

**THE DETERMINANTS OF OVER-THE -COUNTER ANTIBIOTICS CONSUMPTION  
IN GHANA (A Case Study In The Ejisu-Juaben Municipality)**

**BY**

**SAMUEL KWAKU ADJEI B A (ECONOMICS)**

**A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS, KWAME  
NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, IN PARTIAL  
FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF**

**MASTER OF PHILOSOPHY (ECONOMICS)**

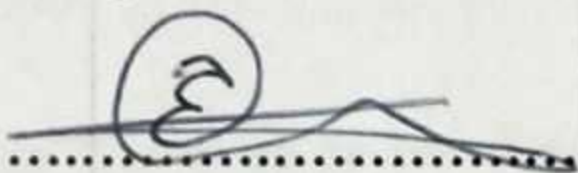
**FACULTY OF SOCIAL SCIENCES**

**COLLEGE OF ARTS AND SOCIAL SCIENCES**

**JUNE, 2013**

## DECLARATION

I declare that this thesis herein submitted is an original work I have personally done with the exception of references to other people's work which I have appropriately acknowledged.



**SAMUEL KWAKU ADJEI**

**(INDEX NO: PG5540811)**

21/10/2013

**DATE**

**CERTIFIED BY**



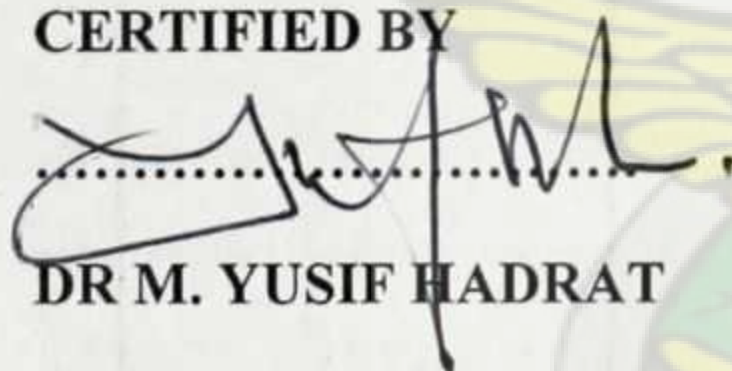
**DR. SR EUGENIA AMPORFU**

**(SUPERVISOR)**

23/10/13

**DATE**

**CERTIFIED BY**



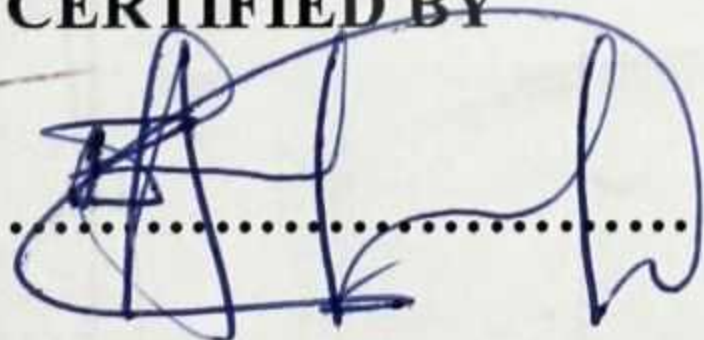
**DR M. YUSIF HADRAT**

**(2<sup>nd</sup> Internal Supervisor)**

21/10/2013

**DATE**

**CERTIFIED BY**



**DR. SR EUGENIA AMPORFU**

**(HEAD OF DEPARTMENT)**

23/10/13

**DATE**

## DEDICATION

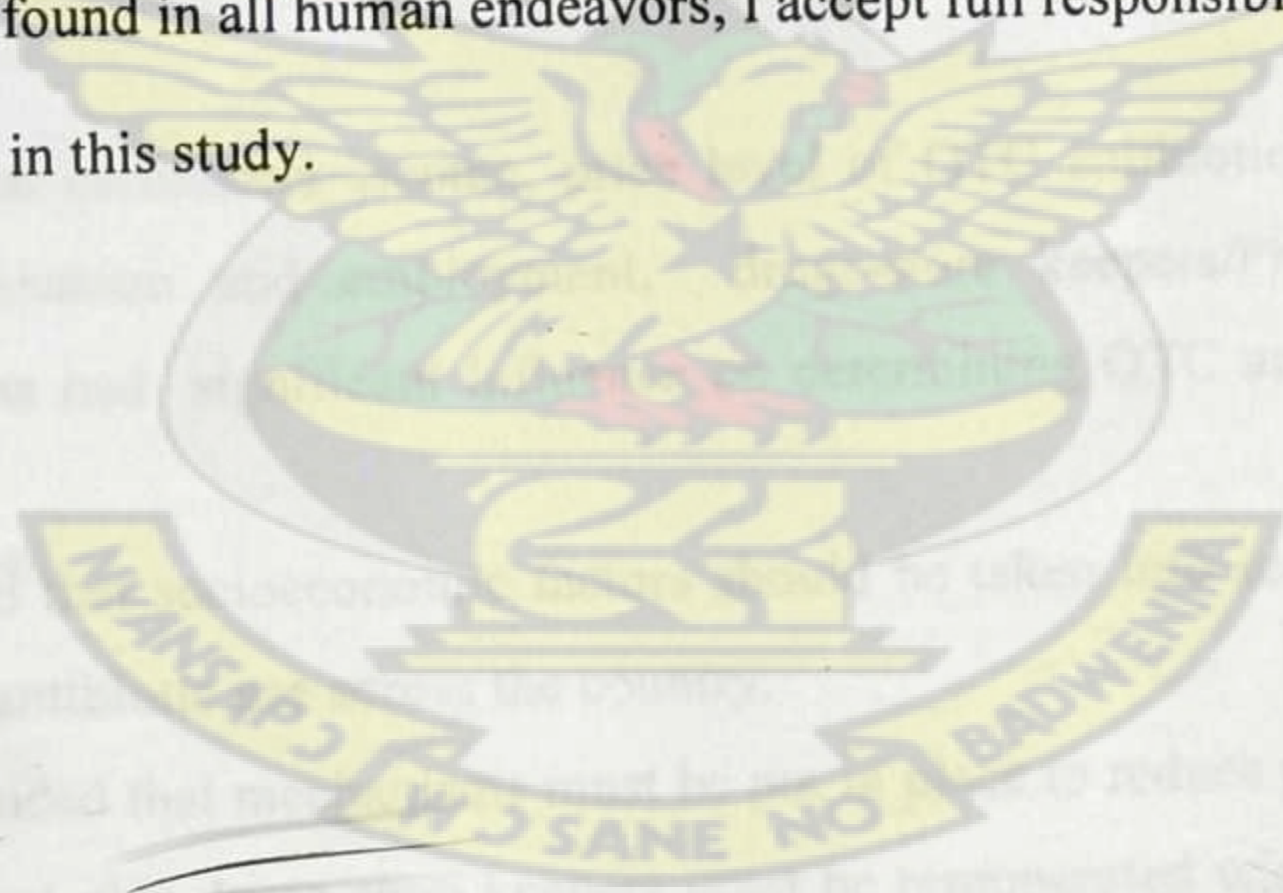
I dedicate this work to my dear wife, Nani Elizabeth, and my children, Suzanne Adjei, Melissa Adjei, and Mansfield Adjei and my lecturer and mentor, Mrs. Grace Ofori-Abebrese for their unflinching support, care and sacrifices throughout my educational life.



## ACKNOWLEDGEMENT

I am very grateful to the Almighty God for his guidance and protections throughout my life and for making this work a success. I also wish to express my profound and sincere gratitude to my supervisor, Dr. Sr. Eugenia Amporfu, whose constructive criticisms, suggestions, comments and guidance have made this work a success. She has been very cooperative throughout this work and I am very grateful to her. This section will be incomplete, if I fail to acknowledge my friends (also my seniors), Immurana Mustapha and Samuel Owusu, who introduced me to STATA 11.0 econometric package for my data analysis and also made constructive criticisms of my work. I am also grateful to the following people for their support and encouragement: Mrs. Grace Ofori – Abebrese, Dr. A. K. Osei-Fosu, Dr. Daniel Sakyi and all lecturers as well as the administrative staff at the Department of Economics, KNUST.

Lastly, as errors are found in all human endeavors, I accept full responsibility for any error of fact or interpretation in this study.



## ABSTRACT

The introduction of antimicrobial agents in human clinical medicine and animal husbandry has been one of the most significant achievements of the 20th century. However, shortly after the introduction, resistance began to emerge.

Today in Ghana, the increase in resistance of microbial treatment is a major threat to livelihoods and lives; this again, threatens to undermine the effectiveness of the country's health delivery programs. However, the magnitude and determinants of the impact of resistance on human health is unknown. Few studies have evaluated the burden of disease caused by antibiotic resistant bacteria in low income countries.

The objective of this study was to investigate the socioeconomic determinants and the supply-side factors influencing OTC antibiotics consumption in Ghana.

Methodology used in this study was logit regression estimation (An econometric modeling) to help investigate the likelihood of the consumer demanding the OTC antibiotics, instead of purchasing with prescriptions from physicians. Other influencing factors from supply-side was also investigated.

It was found out that consumers income, price level of OTC antibiotics and socioeconomic factors such as education and employment, drugs-store keepers/Pharmacists and their remuneration systems had significant influence on determining OTC antibiotic consumption ; *ceteris paribus*.

The study concluded that socioeconomic factors should be taken into account while explaining differences in OTC antibiotic use across the country.

The study recommended that mechanisms must be put in place to reduce patients waiting time in healthcare centers and also drugs shop keepers must be remunerated with fixed salary and also authorities must replace expired drugs in shops at less or zero cost to shop operators.

**Key words:** Over-the-counter antibiotics, Determinants, consumption.

## TABLE OF CONTENTS

CONTENT	PAGE
DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
TABLE OF CONTENT	vi
LIST OF FIGURES	ix
LIST OF TABLES	x
LIST OF ACRONYMS AND ABBREVIATIONS	ix
 <b>CHAPTER ONE</b>	 
1.0 INTRODUCTION	1
1.1 Background of the Study	1
1.2 Statement of Problem	6
1.3 General objectives of the Study	6
1.3.1 Specific objectives	6
1.4 Rationale for the Study	7
1.5 Method of the Study	8
1.5.1 Study design and sampling	8
1.5.2 Instruments for survey	8
1.5.3 Statistical test for data analysis	9

1.5.4 Hypothesis	9
1.6 Organization of the Study	10
<b>CHAPTER TWO</b>	
2.0 Introduction	12
2.1 Theoretical Review	12
2.2 Nature of pharmaceuticals demand on the market	13
2.3 Demand and consumer behaviour	14
2.4 Dependence (the lagged effect)	15
2.5 Supplier induced demand	16
2.6 Brand Loyalty	17
2.7 Demand- side factors	18
2.7.1 Income and employment	18
2.7.2 Education	19
2.7.3 Age influence	19
2.7.4 Cultural influence	20
2.8 Supply-side factors	21
2.8.1 Density of health professional and payment systems	21
2.8.2 The physician's scribbles	22
2.9 Empirical review	23
2.9.1 Summary	28

## CHAPTER THREE

3.0 Introduction	29
3.1 Background of the study area	29
3.2 Population density	30
3.1.2 Health issues	30
3.1.3 Education	31
3.2 Methods of study	32
3.2.1 Study design and sampling	32
3.2.2 Instruments for survey/study tools	33
3.3 Empirical estimation	34
3.3.1 linear probability model	35
3.3.2 Specification of model	36
3.4 The expected signs of the estimated coefficients	38
3.5 Specification of model 3	40
3.6 The expected sign of model 3	43

## CHAPTER FOUR

4.0 Introduction	45
4.1 Descriptive analysis	45
4.2 Summary of descriptive analysis	57
4.3 Quantitative analysis	58

4.4 Interpretation of model 1	61
4.5 Interpretation of model 2	65
4.6 Interpretation of model 3	66
<b>CHAPTER FIVE</b>	
<b>SUMMARY OF MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS</b>	
5.0 Introduction	68
5.1 Summary of major findings	68
5.2 Descriptive statistics	70
5.3 Conclusions	71
5.4 Policy recommendations	71
5.5 Limitations to the study	75
5.6 Suggestion for further research	78
5.7 References	79
5.8 Appendices	82
Appendix 1 Questionnaire for demand-side information	85
Appendix 2 Questionnaire for supply-side information	86
Appendix 3 Logit Regression Estimation: Model 1	88
Appendix 4 Logit Regression Estimation: Model 3	90
Appendix 5 Logit Regression Estimation: Model 2	92
Appendix 6 Tables of descriptive statistics	94

## LIST OF FIGURES AND TABLES

FIGURE:	PAGE
1 and Table 1 Results of commonly used antibiotics on the market	46
2 and Table 2 Results of some common health condition	48
3 and Table 3 Results of consumers' knowledge about microbial infections	50
4 and Table 4 Result of why consumer's demand OTC antibiotics	52
5 and Table 5 Results of knowledge on effects of misuse of OTC antibiotics	54
6 and Table 6 Results of harmful effects of misuse	56



## TABLE:

Table 7: Logit regression results - model 1	58
Table 8: Logit regression results - model 2	60
Table 9: Logit regression results – model 3	67



## LIST OF ACRONYMS & ABBREVIATIONS

OTC: Over the counter antibiotics.

FDB: Food and drugs board.

SXT: Trimethoprim/sulfamethoxazole.

$Y_d$ : Demand for OTC antibiotics

Y: Income Level

EDU: Level of education

AGE: Age distribution of the population

HPA: Health professional's advice

PX: Prices of OTC antibiotics

RES: Residential status

MAR: Marital status

EMPT: Employment status

EOB: Effectiveness of a brand of antibiotics

CDI: Consumption due to infection

CAH: Consumer attending hospital

PDF: Proximity to drug facility/store

ADVTS: Influence of advert on the consumer

CHP: Consult health professionals

CCD: Complete course of drug consumption

$Y_s$ : Supply of OTC antibiotics

SRS: Salaried remuneration system

RBC: Remuneration based on commission

YOE: Number of working experience in a /pharmacy shop

ABTP: The consumer's ability to pay for the drug

REMNT: Reimbursement/Compensation for expired antibiotics in the shop

BEDU: Basic education qualification of chemical shop keepers/pharmacists

SEDU: Secondary school qualification of chemical shop keepers/pharmacists

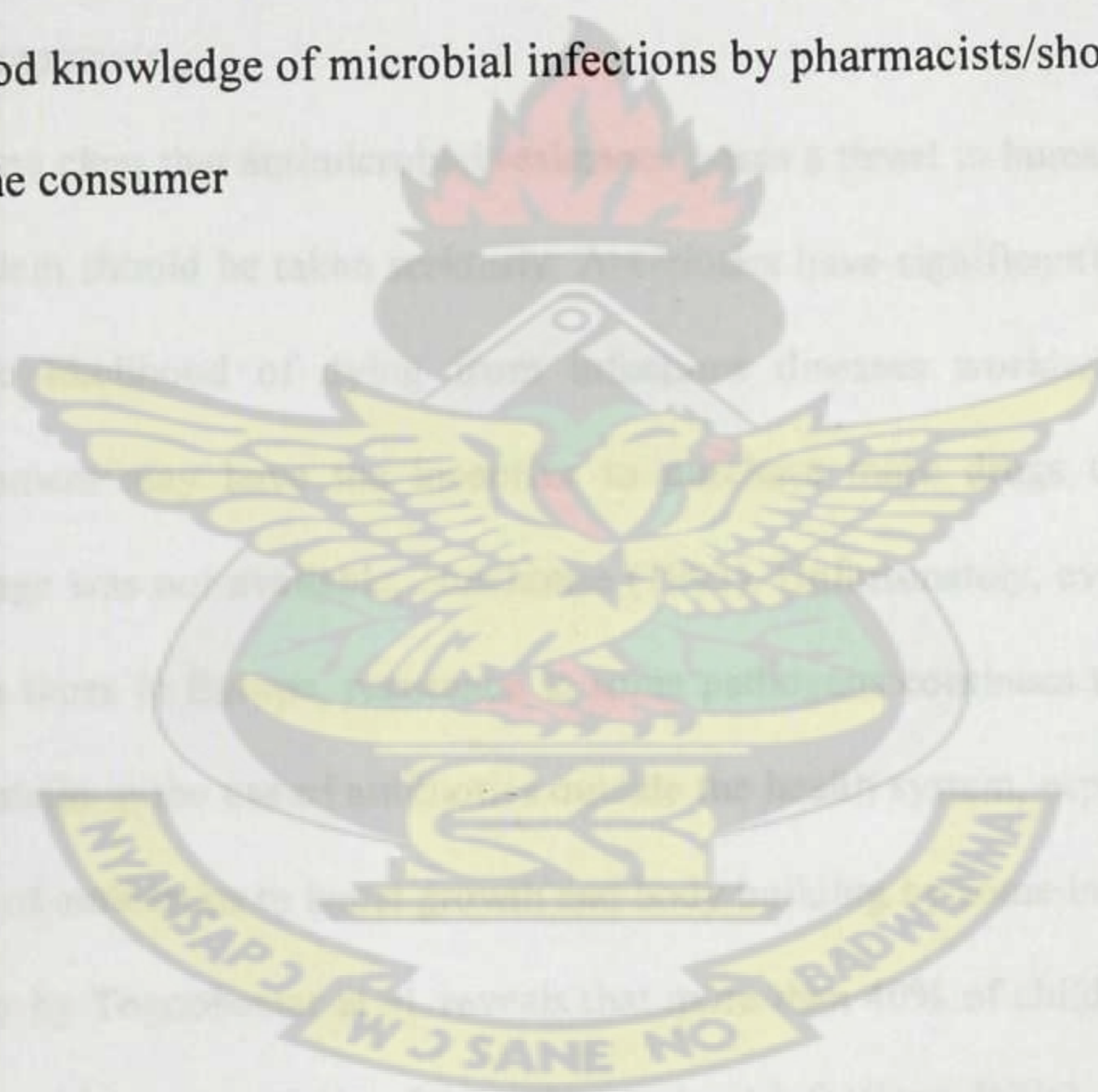
TEDU: Tertiary education qualification of chemical shop keepers/pharmacists

PKNW: Poor knowledge of microbial infections by pharmacists/shop keepers

GKNW: Good knowledge of microbial infections by pharmacists/shop keepers

VGKNW: Very good knowledge of microbial infections by pharmacists/shop keepers

AGE: The age of the consumer



## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 BACKGROUND OF THE STUDY:

The introduction of antimicrobial agents in human clinical medicine and animal husbandry has been one of the most significant achievements of the 20th century. The first antimicrobial agents were introduced in the 1930's, and a large number of new compounds were discovered in the following decades. However, shortly after the introduction, resistance began to emerge and in all known cases emergence of antimicrobial resistance have followed the introduction of new antimicrobial compounds.

It has now become clear that antimicrobial resistance poses a threat to human and animal health and so this problem should be taken seriously. Antibiotics have significantly contributed to the reduction in the likelihood of dying from infectious diseases worldwide, WHO, (2001). However, consumers may have the incentive to purchase more drugs than they would, if insurance coverage was not available, Newhouse (1993). Unfortunately, even in well regulated systems, such as those in Europe, resistance in some pathogens continues to increase unabated and problems remain in the use of antibiotics outside the health system, especially in veterinary use and the use of antibiotics to boost growth and body building by some individuals.

A research paper by Togoobaatar et al. reveals that more than 40% of children in Mongolia are given antibiotics without prescription for respiratory tract infections, WHO, (2010)

In one of the few studies of antibiotic resistance in healthy children in Bolivia, a developing country, Dr. Alessandro Bartoloni found an alarmingly high level of antibiotic resistance of the common E. coli bacteria in healthy Bolivian children.

Sending out teams of consumers with fabricated symptoms to assess the practices of pharmacies in one community, he found that "over two-thirds of pharmacies dispensed antimicrobials without a medical prescription, and the quantity dispensed varied according to the patient's ability to pay." Alexandre Spatuzza,(2002). This studies by Alexandre Spatuzza, a Brazilian journalist, revealed that pharmacies gave antibiotics inappropriately for 92 percent of adults and 40 percent of children with "watery diarrhea but no fever," indicating an absence of infection. Sixty percent gave antidiarrheal drugs to children, although none gave oral rehydration salts, the medically preferred treatment. All of the local pharmacies dispensed enough antibiotics for only two days or less, even though the recommended therapy ranged from one to five days.

In Ghana, antibiotics are available to the public from a variety of sources, including hospitals and pharmacies; licensed medicine stalls and drugstores; markets and roadside stalls and hawkers. They are commonly purchased without a prescription, even when this practice is illegal,Newman et al. (2006), Denno et al. (20020), Mills-Robertson et al. (2002). This widespread availability has lead to inappropriate use by patients

"All the people sampled have bought and used antibiotics at one time or the other whilst majority (71.9%) does not attend the hospitals or clinics when sick. A significant number of the people sampled (71.5%) have purchased antibiotics without doctor's prescription and 69.9% of the lot also did not seek pharmacist's advice before purchase. About 40% have some knowledge of antibiotic abuse although 30% still purchase antibiotics without any disease signs or symptoms. As much as 25.2% of the sample population indicated the antibiotic being purchased did not work when first used" Tagoe et al,(2010)

The inappropriate use of antibiotics may be due to patients' lack of information from appropriate professionals on drug use. In the Ejisu-Juabeng municipality ; it is estimated that

frequency of visit to health facilities is about 0.7% visit daily which may be due to the fact that their cases demands daily checkups, 1.3% visit weekly, 5.3% visit monthly, 4% visit annually and 88.7% visit occasionally. This implies that most of the people in the District do not patronize health facilities regularly. Ejisu-Juabeng Municipal Health Survey report (2006). According to the survey, some problems associated with the use of health facilities in the District include long queues, poor attitude of staff towards patients, high cost, long distance and inadequate health personnel constituting 35.5%, 11.5%, 38%, 9.4%, 5.6% respectively. These and other factors could be the reason why people only visit these health facilities occasionally. This could cause patients to resort to inappropriate means to seek medical care in the municipality from traditional herbalists, hawkers, roadside stalls, over the counter drugs from pharmacy shops and others. Behaviours leading to inappropriate antibiotic use result from complex interactions between individuals, communities and healthcare systems, all influenced by epidemiologic trends as well as cultural, political and socio-economic factors Nordberg et al.(2004). Diseases of bacterial origin are a major cause of morbidity and mortality in low-income countries, like Ghana. Newman and Seidu (2002). Many of these conditions can be prevented with improved personal hygiene, immunization, and environmental sanitation in various communities.

The market for antibiotics is characterized by multiple imperfections. Above all, antibiotic use may contribute to widespread bacterial resistance Elbasha (2003), which still represents a challenge to achieving sustainable health for all by the year 2100 (Butler 2008). A few studies have been published on the availability and choice of antibiotics for specified diseases (Bosu and Ofori-Adjei, 1997; Bosu and Mabey, 1998; Radyowyati and Haak, 2003). But data on quantities of antibiotics sold are extremely difficult to obtain due to the diverse or missing

structure in the rules and regulations for registration of medicines as well as the lack of administrative institutions to monitor drugs and sales Radyowyati and Haak, (2003). In Ghana there is an influx of antibiotics into the Ghanaian market from both foreign and local pharmaceutical companies, which has lead to the considerable increase in the abuse of antibiotics as a result of the Over-The-Counter (OTC) services without prescription from qualified physicians. This was confirmed in the study, in that 66.9% of the people sampled purchase antibiotics in the open market without any prescription. Attah et al, (2010).

## 1.2 STATEMENT OF THE PROBLEM:

The problem of resistance to antibiotics treatment in health centers is attributed mainly to widespread and availability of antibiotic on the drug market, and its misuse by the consumers. The problem of drug resistance has led to a continuous research and development of new generation of the drug, which is increasing healthcare cost in all countries including Ghana. High resistance rates to ampicillin, chloramphenicol, tetracycline and co-trimoxazole are closely connected to the widespread availability and use of these antibiotics over the last 20-30 years according to (Radyowyati and Haak, 2003; Blomberg et al. 2007).

Today in Ghana, the increase in resistance of microbial treatment is a major threat to livelihoods and lives; this again, threatens to undermine the effectiveness of the country's health delivery programs. However, the magnitude and determinants of the impact of resistance on human health is unknown. Few studies have evaluated the burden of disease caused by antibiotic resistant bacteria in low income countries Radyowijati et al , (2003).

When assessing the determinants of inappropriate use of antibiotics, it is important to understand the motivation of the suppliers (pharmacists/shopkeeper) and the consumers of the

drugs. This may have direct bearing on why consumers access over the counter drugs; and pharmacists making these drugs available over the counter, though the practice is illegal. In the minds and hands of some health professionals and lay-people, antibiotics and other pharmaceuticals take on social meaning and values Whyte, (2002). One can just share his/her dosage with a close neighbor or relative to treat similar symptoms or disease in the household or neighborhood. A preliminary information gathered from some consumers in the Ejisu-Juabeng Municipality indicated that there is a general perception that any prescribed medicine from health professionals is expensive, because the consumer is "restricted" and so this give some kind of market power to the pharmacists/shopkeepers to exploit them; this situation is avoided, when one demands the drug over the counter, just like any other consumer in the shops. Again, the motivation to sell antibiotics over the counter by the pharmacists, though this is against the laws of Ghana Food And Drugs Board (FDB), may be as a results of the remuneration system in place. Any remuneration system based on commission- one is remunerated according to the quantity of drugs sold, will influence one's decision to sell to consumers, though without prescription, in order to increase sales and profits levels of the business. Remuneration system, based on salary, is likely to avoid this problem in the drugs and healthcare market. A very significant question usually asked is "why will pharmacists keep on selling antibiotics over the counter, knowing that the practice is illegal" by (FDB). The pharmacists may flout this law, due to the high perishability of the drug; the drug must be sold as quickly as possible to avoid the expiration of the stock in the shop, which can cost the collapse of the business, (supplier induced demand). A system of compensation for unsold or expired drugs in the shops will have avoided this kind of problem, but unfortunately in Ghana, there is nothing of that sort.

High resistance rates to ampicillin, chloramphenicol, tetracycline and co-trimoxazole are closely connected to the widespread availability and use of these antibiotics over the last 20-30 years (Radyowyati and Haak, (2003), Blomberg et al. (2007)). A few studies have been published on the availability and choice of antibiotics for specified diseases (Bosu and Ofori-Adjei, (1997); Bosu and Mabey, 1998; Radyowyati and Haak, (2003)), this may be due to brand loyalty on the market. But data on quantities of antibiotics sold are extremely difficult to obtain due to the diverse or missing structure in the rules and regulations for registration of medicines as well as the lack of administrative institutions to monitor drugs and sales (Radyowyati and Haak, (2003)). These and many other problems have made it imperative to investigate the actual determinants of the injudicious use of OTC antibiotics, the consequences of this actions of the consumer, and then enhance the knowledge base of consumers on drug use in the Municipality and in the country as a whole.

### **1.3 OBJECTIVES OF THE STUDY**

Generally, the research seeks to investigate the major determinants of over-the-counter (OTC) antibiotics consumptions in Ghana, and its socioeconomic implications on the consumer and the economy as a whole.

### **1.4. SPECIFIC OBJECTIVES:**

- 1) .It will investigate the demand-side factors such as economics, social, cultural and demographic information of the households influencing the consumption of over-the-counter antibiotics in Ghana.

- 2). Investigate the supply-side factors such as shopkeepers' remuneration system their years of experience in the shop, reimbursement of shops for unsold/expired drugs, on the demand for over the counter antibiotics consumption in Ghana.
- 3). Improve rational use of the drug and make the appropriate policy recommendations to the health authorities for the regulation of the antibiotics market in the economy.
- 4). Identify major health conditions influencing the consumption of OTC antibiotics consumption in the communities.

### **1.5 HYPOTHESIS OF THE STUDY.**

- The study hypothesizes that demand side factors such as income , price , employment, education and other demographic factors such as residential status , cultural setting, marital status , age etc have no significant influence of the demand of over the counter antibiotics consumption in Ghana.
- The study again, hypothesizes that supply side factors such as shop keepers remuneration system, reimbursement of shops for expired drugs , consumers age, shop keepers work experience, level of education have no significance influence on over the counter antibiotics consumption in Ghana.

## **1.6 SIGNIFICANCE OF THE STUDY:**

Antibiotic resistance is increasing world-wide with serious consequences for complications and mortality of hitherto treatable infections and the main reason is misuse of antibiotics. The rationale for this study will include the following:

Establish community awareness creation systems/ needed to educate consumers on judicious antibiotic use and bacterial resistance to common infections in Ghana.

The research will also provide a the opportunity for healthcare providers to appreciate the negative consequences of inappropriate sales of antibiotics to the consumers,

It will build the capacity and generate the research-based evidence needed for the judicious use of antibiotic in the country's quest for healthcare.

Studies have shown that lack of education, physicians and patients' expectations, uncertainty, cultural and social and economic behavior, and differences in regulatory practices in the market among other factors ,Belongia and Schwatz ( 1998), Finch et al. (2004); influence the demand for OTC antibiotic consumption in the economy.

Patients may systematically lack compliance either because they hardly tolerate the treatment or because symptoms have resolved. Moreover, as suggested by, Cizma (2003), physicians may overprescribe antibiotics to meet patient's expectations or to reduce misdiagnosis of bacterial infections and so the study seeks to investigate what informs these behaviors of both patients and care providers in the healthcare system.

## 1.7 THE SCOPE OF THE STUDY:

The research intends to cover the following aspects of the study area-Ejisu-Juabeng Municipality in the Asante region of Ghana:

- Healthcare consumption behavior of the households in the municipality.

Healthcare facilities and professionals or other caregivers providing healthcare in the individual communities will be studied.

- Cultural and demographic factors influencing the healthcare consumptions decisions of households will be considered.
- Economic and social characteristics of the communities and their influence on the demand for healthcare will also be considered;

The survey conducted included the following geographical areas:

Ejisu Municipality, Juaben, Kwamo, Bonwire, Fumesua, Besease, Onwi, Kwaaso, Adumasa, Nobewam, Achiase, Asotwe, Donyina, Essienimpong, Achinakrom, Bomfa, New Koforidua, Tikrom, Apromase, Akyawkrom, Boankra, Hwereso, Kobease, Adadientem, Peminase and Atia,

## CHAPTER TWO

### LITERATURE REVIEW:

#### 2.0 INTRODUCTION.

This chapter spells out the conceptual framework of the model employed by the study. It also explores the methodology used to elicit information on the demand for over the counter antibiotics from consumers, and the demographic and as well as socio-economic characteristics of respondents. The study employed descriptive and quantitative methods for the data analysis. logit regression model was employed under the quantitative method by the study as the empirical estimation method.

#### 2.1 THEORETICAL FRAMEWORK:

Probably the most important insight into the study of the demand for healthcare is that this reflects a *Derived Demand for Health*; that it is not healthcare per se that people demand, but rather improvement in the initial stock of health Grossman, (1972). According to the Grossman human capital model, health is a choice variable because it is a source of utility (satisfaction) and because it determines income or wealth levels. That is, health is demanded by consumers for two reasons. As a consumption commodity, it directly enters their preference functions. As an investment commodity, it determines the total amount of time available for market and nonmarket activities. Gross investments are produced by household production functions that relate an output of health to ~~such choice~~ variables or health inputs as medical care utilization, diet, exercise, cigarette smoking, and alcohol consumption. In addition, the production function is affected by the efficiency or productivity of a given consumer as reflected by his or her personal characteristics and socioeconomic status.

Thus, one consumes a drug or will do daily physical exercise, “a necessary evil,” to improve upon his health stock or avoid the depreciation of the stock of health capital. Injudicious use of antibiotics. The new pharmaceutical framework makes the analysis of patient preferences interesting, however literature on pharmaceuticals demand are very limited and has always been focused on the behavior of either physicians or pharmacists, Anna Merino-Castello, (2003)

## **2.2 THE NATURE OF PHARMACEUTICALS DEMAND ON THE MARKET:**

Demand for pharmaceutical drugs is unusual, in the sense that, the consumer is typically not the one deciding which product to consume and often not the one paying for it (where there is national health insurance). Indeed, the purchase of pharmaceutical products involves a multistage process: firstly, a physician writes a drug prescription, secondly, a pharmacist dispenses and substitutes whenever possible (diagnosis and treatment) and, finally, a patient pays and consumes (drug consumption), where there is no national health insurance. The role of the pharmacist at the dispensing stage is determined by the nature of national substitution laws and the amount to be paid by the patient depends on the pharmaceuticals reimbursement mechanism that applies to each country, Anna Merino-Castelló, (2003). The drug purchasing process is characterized by the existence of information asymmetries between physicians and patients and uncertainty about drug effectiveness. Because medical knowledge is so complicated, the information held by the physician regarding the consequences and possibilities of treatment is necessarily ~~very much~~ greater than that of the patient, or at least, so it is believed by both parties.

However it must be noted that this is not the case for OTC drugs, available at drugstores without a physician's prescription.

### 2.3 DEMAND AND CONSUMER BEHAVIOUR:

The demand for any drug is determined, like most consumables, by (for example) consumers' tastes and preferences, attitudes, social conditions, and peer pressure. Economics does not have any specific theories about why consumers prefer one product to another, only general theories of consumer behaviour are often employed, Lisa Jones et al (2007). However, even in its simplest state, it may be sufficient to say 'drug consumers like drugs' and hence there is always likely to be a demand for them, Gerstein & Harwood (1990). Even if they are prohibited, there is a strong positive preference for drugs, especially among some population groups (e.g. young adults).

Traditional utility maximizing theory suggests that value is obtained by directly consuming goods and services or as a result of the secondary effects of consumption (e.g. the convenience of driving a car). It is more complex in the drug field where utility and health may conflict. With normal market goods individuals are usually assumed to look after their own personal well-being and possess the full information to do this. Drug taking may be in the pursuit of happiness but information is not always available regarding the dangers and problems that can arise when drug is consumed without professional advice, Fordham et al (2007).

Dasgupta (2001) has argued that classic utilitarian theory ignores the experiential state of 'happiness' for its own sake, which can be momentarily strong and real for individuals but which may not yield ultimate satisfaction or be necessarily in one's best interests. As he states, "one could be in a happy frame of mind under the influence of drugs and yet be in a bad state" (Dasgupta, 2001).

Although the desire to consume OTC antibiotics can be analyzed in the same way as the demand and supply of every day goods, there are obviously some important differences in the

markets, especially for illegal drugs, in particular the consequences of consumption. In unregulated markets the potential magnitude for harm (some irreversible) is significant as information about the content and quality of illegal drugs is very limited. It is not only the addictive qualities of drugs but also the imperfect information and supplier monopolies that weaken 'consumer sovereignty' in illegal markets.

Price in particular is a strong signal (as it is in most markets) and affects both the supply and the demand for drugs. Like conventional consumers, drug users are sensitive to price. Assuming that the majority of drug users are not dependent, price sensitivity may exist when the price of their drug changes. For example, studies have shown that the demand for cannabis and methamphetamines are both sensitive to price and are consumed more at times when their prices are low Abt Associates Inc.,( 2000).

The demand for one particular drug may also depend on changes in the price and availability of another Sumnall et al. ( 2004) on the market

#### **2.4 DEPENDENCE (the lagged effect of the previous consumption).**

There is of course the major issue of dependence, which breaks conventional axioms of '*consumer sovereignty*' in economic rationalism. Dependence is seen from an economic perspective as future levels of consumption being dependent on current consumption levels (with possible increases over time due to tolerance); it is assumed that truly dependent individuals have little control over their personal levels of consumption. In reality, this may not be the case and some dependent users may report that drug taking is counterproductive (e.g. in terms of employment, family relationships) even if they find the acute drug experience satisfying.

It may even be counterproductive to the experience of the happiness-seeking component itself. However, there may be more individuals (who have been described as 'rational addicts') who consciously consume drugs beyond an optimal point in the short run, whilst in the long-run moderating, or even ceasing their consumption altogether Grossman & Chaloupka, (1998). Becker and Murphy (1998) developed the rational model of addiction, which assumes that addicts behave rationally. It is a controversial theory but their model emphasises the interdependency of past, current, and future consumption of an addictive good. The main element of this and other models of addictive behaviour is that an increase in past consumption of an addictive good raises the marginal utility of current consumption and therefore raises current consumption

A key feature of the theory is that addicts are rational or farsighted in the sense that they anticipate the expected future consequences of their current actions, Grossman & Chaloupka, (1998).

## **2.5 SUPPLIER INDUCED DEMAND FOR OTC ANTIBIOTICS:**

Credence goods have the characteristics that, even when consumers can observe the utility they derive from the product/service ex-post, they cannot judge whether the quality they received corresponds to their ex-ante requirements. Therefore, sellers act as experts determining customers' needs. This information asymmetry between buyer and seller obviously creates strong incentives for opportunistic seller behavior Edmonds, (1997). If this expert also supplies the customer with the treatment then the "expert fraudulent" problem can emerge, that is, the expert prescribes excessive use of the product to the consumer. This is usually the case between Pharmacist and consumers (patients). As consumers are aware of the expert fraudulent

problem, they face a psychological switching cost of changing from an expert they believe they can rely on Klemperer, (1995). As a consequence, trust becomes a key element in the relationship between the consumer and the expert. This may result in patients hiding their prescription forms and demand the drug over the counter, based on previous consumer experience or some sketchy information, as this strategy will help the consumer to avoid being defrauded by the drug seller.

## **2.6 BRAND LOYALTY ON THE MARKET:**

As previously mentioned, drug consumption shares the characteristics of experience goods. An experience good is a product whose quality or suitability for the buyer is only discoverable after consumption. When the buyer knows more about the quality of one good the longer he has consumed it, the option to switch is not an attractive one because of the risk it involves. Consequently, in order to switch, buyers may have to be compensated for this uncertainty. As stated by Klemperer (1995), consumers tend to re-use those medicines that have already worked for them, in preference to taking the gamble of trying drugs that they have not tested before and that may not suit them but has been prescribed by health professional.

In pharmaceutical markets, a consumer behaves as if they faced a switching cost equal to the maximum premium that they would be willing to pay to be guaranteed a product of the same value as the one they have previously purchased, Klemperer (1987). Conclusion, under the scenario of easier access to information, patients become more demanding and may even reject their physicians' prescription. Furthermore, new regulation also encourages patients to adopt an active role in the decision-making process between brand-name and generic drugs. Consumers

who have developed their loyalty to a particular drug for a specific treatment are likely to ignore any physician's advice and demand the drug over the counter.

## **2.7 THE DEMAND-SIDE FACTORS:**

### **2.7.1 Income And employment.**

Richer countries generally use more outpatient antibiotics compared to Lower-income countries, M. Filippini et al (2010). The result from the study conjectures that Antimicrobials may not be as strongly normal goods as argued by Baye et al. (1997). It is argued that even patients with prescription forms to purchase drugs will either hide or destroy the form and just purchase the quantity they can, because there is the perception that any prescribed medicine from health professionals (connotes acute condition and scarcity of the drug) is expensive, in that the consumer is "restricted" and so this give some kind of market power to the pharmacists to impose exorbitant prices on the drug and sell to them. Economic pressures influence patients and pharmacists to demand (patients) and supply (pharmacists) antibiotics over the counter. Patients may see it as time wasting to visits a physician, if the infection has ever been reported and then certain antibiotics were prescribed in the first instance, visiting the physician again is a waste of precious time, particularly if the infection or his/her condition is less severe.

In this productivity driven society, patients may seek a fast fixed to all the infections, so long as he/she can "manage" this outside the hospital; given the fact that some jobs pay hourly or daily and certain managers may ~~lay off~~ staff who persistently report sickness on the job. The literature on dynamic aspects of consumption can be divided in two main aspects, Chaloupka, (1991).

The first one is represented by studies on endogenous tastes or habit formation Gorman, (1967); Pollak, (1970, 1976); and Boyer, (1983). The second one consists of studies on rational addictive

consumption Stigler and Becker, (1977); Becker and Murphy, (1988); Becker et al, (1991, 1994). The main insights of rational addiction are theoretically derived by Becker and Murphy (1988), who showed that addictive behaviour is influenced by the discount rate of future consumption, expected income and the price changes. Addictive behaviour with drugs determines its demand by the consumer, even without prescriptions from a qualified health professional.

### 2.7.2 Education:

The level of education is negatively related to the per capita outpatient antibiotic consumption and is highly significant, Goosens et al (2000). It shows that an increase in the percentage of people with higher education reduces the individual consumption of over the counter antibiotics. The study revealed that education elasticity are close to zero in all the estimations. The outcome advances that countries with a higher proportion of highly educated people use antibiotics more efficiently, *ceteris paribus*. In the case of antibiotics in outpatient care the possible link between increasing consumption and the reduced effectiveness due to bacterial resistance may induce more educated individuals to refrain from antibiotic utilization. Another explanation is that more educated individuals show better compliance with antibiotic treatment, hence a lower amount of antibiotic doses is required for effective care, *ceteris paribus*.

### 2.7.3 Age Influence:

Bretteville-Jensen AL (2006) studies estimations showed positive and significant coefficients of the proportion of individuals below 25 and outpatient antibiotic use and misuse. Filippini M, Masiero G, Moschetti K (2009); also found a positive impact of the proportion of the population

between 65 and 79 in their studies for outpatients antibiotics consumption. Indeed, the literature on determinants of health care expenditure generally suggests that the increasing prevalence of chronic health problems as people grow older may determine an increase in the utilization of health care services either in the home or in a hospital facility. However, this may not hold for antibiotics in the same extent. Di Matteo and Grootendorst (1998) found a slightly significant increase in drug expenditure in the population between 64 and 74. The estimated impact of young consumers could even be stronger. The result is not confirmed by the more recent study by Di Matteo (2005). Because of major health problems, one can point out that people in the last few years of life are more likely to consume antibiotics in nursing homes or hospital clinics rather than doing self-medication. Filippini M, Masiero G, Moschetti K (2009).

#### **2.7.4 Cultural Influence:**

Some countries share cultural characteristics that may shape their attitudes towards the use of antibiotics. Indeed, public perception of the need for antibiotics and the prescription policy may be affected by cultural identities, Moschetti K et al (2006). These hypotheses are worth testing also in the light of differences observed in antibiotic consumption across regional clusters Goosens et al., (2005). Cultural covariates introduced in the models exhibited significant coefficients. They indicated that both antibiotic use and misuse are higher in southern and eastern part of Europe compared to western European countries. This result should generally account for cross-country differences in the characteristics of the demand, hence in patients' attitude towards antibiotics. However, it is hard to exclude any dependence between demand and supply, that is, patients and pharmacists, when decisions about consumption are taken.

## 2.8 SUPPLY- SIDE FACTORS:

### 2.8.1 Payment Systems Of Pharmacists:

Differences in outpatient antibiotic use across countries can hardly be explained by epidemiological, demographic and cultural factors only. Supply-side factors such as the density of pharmacists and other health facilities and economic incentives attached to the remuneration system may contribute to the explanation of variations in over the counter antibiotic consumption. Indeed, an increase in the density of pharmacists in a country or a community causes an increase in demand for antibiotics Filippini M, Masiero G, Moschetti K (2009). Any remuneration system based on commission- one is remunerated according to the quantity of drugs dispensed, will influence one's decision to sell to consumers, though they come to shops without prescription, in order to increase sales and profits levels of the business. Remuneration system, based on salary, is likely to avoid this problem in the drugs and healthcare market. A very significant question usually asked is "why will pharmacists keep on selling antibiotics over the counter, knowing that the practice is illegal" by (FDB) and in almost all countries? The pharmacists may flout this law, due to the high perishability of the drug; the drug must be sold as quickly as possible to avoid the expiration of the stock in the shop, which can cost the collapse of the business. A system of compensation for unsold or expired drugs in the shops will have avoided this kind of problem, but unfortunately in Ghana, there is nothing of that sort. It is obvious that drug consumption satisfies the characteristics of an experience good and raises brand loyalty among consumers. The existence of information asymmetries between physician and patients and uncertainty about drug effectiveness generate supplier inducement and brand loyalty respectively.

### 2.8.2 Physicians' "Scribbles" On Forms:

Prescriptions are usually hand-written by the physician and given directly to the patient. The patient then delivers the written prescription to a pharmacy, and, usually after some period of time, the patient receives the medication prescribed. In some cases, a staff member in the physician's office phones or faxes the prescriptions in to the pharmacy. For refill requests, the Pharmacist generally phones the physician for approval. There are many problems inherent in this process. Illegible handwriting by a busy physician may necessitate follow-up by an equally busy pharmacist to ensure the proper interpretation of the prescription. If this follow-up does not occur, there is the risk that the wrong medication may be delivered to the patient or the pharmacist may sell the drug based on the consumer's health condition, his previous experience or financial strength of the consumer (without the prescription), or at best turn the consumer away under the pretence that the drug is not in stock.

The Washington Post in Nov. 30, 1999, reported that the Institute of Medicine of the National Academy of Sciences issued a report that said that medical errors may be the fifth leading cause of death in the United States. This report stated that as many as 98,000 Americans die unnecessarily every year from medical mistakes made by physicians, pharmacists, and other healthcare professionals, Noffsinger and Chin (2000).

Other frequent errors are inappropriately prescribed dosage levels, incorrectly spelled drug names, incomplete prescriptions, incorrect instructions, and drugs prescribed that are outside payer formulary guidelines, The Washington Post (1999). A formulary is a list developed by a payer, such as a managed care organization (MCO), which specifies which drugs will be covered by the payer. These errors require clarifying phone calls by the pharmacist to the physician. It also requires the pharmacist to be an order-entry clerk, which is clearly not the optimal use of

his or her time. Not only does this process waste time, but it also contributes to the high risk of the wrong drug or dosage being delivered to the patient.

Similarly, Consumers who mishandle or misplace their prescription forms are, often times, supplied with “any brand” without double checking with the physician, in fact such consumers may be considered as the vulnerable preys, who lack lots of information on the market, and even their own welfare, and so may easily be preyed upon by the drug seller.

### 2.8.3 EMPIRICAL REVIEW:

Over the counter (OTC) antibiotic consumption refers to the consumption of antibiotics without any form of prescription or advice from a health professional. Antibiotics, like all other drugs, are supposed to be consumed based on the prescription and advice of a qualified health professional who monitors and evaluate the efficacy of the drug on the patient.

Tagoe and Attah, in 2010 conducted a study to determine patient’s perspective and involvement in the use and abuse of antibiotics in the Cape Coast Metropolis of Ghana. A purposive sampling of 530 patients from 15 years and above patronizing 11 pharmacy shops in the Cape Coast Metropolis was undertaken by administering questionnaires and interviews. 59.9% of the interviewees were aware of the harmful potential of antibiotics abuse yet a significant number (71.5%) purchase antibiotics without prescriptions with 69.9% personally requesting specific drugs without seeking advice from the pharmacists. A significant amount of the antibiotics purchased was Amoxicillin (71.5%) whilst Cold/Running Nose (50.8%) and Cough/Chest pains (33.1%) were the most common reasons for antibiotic purchases respectively. About 25.4% of patients purchased the drug without any sign or symptom of illness whilst 18.5% of the patients confirmed the drug did not work when used for the illness for which they were purchasing the

last time. However, 70.8% of the patients have at least secondary education. This research work exposes the abuse of antibiotics, the nature of the abuse and the drugs abused in the Cape Coast Municipality of Ghana.

Andrea Djie-Maletz<sup>1</sup> et al, in 2008, conducted a study on high rate of resistance to locally used antibiotics among enteric bacteria from children in Northern Ghana. It came out that antibiotics widely used in that area include ampicillin or amoxicillin, trimethoprim/sulfamethoxazole (SXT) and chloramphenicol. Stool specimens were obtained from 367 children with or without acute diarrhea. Isolates were differentiated using standard laboratory procedures and tested using a breakpoint microbroth dilution method for their susceptibility to 18 antimicrobials, and by disc diffusion for their susceptibility to chloramphenicol.

The study concluded that enteric bacteria from children in urban Northern Ghana are highly resistant to antibiotics used in that area. Therefore, new antibiotics should be introduced for the treatment of infections caused by these bacteria.

John Wiley & Sons conducted study from 1999–2012 to investigate antibiotic use and abuse in five national household surveys conducted with the WHO methodology to identify key determinants of antibiotic use and abuse in some communities in Africa. Data from The Gambia, Ghana, Kenya, Nigeria and Uganda surveys were combined. The study employed logistic regression models that accounted for the clustered survey design to identify the determinants of care seeking outside the home and antibiotic use for 2914 cases of recent acute illness. Overall, 95% of individuals with acute illness took medicines, 90% sought care outside their homes and 36% took antibiotics; with or without prescription. In multivariate analyses, illness severity was a strong predictor of seeking care outside the home, less severe infection was likely to result to

self-medication with antibiotics. Among those who sought outside care, the strongest predictor of antibiotic use was the presence of upper respiratory symptoms, followed by gastrointestinal symptoms or difficulty breathing, and antibiotics use was less likely if they had fever. The study concluded that nature and severity of symptoms and patterns of care seeking had the greatest influence on decisions to take antibiotics. Antibiotics were widely available and inappropriately used in all settings.

A community-based, cross-sectional survey was conducted in Ulaanbaatar (Mongolia) in March–April 2009, using a Multivariate logistic regression by Togoobaatar et al, on non-prescribed use of antibiotics for children in an urban community (540 households in the communities in Mongolia), using SPSS version 16.0. The overall response rate was 93% (503/540). This study conducted in Mongolia urban community revealed that Antibiotics had been given to 71% (356/503) of the children during the 6-month period before the study. About one-fifth (21%) of the 503 children had taken antibiotics without a prescription, and both prescribed and non-prescribed antibiotics were used concomitantly. In all, 42.3% (95% confidence interval, CI: 37.8–46.9) of the children were given non-prescribed antibiotics. Responses to a multiple-choice question showed that fewer than half of the respondents (210/503) had given antibiotics to the index child without a prescription for symptoms of upper respiratory tract infection such as cough (84%), fever (66%) or nasal (65%) and throat symptoms (60%). The main source of non-prescribed antibiotics was pharmacies (86%). Amoxicillin was the most commonly used non-prescribed antibiotic (58%), followed by ampicillin (25%), erythromycin (6%), chloramphenicol (5%) and trimethoprim-sulfamethoxazole. Of the non-prescribed antibiotics, 31% were given on the advice of pharmacists, 35% on the advice of family members and 8% on the advice of friends.

Reasons for not seeking a physician's advice included the belief that the illness was not severe (70%) and previous experience with the doctor always prescribing the same antibiotics for similar conditions (15%). Past experiences and familiarity with a drug were the main reasons for selecting a particular antibiotic (82%).

Larissa Grigoryan et al, in February 2008, conducted a study on determinants of self-medication with antibiotics in Europe; the impact of beliefs, country wealth and the healthcare system.

Face-to-face structured interviews were conducted in 12 countries. Countries were selected to represent Northern/Western (Austria, The Netherlands, Sweden, the UK and Belgium), Southern (Italy, Malta, Israel and Spain) and Eastern (the Czech Republic, Lithuania and Croatia) European regions.

Questionnaires were mailed to 1000–3000 randomly selected adults in each country for study. These were equally divided between urban and rural area. The results of the multilevel logistic regression analysis showed that Self-medication with antibiotics occurs among the population in Europe, particularly in Southern and eastern countries. The paper studied the impact of predisposing factors (e.g. attitudes and knowledge concerning antibiotic use and self-medication) and enabling factors (country wealth and healthcare system factors) on self-medication with antibiotics in Europe.

The researchers interviewed a subsample of 1101 respondents. A multilevel analysis with two levels (respondent and country) was performed. Variables that were statistically significantly different between users and non-users of self-medication were considered for inclusion into the multilevel regression analyses. Predisposing factors included individual-level characteristics. High perceived appropriateness of self-medication with antibiotics for bronchitis and an attitude favoring antibiotic use for minor ailment were related to a higher likelihood of self-medication.

At the individual level, perceived availability of antibiotics without a prescription was related to increased probability of self-medication. At the country level, higher gross domestic product (wealth) and exact dispensation of prescribed tablet quantities by pharmacies were independently associated with lower likelihood of self-medication.

The conclusion was that, interventions aimed at preventing antibiotics self-medication should include public education, enforcing regulations regarding the sale of antibiotics, and implementing laws for dispensing exact prescribed tablet quantities in pharmacies. With the included determinants, the work explained almost all the variance at the country level, but not at the individual level.

Massimo Filippini et al, in June 2010, conducted a study in Europe on Socioeconomic determinants of outpatient antibiotic use in Europe. The aim of the study was to assess the impact of socioeconomic determinants and the role played by information about bacterial resistance. Data on systemically administered antibiotics and socioeconomic determinants in 17 European countries were available between 2000 and 2005. The study estimated an econometric model using a hybrid log-log functional form and random effects generalized least squares regressions. Lagged values and the instrumental variable method were applied to address endogeneity of bacterial resistance and infections. The results indicated that, population income; demographic structure, density of general practitioners and their remuneration method appeared to be significant determinants of out-patient antibiotic consumption.

The study confirms that socioeconomic factors should be taken into account while explaining differences in outpatient antibiotic use across countries. The impact of income suggests that richer countries in Europe use more outpatient antibiotics compared to countries with lower

ability to pay. The result conjectures that Antimicrobials are normal goods. This means that income may contribute to greater access to medical care in outpatient drug consumption.

The results were stable and no structural difference was observed across the models. The time trend (t) did not show any significant increase in the use of outpatient antibiotics per capita over time. The responsiveness of the per capita outpatient antibiotic use to a 1% change in the average national income, *ceteris paribus*, was between 0.49 and 0.77%. The level of education reduced antimicrobial consumption significantly at less than 10%. A similar impact was observed for women participation in the labour market.

It was observed that a 1% increase in women participation reduced antibiotic consumption by 0.57 and 0.67%. As for demographic covariates, the study revealed an association between the proportions of individuals aged 14–25 years and increasing levels of antimicrobial consumption. The impact of individuals below 14 years was also positive, although not highly significant. Finally, the study found a significant association between the proportion of the population aged 65–79 years and increasing outpatient's antimicrobial use.

González et al (2010), used panel data, estimating dynamic consumption of antibiotics and the shadow effect of bacterial resistance. Consumption of antibiotics is reinforced by past use because of bacterial resistance, which represents a growing concern in many countries. The purpose of the paper was to explore how consumers adjust their current level of antibiotic consumption towards desired levels over time. They constructed a balanced panel dataset (2000-2007) for 20 Italian regions and estimated a dynamic model where antibiotic consumption depends upon demographic and socioeconomic characteristics of the population, the supply of health care in the community, antibiotic price, and the capital stock. Of endogenous bacterial resistance measured by past consumption.

Alternative dynamic estimators were applied for short panels: the bias-corrected least squares dummy variable (LSDVC) and the system Blundell-Bond GMM estimator (GMM-BB) were applied. The estimated results were stable across different model specifications and show that antibiotic use in previous periods has a positive impact on current antimicrobial consumption, (between 0.14 and 0.39). This revealed that the process of adjustment to desired levels of consumption is relatively fast (approximately 1.2-1.6 years).

Anna Merino-Castelló, (2003) investigated the Demand for Pharmaceutical Drugs, adopting the Choice Modeling Experiment. Using a stated preference model based on a choice survey, she found evidence of how significant physicians' prescription and pharmacists' recommendation become, throughout the drug purchase process, and to what extent, brand loyalty influences the final decision of the consumer in the drug market.

The impact of bacterial resistance has been associated with widespread and availability of antibiotics all over the world.

Econometric estimations indicate that the per capita income, the proportion of children and the elderly and cultural attitudes in countries induce higher levels of antibiotic use. On the other hand, higher levels of education reduce consumption. Increasing antibiotic use is also associated with a higher intensity of health professionals' advice in the communities and a fee-for-service and salary remuneration for health professionals. Previous consumption behaviour has a positive impact on current antibiotic use. Addictive behaviors of the consumer with particular drugs determine its demand without prescription; antibiotics are no exception on the pharmaceuticals market.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.0 INTRODUCTION**

This chapter covers the various methods used in undertaking the research and the background of the study area.

The first part looks at the background of the study area. This elaborates on the physical, demographic, as well as socio-economic characteristics: social amenities-health and educational institutions and infrastructures in the study area.

The methods of study describe the source of data, the research design used, the econometrics model adopted in the study and the statistical test for the analysis, sampling methods, development of questionnaires, survey instruments etc.

#### **3.1 BACKGROUND OF THE STUDY AREA:**

Ejisu-Juabeng Municipal is one of the 27 administrative Districts in the Ashanti Region of Ghana. The Municipal is known globally for its rich cultural heritage and tourists attractions notably the booming kente weaving industry at Bonaire, a community in the municipality. The Municipal stretches over an area of 637.2 km<sup>2</sup> constituting about 10% of the entire Ashanti Region and with Ejisu as its capital. Currently it has four urban settlements namely, Ejisu, Juabeng, Besease and Bonwire. The Municipal is located in the central part of the Ashanti Region and provides enormous opportunity for creating an inland port for Ghana to serve northern section of the country. The Municipal falls within the forest dissected plateau terrain region. This region is underlain by the pre-cambrian rocks of the Birimian and Tarkwaian formations. It rises from about 240 metres to 300 metres above sea level. The area is generally

undulating and is drained by a number of rivers, notable among them being Oda, Anum, Bankro, Hwere and Baffoe. In the rainy season, occasional flooding are experienced in the inland valleys along the river basins. The construction of a dam on the Anum River at Nobewam for irrigation offers a great potential for agriculture development in the District.

### **3.1.1 Population Density:**

The working age is about 64 percent of the population whilst the dependant age forms about 36 percent of the population. The age dependency ratio in the district is about 1:0.3 thus substantiating the fact that there are more people in the working age than the dependant age. Steady rise in the population of the district with time. From the socio- economic survey conducted the age dependency ratio for the district is 1:0.7. This means that 100 persons in the active population group are being depended on by 70 persons in the inactive population group. The working population group is not over burdened since one person in the active group takes care of himself and another person in the inactive. The size of the district is 637.2 sq.km and that of the national (Ghana) is 238,537 sq.km. It has been estimated that the population density growth rate of 2.5% (2000-2006) for the district is less than the national rate of 2.6% (2000-2006).

### **3.1.2 Health:**

The inadequacy of health facilities within the various settlements in the Municipal have resulted in most of the people in the Municipal patronizing health services outside the settlements in which they live even though most of these facilities are located in the Municipality, It is estimated that about 59.9 percent of the population patronize health facilities outside the

settlements they live whilst the other 40.1 percent patronize health facilities within the settlements they live. The type of health facility highly patronized within the Ejisu -Juabeng Municipal is the hospital constituting about 67.6 percent. Other health facilities like clinic, health post, traditional healers, maternity homes and drug store constitute about 27.1 percent, 0.3 percent, 0.7 percent, 2.0 percent and 2.3 percent respectively.. The average distance traveled by the inhabitants of the Municipal to the health facilities is about 3.7 km whilst the average travel time is about 42.8 minutes. Source: Population Reference Bureau/ Data Finder - Ghana, 2004).

About 80.3 percent of the population patronizes public health facilities whilst the other 19.7 percent patronize private health facilities.

### **3.1.3 Education:**

According to educational survey conducted in 2005, there are 122 Kindergarten/Nursery schools, 76 are public and 46 are private. The number has been found to be inadequate for the schools to absorb all the children in this bracket. The Primary schools are 134, comprising 88 public and 46 private. These schools are manned by 558 teachers made up of 515 trained and 43 untrained. The total enrolment is 21069. The pupil teacher ratio (PTR) is 38:1. The figure is above the national ratio of 35:1. For the Junior Secondary School (JSS) are 77 and out of this figure, 56 are public and 21 are in the private hands. The total enrolment of these schools is 8000. These schools are manned by 429 teachers with 411 trained and 18 untrained. The PTR is 19:1. In terms of Senior Secondary education, the Municipal has six (6) schools, made up of five (5) public and one private. These schools are not able to meet the total demand of JSS products.

The Municipal therefore, has to encourage communities and individuals to establish their own Second Cycle Schools especially technical and Vocational for employability.

### 3.2 MODEL SPECIFICATIONS.

#### 3.2 .1: MODEL 1 (Demand-Side Factors)

$Y_d = f(Y, \text{EDU}, \text{AGE}, \text{HPA}, \text{PX}, \text{RES}, \text{MAR}, \text{EMPT}, \text{EOB}, \text{CDI}, \text{CAH}, \text{PDF}, \text{ADVTS}, \text{CHP CCD})$

Where:

$Y_d$  = Demand for OTC antibiotics

$Y$  = Income Level

$\text{EDU}$  = Level of education

$\text{AGE}$  = Age distribution of the population

$\text{HPA}$  = Health professionals advice

$\text{PX}$  = Prices of OTC antibiotics

$\text{RES}$  = Residential status

$\text{MAR}$  = Marital status

$\text{EMPT}$  = Employment status

$\text{EOB}$  = Effectiveness of a brand of antibiotics

$\text{CDI}$  = Consumption due to infection

$\text{CAH}$  = Consumer attending hospital

$\text{PDF}$  = Proximity to drug facility/store

$\text{ADVTS}$  = Influence of advert on the consumer

CHP= Consult health professionals

CCD= Complete course of drug consumption

$$Y_d = \beta_0 + \beta_1 Y_{it} + \beta_2 EDU_{it} + \beta_3 AGE_{it} + \beta_4 HPA_{it} + \beta_5 PX_{it} + \beta_6 RES_{it} + \beta_7 MAR_{it} + \beta_8 EMPT_{it} + \beta_9 EOB + \beta_{10} CDI + \beta_{11} CAH + \beta_{12} PHF + \beta_{13} ADVTS + \beta_{14} CCD + \mu_{it}$$

Demand for OTC antibiotics ( $Y_d$ )=is a dummy variable equal to 1, if the consumer demands OTC antibiotics and 0 otherwise.

Income=Y

Education (Edu) = is a vector of variables that takes four different values for each education level

Age=Age

Price (PX) =is a dummy variable equal to 1 if the "Price influence" takes the level YES and 0 otherwise.

Residential Status (RES) = is a dummy variable equal to 1 if the respondent resides in settler community (indigenous) and 0 otherwise.

Marital Status (MAR)=is a dummy variable equal to 1 if the "married" takes the level YES and 0 otherwise.

Employment (EMPT) =is a dummy variable equal to 1 if "employed" takes the level YES and 0 otherwise.

Effectiveness Of A Brand (EOB) =is a dummy variable equal to 1 if consumption is due to the effectiveness of a particular brand and 0 otherwise.

Consumption Due To Infection (CDI)=is a dummy variable equal to 1 if "consumption is due to infection and 0 otherwise.

Consumer Attending Hospital (CAH)=is a dummy variable equal to 1 if "Consumer Attends Hospital when infected" takes the level YES and 0 otherwise.

Proximity To Drugs Facility (PDF) =is a dummy variable equal to 1 if "Proximity" takes the level YES and 0 otherwise.

Influence Of Adverts (ADVTS)=is a dummy variable equal to 1 if "Adverts" takes the level YES and 0 otherwise.

Consult Health Professional (CHP)=is a dummy variable equal to 1 if "Consultation" takes the level YES, and 0 otherwise

Complete Course Of Drug (CCD)=is a dummy variable equal to 1 if "Complete Course" takes the level YES, and 0 otherwise.

The STATA 11.2 version command, "Logit"/executes the task for the binary logit regression model. In STATA's implementation of these estimators in logit, the actual values of the response variables are not relevant. Larger values are taken to correspond to higher outcomes (Baum, 2006). Thus a positive value means that the explanatory variable increases the probability of demanding or supplying the drug over the counter.

### **3.2.2 THE EXPECTED SIGNS OF THE ESTIMATED COEFFICIENTS: Model 1.**

The coefficient of income is expected to be positive or negative; the assumption is that consumption of normal goods and services improves with income including the consumption of

drugs for healthcare; however, if OTC antibiotics considered an inferior product, the relationship will be negative with income improvement.

Education is expected to have a negative influence on the consumption of OTC antibiotics, it is assumed that as one gets a formal, and or any informal education on the drug consumption behaviour from professionals, he/she will avoid the negative consequences of over the counter drug consumption. However, the signs of the various levels of education are unknown.

The age of the consumer is expected to have a positive influence on the drug consumption behaviours; the assumption is that, the individual become more aware of the negative consequences of drug misuse, and so will be very careful in engaging in OTC consumption.

Price is expected to have a significant influence on the consumer behavior of the OTC antibiotic; it is assumed that an increase in the price level will reduced the demand for any normal good, including antibiotics, all things being equal.

The coefficient of consultation of health professional on drug consumption is expected to be negative, implying that as the individual seeks professional advice in drug consumption behaviour, his/her engagement in drug misuse will be reduced to avoid any negative consequences on the individual's health.

The sign of the coefficients of both residential and marital status are unknown, but they are expected to have a significant influence on the demand for OTC antibiotics.

Employment is expected to have a positive and significant impact on the consumption of all goods including drugs for healthcare purposes. However, the signs of the various forms of employment are unknown.

The coefficient of brand effectiveness or drug efficacy is expected to be positive, based on the assumption that consumers will demand a drug which has a higher efficacy on their health condition.

The sign of consumption due to infection is expected to be positive; consumption increases with the level of infection rather than consuming for pleasure, "just to feel high".

The coefficient of consumer attending hospital is expected to be negative, based on the assumption that when the individual attends hospital when infected, he/ she gets professional advice and avoid demanding drugs over the counter.

Proximity to drug facility is expected to be positively related with demand for a drug over the counter- the closeness to the store , the higher the demand

Consultation of health professionals on drug consumption behavior is expected to be negatively related to the demand of the drug over the counter.

The coefficient of consumer completing the course of the drug is unknown; but expected to have a significant impact on the consumption of OTC antibiotics.

Advertisement is expected to have a positive influence on the drug consumption behavior of consumers, on the drug market. However, the signs of the various forms of advertisements are unknown.

### 3.2.3 MODEL 2 : ( Supply-Side Factors)

$$Y_s = f (SRS, RBC, YOE, ABTP, REMNT, BEDU, SEDU, TEDU, PKNW, GKNW, VGKNW, AGE, )$$

Where:

$Y_s$  =Dependent variable for the Supply of OTC antibiotics

SRS = Salaried remuneration system

RBC = Remuneration based on commission

YOE = Number of work experience in a /pharmacy shop.

ABTP= The consumer's ability to pay for the drug

REMNT= Reimbursement/Compensation for expired antibiotics in the shop

BEDU=Basic education qualification of chemical shop keepers/pharmacists

SEDU= Secondary school qualification of chemical shop keepers/pharmacists

TEDU=Tertiary education qualification of chemical shop keepers/pharmacists

PKNW= Poor knowledge of microbial infections by pharmacists/shop keepers

GKNW= Good knowledge of microbial infections by pharmacists/shop keepers

VGKNW= Very good knowledge of microbial infections by pharmacists/shop keepers

AGE= The age of the consumer

$$Y_s = \beta_0 + \beta_1 \text{SRS} + \beta_2 \text{RBC} + \beta_3 \text{YOE} + \beta_4 \text{ABTP} + \beta_5 \text{REMNT} + \beta_6 \text{BEDU} + \beta_7 \text{SEDU} + \beta_8 \text{TEDU} + \beta_9 \text{PKNW} + \beta_{10} \text{GKNW} + \beta_{11} \text{VGKNW} + \beta_{12} \text{AGE} + \mu_{it}$$

Supply of OTC antibiotics ( $Y_s$ )= is a dummy variable equals to 1, if the pharmacists supplies OTC antibiotics and 0 otherwise.

Salaried remuneration system(SRS) = is a dummy variable equals to 1, if the pharmacist is on salary payment scheme and 0 otherwise.

Remuneration based on commission (RBC)= is a dummy variable equals to 1, if remuneration is based on commission, and 0 otherwise.

Number of years worked in a pharmacy shops (YOE).

The consumer's ability to pay for the drug (ABTP)=is a dummy variable equal to 1 if "drug is sold based on the ability to pay" takes the level YES and 0 otherwise.

Reimbursement/Compensation for expired antibiotics in the shop ( REMNT) = is a dummy variable equal to 1 if "Reimbursement" takes the level YES and 0 otherwise.

Basic education qualification of chemical shop keepers/ pharmacists (BEDU)=is a dummy variable equal to 1 if "Basic education qualification" takes the level YES and 0 otherwise.

Secondary school qualification of chemical shop keepers/ pharmacists (SEDU) =is a dummy variable equal to 1 if "Secondary education qualification" takes the level YES and 0 otherwise

Tertiary education qualification of chemical shop keepers/ pharmacists (TEDU) =is a dummy variable equal to 1 if "Tertiary education qualification" takes the level YES and 0 otherwise

Poor knowledge of microbial infections by pharmacists/shop keepers (PKNW)=is a dummy variable equal to 1 if "Poor knowledge" takes the level YES and 0 otherwise

Good knowledge of microbial infections by pharmacists/shop keepers (GKNW) = is a dummy variable equal to 1 if "Good knowledge" takes the level YES and 0 otherwise

Very good knowledge of microbial infections by pharmacists/shop keepers (VGKNW) =is a dummy variable equal to 1 if "Very Good knowledge" takes the level YES and 0 otherwise

The age of the consumer (AGE) =is a dummy variable equal to 1 if "Age" takes the level YES and 0 otherwise

The STATA 11.2 version command, "Logit"/executes the task for the binary logit regression model, In STATA's implementation of these estimators in logit, the actual values of the response variables are not relevant. Larger values are taken to correspond to higher outcomes (Baum, 2006). The probability of supplying the drug without following any prescription increases with positive outcomes, negative outcomes reduces that likelihood.

### 3.2.4 THE EXPECTED SIGNS OF THE ESTIMATED COEFFICIENTS: Model 3.

$\beta_1$  is expected to have a negative coefficient based on the assumption that any remuneration system based on salary will avoid supplier induced demand for the drug over the counter, all things being equal. However,  $\beta_2$  is expected to have a positive coefficients and this is based on the assumption that any payment system based on commission will create supplier induced demand, there is the motivation to increase average sales at the end of the day.

The expected sign of  $\beta_3$ , is expected to be positive, based on the assumption experience builds confidence and the expertise for service delivery.

The coefficient of  $\beta_4$  is expected to be positive; this is based on the assumption that when the consumer exhibits the ability to pay for the drug at the point of sales, there is the motivation to sell the drug over the counter, irrespective of the consequences.

The coefficient of  $\beta_5$  is expected to be negative, based on the assumption that, when expired/unsold drugs are returned to producers or replaced, or the pharmacists reimbursed for expired drugs in the shops, there will be no motivation to sell over the counter and avoid drugs expiring in shops which can collapse the business.

The expected sign of the coefficient of  $\beta_6$  and  $\beta_7$  is positive but  $\beta_8$  is expected to be negative, given the education background of the pharmacists

The expected sign of  $\beta_9$  is negative, but that of  $\beta_{10}$  and  $\beta_{11}$  are expected to be positive, based on the assumption that good or very good knowledge on microbial infections will influence the seller to sell the drug over the counter. The sign of  $\beta_{12}$  is expected to be positive, based on the assumption that elderly persons are likely to follow instructions on drug use and comply, and so the seller is likely to sell to them though they demand without prescription.

### **3.3.0 METHODS OF STUDY:**

#### **3.3.1 DATA SOURCES AND COLLECTION**

Published and unpublished intervention studies on improving antimicrobial use by Health care providers in developing countries were sourced, journal articles, reports, reviews, and newsletters reporting interventions to improve the use of antimicrobial consumption, by health care providers.

This study used primary data in the form of structured interviews (questionnaire) as the means of data collection from consumers and drug sellers since they were the best source of the kind of information needed.

A community-based, cross-sectional study was conducted in the various communities in the Ejisu Juabeng Municipality. The study estimated a sample size of approximately 500 for an assumed prevalence of self-medication with antibiotics, a 95% confidence level and 5% margin of error.

It was essential to ensure that respondents understood the context in which the study was conducted and motivated to cooperate and able to participate in an informed manner. The context had to be as realistic as possible in order to encourage reliable and truthful responses (but not to bias the answers).

The interview consisted of two parts: firstly individuals were asked questions about their sociodemographic characteristics such as age, gender, educational level, professional status, income and habits of drug purchase with respect to over-the-counter antibiotics, and afterwards, they were asked to rank a set of alternatives according to their preferences for OTC antibiotics as against purchasing the drug with prescription on the drug market.

Subjects were selected by convenient sampling of all persons from 15 years and above, visiting all pharmacy shops or purchase drugs from hawkers in the Ejisu Municipality of Ghana for medication purposes.

### **3.3.2 DATA ANALYSIS METHODS:**

Two sets of structured questionnaires were used for the survey to capture information for both demand and supply sides characteristics of the consumer. These questionnaires were developed and administered to respondents. The questionnaire consisted of sections on: the socioeconomic and demographic characteristics of both households and drug sellers; These questionnaire were also developed to help capture information on the educational background, hospital attendance, type of antibiotic purchase, , adverse reactions to antibiotics etc. The questionnaire was completed by the subjects or for illiterate respondents; by the interviewer (The questionnaire was translated into the Asante Twi language and back-translated into English in the same study period.)

Parents and caregivers also reported whether they took antibiotics themselves without a prescription and whether they kept antibiotics at home or taken antibiotics from any tenants or family member in the house or outside the household.

An ad-hoc demand function for OTC antibiotics consumption in Ghana was specified. The demand for OTC antibiotics depends on the individual's stock of health (rate of infections), income, the price level of drug, and other socioeconomic variables such as age, marital status, education employment, effects of antibiotics abuse, and cultural attitudes (residence) towards the use of drugs. Socioeconomic variables are usually included in the model as proxies for the individual stock of health care, which is difficult to measure, Anna Merino-Castello,(2003).

Moreover, the demand for OTC antibiotics could also depend on some characteristics of the supply of health care services, such as health professionals' pieces of advice in the communities or the Pharmacists remuneration system, consumer health knowledge etc

We specify the following parsimonious empirical models for the determinants of OTC Antibiotics in Ghana.

Model 1, estimates the demand-side factors, influencing the over the counter antibiotics consumption in the country.

Model 2 estimated the expanded variable from model 1,(employment, education and adverts)

Model 3 estimates the supply– characteristics determining the consumption of over the counter antibiotics consumption in Ghana

### **3.3.3 EMPIRICAL ESTIMATION:**

Logit regression model is used by the study to determine the likelihood of OTC antibiotics consumption behaviour among the sample population. This study used sample response as to whether they have demanded (consumers) or supplied (chemical sellers) OTC antibiotics in the immediate past. And reasons responsible for these actions would be solicited with structured questionnaires.

Five hundred and ten (510) and two hundred (200) questionnaires were administered to consumers and licensed chemical sellers respectively in the Ejisu-Juabeng Municipality. The STATA 11.2 Version was used to estimate the logit regression model and the results presented in the next chapter; chapter four.

Let  $Y_i$  (Binary Dependent Variable), represents the observed response of each sample population (ith observation). Therefore,  $Y_i = 1$  for Demand for or Supply of OTC antibiotics; and  $Y_i = 0$  for no OTC antibiotics demand or supply. It follows that:

$$\text{Prob}(Y = 1/X) = f(X,\beta)$$

$$\text{Prob}(Y= 0/X) = \{ 1- f(X,\beta) \}$$

$$f(X,\beta) = X' \beta \dots\dots\dots 1$$

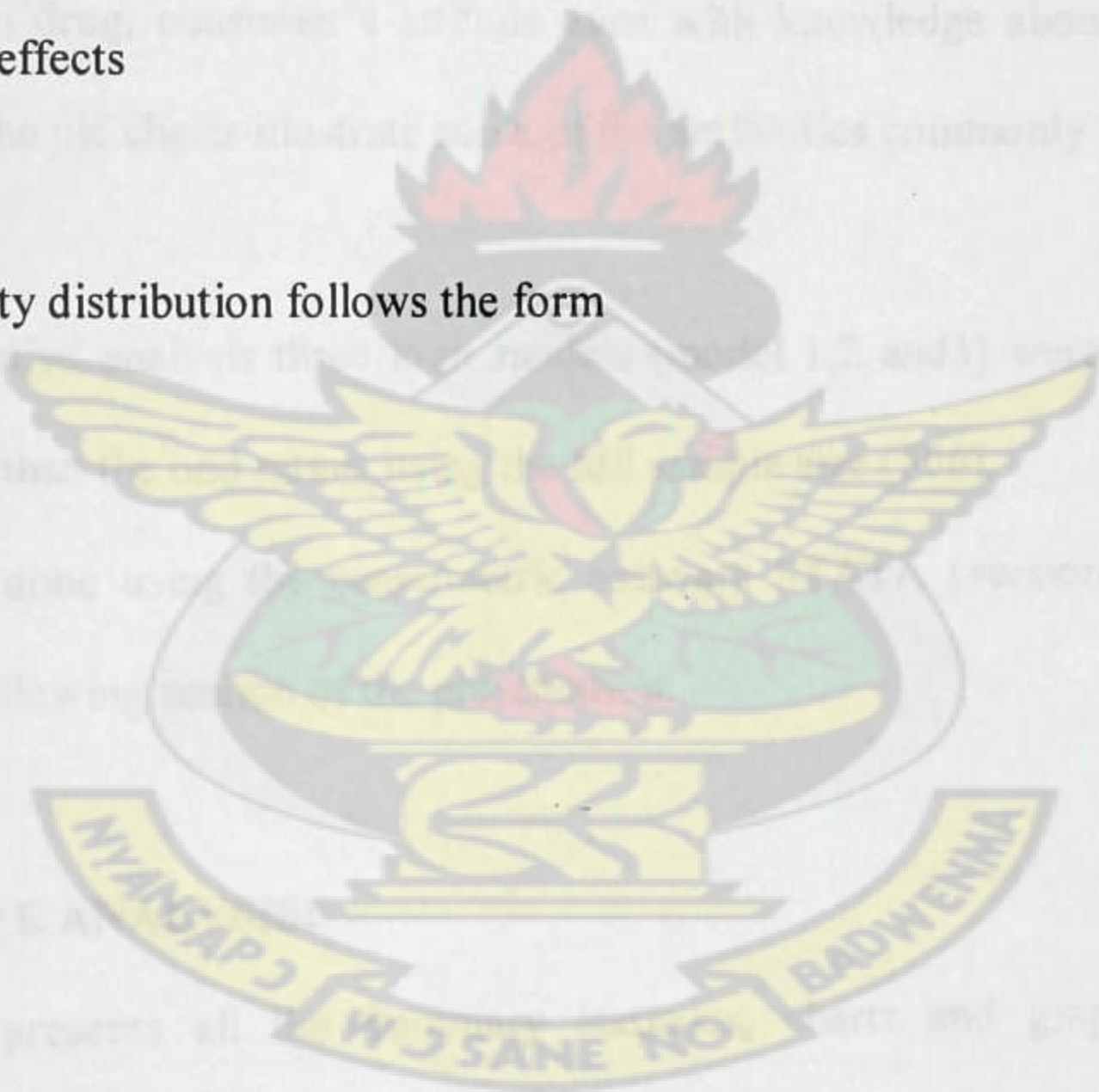
Where

X= Is the relevant effects

$\beta$  = parameters

The logit probability distribution follows the form

$$\text{Prob}(Y_i =1/X) =$$



## CHAPTER FOUR

### DATA PRESENTATION AND ANALYSIS:

#### 4.0 INTRODUCTION.

This chapter presents the analysis of the results of the study. Summary statistics table and bar graphs were employed under the descriptive statistics to consumer behaviour characteristics of the respondents in the study. The bar graphs were specifically used to compare the health conditions that make the consumer demand antibiotics, consumer's knowledge about microbial infections in their communities, why consumers demand the antibiotics over the counter instead of purchasing with drug, consumer's attitude even with knowledge about harmful effects of drug misuse, and the pie charts illustrate some of the antibiotics commonly misused in the study area.

Under the quantitative analysis three logit models (model 1,2 and3) were estimated reporting coefficients rather than the odd ratios, using the full sample size (506).

Estimations were done using the econometric software STATA (version 11.2) and findings discussed in the following section of the presentation.

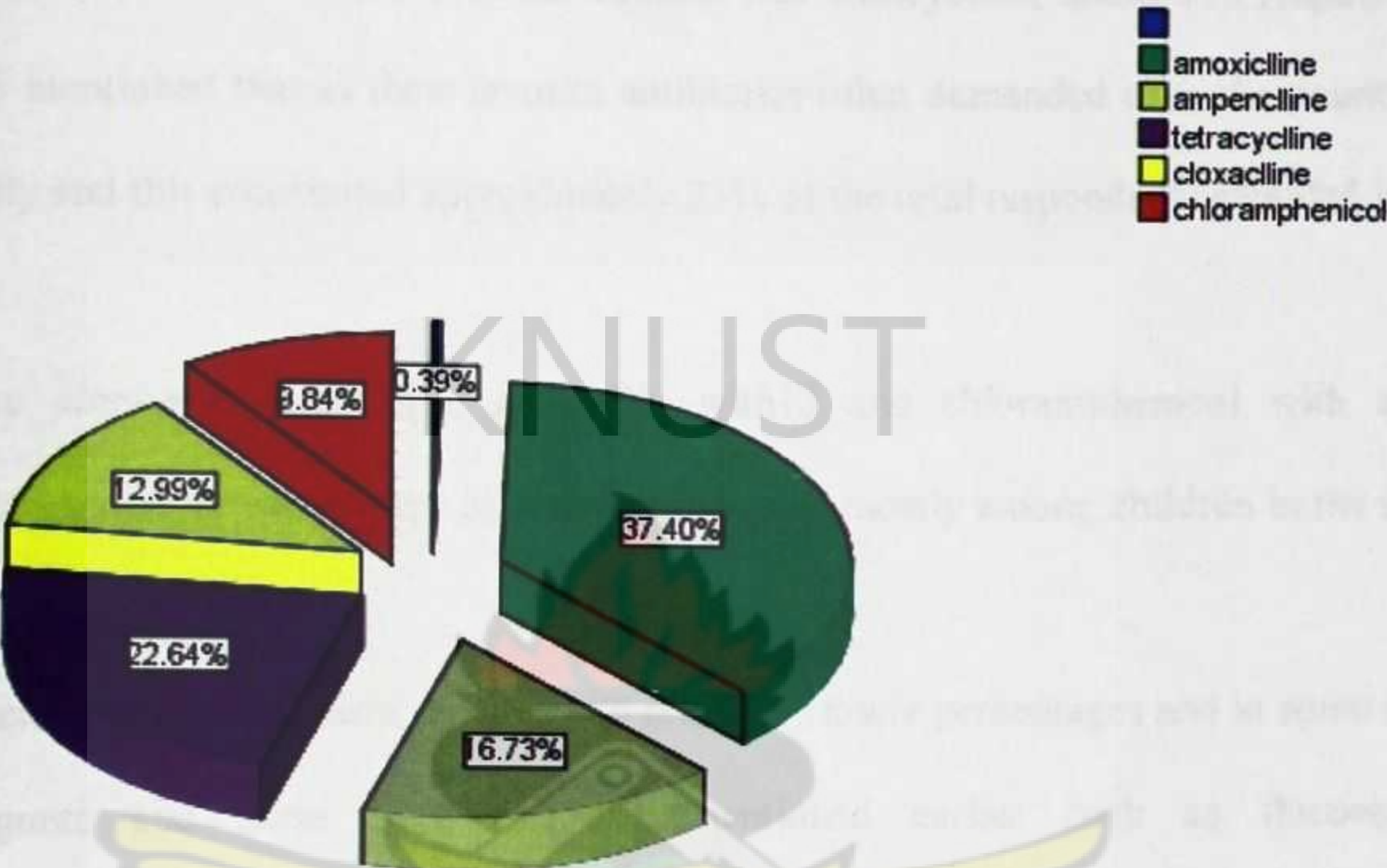
#### 4.1 DESCRIPTIVE ANALYSIS:

Here, the study presents all the Summary statistics, charts and graphs of the consumer characteristics of the respondents as captured during the survey in the Ejisu-Juaben Municipality in the Ashanti Region of Ghana.

The figure1 below illustrates some of the antibiotics commonly misused in the area; others included: metronidazole, flucoxacillin, fluconazole, ciprofloxacin, amoxiclav etc.

A PIE CHART SHOWING SOME OF THE ANTIBIOTICS COMMONLY DEMANDED OVER THE COUNTER

some antibiotics commonly purchased over the counter.



source: researcher's field survey (2013)

Figure 1 and its corresponding table 1:

some antibiotics commonly purchased over the counter.

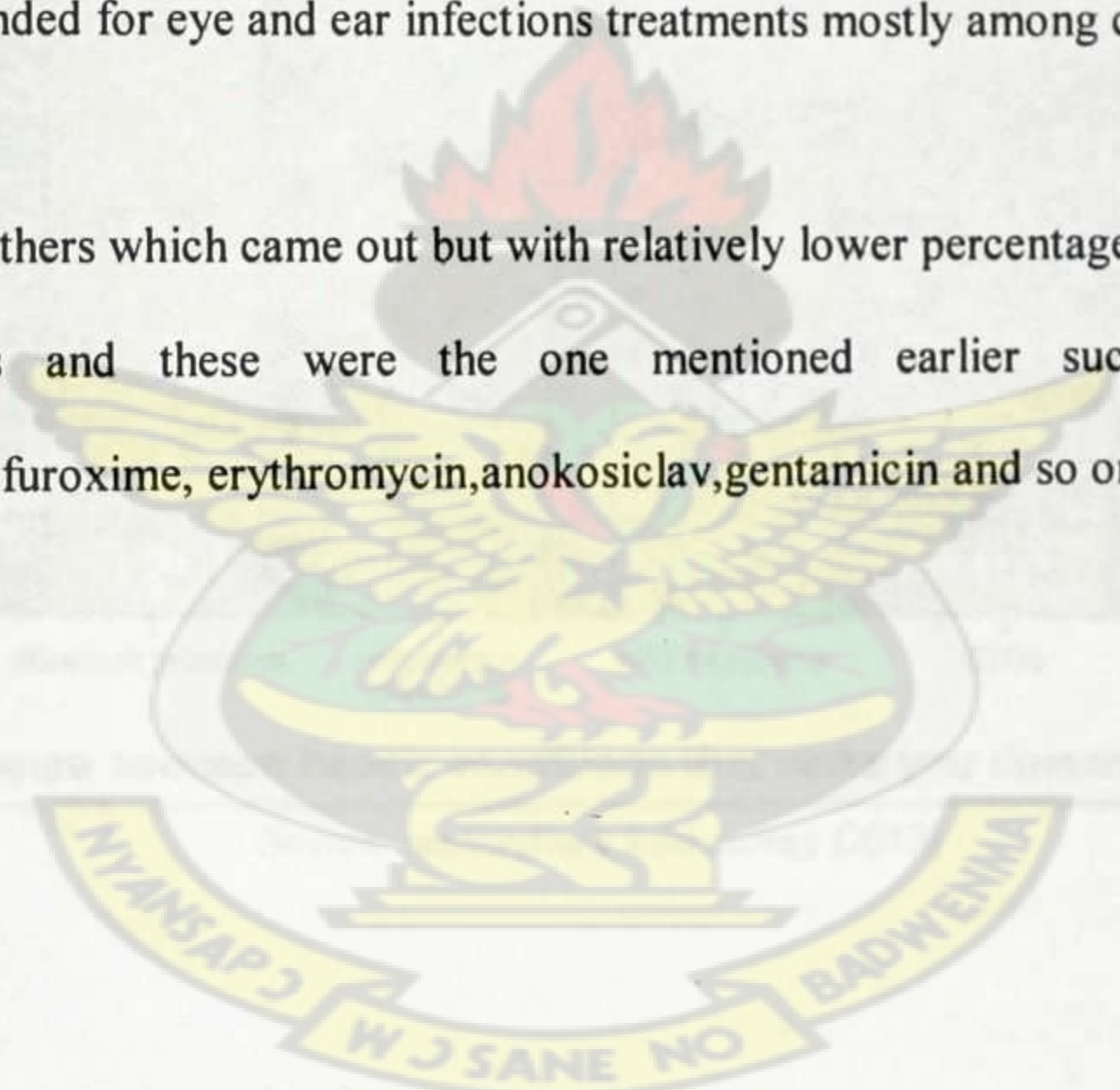
	Frequency	Percent	Valid Percent
Valid	2	.4	.4
amoxicillin	190	37.4	37.4
Ampicillin	85	16.7	16.7
tetracycline	115	22.6	22.6
Cloxacillin	66	13.0	13.0
chloramphenicol	50	9.8	9.8
Total	506	100.0	100.0

From the table above it could be observed that out of the 506 respondents sampled, 190 mentioned amoxicillin as the most common antibiotic they demand frequently over the counter; this figure constitutes about 37% of the total respondents in the survey.

The next antibiotic often demanded over the counter was tetracycline, about 115 respondents out of the 506 mentioned that as their favorite antibiotics often demanded over the counter in the municipality and this constituted approximately 23% of the total respondents sampled in the study.

The rest were ampicillin with 16%, cloxacillin with 13 and chloramphenicol with about 10%(mostly demanded for eye and ear infections treatments mostly among children in the study area.

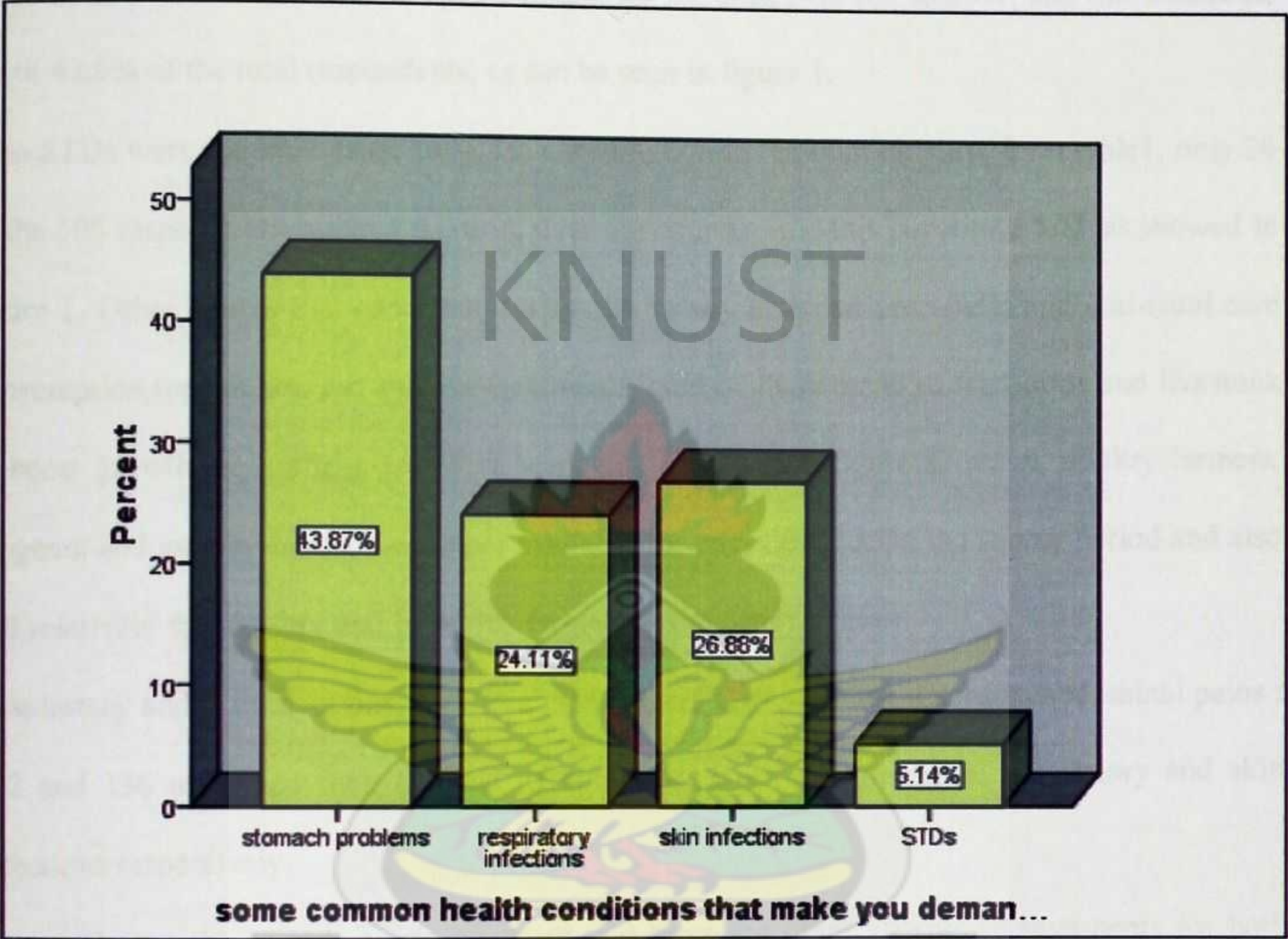
Infect there were others which came out but with relatively lower percentages and in some cases negligible figures and these were the one mentioned earlier such as fluconazole, ciprofloxacin, cefuroxime, erythromycin, amoxiclav, gentamicin and so on.



Valid	Person	Valid Percent
amoxicillin	190	37.4
tetracycline	115	22.7
ampicillin	82	16.2
cloxacillin	66	13.0
chloramphenicol	51	10.1
Total	506	100.0

A GRAPH SHOWING SOME COMMON HEALTH CONDITIONS THAT MAKE CONSUMERS DEMAND OTC ANTIBIOTICS

some common health conditions that make you demand antibiotics



Source: researcher's field survey (2013)

Figure 2 and its corresponding table 2:

some common health conditions that make you demand antibiotics

		Frequency	Percent	Valid Percent
Valid	stomach problems	222	43.9	43.9
	respiratory infections	122	24.1	24.1
	skin infections	136	26.9	26.9
	STDs	26	5.1	5.1
	Total	506	100.0	100.0

From table 1 above, it can be observed that stomach disorders/abdominal pains, were the major causes of demand for over the counter antibiotics consumption in the municipality, according to the survey conducted, 222 respondents out of 506 responded positively to stomach disorders /abdominal pains as the cause of their demand for the drug over the counter; and this constitute about 43.9% of the total respondents, as can be seen in figure 1.

Also,STDs were the least cause for OTC consumption in the municipality, from table1, only 26 of the 506 respondents demand the drug over the counter, and this constitute 5.1%as showed in figure 1. Other causes that came out during the survey included pre –natal and anti-natal care consumption,toothaches, ear and eye treatments, cold or flu,demand to feed birds and livestock to boost growth, and others; but these were just a negligible figure as many, poultry farmers, pregnant and nursing mothers were not available for interview during the survey period and also and relatively few poultry and livestock farmers in the communities.

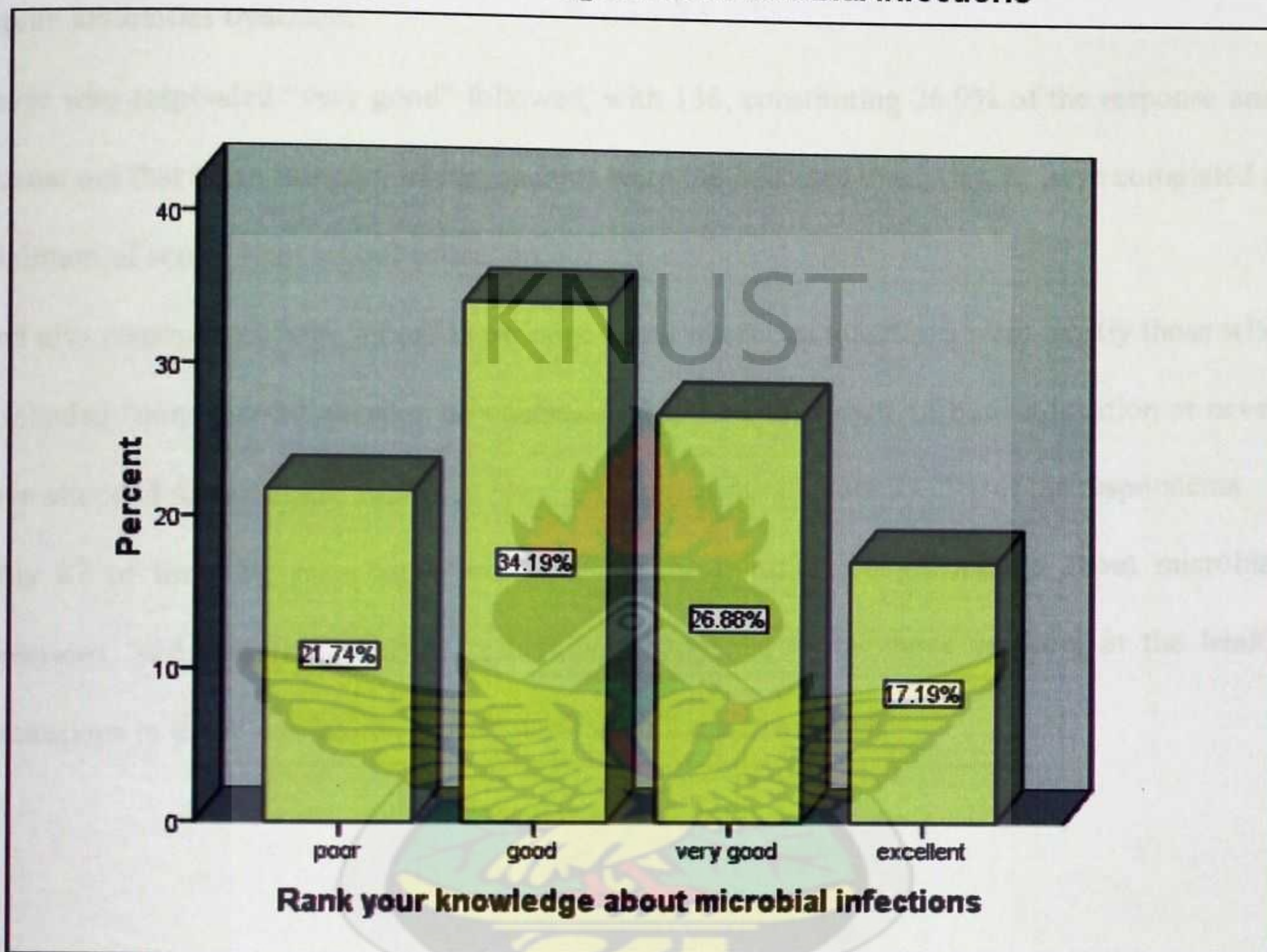
Respiratory and skininfections were the next causes after stomach disorders/abdominal pains ; 122 and 136 attributed their demand of antibiotics over the counter to respiratory and skin infections respectively.

During the survey period, it was observed that there are other alternative treatments for both skin and respiratory infections such as medicated inhalers,herbal preparations for skin application, and ointments for external use only; and that may have contributed to the relatively lower percentages on the chart, with respect to respiratory and skin infections.

	Frequency	Percent	Valid Percent
poor	110	21.7	21.7
good	173	34.2	34.2
very good	126	24.9	24.9
excellent	67	13.2	13.2
Total	506	100.0	100.0

# A GRAPH ILLUSTRATING CONSUMER'S KNOWLEDGE ABOUT MICROBIAL INFECTION IN THE COMMUNITY

Rank your knowledge about microbial infections



Source: researcher's field survey (2013)

Figure 3 and it corresponding table 3:

Rank your knowledge about microbial infections

		Frequency	Percent	Valid Percent
Valid	poor	110	21.7	21.7
	good	173	34.2	34.2
	very good	136	26.9	26.9
	excellent	87	17.2	17.2
	Total	506	100.0	100.0

From the table above, it can be observed that about 173 respondents had good knowledge about microbial infections; this represents about 34.2% in figure 2; that is, diseases and sicknesses that require antibiotics treatment.

Those who responded “very good” followed, with 136, constituting 26.9% of the response and it came out that these category of respondents were the educated ones; that is, have completed a minimum of senior high school education.

And also respondents with “poor” knowledge about microbial infections were mostly those who responded “none” to the question on education; that is , a maximum of basic education or never have attended school at all, and these were 110, representing about 21.7%. of the respondents.

Only 87 of the 506, responded “excellent” to the question on knowledge about microbial infections, and majority of these respondents happened to be those working in the health institutions in the municipality, mostly nurses and the pharmacists.

	Frequency	Percent	Valid Percent
Excellent	87	17.2	17.2
Good	173	34.2	34.2
Fair	105	20.8	20.8
Poor	149	29.4	29.4
Total	506	100.0	100.0

A PIE CHART ILLUSTRATING SOME COMMON REASONS WHY CONSUMERS DEMAND OTC ANTIBIOTICS ON THE DRUG MARKET.

why OTCs instead of purchasing with prescription

- proximity to facility
- price influence
- drug efficacy
- adverts

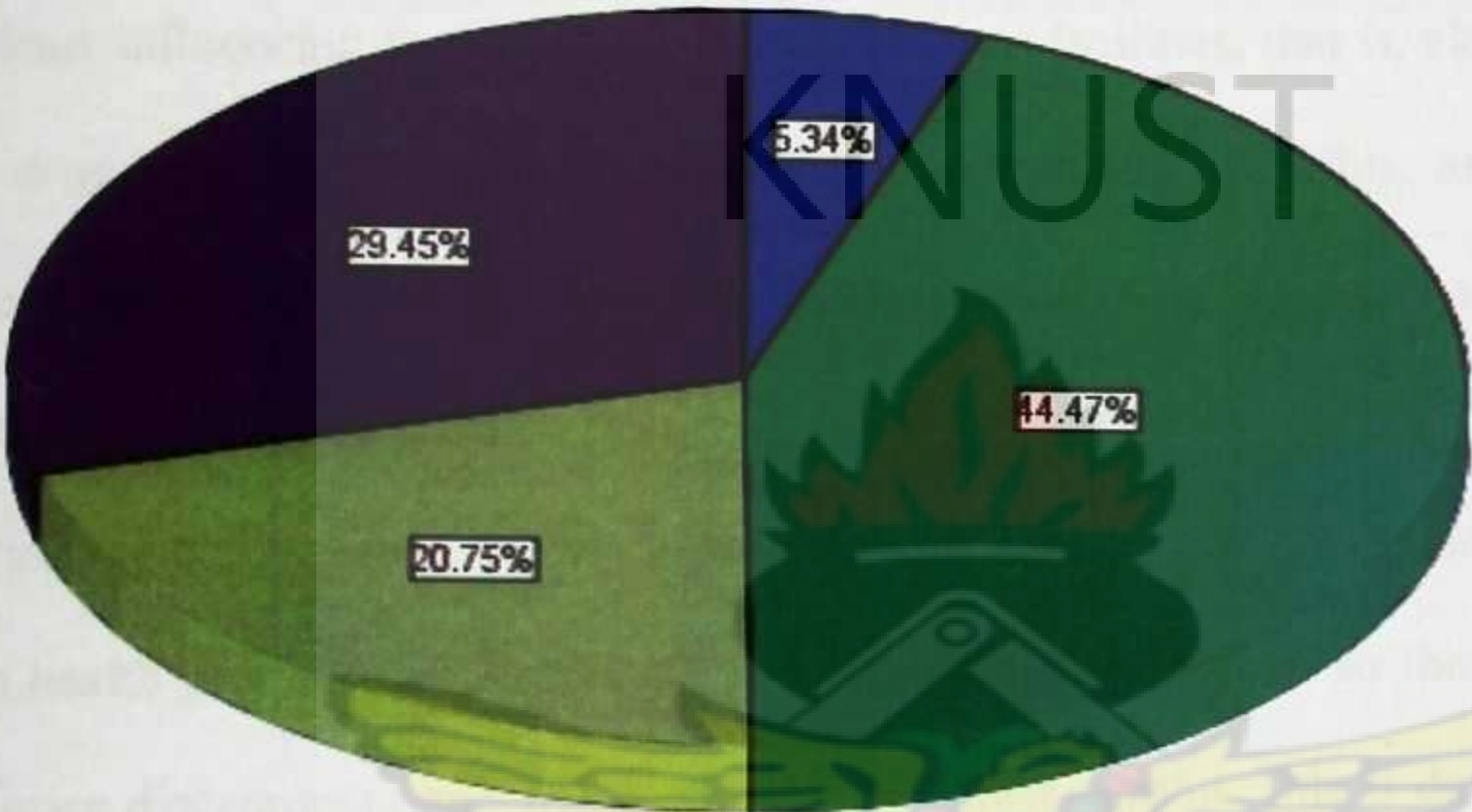


Figure 4 and its corresponding table 4:

why OTCs instead of purchasing with prescription

		Frequency	Percent	Valid Percent
Valid	proximity to facility	27	5.3	5.3
	price influence	225	44.5	44.5
	drug efficacy	105	20.8	20.8
	Adverts	149	29.4	29.4
	Total	506	100.0	100.0

Source: researcher’s field survey (2013)

It can be observed from the table above that 225 out of 506 respondent purchase antibiotics over the counter due the price influence and this represents 44.5% as illustrated on the pie-chart. This is followed by the influence of advertisement in the media about the drug. 149 out of 506 respondents attributed their demand for the drug over the counter to advertisement, this represents 29.4% of the respondents, drug efficacy was next to adverts with 105, thatis 20.8%. The least influencing factor was proximity to drugs facilities, that is, closeness of the consumer to a drug store oo a hospital facility in the community. For this, only 27 out of the 5076 respondents will demand the drug over the counter due to closeness to a facility. This represents about 5.3% of the total respondents sampled during the survey.

During the survey, respondents stated emphatically that purchasing the drug with prescription from health professional reveals the consumer’s preference and so the seller or the pharmacist can price discriminate and reduce his/her consumer surplus, this is done with ease since there are not price tags on drugs in most pharmacy shops. And so the consumer is likely to purchase the drug at a complete price on the drug market when preference is concealed (ie without prescription) or any instructions from health professionals. Respondents confirmed, how on certain occasions, prescription forms are hidden away from the pharmacists or completely destroyed on the way to the chemical shop to avoid being discriminated against in terms of drug prices at the point of sales.

	Frequency	Percent	Valid Percent
Valid not typical of me	105	20.8	20.8
typical of me	141	27.9	27.9
very typical of me	211	41.7	41.7
indifferent	49	9.7	9.7
Total	506	100.0	100.0

**A GRAPH ILLUSTRATING THE ATTITUDE OF THE CONSUMER, EVEN WITH THE KNOWLEDGE OF THE HARMFUL EFFECT OF DRUG MISUSE.**

**change behaviour with knowledge about effects of misuse?**

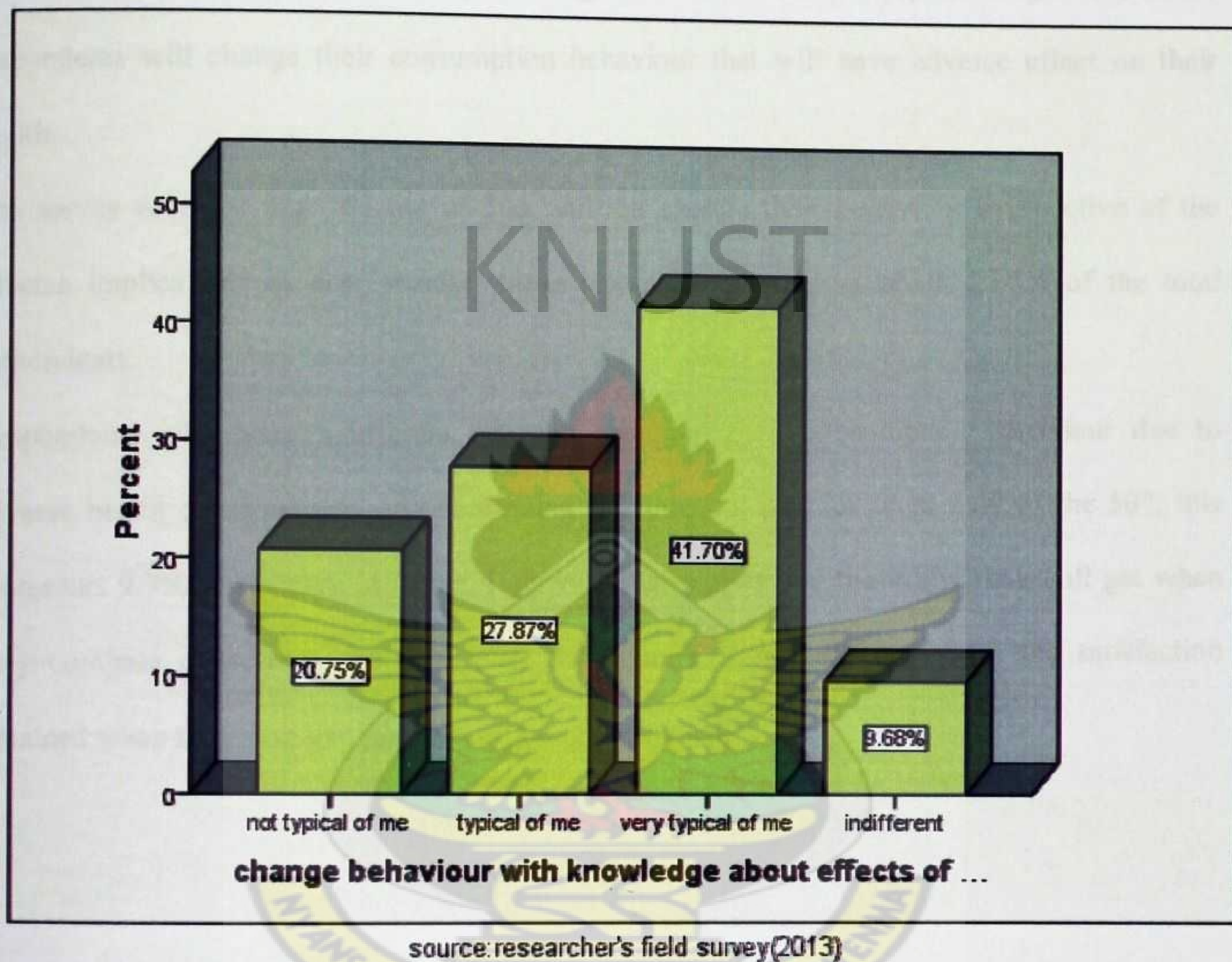


Figure 5and its corresponding table 5

**change behaviour with knowledge about effects of misuse?**

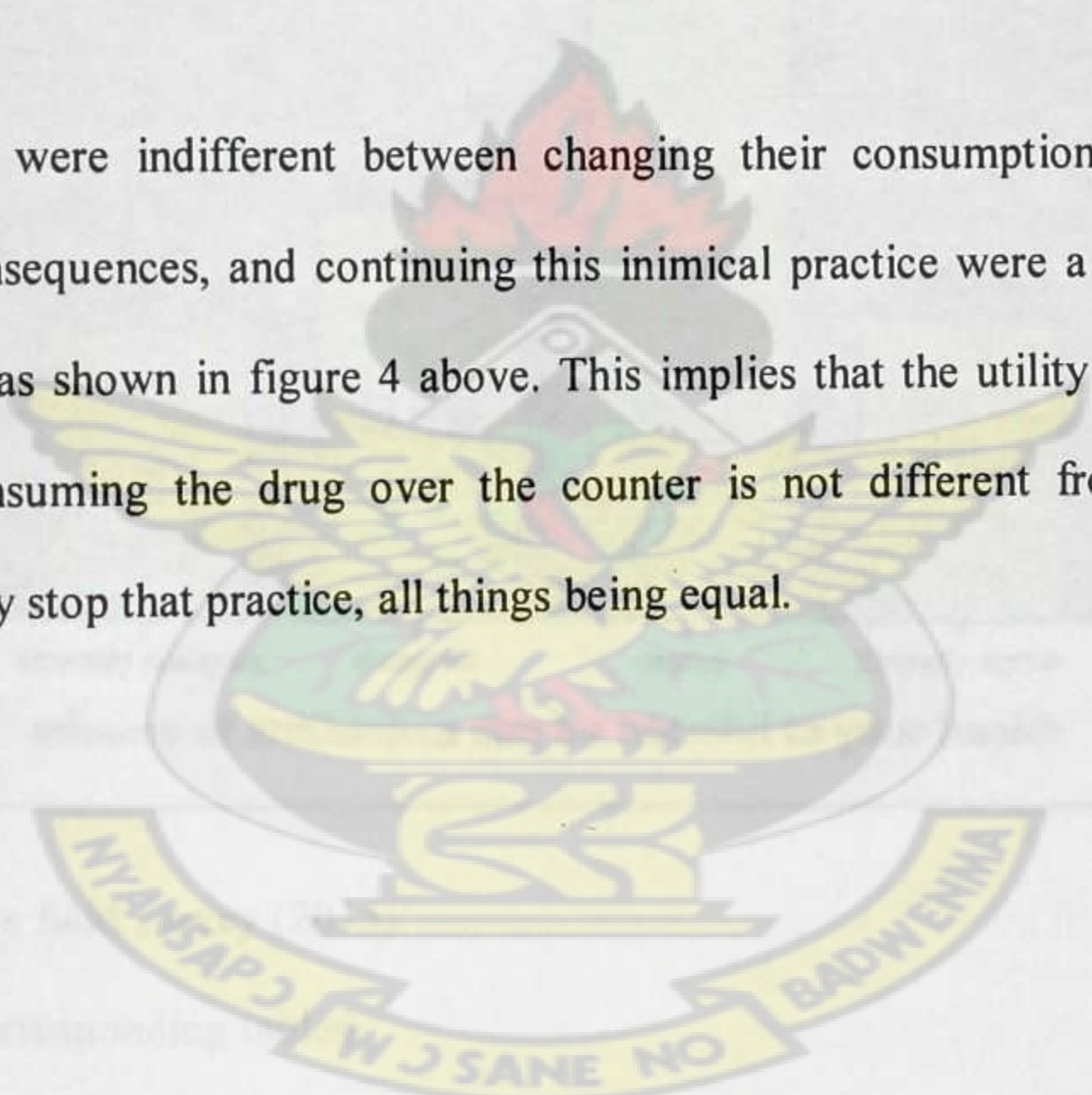
		Frequency	Percent	Valid Percent
Valid	not typical of me	105	20.8	20.8
	typical of me	141	27.9	27.9
	very typical of me	211	41.7	41.7
	Indifferent	49	9.7	9.7
	Total	506	100.0	100.0

From the table above, it can be observed that consumers, who may be misusing the drug out of ignorance, are likely to stop the practice with information on the negative consequences of the drug misuse on the consumer's health.

From the table, 211 out of the 506, representing about 41.7% and 141 representing 27.9% of the respondents will change their consumption behaviour that will have adverse effect on their health.

The survey revealed that 105 out of 506 will not change their behaviour irrespective of the adverse implications of drug misuse; these respondents represent about 20.8% of the total respondents.

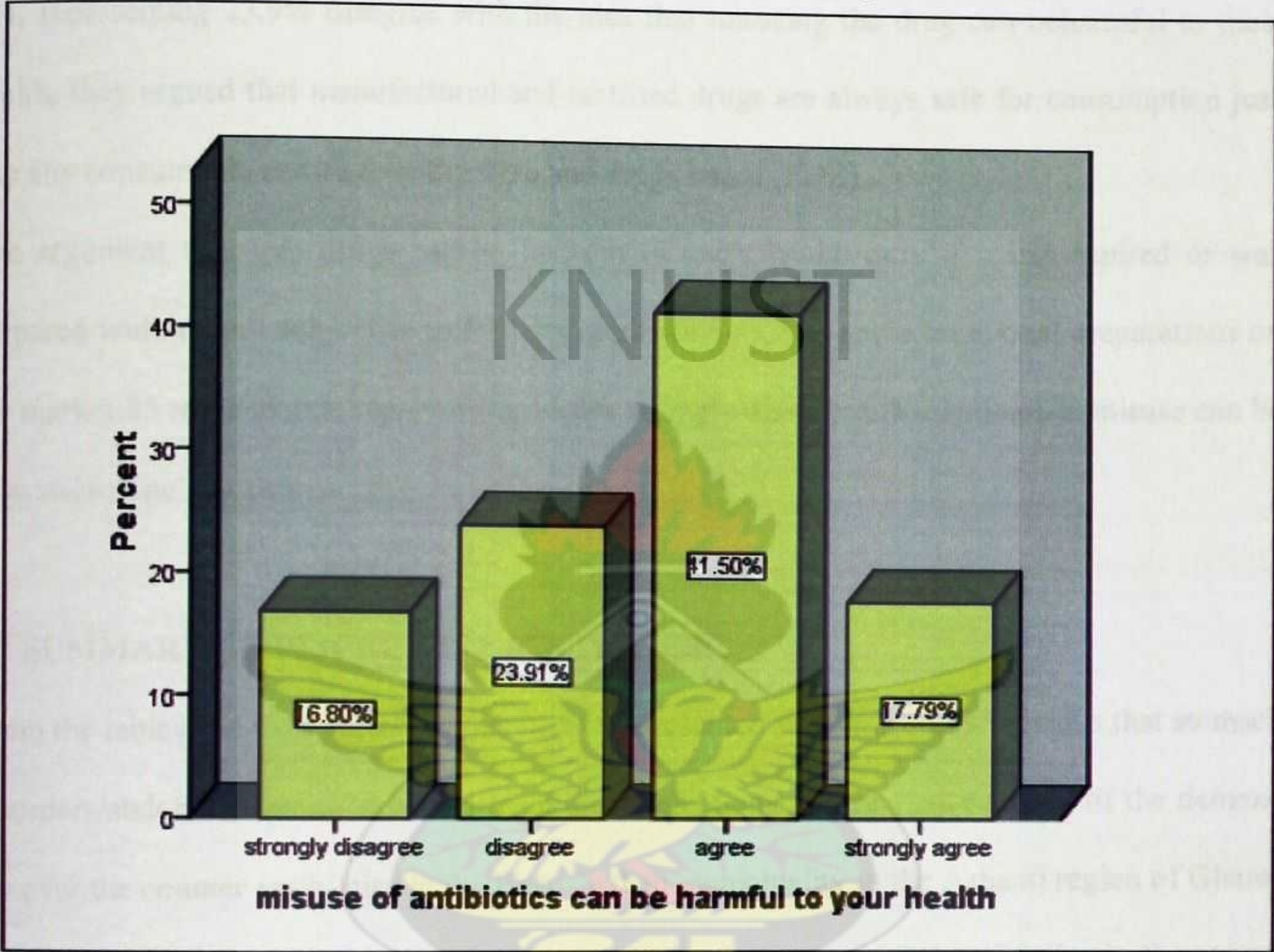
Respondents who were indifferent between changing their consumption behaviour due to adverse health consequences, and continuing this inimical practice were a 49 of the 507, this represents 9.7% , as shown in figure 4 above. This implies that the utility they will get when they continue consuming the drug over the counter is not different from the satisfaction obtained when they stop that practice, all things being equal.



	Frequency	Percent
Valid Strongly disagree	33	10.5
Disagree	121	23.9
Agree	210	41.3
Strongly agree	70	13.8
Total	434	100.0

**CONSUMERS RESPONSE ABOUT THE HEALTH IMPLICATIONS OF ANTIBIOTICS MISUSE**

**misuse of antibiotics can be harmful to your health**



Source: researcher’s field survey (2013)

Figure 6, and its corresponding table6 :

misuse of antibiotics can be harmful to your health

		Frequency	Percent
Valid	strongly disagree	85	16.8
	Disagree	121	23.9
	Agree	210	41.5
	strongly agree	90	17.8
	Total	506	100.0

During the survey, it became obvious that there is a high level of agreement that antibiotics misuse will have debilitating effect on the consumer's health. Out of the 506, respondents sampled, 210, representing 41.5% of the total respondents.

121, representing 23.9% disagree with the idea that misusing the drug can be harmful to their health, they argued that manufactured and certified drugs are always safe for consumption just like any consumable certified by the food and drugs board (FDB).

The argument was that drugs can be harmful to one's health only if it has expired or was prepared without any adherence to formula specifications, like some traditional preparations on the market. 85 respondents, representing 16.8% strongly disagreed that antibiotics misuse can be inimical to one's health.

#### **4.2 SUMMARY OF DESCRIPTIVE STATISTICS:**

From the tables and their figures, generated and presented above, it is now obvious that stomach disorders/abdominal pains, skin and respiratory infections are the major causes of the demand for over the counter antibiotics in the Ejisu-Juaben municipality in the Ashanti region of Ghana; other causes which came up during the survey were demand of OTC antibiotics in the animal husbandry (to boost growth rate and as a dewormer), and demands during maternity.

Again, it became obvious that the educated respondents have good knowledge about microbial infections which requires the treatment with antibiotics. The "none" educated have poor information on microbial infections.

Also, price influence is one of the major determinants of OTC followed by supply side factors such as adverts supplier (drug sellers) recommendation at sales points- drug store. The influence of drug efficacy and proximity to facility are minimal.

Consumer are willing to stay away from this inimical consumer behaviour, if educated on the harmful effects of drug misuse in the community; relatively high number of respondents agreed that drug misuse can be harmful to one's health.

#### 4.3 ANALYSIS OF REGRESSION RESULTS:

Three models were estimated, using the logit regression estimation: Their coefficients reported.

Model 1, estimated the consumer characteristics influencing the consumption of antibiotics from over the counter.

Model 2, estimated the impact of the categories of education, employment and advertisements variables present in model 1.

Model 3, estimated the supply-side factors determining the consumption of over the counter antibiotics in Ghana.

A positive sign of an estimated coefficient implies that there is the likelihood for the consumer to demand the drug or the seller to demand or supply over the counter given the predictor variable.

A negative coefficient reduces the likelihood to demand or supply the drug over the counter

Overall tests of significance of the models show that the models are all statistically significant.

Model 1 has LR of 97.61 with  $p$ -value of 0.0000.

Model 2 has LR of 88.91 with  $p$ -value of 0.000

Model 3 has LR of 95.64 with  $p$ -value of 0.000

The implication is that the variables in the model together have significant impact on over the counter antibiotics consumption.

**MODEL1; LOGIT REGRESSION RESULTS ( Demand-Side Characteristics)**

DEMAND FOR OTC ANTIBIOTICS	COEFFICIENTS	P> Z
INCOME	-.8912304**	0.006
EDUCATION	.3776964*	0.041
AGE	.0285983**	0.003
OTC ANTIBIOTICS PRICES	-.8344081**	0.003
<u>RESIDENCE</u>		
Settler community	-.115259	0.757
Indigene community	-.7997299*	0.026
EMPLOYMENT	.6751444***	0.001
DRUG EFFICACY	.64436***	0.000
CONSUMPTION DUE TO INFECTION	.07769642	0.141
CONSUMER ATTENDS HOSPITAL	-.3474878**	0.000
PROXIMITY TO DRUG STORE	-.179655	0.638
CONSULT HEALTH PROFESSIONAL	-.8240885***	0.000
COMPLETE DRUG CONSUMPTION COURSE	-.4659237*	0.013
ADVERTISEMENT	1.524324*	0.033

Legend: \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

**MODEL 2: (Categories of Employment, Education, and Adverts from model 1)**

DEMAND FOR OTC		P> Z
ANTIBIOTICS	COEFFICIENTS	
<b>EMPLOYMENT</b>		
Farming	1.084803*	0.013
Trading/Artisan	1.214281	0.114
Public/Civil Servant	1.57959***	0.001
<b>EDUCATION</b>		
Basic Level	.9073361**	0.009
Senior High	1.104714*	0.015
Tertiary level	-.1429466*	0.011
<b>ADVERTISEMENT</b>		
Print media	-1.543286	0.192
Electronic media	.8960872***	0.000
Mobile P. A. System	-.3237231*	0.015

Legend: \*  $p<0.05$ ; \*\*  $p<0.01$ ; \*\*\*  $p<0.001$

## INTERPRETATION – Model 1:

The results in the Logit Regression, Model 1, showed that majority of the prior expected signs of the coefficients were met; with exception of income, which was one of the main variables of interest in the survey; in addition to price, education and employment.

The survey revealed that income effect on the demand for antibiotics over the counter was negative; though the expected sign was positive; the coefficient of income according to the survey was negative and significant at 0.01 alpha levels. The implication is that, an improvement in the income level reduces the probability of the individual demanding the drug over the counter; compared to when income levels are low.

This confirms the study conducted in June 2010 by Massimo Filippini et al in Europe on socioeconomic determinants of outpatient antibiotic use; which discovered that the population income was a significant determinant of outpatient antibiotics consumption.

This implies that OTC antibiotics are considered to be inferior commodity for the affluent; all things being equal, compared with purchasing with prescription. The consumer will attend hospital when income level improves and seek better healthcare from healthcare professionals.

Seeking medical care from road side shops, drug peddlers, and traditional healers are typical behaviour of the lower income earners and the less endowed in the economy.

So when income level improves, demand for the drug with prescription increases, as against over the counter consumption, this is because one is able to attend hospital and seek proper medical care, even in private health facilities; this consumer behaviour makes the income effect on OTC antibiotics consumption negative.

The coefficient of formal education was expected to be negative according to ,Goosens et al (2000). But this was not met; the estimate was positive and significant at 0.05 alpha level. This

implies that the likelihood of the consumer to demand the drug over the counter increases with formal education, compared with the none educated; (with the dummy variable = 1, if respondent received formal education and 0 otherwise). These results could be attributed to the fact that consumers may demand the drug over the counter, given the fact that they will be able to read and understand all instructions and comply accordingly, with respect to consumption, to avoid any devastating consequences on their health after consumptions.

The results indicated that the coefficient of age is positive and significant at 0.01 alpha levels - the respondent's age had positive relationship with demand for OTC antibiotics; this implies that as one advances in age, the probability of demanding antibiotics over the counter increases, compared to the younger ones; all things being equal.

This could be attributed to a deteriorating health conditions, coupled with non-availability of alternative arrangements for healthcare delivery for the aged- they have to queue for long hours just like any other patients at various health facilities to seek for healthcare, even at their old age and fragile health status; it is only the well endowed and the affluent that will be able to seek healthcare at private facility for special attention to avoid drug misuse. The aged consume different kinds of drugs in order to maintain a stable health condition, and these include antibiotics.

The effect of price on the demand for OTC antibiotics was negative and significant at 0.01 alpha levels; (with dummy variable = 1, if price levels influences demand and 0 otherwise), the implication here is that the probability of demanding OTC antibiotics reduces with increase in price level, compared to when price levels are low; all things being equal; to consumers of OTC antibiotics (mostly lower income earners and the less endowed), it is a normal commodity.

This behaviour of consumers could be due to the substitution effect, as consumers were able to outline some other alternative means of treating microbial infections in the community including special inhalers for upper respiratory tract infections, herbal and certain ointments for external application, and some herbal preparations from traditional sources for internal use.

Residing in an indigenous community showed a negative and significant coefficient at 0.05 alpha levels. The implication here is that, the probability of demanding the drug over the counter reduces when the individual is residing among the indigenes. This could be attributed to positive socio-cultural values of sharing and playing the “brother’s keeper role” for the common good in the community-“antibiotics consumption and prescription policy may be affected by ethnic and cultural identities”, Moschetti K et al (2006), Lecomte and Paris (1994). Good values are freely shared and upheld among kinsmen, including avoiding drug misuse, which has a debilitating effect on family life.

The coefficient of employment was expected to be positive, and this expectation was met; (with dummy variable =1, if respondent is employed and 0 otherwise). The coefficient was positive and significant at 0.001 alpha levels; the implication here is that the likelihood of the consumer to demand the drug over the counter increases with employment; compared to the unemployed; all things being equal. When one is employed he /she is better positioned to demand all other goods that will make him/maximize his /her utility, including drugs for optimal healthcare. Unemployment reduces the purchasing power of the consumer on the market.

Drug efficacy was expected to have a positive coefficient and this expectation was met and was significant at 0.001 alpha levels. The positive sign implies that the probability of demanding the drug over the counter increases with drug efficacy; compared to non-efficacious drug; when the drug is effective to the consumer and that response to treatment with the drug is high, he/ she

will demand it over the counter irrespective of medical advice from health professionals for a different brand - there is consumer loyalty to the brand.

Consumption of the drug due to infection was expected to have positive coefficient with demand for OTC antibiotics, and this expectation was met, though this was not statistically significant at 0.05 alpha level.

The consumer regular attendance to hospital was expected to be inversely related to demanding the drug over the counter, and this expectation was met and was statistically significant, at 0.01, alpha level; implying that as one attends hospital when infected, the likelihood to purchase drugs over the counter reduces, compared to those who do not attend hospital, this may be due to professional advice or purchasing with prescription from a physician.

Consultation of health professional on drug consumption behaviour was expected to have a negative relationship with the demand for over the counter antibiotics and this expectation was met and was very significant at 0.001 alpha levels. This implies that the likelihood of the consumer to demand OTC antibiotics reduces with consultation, compared to those who do not consult professionals. If the individual received medical advice from health professional, he/ she avoids drug misuse; all things being equal.

The attitude of regularly completing a course when put on drugs was expected to be negative based on the assumption that compliance to consumption instruction increases drug efficacy, compared to when one does not complete course. This expectation was met and was statistically significant at 0.05 alpha levels. This may be due to the fact that the consumer experiences the full efficacy of the drug and get treated; this will reduce the tendency to demand additional doses over the counter for continuous treatment.

Another argument by Becker and Murphy (1998), is that, regular consumption can create addictive behaviour and dependence, the lagged effect of previous consumption. The main element of this and other models of addictive behaviour is that an increase in past consumption of an addictive good including drugs, raises the marginal utility of current consumption and therefore raises current consumption, Becker and Murphy (1998).

The coefficient of drug advertisement was expected to have a positive sign, and this expectation was met with statistical significance at 0.05 alpha levels. This implies that the probability of demanding the antibiotic drug over the counter increases, with consumer exposure to advertisement on the drug compared to those who have not been exposed to the advert.

Marital status, proximity to drug store, and consumption due to infection were not statistically significant in the model estimated.

#### **INTERPRETATION- Model 2:**

Model 2 estimated the categories of employment, education and advertisement on OTC antibiotics consumption.

In model 2, the estimated sign of the coefficient of farming was positive; and was significant at 0.05 alpha levels. This implies that the probability of consuming the antibiotics from over the counter increases with the farming occupation, compared to none farmers. Farmers are likely to demand the drug from over the counter than non-farmers, all things being equal. This may be due to the low income levels of the farmers in the communities, minor cuts sustained and other infections picked up during their farming activities on the fields.

The likelihood of traders and artisans to demand the OTC antibiotics over the counter was not statistically significant. However, that of public and civil servants was positive and significant

at 0.001 alpha levels. Implying that the probability of demanding OTC antibiotics over the counter increases among public and civil servants compared to none /public civil servants. This may be attributed to their acquisition of formal education to be able to read and understand instructions and comply during the medication priod.

The coefficient of basic and senior high schools were positive and significant at 0.01 and 0.05 alpha level respectively; implying that the likelihood of demanding OTC antibiotics increase with these education variables . Basic and high school graduates are more likely to demand OTC antibiotics than the uneducated. However, the tendency to demand OTC antibiotics reduces with tertiary education qualification, all things being equal.

The coefficient of advertisement in the print media was not statistically significant;however, that of electronic and mobile p. a. systems were significant at 0.001 and 0.05 alpha level respectively.

This implies that the likelihood of demanding the OTCantibiotics increases when the consumer is exposed to these forms of advertisements on the drug market; compared to those who do not have access or exposure to these forms of advertisements on the drug market.

### MODEL 3( supply-side characteristics influencing OTC antibiotic consumption)

SALSAE OF OTC ANTIBIOTICS	COEFFICIENTS	P> /Z/
<u>REMUNERATION(Shop-Keeper)</u>		
Salaried	-.030244**	0.012
Commission	.1327751***	0.000
<u>YEARS OF EXPERIENCE</u>	.3922679*	0.013
<u>CONSUMER ABILITY TO PAY</u>	.0575618	0.737
<u>REIMBURSEMENT OF SHOPS</u>	-.707240**	0.009
<u>EDUCATION (Shop-Keeper)</u>		
Basic level	.279089	0.244
Senior high	.2237301	0.197
Tertiary level	-.792724*	0.041
<u>KNOWLEDGE ON MICROBIAL INFECTIONS</u>		
Poor knowledge	-.843093	0.143
Good knowledge	.815145*	0.009
Very good knowledge	.1822604***	0.000
<u>Consumer's Age</u>	.709484	0.123

Legend: \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

### INTERPRETATION - MODEL 3:

Model 3 represents the estimated results of the logit regression, using the supply-side characteristics of pharmacists or the shop-keepers in the drug stores in the municipality.

The main variables of interest were employer's remuneration and reimbursement of pharmacy shops by pharmaceutical firms when their drugs expire on the shelves in the pharmacy shops.

From the regression estimates majority of the apriori conditions were met, with the exception of senior high school education qualification and consumer's ability to pay for the drug.

The coefficient of salaried worker was negative and significant at 0.005 alpha levels. (the dummy variable =1 if "salaried" take the level yes, and 0 otherwise). This indicates that the likelihood of selling the OTC antibiotics to the consumer reduces when the pharmacists/shop-keeper is remunerated based on a fixed monthly salary, compared to none salaried workers. This may be due to certainty of receiving the fixed amount of money as salary; irrespective of sales level at the end of the month, here, there is no motivation to induce demand and sell the drug over the counter to the consumer.

The coefficient of commission based remuneration was positive and significant at 0.001 alpha level. This implies that the probability of selling the OTC antibiotics increases with commission based remuneration system for pharmacists/shop-keepers, compared to the none commission based remuneration system. This may be due to induced demand, there is motivation in this instance to induce demand and increase sales for a higher percentage of the accrued profit from sales.

Years of experience in the drug marked or the pharmacy shop has a positive coefficient and this was statistically significant at 0.05 alpha levels. This implies that the likelihood of selling the drug to the consumer without prescription increases with years of experience in the pharmacy

shop, compared to those who are less experienced in the shop; this may be due to the fact that the shop-keeper has encountered similar conditions over the years where these drugs were prescribed by physician, for patients to treat their infections and consumers responded positively to treatment with these drugs.

Consumer's ability to pay was not statistically significant to the model, though this has a positive coefficient.

Reimbursement has a positive coefficient and was significant at 0.01 alpha level, this implies that the likelihood of selling the drug to the consumer without prescription increases at the point of sales, if expired drugs are not replaced by the producer or pharmacist's money refunded to him for the loss in the shop, compared to a situation where these outdated drugs are not replaced or part or whole loss is reimbursed. Replacing expired drugs or refunding percentage of the loss to the pharmacists will reduce the tendency to sell OTC antibiotics to the consumer; to avoid drugs expiring in the shop which can collapse the business.

Basic and senior high school graduates keeping drug stores had positive coefficients as expected but these were not statistically significant, according to the model estimated. However, tertiary education had a negative and significant coefficient at 0.05 alpha levels. Implying that the probability of selling OTC antibiotics to the consumer reduces with tertiary education qualification compared to the none educated. This may be due to the fact that most of these were qualified health professionals with Polytechnic or university degrees or other equivalent qualifications, who are working as full-time employees in these pharmacy shops.

The coefficient of good and very good knowledge on microbial infections was positive and significant at 0.05 and 0.001 respectively. This implies that the probability of selling the OTC antibiotics to the consumer increases with good knowledge on microbial infections (infections

which requires antibiotics treatments). This could be due to years of experience with similar conditions or formal knowledge acquired on training programmes. However, poor knowledge was negative but not statistically significant according to the estimated model.

The coefficient of age of the patient was not statistically significant though positive in the model.



## CHAPTER FIVE

### SUMMARY OF FINDS CONCLUSIONS AND POLICY RECOMMENDATION

#### 5.0 INTRODUCTION

This chapter summarizes the results of the study and explains any conclusions that have resulted from the statistical analysis of the data. It cites and explains any shortcoming of the study. Policy implications and recommendations obtained from the study is included and suggestions for further research studies on the subject investigated.

#### 5.1 SUMMARY OF MAJOR FINDINGS:

Stomach/abdominal and skin infections were the major infections influencing the demand for antibiotics over the counter in the survey conducted, this is contrary to many studies in Asia and other developing countries such as Brazil, Mongolia and Bangladesh, where cold/ flu and other respiratory tract infections were the leading cause of the demand for OTC antibiotics, Alexander Spatuzza (2002), Togoobaatar et al (2010).

The people in the community have good knowledge about microbial infections that was estimated at about 60% of the respondents in the survey conducted.

Price and income were significant determents for the demand for over the counter antibiotics.

The demand for over the counter antibiotics falls when price increases. However, an increase in consumer income reduces the demand for the over the counter, creating both substitution and income effect in demand for the drug over the counter. The negative income effect reinforces the substitution effects; making the total effect negative.

About 68% of consumers will change their behaviour when educated on the negative consequences of drug misuse, as 59.3% agreed that drug misuse can be detrimental to their health.

Drug sellers are likely to dispense antibiotics over the counter, if their remuneration depends on the level of sales made at the end of the day, however, if remuneration is based on fixed amount/salary, the probability of selling over the counter reduces, these were very significant

Employment is a key determinant of OTC antibiotics demand, according to the survey, and this was significant at 0.001 alpha levels.

Drug efficacy to the consumer is also another key determinant, its impact on the demand for OTC antibiotics is about 64%, and this is significant at 0.001 alpha levels.

Consultation of health professional is a major influential factor; its impact was statistically significant at 0.001 alpha levels.

The consumer's age, his/ ability to attend hospital regularly, are next major determinants with statistical significant level of 0.01 alpha levels.

Replacing or reimbursing the pharmacy shop when drugs go bad reduces the tendency to sell OTC antibiotics to patients.

### 5.3 CONCLUSION:

Demographic and socioeconomic and cultural characteristics such as age, density of health professionals, and community of residence, education employment, and income and price levels have significant impact on over the counter antibiotics demand in Ghana.

However, sex, marital status, residing in settler community, proximity to a chemical shop does not have a significant impact on the consumer's demand for over the counter antibiotics.

Again, remuneration of shop keepers and reimbursement are significant determinants of a OTC antibiotics consumption in Ghana.

and these conclusions are based on the data sampled for the study.

### 5.4 POLICY RECOMMENDATION:

Government must put policy in place to make it a disincentive to consumers who purchase the drug over the counter; for instance, purchasing the drug over the counter should come with extra cost to the consumer; ie, over the counter antibiotics must be relatively expensive. In the same vein, coming to pharmacy shop with a prescription form must attract an incentive; government can subsidized the purchase of antibiotics with prescriptions in the shops to encourage the purchase with prescription

Although awareness levels were high of the consequences of the antibiotics misuse, it is recommended that target oriented education on the use and abuse of antibiotics across the populace should be employed through community programmes, radio, television and news papers publication, and pharmacists/drug-store keepers should be pressed upon to consider the

long term effects of abuse, rather than short term financial benefits, and punitive measure must be put in place to ensure compliance to the directives by state authorities.

Health Educational interventions must target caregivers, the aged, the employed and the educated(formal); regarding stomach, skin, respiratory tract infections and STDs, this must be organized by government and NGOs to reduce the inappropriate use of antibiotics. Previous interventions have included the distribution of educational materials to hospitals and pharmacies, and the communication of information through the media and community health professionals. This intervention must continue on regular bases to ensure total awareness of effects of drug misuse.

Integrated monitoring and evaluation of antibiotic sales and consumption programmes, coordinated and paid for by the government and private pharmaceutical firms, and regulation of use in communities and hospitals must be put in place to ensure effective availability and use of antibiotics in the country, this will reduce the level of misuse of the drug in communities.

Interventions aimed at preventing the inappropriate use of antibiotics should be directed primarily at reducing the availability of non-prescribed antibiotics and educating the general public to dispel the misconceptions that virtually all infections respond to antibiotic treatment.

Government must institute sufficient hospital-based programs and training institutions, aimed at reducing the use of antibiotics, and promoting antiseptic conditions that inhibit the growth and development of bacterial in the communities; if possible the sanitary inspection system, popularly referred to as "Samansaman" in the local dialect must be reintroduced in the communities to ensure good sanitary practices to avoid microbial infections in the communities.

From the supply-side, pharmacists, and licensed chemical sellers must be remunerated with fixed wages/ salaries, to reduce supply induced demand of the drug in their chemical shops, another supply-side, problem is the physician's "scribbles" on the prescription forms. Illegible hand writing from doctors also came out during the survey; some licensed chemical sellers confirmed their inability to read certain prescriptions and so ask the consumer to purchase based on previous experience with same or similar health condition, when they do not want the sales to go to another competitor on the market. Hand writing legibility must be part of the training of all health professionals, particularly doctors to ensure prescription forms are legible enough to avoid this problem.

Joining long and winding queues, delayed healthcare delivery and reduces the productive time of the economically active individuals who visited the public health facilities for healthcare services, this was a major complain from almost all consumers; this problem encourages the demand for healthcare services from drug peddlers or vendors on the road side and other quack practitioners; including the demand for OTC antibiotics for treating infection.

Ministry of Health and Ghana Health Service must put internal control mechanisms in place to ensure quick and quality healthcare delivery to avoid "waste" of patient's time in various care centers; this positive attitude of health professionals and the hospitals who adhere to this directives must be acknowledged and rewarded accordingly by the healthcare system in the country ; this will serve as an example for other facilities to emulate the good practice.

Density of health professionals in the communities must be increased, government and other private institutions must assist to increase the recruitment and training of healthcare providers and provide the incentives to serve in the communities so that members will have access to

consultations and professional advice with respect to drug consumption behaviour, this will reduce the misuse of the drug and winding queues in the hospitals.

Record keeping on patients in health facilities must be improved so that they can be given the type of drugs that worked effectively with their system, because the efficacy of a particular drug is never the same with different patients, but it has been revealed that consumers will demand drug based on its effectiveness to their health condition whether there is prescription or not.

Family-Heads and Opinion leaders must be empowered and supported to lead the campaign against drug misuse in both indigenous and settler communities in the country. The influence of sociocultural and ethnic factor to prevent drug misuse is significant according to the survey conducted.

## 5.5 LIMITATION TO THE STUDY

Financial constraint and means of transport were some main challenges faced during this study, there was no enough money to get transport to the rural communities and some farming communities which are in the area for the study.

Time constraint was also a major challenge during the study,

Language barrier was another challenge for this study, most of the rural and farming communities speak the local language, that is the AsanteTwi and other different local dialect (the Hausa and the ewe dialect dominated the communities; aside the Ashanti twi ) in the indigenous and settler communities and so questions must be translated into the local dialect for respondents to answer, this made completing the questionnaires very challenging during the study.

Respondents were in certain areas reluctant to help complete questionnaires with the notion that the police may come after them since it is an issue relating to drug abuse/misuse. There is the general perception that abusing/misusing a drug is a deviant behaviour and must attract the attention of the state authorities; this misconception is based on previous experience with narcotics and the police in the communities concerned.

Pharmaceutical firms/ Shops were also at certain point reluctant to give out information with the notion that this may expose their operations to the Food and Drugs Board (FDI) who will eventually come after them and that may not auger well for their business in the drug market.

The survey did not consider national health insurance card holders and their behaviour toward OTC antibiotics use in the communities.

#### **5.6 Suggestion For Further Research:**

As shown by the current study conducted in the Ejisu-Juabeng municipality, personal attitudes and behaviour of health personnel may also reinforce self-medication with antibiotics, although these factors were not examined in the current study. In the future, questions relating to the prescription of antibiotics, the doctor-patient relationship, patient satisfaction with services and quality or accessibility of health care should be included in survey instruments.

The information obtained with these items will result in a better understanding of the determinants of non-prescription antibiotic use in Ghana.

The use and misuse of OTC antibiotics among pregnant women and children in the country must be researched into as it was observed in the current study that this phenomenon is widespread in the rural communities sampled for the survey.

## 5.7 REFERENCES:

- 1) Tagoe, and Attah (2010) "A Study of Antibiotic Use and Abuse in Ghana: a case study of the Cape Coast Metropolis". The Internet Journal of Health.
- 2) Togoobaatar G, Ikeda N, Ali M, Sonomjamts M, Dashdemberel S, Mori R, et al., et al (2010). "Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia WHO.
- 3) Filippini M, Masiero G, Moschetti K (2006) "socioeconomic determinants of regional differences in outpatient consumption": Evidence from Switzerland. Health Policy 78:77-92.
- 4) Bertoldi AD, Barros AJ, Wagner A, Ross-Degnan D & Hallal PC (2008) "A descriptive review of the methodologies used in household surveys on medicine utilization." BMC Health Services Research 8, 222.
- 5) Filippini M, Masiero G, Moschetti (2009) "Regional consumption of antibiotics: A demand system approach. Economic Modelling" 26:1389-1397.
- 5) Naivalulevu L.(1990) Training for rational drug use (prescription of antibiotics for coughs and colds in Fiji has been greatly reduced since health staff participated in training workshops). ARI News.
- 6) Hossain MM, Glass RI, Khan MR.(1982) "Antibiotic use in a rural community in Bangladesh". Int J Epidemiol; 1982; 11:402-5.
- 7) Pechère J.C.(2001) "Patients' interviews and misuse of antibiotics", 3rd edition; 33 Supply distributors, France. Pages 170–173.
- 8) McNulty CA, Boyle P, Nichols T, Clappison P, Davey P.(2007) "The public's attitudes to and compliance with antibiotics". Pages 63–8.

- 9) Cornaglia G, Pechère JC, Hughes D, Kardas P.(2007) "Non-compliance with antibiotic therapy for acute community infections: a global survey". *Int. J. Antimicrobial. Agents*; 245–53.
- 10) Helegbe, G.K., L.Y. Anyidoho and F.N. Gyang (2009). "Screening of the efficacy of some commonly used antibiotics in Ghana." *Res. J. Microbiol*; 4: 214-221.
- 11) Carvalho, R.P et. al.(200) "Inappropriate prescription practices of antibiotics". Sao Paulo's Pharmacy Council; Brazil.
- 12) Matuz M, Benko R, Doro P, Hajdu E, Nagy G; Nagy E; Monnet DL, Soos G (2003)"Regional variations in community consumption of antibiotics in Hungary". *British Journal of Clinical Pharmacology* 96-100.
- 13) Marlière GLL, Ferroz MB, Quirino dos Santos J(2000). "Antibiotic consumption patterns and drug leftovers in 6000 Brazilian households. *Advances in therapy*"Vol 17. No.1.
- 14) Spatuzza A.(2008) "The misuse of antibiotics in both developed and developing countries".Brazil.
- 15) Wolff MJ.(1993),"Use and misuse of antibiotics in Latin America. *Clin Infect Dis.* 2:S346-S51.
- 16) Lansang MA, Lucas-Aquino R, Tupasi TE, Mina VS, Salazar LS, Joban N. (1990),"Purchase of antibiotics without prescription in Manila, the Philippines". *Inappropriate choices and doses.JClinEpidemiol*; 43:61-7.
- 17) Saradamma RD, Higginbotham N, Nichter M,.(2000),"Social factors influencing the acquisition of antibiotics without prescription in Kerala State", south India.
- 18) Suleiman S, Ketsela A, Mekonnen Z(2009). "Assessment of self-medication practices in Assendabo town," Jimma zone, southwestern Ethiopia.

- 19) Lleras-Muney A, and Lichtenberg FR.(2002) "The effect of education on medical technology adoption: are the more educated more likely to use new drugs?", NBER Working Paper 9185.
- 20) Saradamma RD, Higginbotham N, Nichter M,(2000). "Social factors influencing the acquisition of antibiotics without prescription in Kerala State", south India.
- 20) Belongia EA, Schwartz B. (1998),"Strategies for promoting judicious use of antibiotics by doctors and patients". BMJ1998; 317: 668-7.
- 21) Nyazema N, Viberg N, Khoza S, Vyas S, Kumaranayake L, Tomson G, et al., et al(2007). "Low sale of antibiotics without prescription": a cross-sectional study in Zimbabwean private pharmacies, Zimbabwe. Grigoryan L, Burgerhof JG, Haaijer-Ruskamp FM, Degener JE,
- 22) Deschepper R, Monnet DL, et al, "Is self-medication with antibiotics in Europe driven by prescribed use?" J Antimicrob Chemother 2007; 59: 152-6.
- 23) Suleman S, Ketsela A, Mekonnen Z. (2009); "Assessment of self-medication practices in Assendabo town, Jimma zone", southwestern Ethiopia. 5: 76-81.
- 24) Saradamma RD, Higginbotham N, Nichter M. (2000) "Social factors influencing the acquisition of antibiotics without prescription in Kerala State," south India.
- 25) Lkhagvadorj V. Mongolian pharmaceutical sector assessment report. Ulaanbaatar: Department of Pharmacy, Government Executing Agency; 2004.
- 25) Perz JF, Craig AS, Coffey CS, Jorgensen DM, Mitchel E, Hall S, et al., et al (2002). "Changes in antibiotic prescribing for children after a community-wide campaign". JAMA; 287: 3103-9.

- 26) Väänänen MH, Pietilä K, Airaksinen M(2006). "Self-medication with antibiotics—does it really happen in Europe?" *Health Policy*.166-71.
- 27) Belongia EA, Naimi TS, Gale CM, Besser RE. Antibiotic use and upper respiratory infections: a survey of knowledge, attitudes, and experience in Wisconsin and Minnesota. *Prev Med* 2002; 34: 346-52
- 28) Grigoryan L, Burgerhof JG, Degener JE, Deschepper R, Lundborg CS, Monnet DL, et al., "Self-Medication with Antibiotics and Resistance (SAR)" *Antimicrob Chemother*2008;
- 29) Baum F. Christopher(2006). "An Introduction to Modern Econometrics using Stata". Stata Press. ISBN 1-59718-013-0.
- 30) Bremon AR, et al(2000). "Non-hospital consumption of antibiotics in Spain" 1987-1997", *JournalAntimicrobial Chemotherapy*, 45, 395-400,
- 31) Cizman M. "The use and resistance to antibiotics in the community", *International Journal of Antimicrobial Agents*, 21, 297-307, 2003.
- 32) Wilson J.et al(1996) "Growth in the use of antibiotics in the community in England and Scotland *British Medical Journal*, 312, 613.
- 33) Filippini M, Measiero G, and Moschetti K. (2006) "Socioeconomic determinants of regional differencesin outpatient antibiotic consumption: Evidence from Switzerland", *Health Policy*, 78, 77-92.
- 34) Finch RG, Metlay JP, Davey PG, and Baker LL(2004). "Educational interventions to improve antibioticuse in the community: report from the International Forum on antibiotic resistance(IFAR) .
- 35) Goossens et al, The ESAC Project Group,(2005)"Outpatient antibiotic use in Europe and association with resistance: a cross-nationaldatabase study", *The Lancet*, 365, 579-587.

- 37) Harbarth S, Albrich W, and Brun-Buisson C(2002). "Outpatient antibiotic use and prevalence of antibiotic-resistance, a sociocultural perspective", Germany.
- 38) Holloway KA, Ivanovska V, Ross-Degnan D et al. (2009) "Medicines use in primary care in developing and transitional countries." WHO, Geneva.
- 39) Gonzales Ochoa EL et al (1996). "Prescription of antibiotics for mild acute respiratory infections in children." Bulletin of the Pan American Health Organization 106–117.
- 40) Anna Merino-Castello, (2003) "Demand for Pharmaceutical Drugs": a Choice Modelling Experiment, Barcelona, Spain.
- 41) Angunawela I, Diwan V, Tomson G.(1991) "Experimental evaluation of the effects of drug information on antibiotic prescribing": A study in outpatient care in an area of Sri Lanka. International Journal of Epidemiology:558–564.
- 42) Bexell A et al(1996), "Improving drug use through continuing education: a randomized controlled trial in Zambia." Journal of Clinical Epidemiology 49:355–357.
- 43) McNulty CA, Boyle P, Nichols T, Clappison DP, Davey P.(2006), Antimicrobial drugs in the home, United Kingdom. Emerg Infect 12: 1523-6 pmid: 17176566
- 44) Becker G, Grossman M, Murphy KM (1991) "Rational addiction and the effect of price on Consumption". American Economic Review 81(2):237-241
- 45) Johnson, F. R., Mathews, K. E., and Bingham, M. F., (2000), "Evaluating welfare-theoretic consistency in multiple-response, stated-preference surveys", Triangle Economic Research Technical Working Paper No T-0003.
- 46) Long, J. Scott. 2001. "Regression Models for Categorical and Limited Dependent Variables Using STATA". Texas: STATA Corporation.

47) Armentieres O and Namoro S.D. (2002), "Prescription Drug Advertising and Patient Compliance. a Physician Agency Approach," Stony Brook Working Paper, Department of Economics.

48) Carlsson F. and Martinsson P. (2002), "Design Techniques for Stated Preference Methods in Health Economics," Health Economics (in press).

49) Reginald et al(2008), "Determinants of self-medication with antibiotics in Europe": the impact of beliefs, country wealth and the healthcare system, journal of Antimicrobial chemotherapy, 61172-1179.

50) Williams Greene,(2003) "Econometrics Analysis" New York University press

5.8 APPENDIX:

Appendix 1 QUSTIONNAIRES (1)

**CONFIDENTIALITY:**Any information provided on this sheet is strictly for research purposes to estimate the determinants of over-the –counter antibiotics consumption in Ghana, and shall no means be made to reflect your identiy. Your identity shall not be made available to any body, institution or organization anywhere.

Kindly answer the following questions carefully. Tick ☐ , where appropriate or provide brief answers where necessary.

SOCIODEMOGRAPHIC INFORMATION

1). Age .....

2).Sex ☐ Male =1, ☐ Female =2

3).Marital status ☐ Married =1 ☐ single =2

4).Community of residence ☐ settler =1 ☐ Indigenous= 2 ☐ Mixed =3

5) Educated ? ☐ Yes =1 ☐ No = 0

6).Level of education ☐ Basic = 1 ☐ SHS=2 ☐ Senior High or tertiary =3

7). Employed? ☐ Yes =1 ☐ No= 0

8) Types of employment☐ Farming= 1 ☐ Artisan/Trading =2 ☐ Pub/Civil =3

9) Income level .....

### CONSUMER BEHAVIOUR INFORMATION

10).Do you attend hospital when ill? ☐ no=2 ☐ yes=1

11) Rank your knowledge about microbial infections:

☐ Poor = ☐ Good= 2 ☐ Very Good =3 ☐ Excellent=4

12).Do you purchase antibiotics without prescription ☐ Yes =1 ☐ No =2

If no, give reason(s).....

13).If yes, are purchases based on symptoms of health condition ☐ Yes =1 ☐ No=2

If NO, specify.....

14).What are some common health conditions that will make you demand antibiotics.

☐ Stomach problems =1 ☐ Respiratory infections =2 ☐ Skin infections=3 ☐ STDs=4

15).Why over the counter antibiotics, instead of purchasing with prescription?

☐ Proximity =1 ☐ Profit/Not for profit facility =2 ☐ Drug efficacy= 3 ☐ Adverts=4

others; specify.....

16).How often do you consult health professionals on your drug consumption behaviour?

☐ Never =1 ☐ Sometimes=2 ☐ Often =3 ☐ Very Often=4

17).What are some of the antibiotics often purchased/used in the home?

.....

18). Do you usually complete the course of your antibiotics consumption in the home?

☐ Never=1 ☐ Sometimes=2 ☐ Often =3 ☐ very Often.

18).Do you purchase antibiotics over the counter base on its efficacy?.

☐ Yes =1 ☐ no =2

20). If no give reasons.....

21).Under or Over utilization of antibiotics can be harmful to your health.

☐ Strongly disagree=1 ☐ Disagree=2 ☐ Agree=3 ☐ Strongly agree =4

22) Are you influenced by adverts to purchase OTC antibiotics? ☐ Yes =1 ☐ No = 0

23) Which of the following adverts influences you the most?

☐ One-on-one=1 ☐ Mobile P.A Systems=2 ☐ Print media= 3 ☐ Electronic=4

24).Will your consumption behaviour change with knowledge about the harmful effects of antibiotics misuse on your health?

☐ Not typical of me=1 ☐ Typical of me=2 ☐ Very typical of me=3 ☐ Indifferent=4

THANK YOU:

## Appendix 2 QUESTIONNAIRES (2)

**CONFIDENTIALITY:** Any information provided on this sheet is strictly for research purposes to estimate the determinants of over-the -counter antibiotics consumption in Ghana, and shall no means be made to reflect your identity. Your identity shall not be made available to any body, institution or organization anywhere.

Kindly answer the following questions carefully. Tick ☐ , where appropriate or provide brief answers where necessary.

1). Age .....

2). Sex ☐ Male = ☐ Female = 2

3). Marital status ☐ Married = 1 ☐ single = 2 ☐ divorced = 3 ☐ widowed = 4

5). Level of education ☐ None = 1 ☐ Basic = 2 ☐ Senior High = 3 ☐ Tertiary = 4

6). Years of experience in drug sales .....

7) How will you rank your knowledge on microbial infections in the community?

☐ Poor = 1 ☐ Good = 2 ☐ Very good = 3 ☐ Excellent = 4

8). Do you sell antibiotics to patients without prescription from health professional?

☐ YES = 1 ☐ NO = 0 ☐

9) Which of the following will make you sell antibiotics over the counter to consumers ?

☐ Consumer's age = 1 ☐ Ability to pay = 2 ☐ others; specify.....

9) Rank your knowledge about microbial infections

☐ Poor = ☐ Good = 2 ☐ ~~Very Good~~ = 3 ☐ Excellent = 4

10). What is the system of remuneration for the job?

☐ Monthly Salary = 1 ☐ Commission = 2 ☐ not for profit = 3 ☐

others.....

11).Do your suppliers reimburse or replac[ ]gs in the shop when they expire , or over stay in the shop? [ ] YES=1 [ ] NO = 0

THANK YOU.

APPENDIX3:

Logit Regression Estimation:

logitConsumeOTCs age maritalstatusSettlerCmtIndigeneousCmtPriceinfluence Adverts  
education employment incomelevel

>attendhospitalconsulthealthantibioticspurchcompletecourserankeffect

Iteration 0: log likelihood = -203.38087

Iteration 1: log likelihood = -162.91293

Iteration 2: log likelihood = -154.74116

Iteration 3: log likelihood = -154.5749

Iteration 4: log likelihood = -154.57451

Iteration 5: log likelihood = -154.57451

Logistic regression	Number of obs = 506
	LR chi2(18) = 97.61
	Prob > chi2 = 0.0000
Log likelihood = -154.57451	Pseudo R2 = 0.2400

Estimated model 1

ConsumeOTCs	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
age	.0285983	.0094646	3.02	0.003	.010048	.0471486
maritalstatu	-.0565053	.1959587	-0.29	0.773	-.4405774	.3275668
SettlerCmtly	-.115259	.3718576	-0.31	0.757	-.8440865	.6135685
Indigeneouco	-.7997299	.3591956	-2.23	0.026	-1.50374	-.0957195
Proximitytof	-.179655	.3822699	0.47	0.638	-.5695801	.9288902
Adverts	1.524324	.7143767	2.13	0.033	.1241711	2.924477
Education	.3776964	.1849218	2.04	0.041	.0152564	.7401365
Employment	.6751444	.1977918	3.41	0.001	.2874795	1.062809
Incomelevel	-.0012304	.0005873	-2.10	0.036	-.0023816	-.0000793
Priceingluen	-.4344081	.1757737	-2.47	0.013	-.7789183	-.0898979
consulthealt	-.8240885	.1898146	-4.34	0.000	-1.196118	-.4520587
consumeratte	-.3474878	.1207801	-2.88	0.004	-.5842125	-.1107632
Completecour	-.4659237	.187118	2.49	0.013	.0991792	.8326682
drugeffica	.64436	.1736987	3.71	0.000	.3039169	.9848031
_cons	-.3861405	.9238883	-0.42	0.676	-2.196928	1.424647

legend: \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

MODEL 2

SUPPLYOTCAs = Conf. Std. Err. z P>|z| [95% Conf. Interval]

APPENDIX 4

Iteration 0: -135.37171 0.00000 0.0000 0.0000 0.0000 0.0000

. logit SUPPLYOTCAs salariedworkercommissionbased employment abilitytopay legibility  
reimbursement age basiceduseconda  
>ry tertiary poorknowledgegoodknowledgeverygoodknw

Iteration 0: log likelihood = -135.37171  
Iteration 1: log likelihood = -117.80421  
Iteration 2: log likelihood = -117.55107  
Iteration 3: log likelihood = -117.55038  
Iteration 4: log likelihood = -117.55038

Logistic regression                      Number of obs =        200  
LR chi2(14)        =        95.64  
Prob > chi2        =        0.0000  
Log likelihood = -117.55038              Pseudo R2        =        0.2316

MODEL 2

SalesOTCAs	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
salaries	-.030244	.0096563	3.13	0.002	.0113179	.0491715
commission	.1327751	.1448852	0.92	0.000	-.1511947	.4167449
experience	.3922679	.3887346	-1.01	0.013	-1.154174	.369638
abilitytopay	.0575618	.1717152	-0.34	0.737	-.3941174	.2789937
reimburse	-.707240	.1917362	3.69	0.009	.3314448	1.083031
basicedu	.279089	.2397093	1.16	0.244	-.1907318	.7489114
secondary	.2237301	.17356	1.29	0.197	-.1164413	.5639015
tertiary	-.792724	.3874938	2.05	0.041	.0332508	1.552198
poorknowle	-.843093	.4170526	2.02	0.143	.0256852	1.660502
goodknowle	.815145	.1865961	-4.37	0.009	-1.180867	-.449423
verygoodknw	.1822604	.1644496	-1.11	0.000	-.5045757	.1400548
ageofconsu	.709484	.1736738	4.09	0.123	.3690897	1.049878
_cons	-1.644427	1.548975	-1.71	0.009	-5.680363	.3915094

APPENDIX 5

Estimates of expanded variable from model 1

. logitConsumeOTCs basic secondary tertiary farming trade pubcivil poor good verygood never  
sometimes often printmedia e  
>lectromicmediamobilepaathsettindprox

Iteration 0: log likelihood = -203.23182

Iteration 1: log likelihood = -165.17628

Iteration 2: log likelihood = -155.76875

Iteration 3: log likelihood = -155.27929

Iteration 4: log likelihood = -155.27821

Iteration 5: log likelihood = -155.27821

Logistic regression  
Number of obs = 506  
LR chi2(18) = 88.91  
Prob > chi2 = 0.0000  
Pseudo R2 = 0.2360  
Log likelihood = -155.27821

MODEL 3

-----  
ConsumeOTCs |    Coef.   Std. Err.    z   P>|z|   [95% Conf. Interval]  
-----+-----

basic		.91562	.4650918	1.97	0.009	.0040568	1.827183
secondary		.823931	.482157	1.71	0.007	-.1210793	1.768941
tertiary		-.1272564	.6050073	-0.21	0.013	-1.313049	1.058536
farming		.4190332	.1831834	2.78	0.005	.0600304	.778096
trade		.6748241	.1937305	3.38	0.117	.2951192	1.054529
pubcivil		-.867289	.5453796	3.42	0.001	.7983643	2.936213
poor		-.8905359	.5329849	-1.67	0.195	-.935167	.154095
good		.0576339	.5437375	0.11	0.006	-1.008072	1.123341
verygood		.3259012	.5710026	0.57	0.008	-.7932433	1.445046
electro		.626309	.17515819	3.57	0.000	.27329183	.919699
printmedia		-.0328298	.9745806	-0.03	0.117	-1.942973	1.877313
mobilepasyst		-.3962245	.1821389	-2.96	0.008	.0392388	.753210
_cons		.0535762	.0257335	0.59	0.035	-1.634896	1.041763

-----  
estimate table, star (.05 .01 .001) style (oneline)

APPENDIX 6

Tables of descriptive statistics

some common health conditions that make you demand antibiotics

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid stomach problems	222	43.9	43.9	43.9
respiratory infections	122	24.1	24.1	68.0
skin infections	136	26.9	26.9	94.9
STDs	26	5.1	5.1	100.0
Total	506	100.0	100.0	

why OTCs instead of purchasing with prescription

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid proximity to facility	27	5.3	5.3	5.3
price influence	225	44.5	44.5	49.8
drug efficacy	105	20.8	20.8	70.6
adverts	149	29.4	29.4	100.0
Total	506	100.0	100.0	

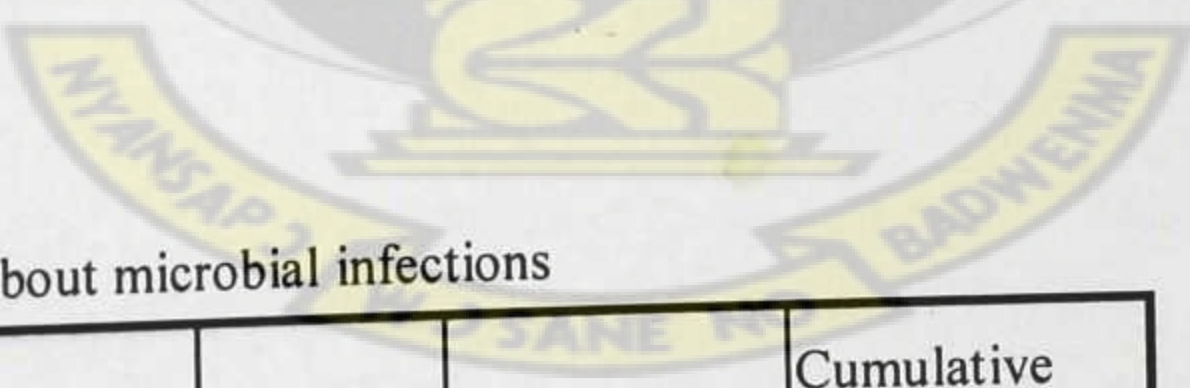
misuse of antibiotics can be harmful to your health

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly disagree	85	16.8	16.8	16.8
disagree	121	23.9	23.9	40.7
agree	210	41.5	41.5	82.2
strongly agree	90	17.8	17.8	100.0
Total	506	100.0	100.0	

KNUST

change behaviour with knowledge about effects of misuse?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid not typical of me	105	20.8	20.8	20.8
typical of me	141	27.9	27.9	48.6
very typical of me	211	41.7	41.7	90.3
indifferent	49	9.7	9.7	100.0
Total	506	100.0	100.0	



Rank your knowledge about microbial infections

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid poor	110	21.7	21.7	21.7
good	173	34.2	34.2	55.9
very good	136	26.9	26.9	82.8
excellent	87	17.2	17.2	100.0
Total	506	100.0	100.0	