significantly associated with BMI (P=0.03) between males and

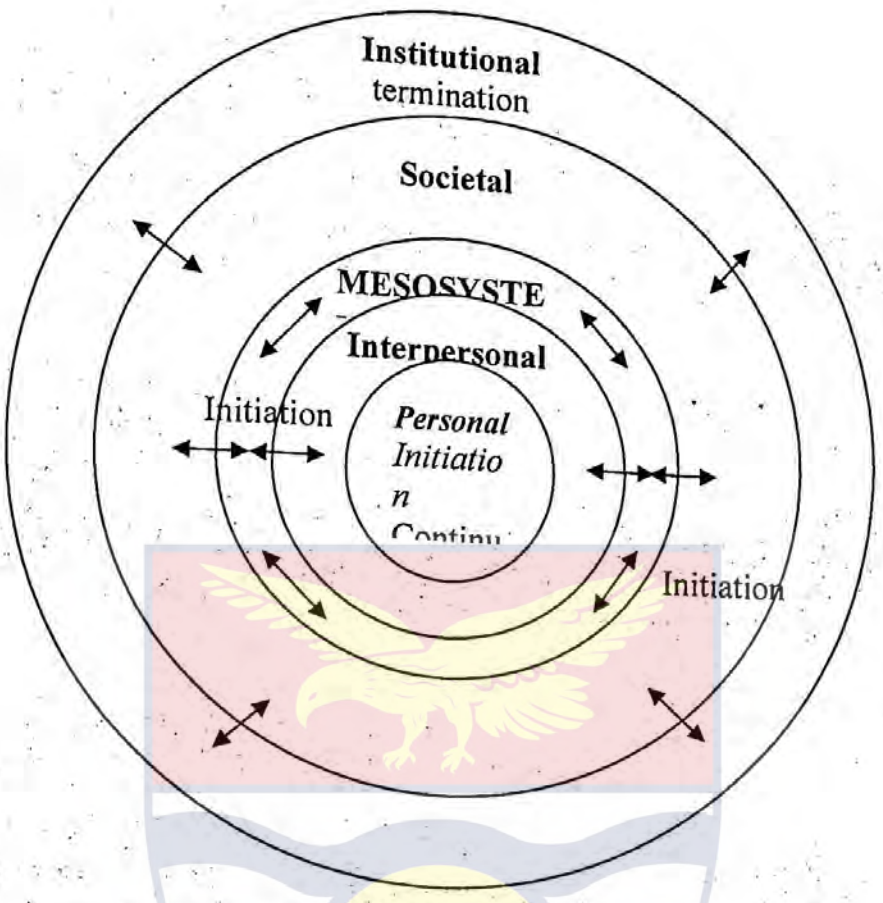
females at a frequency of 1-3/day. At a frequency of > 6/day use of cocaine was associated with body mass index (P=0.002) and per cent body fat (P=0.002) between males and females differently. Gender and some background characteristics were found to be associated with nutritional status (BMI). For instance, females have 16.4 per cent decrease (IRR=0.84; P<0.01) in BMI compared with males. Similarly, based on incident risk ratio age, gender, educational, occupational and marital statuses and hallucinogen use independently predicted per cent body fat. For example, females have 35.1 per cent decrease (IRR=0.65; P<0.01) in per cent body fat compared with males. Those who had tertiary education have 25.0 per cent less (IRR=0.75; P< 0.01) in per cent body fat compared with those who received no formal education.

There were differences in the biochemical and enzymatic characteristics observed between male and female illegal drug users who used the same illegal drugs. Type and frequency of illegal drugs use were found to be associated with changes in serum albumin (SA), Gamma Glutamyl transpeptidase (LDA), indirect bilirubin (IB), Aspartate Aminotransferase (AST) and Alanine transaminase (ALT). There was statistical significant difference (P=0.004) in the amount of indirect bilirubin generated between males and females who used rock at the same frequency of 1-3/day. Total protein nutrition was statistically different (P=0.026) between males and females who used marijuana at the same frequency of >6/day. Regarding hallucinogen users, there were statistical significant differences in between

males and females in the amounts of alanine transaminase (ALT) (P=0.010) and high density lipoprotein (HDL) (P=0.040).

Conclusions

Although the number of female respondents was small (18) compared with males (123) the study found differences in the illegal drug use habits between males and females. Background characteristics of males and females were associated with different illegal drugs. Males used hallucinogens while females used hallucinogen and stimulants. Personal and societal factors were associated with continuation, interpersonal and societal factors were associated with initiation of drug use, societal and institutional factors were associated with termination. Majority of illegal drug users were more than 35 years and age and ever married statuses predicted illegal drug use. Intrapersonal factors were the main reason for initiation of illegal drug use for both males and females. Continuous use of illegal drugs depended on motivation and enjoyment derived upon use and these are personal characteristics while termination depended on institutional and personal factors. Males share drugs during use while females share prefer to use illegal drugs alone. Gender specific changes were observed when male and females used the same illegal drug. Narcotics and hallucinogen use predicted changes in BMI and body fat differently among males and females. Protein nutrition based on serum albumin-to-globulin ratio was better in females compared with males. Cellular functions of females and males are altered to different degrees when the same drugs were admitted.



Source: Author, 2014.

Figure 7: Ecological Paradigm and Illegal Drug Use

Frequencies of use of illegal drugs were found to have associations with nutritional status, and that the same drug had different association with nutritional status marker between males and females. For instance, use of cocaine had different significant associations on %BF ($P<0.000$) and hip circumference ($P=0.014$) between males and females. Use of illegal drugs can lead to under- or over-nutrition among males and females. Different illegal drugs had associations with physiological functions of cells and organs of the body hence influenced the amounts of biological markers in the serum of males and females. For example, there was statistical significant difference ($P=0.020$) in total protein between males and females

who used narcotics while statistical significant difference was also reported in globulin (p=0.040) between males and females who used unspecified drugs. Illegal drug use had an association with cellular integrity by influencing the amounts of enzyme that are available to catalyze cellular reactions of males and females. For example, there was statistical significant difference (P=0.040) in the amount of alanine transaminase enzyme between males and females who used unspecified drug. There was also, statistical significant difference (P=0.015) in the amount gamma glutamyl transpeptidase between males and females who used cocaine.

Evaluation of the Adopted Conceptual Framework

This study used the framework developed by Bronfenbrenner, (1979) to assess the socio-ecological dimension of use of illegal drug in the Greater Accra of Ghana. The framework has four constructs: personal, interpersonal, societal and institutional. It assumed that personal factors and environment exerts mutual influence on each other.

The model provided a methodological approach for examining social, community and peer influences as well as individual attributes in the use of illegal drugs. Often, behavioural risk factors have been treated as individual attributes ignoring environmental influences (Dieterich et al., 2013). Attention has now focused on the link between the individual and their contextual settings (Gu et al., 2010). This relates to the general observation that health interventions are effective when changes occur at different levels of the socio-ecological scale (Buckner et al., 2012; Song & Wenzel, 2014).

Socio-ecological influences on illegal drug use were examined under illegal drug use initiation, continuation and termination (Figure 7). It was observed that illegal drug use initiation was influenced by interpersonal, personal, societal and institutional factors, with interpersonal factors (family, friends) accounting for the highest proportion of influence on illegal drug use. Majority of users were introduced to illegal drug use by people who were already using illegal drugs. Personal interest and the availability of the drugs in the community were other factors. Users were aware of the law prohibiting the use of illegal drugs yet decided to start the habit.

It was also observed that, after acquisition of illegal drug use habits, users sustained the habit through personal, interpersonal and societal influences. However, personal factors were responsible for a higher proportion of reasons for continuation. This may suggest personal satisfaction and the development of self-efficacy that comes with the use. The availability of the drug in the community and societal norms may contribute to the continuation of illegal drug use habits.

Users of illegal drugs do not use the drug in the open and therefore this accounted for the consideration of this factor in illegal drug use consideration. All four constructs of the socio-ecological framework were found to be associated with termination. The institutional factors appeared to be paramount in the decision to terminate drug use possibly because of fear of arrest and prosecution, when caught. Law enforcement agencies sometimes swoop on their hideout and make arrests. An example was in December, 2013 when Police raided suspected illegal drug outlet and made

arrests. This was why the Tema group refused to take part in this study. Despite the recognition that they could be arrested and prosecuted most of them did not consider stopping the illegal drug use habit immediately. The earliest period was within a month. This could be due to the addictive nature of the illegal drugs used.

Reflections on Results

The study established that illegal drug use has socio-ecological dimensions and that different factors were associated with initiation, continuation and termination of illegal drug usage. This study provided evidence to support the observation that illegal drug use was associated with body composition changes and metabolic integrity of users. These changes predict cardiovascular risks which has implications for health care. Although sample size is small and the study area localized in one region, the findings serve as initial data that will guide policy on harm reduction in terms of public health initiatives to manage health conditions of illegal drug users. For example, in treating patients socio-ecological factors should be taken into consideration. If people go back to the same environment after rehabilitation, the likelihood that they will go back to the habit is high. This is because the friends and acquaintances will be available.

The study also provided data on nutritional status of the vulnerable group that can guide inputs into Sustainable Development Goal 3: good health and well being and Goal 10: reduced inequality which in this case is access to health care of illegal drug users by the year 2030.

Policy Implications of Findings

The findings of this thesis have policy implications. Firstly, the fact that several types of drugs are used, distributed in physical locations despite the harsh punitive measure suggest that the policy on illegal drug use, possession and distribution is not deterrent enough. The policy of surveillance in a community may be useful in reducing, distribution and use. That these activities are carried out at the blind side of the law suggest a need for change to change the policy as it is now to one that will allow drugs to be sold in the open and then regulated. In a ten year study in North America, it was found that legalising marijuana use did not increase its use (Cerdά et al., 2012).

Use of illegal drug has health consequences such as risk of cardiovascular disease as indicated by changes in per cent body fat (% BF) and waist-to-hip ratio indices. This calls for education on use of illegal drugs through various media.

Access to health for all is a universal right which the government of Ghana ascribes to. The criminalization of the use of illegal drugs has made it impossible for users to access health care for fear of being identified and arrested. Therefore, the policy on illegal drug use such as PNDC law 236 needs amendment to allow access to health care facilities for treatment of health conditions that may be due to illegal drug use. The policy on nutrition by the Ghana Health Service should include issues that aim at maintaining adequate nutrition for this group.

Recommendations for Future Policy on Illegal Drug Use

Text now reads 'Education on the possible health consequences of illegal drug use should be intensified by the Ghana Education Service (GES) and Ghana Health Service GHS should develop protocols for management of illegal drug use'. GHS should include drug use consequences on health as part of health promotion activities in schools and in the communities. This education should be done in secondary schools and a day on drug awareness set aside for public education in the communities since studies have shown that when community serves as stakeholders there is commitment and awareness is increased. Rehabilitated illegal drug users can serve as role models in educating the public and those who still use illegal drugs. These individuals know where illegal drugs are sold and will be useful in recruiting users for rehabilitation and also perform education at the places where illegal drugs are sold.

Research Implications/Areas for Future Research

Background characteristics were found to be associated with illegal drug use and males and females used different illegal drugs. This calls for further studies to find out which background characteristics for males and females that are specifically related to illegal drug use. The chances are that earlier efforts by the government to eliminate illegal drug use failed because background factors were not considered. Since females and males used different illegal drugs it will also be prudent to research into why this is so. This study used structured questionnaire and solicited responses in pre-defined areas.

It will also be important to document places that illegal drugs are sold and used nationwide. The database will serve as rallying points for interventions. For instance, treatment and rehabilitation points could be situated in some of these areas for illegal drug users to seek help. Although the study found association between illegal drug use and nutritional health, the attribution cannot be quantified. Undertaking another study with controls will provide data that will guide intervention efforts.

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LIST OF APPENDIXES

APPENDIX A: Informed consent and study questionnaire

UNIVERSITY OF CAPE COAST

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF POPULATION AND HEALTH

INFORMED CONSENT FORM

Participation Information Leaflet and Consent Form

This leaflet must be given to all prospective participants to enable them know enough about the research before deciding to or not to participate

Title of Research: Nutritional Status of Drug Users in Greater Accra

Name and affiliation of researcher and supervisors

Principal Investigator

1. Jacob Setorglo, Department of Population and Health, University of Cape Coast, Cape Coast. Tel: +233274171639.
   E-mail: yawose12@gmail.com.

Supervisors

1. Professor K. Awusabo-Asare. Department of Population and Health University of Cape Coast, Cape Coast.
   Telephone +233244704605,

   E-mail: k.awusabo-asare@ucc.edu.gh

2. Professor. A. Adu-Oppong. University of Cape Coast. Cape Coast.
   Email: a.adu-oppong@uccsms.edu.gh
   Telephone : +233248631020

Background

Drug use as a lifestyle choice, is influenced by factors such as personal, familial, social, and community influences as well as government policies. Studies on drug users have identified public health problems associated with individual behavioural changes as well as micronutrient nutritional deficiencies, weight loss and poor dietary patterns. The aim of the study is to assess the nutritional health of drug users analysis of body composition measures and biological markers. The study will also explore socio-ecological factors that influence drug use among the population.

Purpose of study

The aim of the research is to assess the nutritional status of drug users and also determine the factors that influence it in Greater Accra.

Procedure of the Research

Drug users will purposively be sampled through snowball technique in the study area. Each respondent will be asked questions concerning drug habit, socio-demographic background and the influences of personal, interpersonal, society, community and the policy on illegal drug use. Height, weight, waist and chest circumferences and percent body fat of participants will be measured using standard procedures. A teaspoonful of venous blood will be drawn from the left arm and analysed for certain nutritional and metabolic status markers in the blood.

Risk(s)

One teaspoonful of blood will be drawn from the vessel in the arm as part of the process. In addition we will take some measurements of your body. This is a routine procedure. The taking of blood will be a little painful but will not put your health at risk.

Benefit(s)

After the interview, we will know some indices of nutritional status such as the waist-to-hip-ratio, BMI, haemoglobin. This will be disclosed to respondents at no cost. We will give you advice on diet if you so wish Dietary advice will be given to those who need it while others may be referred to a health care facility depending on severity of their status. We will disclose to you on request some of the rapid research findings such as haemoglobin level, BMI and waist-to-hip ratio as well as percent body fat which are performed to you, if you so wish. In addition you will be given ten Ghana cedis (GH₵ 10.00) for transportation.

Confidentiality

All information gathered in this study will not be disclosed to anybody else, except the principal investigator and the supervisor. Data will be coded at source and will be strip of all identifiers of respondents. No name or participant identifier will be used for any report or publication. However, as part of our responsibility to conduct this study, and according to established rules, the researchers involved in the work will be allowed the use of the data. Before that is done, the data will be stripped of any personal identification. A pre-arranged counselling service will be available to those who will need it. Arrangement will be made with the University of Cape Coast counselling unit

Volunteerism

We are inviting you to participate in this study voluntarily. You are under no obligation to be part of it. You can decide not to participate in the study and also refuse to participate any further at any stage of the study. This will not affect your access to any services which may be due you as part of this exercise. You may choose to withdraw from the interview at any time without having to give us reason(s) for your decision. You may also choose not to answer any question(s) you are uncomfortable with or/and find personal/private. In addition you may refuse to donate one teaspoonful of blood. There will be no consequence, loss of benefit or health care to you if you choose to withdraw from the research at any time.

Cost/Compensation

There will be no financial cost to you as a result of participating in this study and you will also not be paid. However, you will be given ten Ghana cedis (GH₵ 10.00) to cover transportation cost.

Contacts:

If you have any question concerning this study, please do not hesitate to contact Professor K. Awusabo-Asare (Principal Supervisor) on +233244704605, E-mail: k.awusabo-asare@ucc.edu.gh

Further, if you have any concern about the conduct of this study, your welfare or your rights as a research participant, you may contact: The Chairman, Institutional Review Board. Telephone: .....

CONSENT FORM

Title of Research: NUTRITIONAL STATUS OF ILLEGAL DRUG USERS IN GREATER ACCRA.

Statement of person obtaining informed consent:

I have fully explained this research to ----------
---------- and have given sufficient information, including that about risks and benefits, to enable the prospective participant make an informed decision to or not to participate in this study.

Date---------- Name:----------

Statement of person giving consent:

I have read the information on this study/research or have had it translated into a language I understand. I have also talked it over with a relative, friends and the interviewer, I was given the opportunity to ask question and I am satisfied with the responses given. I understand that I can stop being part of this study at any time without having to explain the reasons for my decision.

I accept that my participation is voluntary.

DATE---------- SIGNATURE/THUMBPRINT:----------

WITNESS' SIGNATURE (If participant is not literate):.....

NAME OF WITNESS.....

Interviewer/Principal investigator's signature=========

UNIVERSITY OF CAPE COAST

FACULTY OF SOCIALSCIENCES

DEPARTMENT OF POPULATION AND HEALTH

PhD Study Questionnaire

TOPIC: Nutritional status of illegal drug users in Greater Accra

1. ID Number---------- 2.Date of interview (DD/MM/YY)----------

3. Time started interview-------Time ended interview------
Duration.....

4. Name of Interviewer..... Signature .....

SECTION A: ILLEGAL DRUG TYPES AND USE

I will like us to talk about illegal drug use and its acquisition. That is any drug you used for recreation that was not prescribed by a qualified health care provider. Any drug that you can be arrested for when found in your possession by a law enforcement Officer such as the Police. Can you kindly tell me when at what age you started using drugs, what drug(s) you use and how you acquired the drug(s) for use. We will start from today: please tell me.....

A1. Have you taken any drug(s) today? 1. Yes ☐ 2. No ☐

A2. How did you take (*name of drug) today*? *Please tick as appropriate*

Name of drug	Injection	Smoking	Chasing	Drinking	Others (specify)	Frequency

1.						
2.						
3.						
4.						
5.						
6.						

- *Use a separate sheet and record additional drug intake(s)*

A3. What about yesterday? Did you take any illegal drug?

1. Yes ☐ 2. No ☐

If yes then proceed to next question (A4); If no then skip to (A5). If yes Use information provided to complete table below. Ask how each drug was taken and the frequency.

A4. If you took a drug yesterday, which and how did you take (*name of drug*)?

Names of drug	Injection	Smoking	Chasing	Drinking	Others (specify)	Frequency
1						
2						
3						
4						
5						
6						

A5. The day before yesterday, Did you take any illegal drugs?

1. Yes ☐ 2. No. ☐

If No, skip to (A7). If yes find out how the drug(s) were taken and frequency of intake. Use information to complete table below

A6. Record *(name of drugs)* methods of use and frequency.

Names of drug	Injected	Smoked	Chased	Drunk	Others (specify)	Frequency
1						
2						
3						
4						
5						
6						

A7.*Complete the table below by finding out where each drug was taken*

	1	2	3	4	5	6
A8. Where did you get *(name of drug)* you took today?						
A9. Indicate where the drug was consumed. *Mention name of locality with identifiable landmark*						
A10. If no tell me where you took the drug						
A11. Where did you get drug you took yesterday?						
A12. Where did you take the drug? *Mention name of locality*						

If today and yesterday's drug intake were different then complete the table A4 for the day before yesterday.

A13. Did you take any drug 3 days ago? 1.Yes ☐ 2. No ☐

If no skip to A15

Ask for name of drug, how each drug was taken and the frequency. Uuse information to complete the table

A14. How did you take *(name of drug)* 3 days ago?

Names of drug	Injection	Smoking	Chasing	Drinking	Others (specify)	Frequency
1						
2						
3						
4						
5						
6						

Find out where the various drugs were bought and used by asking the questions in the table below.

	1	2	3	4	5	6
A15. Is the place of purchase of *(name of drug)* 3 days ago different from earlier places mentioned? 1.Yes ☐ 2.No ☐ *If no, skip* to A17						
A16. Where did you get *(name of drug)* you took 3 days ago?						
A17. Where did you take *(name of drug)* you took						

3 days ago?						
A18. The drug you took 3 days ago was it different from that taken today ? 1. Yes 2. No *If no skip to A20*						
A19. What drugs did you take if different?						
A20. The drug you took 3 days ago was it different from that taken yesterday? 1. Yes 2. No *If no skip to A22*						
A21. What drugs did you take if different?						
A22. The drug you took 3 days ago was it different from that taken the day before yesterday? 1. Yes 2. No						

You said you took (name of drug)

	1	2	3	4	5	6
A23. Did you take it alone or shared with others? 1. Alone 2. Shared with others. *Indicate code 1 or 2 under name of drug*						
A24. What about yesterday? Did you take it alone or shared with others? 1. Alone						

2. With others. *Indicate code 1 or 2 under name of drug*						
A25. What about the day before yesterday? Did you take it alone or with others 1. Alone 2. With others. *Indicate code 1 or 2 under name of drug*						

A26. Have you ever taken a combination of drugs before? 1.Yes ☐ 2 No ☐

A27 If yes, tell me the names of the drugs

Name of drug A	Name of drug B	Name of combined drug
1		
2		
3		
4		
5		

A28. Have you ever taken a drug that has already been combined?

1.Yes ☐ 2. No ☐

Influences of illegal drug use

Local names of drugs	1	2	3	4	5	6
A29. At what age did you first use drug(s)?						
What drug(s) was it?						
A30. What influenced (s) you						

to start taking drugs?						
A31. What influenced you to continue taking drugs)						

- *Use socio-ecological codes to complete table*

A32. Will you ever consider stopping drug use? 1. Yes ☐ 2. No ☐

If yes, when do you want to stop?

1. Immediately ☐
2. Within a month ☐
3. Within three months ☐
4. More than three months ☐

A33. If not now, ask. Why not now but at *(use response to previous answer)*

A34. If no, why don't you want to stop?

.....

.....

SECTION B: SOCIO-DEMOGRAPHIC CHARACTERISTICS

B1. Date of birth (dd/mm/yy).....

B2. How old are you? Completed years).....

B3. What is your gender? *Please tick as appropriate* 1. Male ☐ 2. Female ☐

B4. What is your ethnicity? *See code and select*

B5. What is the highest level of education completed? *Read list*

B6. What is your main occupation *Select from code*

B7. What is your marital status? *Select from code*

B8. What is your religious affiliation? *Select options from code and indicate here*

THANK YOU FOR ANSWERING THIS SET OF QUESTIONS.

SECTION C: ANTHROPOMETRY AND BIOCHEMICAL VARIABLES

We have reached the end of this set of questions. I would like to measure your weight and height. In addition the nurse will measure your blood pressure and take about a teaspoonful of blood from your arm.

Measurements	**Measurements**			
	1	2	3	Average
C1. Body weight(kg)				
C2. Standing height (cm)				
C4. Percent body fat (% BF)				
Girth measurements (cm)				
C5. Waist circumference				
C6. Hip circumference				

D. BIOCHEMICAL ANALYSIS

D1 Total cholesterol *D2 High Density Lipoprotein-cholesterol* *D3Low Density Lipoprotein-cholesterol* *D4 Very Low Density Lipoprotein –cholesterol*			
Serum protein fractions *D5 Albumin* *D6 Globulin*			

D7Total bilirubin			
D8. Alanine aminotransferase (AST) (iu/l)			
D9 Aspartate aminotransferase (AST) (iu/l) (ALT)			
D10. Gamma glutamic transpeptidase (iu/l) (LDA)			
D11.Alkaline phosphatise (ALP) (iu/l),			

CODES FOR BACKGROUND CHARACTERISTICS

Codes for ethnicity

01= Akan 02 =Other Akan
03= Ga-Dangbe 04 =Ewe
05 =Guan 06= Mole-Dagbane
07= Other northerner
08 =Don't know

Codes for religion

01 =Catholic 02= Anglican 03= Presbyterian
04 =Methodist 05= Pentecostal/Charismatic
06= Other Christians 07= Moslem 08= No Religion 09 =Others (specify)

Codes for 04: Gender

01= Male
02= Female

Codes for Occupation

01= Legislators/managers, 02 =Professionals, 03= Technicians and associate professionals, 04= Clerks Service/sales workers 05= Agriculture/fishery workers, 06= Craft and related trades workers, 07= Plant and machine operators

Codes for Socio-ecological influences

01= personal, 02= Interpersonal, 03= societal, 04 = Institutional

Codes for marital status

01= Never married
02= Currently married
03= Separated
04= Divorced
05= Widowed

CODES FOR SOCIO-ECOLOGICAL VARIABLES

Codes for personal influences

01= gender, 02= health, 03= age,

Codes for interpersonal influences

01= Peers, 02= Family, 03= School mates, 04 = Church members

Codes for Societal influences

01= Media, 02= Neighbours, 03= Norms, 04 = Workplace

Codes for institutional influences

01= Attitudes, 02= Laws

Appendix B: Letter to Ankaful Prison

UNIVERSITY OF CAPE COAST

DEPARTMENT OF POPULATION AND HEALTH

16 th February 2014

The Officer I/C

Ankaful Maximum Prison

Ankaful

Dear Sir/Madam,

PERMISSION TO CARRY OUT A PILOT STUDY IN YOUR FACILITY

I write and seek permission to conduct a pilot study in your facility on 20th February, 2014.

The pilot study will involve inmates. Please find attached the study questionnaire and ethical clearance certificate. The objective of the study is to assess the nutritional status and metabolic integrity of illegal drug users.

Yours faithfully,

Jacob Setorglo

(Principal Investigator)

Appendix C: Ethical clearance from Institutional Review Board (IRB)

UNIVERSITY OF CAPE COAST

Institutional Review Board
School of Graduate Studies and Research

TELEPHONE: +233 42 32480-9 & 32480-9 Ext. 237
DIRECT: +233 42 35351 & 028 9670793(4)
TELEGRAM: UNIVERSITY, CAPE COAST.
C/O UNIVERSITY POST O
CAPE COAST, GHANA

Our Ref: UCC/IRB/2^A
Your Ref:

12th February.

Prof. K. Awusabo-Asare – Principal Investigator &
Prof. Ahmed Adu-Oppong, Jacob Setorglo – Co-Investigators
Faculty of Social Sciences
Department of Population and Health
University of Cape Coast

ETHICAL CLEARANCE –ID NO: UCCIRB:12/02/14

The University of Cape Coast Institutional Review Board (UCCIRB) has granted **Prov** Approval for implementation of your research protocol titled:

"Nutritional Status of Drug Users in Accra"

This approval requires that you submit periodic review of the protocol to the Boar final full review to the UCCIRB on completion of the research. The UCCIRB may obs cause to be observed procedures and records of the research during and after implemer

Please note that any modification of the project must be submitted to the UCCIRB for and approval before its implementation.

You are also required to report all serious adverse events related to this study to the U within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with relation to this protocol

(Joseph C. Sefenu)
ADMINISTRATOR

cc: The Chairman, UCCIRB

APPENDIX D: LETTER TO THE GREATER ACCRA REGIONAL COORDINATING COUNCIL

Department of Population and Health

University of Cape Coast

14th January, 2014

The Chairman

Regional Coordinating Council

Greater Accra Region

Accra

Dear Sir/Madam,

PERMISSION TO CONDUCT A RESEARCH IN THE GREATER ACCRA REGION OF GHANA

I wish to require permission to perform a study in the Greater Accra Region **entitled Nutritional Status of Illegal users in Greater Accra** as part of my Ph.D study at the University of Cape Coast. The data collection will begin on 20th February, 2014.

Please find attached the study protocol and a copy of the approved ethical clearance letter from the Institutional Review Board of University of cape Coast. The study is for academic purpose and therefore data collection will be guided by the highest ethical standards. You can contact me on 0274171639 or through e-mail: j.setorglo@uccsms.edu.gh.

Yours faithfully,

JACOB SETORGLO

APPENDIX E: LETTER TO CAPE COAST TEACHING HOSPITAL LABORATORY

University of Cape Coast

14th January 2014

The Head

Cape Coast Teaching Hospital Laboratory

Cape Coast

Dear Sir/Madam,

PERMISSION TO CONDUCT A RESEARCH IN THE GREATER ACCRA IN GHANA

I wish to require permission to analyse blood samples for biological and nutritional markers in your laboratory between 4th March 2014 and 30th September 2014.

I am by this letter also asking for space to store blood samples.

Reagents for the analytical procedures will be provided by the investigator. The study, entitled **Nutritional Status of Illegal Drug Users in t Accra Region of Ghana** is part of a Ph.D research. Please find attached the study protocol and a copy of the ethical clearance.

You can contact me on 0274171639 or through e-mail:

j.setorglo@uccsms.edu.gh.

Regards,

Yours faithfully,

JACOB SETORGLO