ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

A STUDY OF THE PERSONAL AND SOCIOECONOMIC CHARACTERISTICS OF OFFENDERS WHOSE CASES WERE DECIDED BY THE HIGHER COURTS OF OROMIYA

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June, 2000

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By

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Dedicated to:

My mother Shashu Hussein

and

My father Kedir Geleto

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ABSTRACT

The main objective of this study is identifying the determinants of criminality through studying the personal and socioeconomic characteristics of the offenders whose cases were decided by the higher courts of Oromiya.

To meet this objective, the combined two-stage sampling procedure and the method of logistic regression are used to analyse the data. Information on age, sex, marital status, level of education, occupation, mental sanity/stability, place of residence, zone of residence and economic status of the offenders were considered for a random sample of 967 individuals accused of committing crimes at different times before 1997/98 and decided as criminals and non-criminals in 1997/98.

Different models have been built for all types of crimes and all the selected zones, for each of the two strata, and for different groups of crimes.

When all the cases are considered together the most important determinants of criminality are found to be age, economic status and zone difference. In this study criminality is found to be negatively related to 'poverty' which is against the theories and empirical studies on the causes of crime.

Different types of crimes were also studied separately, and the following were the findings.

For murder including attempt and grave willful injury the most important factors of criminality are found to be age, place of residence and zone difference.

For theft and robbery the most important determining factors of criminality are age and zone difference.

For crimes particular to government authorities, criminality is found to increase with age until it stabilizes at the higher ages. The occupation 'farming' is also found to be the most significant factor with positive relation with criminality.

When the strata are separately considered, criminality for East of Rift Valley Oromiya is significantly determined by the age and economic status of the individuals. The analysis showed that criminality is positively related with poverty supporting the literature. For West of Rift Valley Oromiya, level of education and economic status are found to be the most important determinants of crime.

CHAPTER I

I. Introduction

1.1. Organization of the Study

The study is organized in four chapters. In Chapter I, general description of the region, significance and objectives of the study, and literature review are given. Chapter II deals with the method of data collection and adoption of the method for the study. In Chapter III, variable description and some preliminary data analyses are given. In Chapter IV, the method of logistic regression is introduced, the results for the analysis are given and discussed. Finally the summary of the findings and recommendations are given.

1.2. General Description of the Region

Oromiya is one of the regional states in Ethiopia. It is located between $3^{o}22'$-$10^{o}46'$N latitude and $34^{o}08'$-$42'$-$55'$E longitude covering an area of about 367,000 km^2. It has 12 administrative zones, 180 districts and 6800 kebeles. Addis Ababa or Finfine as it is known by it name by Afan Oromo is the capital of the Regional State as well as the central government. Afan Oromo has been the working language of the regional government and medium of instruction in elementary and junior secondary schools since the formation of the regional state. It is a mother tongue for a population of 15.7 million and a second language for nearly 1 million others out of the 18.7 million population of the Region (CSA, 1996).

According to CSA (1996) estimate the population of Oromiya will be 21.5 million as of July 1, 2000. It was 18.7 million in 1994. About 90 percent of this population live in rural areas and depend on agriculture.

The ethnic composition of the region comprises many ethnic groups. However, more than 85 percent are the Oromos. The ethnic heterogeneity increases as one moves from rural to urban areas. In most of the towns of the region the Amharas and Gurages are the significant ethnic groups.

Islam and Orthodox Christianity are the dominant religious groups in the region. The number of Muslims is the largest both in the whole population and rural Oromiya followed by Orthodox Christian. In the urban areas, the number of Christians exceeds that of the Muslims. 'Traditional' religions are also reported to exist in different zones of Oromiya and these are exercised very much in Borena zone. There is also some variation in religious composition of the population from zone to zone as it varies from rural to urban. In Arsi, Bale, East Hararghe, West Hararghe and Jimma the Muslims constitute up to more than 95 per cent of the population. This happens to be the opposite in North Shawa, West Shawa, East Wollega and West Wollega. In East Shawa and Ilu Abba Bora the number of Muslims and Orthodox Christians are nearly equal..

The Gada Sytem is the most important building block of the culture of the Oromo people. The traditional conflict resolution system of the people is called *Guma*, which is

synonymous to what the literature on African traditional justice system called *Compensation*. As other traditional African justice systems the *Guma* system does not *involve* capital punishment, like modern criminal systems existing both in our country and others. There is also a unique element of conflict-resolution mechanism in the culture of the Oromo people. This is the case of an offence against a woman who deliverd a child during the last six months, called the 'Qenefa stage' in the culture. In such case only women judge the offence and the offender is punished by slaying a cattle to feed the woman and apologize not to repeat such an offence even to other women. All these cultural values are losing their bases with the expansion of different religious groups and the teachings of the 'Eradication of the harmful traditional practices'.

In addition to the cultural diversity the region has a varied and rich amount of natural resources. There are many big rivers like Awash, Gibe, Wabe Shabele and Weyb to mention some. Abiyata, Beseka, Dendi, Fincha'a, Melka Wakena, Langano, Shala, Wenci, Ziway and Abaya (it is found on the boundary of Oromiya and SNNP) are the known big lakes in the region. The region also has big mountains like Batu (4307m), Kaka (4245m), Gughe (4200m), Bada (4170m) and other 19 mountains having altitudes of greater than 2989m above sea level (OPEDB, 1996).

Different species of trees exist in these mountains and they are home for wild animals. There are also different parks and sanctuaries in the region. These include the Awash

National Park, the Bale Mountains National Park, the Rift Valley Nation Park, the Bale and Awash Game reserves and the Sinkile sanctuary (OPEDB, 1996).

The suitability of the soil for crop production is also mentioned in different literature. Most zones of the region are also well known potential coffee producers and suppliers of foreign export of the Coffee Market of Ethiopia (OPEDB, 1996). The availability and extraction of different mineral resources is also described in the Statistical Abstract of the Regional State Published by OPEDB.

There is also some evidence of industrialization, which is however limited to Adama and towns nearer to the capital. These are mainly factories owned by the Central Government, and some medium and small-scale private industries.

1.3 Statement of the Problem

The economy of a country is based on three elements of production of goods and services. These resources are land which would be important for agricultural use and exploitation of natural resources, capital which is necessary for purchasing tools and machinery and labor, that is, the knowledge, skills, physical strength and motivation of human beings without which neither production of goods nor service rendering activities would be exercised.

The availability of land with rich and varied natural resources could provide a good condition to raise the standard of living of people. Availability of natural resources and the

technical ability to use them assures sustained economic growth. However, most nations remain economically poor because they either lack the technology to change the natural resources into use, or due to scarcity of natural resources, or disability to organize and mobilize its human resources and capital to import, create or use the technology. African countries are mentioned first to have such a problem as an ILO report once puts, "... It is estimated that Africans on the average, have become poorer in the 1980s, and that the share of people living below the 'poverty line' will grow from 48 per cent to 50 per cent in the year 2000." (ILO, 1995).

Ethiopia is mentioned in the Europa Yearbook (1985) as one of the least economically developed countries in the world. According to the Europa Yearbook (1985) Ethiopia's GNP per head was only $140 (at average 1980-82 prices), the second lowest level among African countries and one of the six lowest in the World.

Even different recent reports on development aspects of nations show that Ethiopia has not escaped from the trap of poverty it had been dwelling for long. The World Bank's report of 1998 indicates that in 1996 Ethiopia's GNP is $6.0 billion and GNP per capita is only $100. Life expectancy is 48 years for male and 51 for female. Prevalence of child malnutrition in the case of children Under-5 during 1990-96 is 48. Only 10% of its population has access to sanitation and only 27% has access to safe water. Infant mortality rate is 109 per 1000 and Under-5 mortality rate is 177 per 1000 children. Maternal mortality ratio is 1400 per 100,000. The report adds that 46 per cent of Ethiopians live

below $1 a day international poverty line, 89 per cent of its people live below a $2 day international poverty line.

The question, which follows, is then why Ethiopia remains economically poor. Is it the absence of natural resources and/or technology or is it due to disability to mobilize human resources to make natural resources into use?

This research attempts to provide empirical answers to the above question by considering Oromiya one of the Regional States in Ethiopia. As it is mentioned earlier Oromiya is endowed with varied and rich natural resources. It has many potential rivers that can be used for irrigation and to generate electricity. Many scenes of tourist attraction of the country are found in this Region. Coffee, the main export commodity of Ethiopia is, mostly, grown in this Region. There are also different metallic and nonmetallic mineral resources.

Nevertheless, the Region is characterized by many socio-economic problems. To mention a few, among its population aged 5 years and above only 13% attended school before 1994. Infant mortality rate by 1994 was 118 per 1000 live births; Under-five mortality rate was 173 per 1000 children. There is a high shortage of infrastructure facilities, health services, poor media of communication and high rate of youth unemployment (CSA, 1996).

From this it is clear that the absence of natural resources cannot be the cause of the poverty in the Region. The remaining reasons are technology and inefficiency to mobilize human resources to use the natural resources. The absence of technology is clear. But, should a country remain poor if it does not have technology? Did all the economically advanced countries develop only because they have technology? Of course not!

> *"... Unlike the medieval English, the Japanese did not have to wait for a new technology. They went to England to study the navy and merchant marine, to Germany for the army and the medicine, to France for law, and to the United States for business methods. The result was rapid modernization."(Mendelson, 1992).*

Mendelson (1992) cites the civil and criminal laws as important elements of the things Japan imported for its development. According to Mendelson, not only Japan but also America and England reached the current stage not only because of technology but also by adopting laws, that helped them to use their resources properly, especially human resources.

Law is a stabilizing or conserving force, according to Mendelson. It is also simultaneously a crucial instrument of social change. So a nation's law should comprise not only the rules and procedures for setting cases when they occur but also some mechanisms to prevent the cases from occurring.

To prevent acts against the law, we should know the causes and consequences of these acts. Ethiopia, for instance, has civil and criminal laws. It has police forces to prevent crimes, courts to judge the cases when they occur. Nevertheless, no study has been undertaken to know the causes and consequences of violation of the laws.

The crimes, on the other hand, do not cease to occur. In the Regional State of Oromiya courts loot into tens of thousands criminal cases every year. Since the formation of the Supreme Court of Oromiya by Proclamation No. 3/1993 of the Regional State not less than 74183 criminal cases were registered in the Region. Among the criminal cases seen at the level of the higher courts in 1996, for instance, 32.05% were murder cases while attempt to murder constitute 6%. In the same year robbery and theft constitute 13.36% of the criminal cases; murder constitute 63.14% of the cases seen by the Supreme Court (OSC, 1996). The Region should, therefore, devise some means to prevent loss of human life and property. To do so, it needs to know the causes or factors that induce people to comit crimes and the cost incurred both through loss of life and/or property and to prevent and settle the cases.

The main objective of this research is, therefore, identifying the determinants of criminality through studying the personal and socio-economic characteristics of the offenders whose cases were decided by the higher courts of Oromiya.

1.4. Objectives of the Study

The study has the following specific objectives: -

1. Identifying the common types of crimes committed in the Region
2. Identifying the main factors of criminality in the Region
3. Determining the variation in crime by zone and various socio- economic classes of individuals.

1.5. Literature Review

In order to understand the literature on the causes and consequences of criminal activities it is necessary to know what the term crime itself is. A criminal act is one the society (or one of its subdivisions) has decided it is better off without and which it has therefore made illegal through laws, ordinances, and the like (Sharp et al., 1990). Consequently, crime is defined in the present study what Ethiopian laws categorize as illegal and which the courts register as crime.

Whichever way a society defines crime and criminal activities there had been some general theories concerning the causes of crime and criminal activities in the history of mankind.

Prior to the 18th century there was a theory called the Demological theory of the causes of crime. This theory considers crime as a product of an evil spirit or an affected mind (Reckless, 1961). During the eighteenth century, Beccaria (Italy, 1735-95) and Bentham (England, 1748-1832) developed the classical school of criminology. According to the

school human behavior was supposed to be guided by what brought him/her pleasure and he/she was supposed to turn away from the things which brought him/her pain and penalties (Reckless, 1961). That is to mean that people commit crime because they found pleasure in it and those who do not commit crime do not commit because they do not feel pleasure in committing crime.

In the early 19th century geographers developed what was called the Thermal Theory of the causes of crime. According to this theory crimes against the person are induced by hotter climates and crimes against property, by colder climates (Reckless, 1961).

In the nineteenth century Lomboroso (Italy, c.1876) basing on the Evolution Theory of Darwin developed the theory of 'Born Criminal'. According to the theory, the serious criminal, especially the murderer was 'born criminal' (Reckless, 1961, Cressey, 1969). Reckless (1961) concluded that Lomboroso broke the backbone of rationalistic theory of Beccaria and Bentham. However, it is surprising to see the revival of the rationalistic theory of the causes of crime by other criminologists in the end of the 20th century. Nagin and Paternoster (1997) concluded that variations in criminal offending is attributed to variations in more proximate influence such as the accessibility and vulnerability of the target and perceptions of the costs and pleasures of offending.

Goring (1910), as cited in Reckless (1961), demonstrated by measure and statistics the carnal and skeletal characteristics of born criminals as observed by Lomboroso did not

apply to 3000 English convicts. He did find some relationship between physique and type of crime and reached on the conclusion that weak- mindedness was probably the most important factor in criminality. This belongs to the psychiatric theory of the causes of crime. Another proponent of this theory, Hakeem (1958), as mentioned in Cressy (1969), held the position that says criminals constitute an inferior type, characterized by mental disorder, alcoholism, neuroticism, and the like.

Early in the twentieth century, another psychiatrist, called Healy (Reckless, 1961) systematically studied the case histories of several hundred delinquency referrals to his clinic from the Chicago juvenile court. He called attention to the fact that there are multiple causative factors in each case. Healy found that on average there were 3.5 causative factors per case, out of a sample of 823 repetitive delinquents referred to his clinic from the juvenile court (Reckless, 1961).

Healy's research opened the door to a Multiple Factor Approach (MF). In 1925, Burt, a British psychologist after studying a sample of 123 boys and 74 girls who had been referred for clinical diagnosis by the juvenile courts of London and another sample of 400 nondelinquent boys and girls who came from the same neighborhood and discovered that there were approximately nine conditions per case which, in different combinations and varying numbers forced the child into delinquency.

As it is cited in Reckless (1961) Glueck and Glueck (1950) made an elaborate study of 500 cases of delinquent boys from Boston, who had been committed to state schools for delinquent youth, and 500 cases of nondelinquents, matched by pairs for age, neighborhood, economic status, I.Q, and so on. They formulate a five causal laws containing constitutional, temperamental, emotional (attitudinal), psychological, and family differences.

Sampson and Laub (1997) reanalyzed the Gluecks' data and reached the conclusion that poverty appears to inhibit the capacity of families to achieve informal social control which in turn increases the likelihood of adolescent delinquency. The most important determinants of adolescent delinquency according to Sampson and Laub, and other researchers are family size, erratic/ harsh discipline, maternal supervision, and parent child attachment.

The other important theories of the causes of crime are the Sociological Theories. These theories link variations in crime rate of societies and groups with such social processes as mobility, competition, and cultural conflict, political, religious, and economic ideologies, population density and composition and the distribution of wealth, income and employment (Cressey, 1969).

The Sociological Theories of the causes of crime are more comprehensive than the others. They have also different characteristics. Some of them are the Differential Association, the

Differential Social Organization, the Conflict/culture conflict, and the Strain Sociological theories of the causes of crime.

Differential Association theory of the causes of crime was developed by Sutherland (1947). According to the theory criminal behavior is learned in interaction with other persons, especially in intimate personal groups. The learning consists of techniques of committing crimes as the favorable or unfavorable direction of motives and drives is learned from the way surrounding persons (probably key persons in one's world) define the importance or unimportance of obeying the legal norms. The theory again says a person becomes delinquent because of excess definitions favorable to violation of law over definitions unfavorable to violation of law (Reckless, 1961).

Vold's Conflict Theory contends that a large part of criminal activity may be explained as behavior of conflict. Explaining this theory Vold (1958) says that human beings belong to groups and participate in groups that have interests opposite to those of other groups. Groups are involved in continuous struggle to defend and maintain themselves and to enhance their status. Since, their interests and purposes overlap, they encroach on one another and become competitive. A group in competition with another group sees that there is a danger of being taken over or replaced.

Another form of the Conflict Theory is the Culture Conflict Theory. According to the Culture Conflict Sociological Theory both criminality and non-criminality of individual

persons are attributable to the kind of conduct and norms that have been experienced. Learning of divergent conduct and norms presupposes the existence of society in which the conduct norms of one group are in conflict with norms of another.

The Strain Sociological Theory of the causes of crime relates criminality with negative relationship between people. According to the theory other individuals may prevent one from achieving positively valued goals, remove or threaten to remove positively valued stimuli that one possess, or present or threaten to present one with noxious or negatively valued stimuli (Agnew, 1997). Strain Theory assumes that structural constraints generate frustration and crime by blocking access to opportunities for achieving desired success goals such as perceived blocked opportunities, occupational, educational and economic opportunities.

At this juncture it is worth mentioning that our discussion with some old men during a visit for another work to Arsi zone reveals the applicability of the strain theory of the causes of crime even at family level. One of our respondents, Haji Chirfa, says children of the rich family usually become delinquent because their parents always put their property, especially money, where children cannot reach. In such cases the children try to take the money when the parents are out of their home. This tempts the children to take the property without the knowledge of the owner.

Gottfredson and Hirsch (1990) developed what is called a general theory of crime. The central theoretical concept in Gottfredson Hirsch Scheme is self-control, the elements, which include an inability to defer gratification, self-centeredness, a preference for risk taking, and little interest in long term planning (Nagin and Paternoster, 1997).

Nagin and Paternoster (1997) found that intentions to engage in drunk driving, theft, and sexual assault are positively and very significantly related to self- control.

The Political Theory stresses that any behavior is criminal only because that the government defines and punishes anti-social behavior, personality problems.

Sharp et al. (1990) summarizes the underlying causes of crime as unrestrained passions or emotions, poverty coupled with high levels of economic and social aspirations, and low standards of social value.

Thorton and Endo (1992) from their comparative study on Japan and US America come up with the empirical finding that rapid urbanization and high population mobility, poverty, inflation, family breakdown and inadequate parenting, the school dropout effect, unemployment, drug and alcohol abuse and lack of respect for authority as a top list of the causes of crime and delinquency in Japan and America. They added easy availability of firearms, acute shortage of jail space to incarcerate offenders and racial discrimination are also the causes of crime and delinquency in America.

The same comparative study shows that the low crime rate in Japan as compared to US America is due to fine and/ or a minimum term penal sentencing system in Japan believing that long and harsh sentences only plunge the offender deeper into the criminal sub-culture and more criminal behavior, while in America offenders are sentenced for prison and longer prison of time and harsh treatment.

Describing the influence of justice system on crime, Shaidi (1992) and Nsereko (1992) say that the indigenous African system of justice has advantages over the contemporary criminal justices as it facilitates speedy and inexpensive justice to the victim, in consonance with the adage that "Justice is sweetest when it is freshest". Nsereko (1992) concluded that compensation for the victim, which was the central body of the indigenous African justice system, is the single most important mechanism of ensuring that justice is done. Different papers in Criminology in Africa stress the unimportance of prison and capital punishment. They also describe that criminal justice systems found in the majority of African states today are those inherited from the former colonial powers. They are, by and large, Western European oriented. Their primary preoccupation is maintaining the "kings' peace" or governmental authority. They pay little attention to, and do very little, if any thing, for the victim, the person whose rights might have been so grievously violated.

Japan's culture, especially the marriage system, prevents people from engaging in crime, according to the comparative study on Japan and America. The study quotes the following to show the importance of marriage system in Japan in preventing crime,

> " ... Not only is the unfortunate ex-offender stigmatized so is his entire family. Even a daughter may be unable to find a husband to marry her. No prospective husband wants his family name sullied by marriage to an ex-offender's family. Such facts are normally discovered during the searching premarital examination by the go- between whose background investigation is a vital part of the Japanese arranged marriage system. In some respect, marriage in Japan is much a union of two families, as it is two individuals. Doubtless this accounts for the low divorce rate compared with the united states which may in itself be a factor in Japan's low crime rate."

The same study adds that Japan is a knit (homogeneous) society with a strong sense of community. The United States is essentially a pluralistic immigrant society, most of whose citizens are but two generations removed from some other country. American society is individualistic rather than group oriented.

Most Japanese possesses an unusually strong work ethic and commit themselves with dedication and diligence to any job they are doing. Coupled with a very low unemployment rate, this work ethic creates a society that is 98 per cent gainfully employed. This work ethic is inculcated in Japanese from childhood. For America this is the opposite.

The education system, respect for law, religious ethic and geographic insularity are other reasons for Japan's low crime rate as compared to that of America as this comparative study investigates.

Another important point in studying crime is that crime has costs, economic or not. Sharp et al. (1990) explain the economic costs of crime by comparing what economy should produce in the absence of crime and crime prevention activities and when they are. Thus, they determine the economic cost of crime in terms of reduction in Gross National Product (GNP). They stated that the cost of crime consists of the offender or victim's being held from production, the cost of prevention, apprehension, and correction since resources used for these purposes could have been used to produce alternative goods and services valuable to consumers.

People become unemployed because of crime whatever the length of time is. Unemployment is a waste of resources to the society and to the individual as well. Sharp et al. (1990) explain the effect of unemployment on GNP saying,

> *" Idle human resources represent a waste, a loss of goods and services, and, therefore, a loss of real income. Unemployed resources could have contributed to society's well being, the economic value of this lost contribution of goods and services is the economic cost of unemployment. The difference, then, between what may be produced at full employment*

and what is produced less than full employment measures the total cost of unemployment."

It is not difficult, thus, to understand that crime makes people unemployed either through imprisonment or through the time lost to follow the cases. People's being unemployed today has also a great problem for the future production of the society as stated by sharp et.al:

> *" Unemployment may affect not only current production of goods and services but also future production. During periods of unemployment, machinery as well as workers are idle. Capital goods, plants and equipment, become obsolete and are not replaced. The productivity of labor and the overall ability of the economy to produce in the future are reduced during the periods of unemployment."*

With this we come to the end of the literature review and turn our attention to the situation in Oromiya. To the best of our knowledge, no study concerning the causes and/or economic costs of crime has been undertaken in the country leave alone in Oromiya. Crime, however, is always there in this country and it is even increasing from time to time. In Oromiya, for instance tens of thousands of criminal cases are reported to the courts every year. There were 26,205 criminal cases presented to the courts of the Region in only 9 months of 1993/94. In 1994/95 it reached 63,132 (12 months data). The figure raised to 121,203 in 1996 (OSC, 1995-1999).

This research, therefore, aims at identifying the determinants of criminality through studying the personal and socio-economic characteristics of offenders whose cases were decided by the higher courts of Oromiya in 1997/98. Hopefully, the outcome of the research would assist in developing some policy measures to solve the problems in our country or countries of similar standard. The research may add something to the hitherto existing theories and would serve as bases for further research.

1.6. The Scope and Limitations of the Study

The objective of the study, availability of information and resources at hand detect the scope of the study.

The study population for this study is the population of individuals (18 and above years old) accused of committing crimes at different times before 1998 and decided to be criminal or non-criminal by the higher courts of Oromiya during the year 1997/98.

Due to certain similarities between some zones and, time and resources limitation for the study, the study covered only 6 of the 12 zones. The criminal cases of the district courts and the supreme court are not covered by the study, as the former are bulky in number to be covered by this study, and, the latter are the appeals from the higher courts and the most sensitive cases of the central government, that require a study of special kind.

As the availability of information also matters the study covers only the offenders that got decisions during 1997/98.

This study is not without limitations. Some of the limitations this study admits are:

1. Those individuals who have never been accused of committing crimes have not been included in the study.
2. The court files lack some information like ethnicity, religion, family size and previous criminal records of the offenders; and no information was obtained concerning the victims.
3. As this study is the first of its kind in our country, to the best of our knowledge, some criticism may arise from the reader in the future. We are happy to receive such comments.

CHAPTER II

The Methods of Data Collection

Introduction

To come up with useful results from a research the method of data collection should be specified and designed carefully. The methods of data collection are generally divided into two broad categories. These are the census or complete enumeration and the sampling method, which essentially mean to take some parts of the whole to infer about the whole.

Which method to follow in research process depends on the purposes of the study, resources available, and the nature of the population to be studied. When we want to know about every element of the population we use the complete enumeration. This is the case, for example, when one wants to know the total number of human population of a country or in the case of admitting students to higher education as it is not possible to give examinations for some of them and admitting others basing on the results of those who take the examinations.

Although complete enumeration enables one to know everything about the population under study, the sampling method is preferred because it requires less resource and enables obtaining results on time. As it requires less resource we can employ qualified enumerators and come up with data of superior quality. Sampling is also the only way-out in studying an infinite population and elements of destructive nature like testing the quality of industrial products.

The sampling procedure itself can be probability sampling or non-probability sampling. If the sample selection procedure is based on probability theory it is called probability sampling or random sampling. On the other hand, if the procedure is based on some subjective knowledge of the researcher it is called non- random or non-probability sampling.

Nonrandom sampling is used when the elements to be sampled are the ones about which the researcher has some prior knowledge and selecting others by chance alone will be useless and may also negatively affect the result of the research. Examples of such cases can be studying the history of a nation and obtaining professional ideas of the persons to be interviewed should be those who have knowledge about the problems. Nonrandom sampling can also be used for testing questionnaire.

A probability sampling especially designed and using specific techniques can provide estimates of errors and biases other than those due to sampling, that affect both a sample and a complete enumeration such as response or observational errors, the differential bias of enumerators, errors arising from incomplete samples, processing errors, etc. Therefore, probability sampling is usually preferred in statistical inferences in which precision is required.

Probability samples are again divided into four major types. These are simple random sampling, systematic sampling, and stratified sampling and cluster sampling. To decide which sampling method to use in this work a brief description of each of these methods is given below.

2.1 Simple Random Sampling: If a sample is taken from the population in such a way that every element of the population has equal prior chance of being included in the sample the sampling procedure is called simple random sampling (SRS). SRS can be with or without replacement. When SRS is done with replacement, the sampled unit is returned to the population at each draw before the next unit is selected. When the unit is not returned to the population after it is drawn, the sample is a simple random without replacement.

2.2 Systematic Sampling: To select a sample of size n from a population having N units labeled from 1 to N, we divide N by n and let the result k, usually termed sampling interval. We choose a random start between 1 and N and take on the sample every k^{th} element in such a way that every element has the probability 1/k of being selected. In some situations N may not be exactly divisible by n. In such a case we select a random start from 1 to n and then thereafter selecting every k^{th} unit, k being the nearest integer to N/n, in a circular manner, until a sample of n units is obtained.

In systematic sampling, since the sample is taken following a particular path through the population units, the arrangements of the units play an essential role to the performance of

the estimator. When a particular pattern exists in the arrangements such as periodic variation, precaution must be made before drawing a systematic sample to guard against potential loss of efficiency. If the population has unforeseen periodicity the estimates of the population mean value may be biased. However, if the units were arranged at random, we would expect that systematic sampling and SRS are equivalent.

The important advantages of systematic sampling are that it is operationally convenient, second the population size need not be known before hand and a systematic sample may be selected with the listing of the population or with a census if the sampling fraction is fixed beforehand. Third, a systematic sample is spread out more evenly over the population so that it is likely to produce a sample that is more representative and more efficient than a SRS.

2.3 *Stratified Sampling*: When the population to be studied has some natural grouping(s) it is possible to study the groups as sub- populations. Each sub-population in such grouping is called stratum and the number of elements in each stratum is called stratum size. The stratifying variable may be geographical divisions, administrative divisions, economic levels,..., and others depending on the nature of the study population.

Cochran (1977), Tryfos (1996) and other workers on sampling theory and applications state that stratified sampling is important when it is desired to estimate the characteristic of each group separately in addition to those of the population, when estimates of

population characteristics are required with increased efficiency per unit of cost, when a greater weights are required to be given to some units that occur infrequently in the population and when different sampling procedures are to be adopted for different sub populations.

2.4 *Cluster Sampling*: If the study population is divided into non- overlapping groups according to a certain criterion and all units in a group are enumerated the sampling procedure is called cluster sampling.

2.5. *Multi-Stage Sampling:* In all of the sampling procedures discussed above the samples can be taken in one stage or in stages. If the samples are drawn in one stage the procedure is called single -stage sampling. If the sample is drawn in a number of stages it is called a Multi- stage sampling.

In Multi- stage sampling, the population is divided into a number of first- stage (or primary sampling) units, which are sampled; then the selected first- stage units are sub-divided into a number of smaller second- stage units, which are again sampled; the process is continued until the ultimate sampling units are reached.

Multi-stage sampling is required when sampling frame may not be available for all the ultimate observational units in the population and it is extremely laborious and expensive to prepare such a complete frame. Greater savings are achieved as sampling frames need be constructed only for the selected sampling units and not for all sampling units in the

population. Even when suitable sampling frames for the ultimate units are available for the population, a Multi-stage may be more convenient than a single-stage sample of the ultimate units, as the cost of surveying and supervising such a sample in a large scale surveys can be very high due to travel, identification, contact, etc. Multistage sampling can also be a convenient means of reducing response errors and improving sampling efficiency by reducing the intra-class correlation coefficient observed in the natural sampling units.

Tryfos (1996) shows that two- stage sampling is less expensive and more convenient than the stratified sampling of the same size. Tryfos added that, if the sample size is treated as a constant and if the samples from each selected group are to be of the same size, the optimal strategy is to either take a stratified sample with n/M (M is the number of groups in the population) elements sampled from each group, or to take a two- stage sample with only one group selected in the first stage. For estimating the population mean of a variable, the smaller the differences among the group means and the group variances, the better is the two- stage sample in relation to a stratified sample of the same size. For estimating a population proportion, the smaller the differences among the group proportions, the better is a two- stage sample relative to the stratified samples of the same size. Conversely, the greater the differences among the group means or proportions and the smaller the group variances, the better is a stratified sample in relation to two- stage sample of the same size.

Multistage sampling is sometimes combined with stratified sampling to gain the benefits from the two procedures.

2.6. Estimation of Sample Size

Determination of the sample size is the most important element of survey sampling. The sample size should not be too small to give sufficient information nor should it be too large and cause wastage of resources by redundantly enumerating the elements that contain the same information about the population.

The determination of sample size depends on the purpose of the study, resources available, precision required, whether it is required for a characteristic or many characteristics, whether the results are required for the whole population or for some divisions separately, to mention some.

The sample size is thus usually expressed in terms of variance. The variance, when not known, can be estimated by taking the sample in two steps, by the results of a pilot survey, from previous survey of the same nature, or by guesswork about the structure of the population, assisted by some mathematical results (Cochran, 1977).

Tryfos (1996) says, provided that the accuracy requirements are demanding enough, the size (n) of a SRS needed to estimate the mean μ or the proportion P of individuals that belong to a given category within $\pm c$ with probability $(1-\alpha)$ is

$$n = \frac{NA}{\left[(N-1)D^2 + A\right]} \qquad (2.1)$$

where D=(c/$Z_{\alpha/2}$), and A=P(1-P) for estimating P, or A=σ^2 when estimating μ and c is a small positive number to represent the error of estimation.

In estimating P, n in (2.1) is largest when P (1-P) is largest when P=0.5. Therefore, if there is no information at all concerning P, it could be assumed conservatively that P=0.5 and the required sample is size calculated under this assumption. That large a sample will be greater than needed no matter what the value of P happens to be.

For stratified random sampling, provided that the accuracy requirements are demanding enough, the total size n of a stratified sample needed to estimate μ or P within $\pm$c with the probability (1-α) and to be allocated to the groups according to $n_i = nv_i$ is

$$n = \frac{\sum\left(N_i^2 Ai/_{vi}\right)}{N^2D^2 + \sum N_i A_i} \qquad (2.2)$$

where, D=(c/$Z_{\alpha/2}$), and A_i=P_i(1-P_i) when estimating P, or A_i=σ_i^2 when estimating μ and c is as defined in (2.1).

2.7. The Method of data Collection Followed for this Work

The purpose of reviewing theoretical and empirical literature is not only to qualify or modify them but also to build a good base for current research. Not only written literature, different persons were also contacted to give their own personal experience and view on what induces individuals to commit crimes.

The schedule for data collection for this research, therefore, is based on theories of the causes of crime, empirical findings from some past researches and personal ideas. Every effort has been made in preparing the schedule to obtain complete and accurate information within the limits of the resources available.

As the information is to be collected from files there was no need to undertake a pilot survey, which is a usual practice in statistical sample surveys. When the proposal was prepared the idea was to take the sample in two steps; however, doing so was found to be financially beyond the scope of the survey.

The sampling procedure followed is a *Combined Stratified-Two-Stage* sampling procedure. Accordingly, the region is first divided into two sub-regions named, only for this research, East of Rift Valley Oromiya and West of Rift valley Oromiya. The East of Rift Valley Oromiya Sub-region comprises Arsi, Bale, Borena, Eastern Hararghe and Western Hararghe administrative zones. The Western Oromiya Sub-region comprises Ilu Abba Bora, Jimma, East Shawa, North Shawa, West Shawa, East Wollega and West Wollega administrative zones. The stratifying variable is, in fact, the rift valley system that

passes through Arsi and East Shawa Zones. (*See the map of Oromiya in Figure 1.1, in Annex I*).

From each stratum the sample of zones is selected. These include Bale, Borena and West Hararghe from East of Rift Valley Oromiya, called stratum 1; Ilu Abba Bora, North Shawa and East Wollega from West of Rift valley Oromiya, called stratum 2 in this work. The sampling frame is the file of the criminal cases decided at the level of the higher court in the selected zones during the year 1997/98.

Besides the physical division used to form the strata the sample of zones from each stratum is selected basing on the percentage of urban population, dominant economic activities of the people, regional and international boundary share, the diversity of culture, and the religious and ethnic composition.

Regarding the unselected zones we have the following to say. Arsi and East Hararghe can be represented by Bale and West Hararghe zones respectively, in almost all respects. East Shawa and West Shawa zones can both be represent by North Shawa. Ilu Abba Bora and East Wollega can represent Jimma and West Wollega, respectively.

The main objective of this research is to study the factors that contribute to person's engagement in crime. Nevertheless, for the sake of determining the sample size and also to make the research useful for multipurpose, the proportion of offenders decided to be

criminal is taken as the most important variable to determine the sample size. Therefore, the sample size for the research is decided so as to estimate the proportion of criminals with optimum precision and then studying the behavior of those selected offenders.

As usual sample size is determined depending on some precision (variance) and cost. The only available information for this study is, however, the number of criminal cases decided in the year. There has been no study of similar character to take the estimates from. Nor it was possible to take the sample in two steps to obtain the estimates for the final study for the reasons mentioned before. Therefore, the only alternative was to use the conservative rule discussed by Tryfos (1996).

According to the available information there were a total of 3056 criminal cases decided at the level of higher courts during 1997/98 of which N_1=1056 belong to stratum 1 and N_2=1998 to stratum 2 giving $\nu 1$=0.346, $\nu 2$=0.654

Using Equation (2.2) with α=0.05, c=0.03 and P=0.5=P1=P2 we obtain $A_1=P_1(1-P_1)$= 0.25=$A_2=P_2(1-P_2)$ and the resulting sample size becomes

$$n = \frac{\left\{N_1^2 A_1 \nu_1 + N_2^2 A_2 / \nu_2\right\}}{N^2 D^2 + N_1 A_1 + N_2 A_2} = 791$$

The sample size is $n_1=n\nu_1$=791(0.346)=274 for stratum 1, and $n_2=n\nu_2$=791(0.654)=517 for stratum 2. Proportional allocation to the selected zones in each stratum gives what is shown in Table 2.1.

The individual files were selected using circular systematic sampling technique. The sampling interval used is the nearest largest integer to N/n and the random start is different for every zone.

Table 2.1. *Sampling frame and the selected sample size for studying the factors that induce individuals to comit crimes in Oromiya.*

Sub-Region	Selected zones	Population size	Proportion in the sub-Region	Sample size
East of Rift Valley	Bale	149	0.23	63
	Borena	334	0.51	140
	West Hararghe	169	0.26	71
West of Rift Valley	Ilu A/B	397	0.35	181
	North Shawa	349	0.30	155
	East Wollega	402	0.35	181

The personnel for data collection was selected on the bases of levels of education those who completed 12 grade, having readable handwriting, and acquaintance with the work of courts and able to read, understand and interpret information in Afan Oromo. Before they begun with data collection they were briefed on the objective of the research and how to extract information from the files to the schedule using the codes prepared by the researcher. They were given some files to fill independently and checked how clearly they understood the schedule.

CHAPTER III

Variable Description and Preliminary Data Analysis

Introduction

Once the data are collected through a carefully designed procedure the next step is to edit and analyze them. Interpretation then follows. The statistical method of data analysis to be used in the study mainly depends on the objective of the study and the nature of the data to be analyzed.

This chapter has three main sections. In section one we will describe the variables used in the study. The second part of the chapter deals with the derivation of some descriptive statistics from the data and consequently making some arrangements to the data in such a way it makes smooth the work of the regression analysis to be dealt with in the next chapter. In the last section of the chapter we will give some dummy variable coding to be used in the analysis.

3.1. Variable Description

The variables used in this study were selected based on the different theories of the causes of crime discussed in the literature and the ideas gained from discussions with persons having acquaintances with the services of the courts either by working in the courts or by having cases there.

The dependent variable is the measure of criminality denoted by y. It can have only two values 1 or 0 depending whether the person is labeled criminal or not. The courts already decided the criminality or non-criminality of the individuals; but the objective of this study is to find the factors that most probably discriminate the criminals from the non-criminals. The predictor variables are given with their descriptions in Table 3.1.

Table 3.1 Predictor variables Description (*all variables refer to the offender*)

Variable	Description	Levels
X_1	Age	
X_2	Sex	1=male, 0=female
X_3	Marital status	1=married, 0=unmarried
X_4	Occupation	1=farmer 2=merchant 3=government employee 4=administrative/military 5=unemployed/daily laborer 6=others not mentioned in 1 −5
X_5	Mental stability/sanity	1=normal, 0=ill
X_6	Level of education	1=illiterate 2=grades 1-6 3=grades 7-8 4=grades 9-12 5= above 12th grade
Defcon	Defense consul	1=public, 0=private
X_{12}	Zone of residence	11=Bale 12=Borena 13=West Hararghe 21=Ilu Abba Bora 22=North Shawa 23=East Wollega 30=other zone/regions
X_{14}	Place of residence	1=rural, 0=urban

Defense consul/lawyer of the offender here is used as a proxy to the economic status of the offender because it was not possible to obtain information about the incomes of the individuals either in terms of monthly salary or production per unit of time. According to the information obtained from the court the government nominates public defense consul for those offenders who bring the letter of confirmation from their kebeles that they are poor and cannot hire private consul. Thus, even if it is not possible to set the poverty line to separate the individuals it is at least possible to classify them as economically poor and economically better groups.

The types of crimes are coded as: - 1=murder, 2=attempt to murder, 3=theft, 4=robbery, 5=abuse of power, 6=grave willful injury, 7=abuse of the right of search or seizure, unlawful arrest or detention, 8=false testimony, 9=mischief, 10=carrying unlicensed weapons, 11= contraband, 12=aggravated assualt, 13=damages to services and installations of public interest, 14=aggravated recieving, 15=fraudulent misrepresentation, 16=bribery, 17=burning house, 18=abducting girl).

3.2. The Preliminary Data Analysis and Stratification after Sampling

The data for the study were collected for 993 individuals decided to be criminal or non-criminal in the year 1997/98. Some 26 individuals were reduced because of unidentified type of crime they committed. Hence the analysis and discussions in this study will be based on the remaining 967 observations.

The frequency counts of the individual show that among the 967 individuals 940 are male and 27 are female. The distributions of the marital status of the individuals show that 709 are married, 251 unmarried, and 7 with unidentified marital status. Among the 967 selected individuals 772 and 194 are rural and urban residents respectively. There is one individual with unspecified place of residence. Among these 967 individuals 672 were accused to have committed the crimes at rural areas, 252 at urban areas, and 43 at unidentified places.

The important point to be used for preparing data for the regression analysis of the next chapter is the frequency count of the occupation, education and zone addresses of the offenders. The occupational distribution shows that farmers, merchant, government employees, administrative, unemployed/ daily laborer and the others constitute 78.6, 4.2, 5.5, 2.3, 2.6, and 6.8 per cent of the total sample size, respectively. The educational distribution shows 82.3, 8.8, 3.3, 4.7, and 0.9 per cent illiterate, grade 1-6, grades 7-8, grades 9-12 and above grade 12 respectively of the total sample size.

The frequency distribution of the types of crimes is also considered. Murder including attempt, robbery and grave misrepresentation constituting 57, 11.9 and 11.8 per cent, respectively of the all crimes appear as the first three leading types of crime reported in the data.

Basing on this frequency count some elements either with similar characteristics or with very small relative frequencies have been merged with others to facilitate the regression analysis.

Thus, the occupations are reclassified as farmer, other employment and unemployed/ daily laborer. In this case the former government employee, merchant, military/ administrative and other employment became the new other employment category. The level of education is reclassified as illiterate, elementary education, secondary and above (better educated). The former grades 1-6 and 7-8 merged into elementary education, the 9-12 and above 12 merged to the better-educated category. The category illiterate retains its former name. The zone address of the offenders which are different from the selected zones are merged into one name, others. The types of crime are reclassified as murder including attempt and grave willful injury (1), theft and robbery (2), cheating, dishonesty, false testimony and aggravated receiving (3), crimes particular to government authority (4), and other crimes not included in the four lists (5).

In this classification, the category, crimes particular to government authority include abuse of power, abuse of the right of search or seizure, unlawful arrest or detention and, damages to services and installations of public interest, and taking bribe.

3.3. Dummy Variable Coding

The coding of the variables given in section 3.1 helps us for easy and fast extraction of information from the files. However, it is not necessarily meant that they can be used directly in the analysis. For their use in inferential statistics some modifications are required.

The modifications are for the nominal scale variables describing the qualitative aspects of the individuals. When we code farmer by 1, other employment by 2, and unemployed/daily laborer by 3, it is possible in no way to infer that an occupation with the smaller code is inferior to the occupations with the larger code or vice versa. We cannot also say that the difference between unemployed/daily laborer and farmer is 2 by subtracting the code of the latter from that of the former. In the same sense we cannot order the two sexes by giving different numbers. The numbers are only the identifications.

Then how can we compare the effects of being a farmer with that of being in other employment or unemployed/daily laborer? Or how can we compare the effect of being male with that of being female in committing crimes? The best way of representing qualitative independent variables in such a way that it is possible to measure their effects on the dependent variable is by representing their levels with dummy 0,1 coding (Cohen and Cohen (1983), Hosmer and Lemshew (1989). In such a coding 1 represents the presence and 0 the absence of the quality of interest in an individual.

Any two numbers can be used as dummy variables (Cohen and Cohen, 1983), but using 0 and 1 simplifies interpretation and understandability. Hosmer and Lemeshaw (1989) also share the same idea. They also cited case in which the method of orthogonal polynomials is preferred to the 0 and 1 coding. That is, when we want to assess the trend in the response variable over increasing levels of an interval scaled independent variable. If such a categorized ordinal or interval scaled variable show some evidence of trend in the analysis we may use the variable as a continuous variable and model it with a single parameter than using its levels.

In using dummy variables the observations are assigned to k mutually exclusive and exhaustive categories and each case can be assigned to one (and only one) of the k groups. If there are k groups (levels) of a given variable we need k-1 dummy variables to represent the membership.

The logistic regression program of SPSS software gives the dummy variable coding upon the request from the user. Hence we are not going to discuss the way the dummy variables are created.

Using the dichotomous independent variables coded with 0 and 1 as they were given above, we give the dummy variable coding used for independent variables having more than two levels.

1. Level of education (EDCLS)

	EDCLS(1)	EDCLS(2)
Illiterate	1	0
Elementary education	0	1
Better educated	0	0

2. Zone address of the offenders

Zone	Zone(1)	Zone(2)	Zone(3)	Zone(4)	Zone (5)
Bale	1	0	0	0	0
Borena	0	1	0	0	0
West Hararghe	0	0	1	0	0
Ilu Abba Bora	0	0	0	1	0
North Shaw	0	0	0	0	1
East Wollega	0	0	0	0	0

3. Occupation (ocupcat)

	Ocupcat(1)	Ocupcat(2)
Farmer	1	0
Other employment	0	1
Unemployed/ daily laborer	0	0

4. Zone code when only stratum 1 is considered

	Str1zn(1)	Str1zn(2)	Str1zn(3)
Bale	1	0	0
Borena	0	1	0
West Hararghe	0	0	1
Others	0	0	0

5. Zone code when only stratum2 is considered

	Str2zn(1)	Str2zn(2)	Str2zn(3)
Ilu Aba Bora	1	0	0
Norht Shawa	0	1	0
East Wollegga	0	0	1
Others	0	0	0

CHAPTER IV

The Logistic Regression Analysis and Discussion of the Results

Introduction

In chapter one, we introduced the importance of this research and reviewed the literature. In chapter two, different methods of data collection were discussed and finally we adopted a method that seemed appropriate for the research. In chapter three, the variables used in the study were explained and certain arrangements were made to the data after preliminary data analysis, mainly based on frequency distributions. This chapter deals with the methodology of data analysis that helps in identifying the factors that induce individuals to comit crimes in Oromiya.

The chapter has two main parts. The first part introduces aspects of logistic regression such as model formulation, estimation of coefficients and tests for their significance, assessment of the goodness-of-fit, regression diagnostics, variable selection and interpretation of the results. The second part of the chapter solely deals with the results and discussion of the analysis for the crime data under consideration.

4.1. The Logistic Regression Analysis

Many social studies involve qualitative dependent variables. Thus, social researchers use only the frequencies and some measures of association to describe the relationships that exist between different phenomena.

However, the objective of the inquiry may not be limited to frequency counts and percentages, and describing the degrees of association, but it may require fitting models that show the relationship. It may need the determination of the effect of some characteristics on another and/ or the prediction of the value of one characteristic based on the value of another. A variable's contribution to the change of another can also be viewed in its effect in combination of other variables. Such a relation usually needs building a mathematical model that expresses a given characteristic as a function of another.

Sometimes we may have a dichotomous dependent variable involving the presence or absence of a certain characteristics in individuals, say, criminal or non-criminal. Let y be such a variable, and C is a category into which the individuals belong. Then y can be defined as

$$y = \begin{cases} 1, \text{ if the individual belongs to category C,} \\ 0, \text{ otherwise.} \end{cases}$$

The most commonly used statistical model for such variables is the linear probability model. In linear probability function we treat the dichotomous dependent problem as an ordinary linear regression problem taking the expected value of y to be a linear function of the independent variable as

$$y = X\beta + \epsilon, \tag{4.1}$$

with $E(\epsilon)=0$ and the classical least squares estimators are required.

In view of the 0,1 nature of the dependent variable, the conditional expectation of y given the x's may be interpreted as the conditional probability that an individual belongs to category C given the x's. Then the calculated value of y is interpreted as an estimate of this conditional probability.

The weakness of this procedure is that the assumption of constant variance or homoscedasticity is not tenable and sometimes E (y)=Xβ exceeds 1 or sometimes it may fall below 0, which contradicts both the definition of y and the interpretation of the expectation as a probability (Madalla, 1987).

One of the methods in which E (y) is kept within the unit interval is the logistic regression analysis. This is the method we are going to use for our data.

4.1.1. Model fitting and Estimation of Coefficients

Suppose we have a sample of n independent observations of the (x_i, y_i), i=1,2…,n, where y_i denotes the value of a dichotomous dependent variable and x_i the value of the independent variable for the i^{th} subject. Then the logistic regression equation that relates x_i and y_i is given by the equation

$$p(x)=\frac{\exp(\beta_o+\beta_1 X)}{1+\exp(\beta_o+\beta_1 X)} \qquad (4.2)$$

The coefficients β_0 and β_1 are estimated using the method of maximum likelihood. The method of maximum likelihood involves finding the value of β that maximizes the likelihood function, which is defined as

$$L(\beta)=\prod_{i=1}^{n} p(x_i)^{yi}\,[1-p(x_i)]^{-yi} \tag{4.3}$$

or its logarithm which is given as

$$l(\beta)=\sum_{i=1}^{n}\{yi\ln[p(xi)]+(1-yi)\ln[1-p(xi)] \tag{4.4}$$

where p(x) is the conditional probability of y=1 given x, and 1−p(x) is the probability y=0 given x.

Maximizing the logarithm of the likelihood function is the same as maximizing the function, and it is simpler to work with. Thus equation (4.4) is the one to be dealt with in the subsequent subsections.

If we differentiate $l(\beta)$ with respect to β_0 and β_1 and set the resulting expressions to zero we obtain the equations

$$\sum_{i=1}^{n}[yi-p(xi)]=0 \tag{4.5}$$

and

$$\sum_{i=1}^{n}xi[yi-p(xi)]=0 \tag{4.6}$$

These equations are called likelihood equations. The values of β_0 and β_1 obtained by solving these equations give the maximum likelihood estimates of the coefficients.

As the expressions (4.5) and (4.6) are non-linear in β_0 and β_1 the solutions for β_0 and β_1 are obtained by some iterative methods like Newton Raphson method. If we have multiple independent variables x_1, x_2, ------; xk to be related to a dichotomous dependent variable, the corresponding equation to (4.2) is given by

$$E(y) = \Pr(y = 1) = \frac{\exp\left[\beta 0 + \sum_{i=1}^{k} \beta i \chi_i\right]}{1 + \beta 0 + \sum_{i=1}^{k} \beta_i \chi i} \tag{4.7}$$

or

$$g(x) = \ln \frac{\Pr(y = 1)}{\Pr(y = 0)} = \beta 0 + \sum_{i=1}^{k} \beta_i \chi_i \tag{4.8}$$

In this case there will be k+1 likelihood equations which are obtained by differentiating the log-likelihood function with respect to the k+1 coefficients. The likelihood equations in this case are

$$\sum_{i=1}^{n} [y_i - p(\chi_i)] = 0 \tag{4.9}$$

and

$$\sum_{i=1}^{n} x_{ij}[yi - p(xi)] = 0 \tag{4.10}$$

j=1,2,. . . , k

and the $\beta's$ are obtained using iterative method like in the case of a single predictor variable.

4.1.2. Testing for the Significance of the Coefficients

After we have fitted a model and estimated the coefficients of the variables the next step is to test how important a variable is in determining the characteristics of the data. This is accomplished by testing the significance of the coefficients. The significance of a variable in expressing the characteristics of the data is usually tested by comparing the nature of the model in the presence of the variable and when it is not included in the model. There are different methods that are used to test the significance of the coefficients. One of them is the likelihood ratio test.

The likelihood ratio test depends on the value called deviance. The deviance is given as.

$$D = -2\sum\left[y_i \ln\left(\frac{\hat{p}i}{y_i}\right)^{-1} + (1-y_i)\ln\left(\frac{1-\hat{p}_i}{1-y_i}\right)^{-1}\right] \qquad (4.11)$$

where $\hat{p}_i$ is the estimate of its logit.

For purposes of assessing the significance of an independent variable we compare the value of D with and without the independent variable in the equation. The change in D due to including the independent variable in the model is obtained as

G= D (for the model without the variable) -D(for the model with the variable)

or

$$G = -2\ln\left[\frac{\text{likelihood without the variable}}{\text{likelihood with the variable}}\right] \tag{4.12}$$

Under the hypotheses that β_i equal to zero, the statistic will follow a chi-square distribution with 1 degrees of freedom. Another test for the significance of a variable is the Wald test. The Wald test (for one independent variable) is the ratio of the maximum likelihood estimate of the coefficient to an estimate of its standard error.

That is,

$$W = \frac{\hat{\beta}}{s.e\left(\hat{\beta}\right)} \tag{4.13}$$

In case of multiple independent variables, we have the data matrix

$$\mathbf{x} = \begin{bmatrix} 1 & x_{11} & \cdots & x_{1k} \\ 1 & x_{21} & \cdots & x_{2k} \\ \vdots & & \cdots & \vdots \\ 1 & x_{n1} & \cdots & x_{nk} \end{bmatrix} \tag{4.14}$$

and

$$\mathbf{v} = \begin{bmatrix} \hat{p}_1(1-\hat{p}_1) & 0..... & 0 \\ 0 & \hat{p}_2(1-\hat{p}_2)..... & 0 \\ \vdots & & \\ 0 & 0 & \hat{p}_n(1-\hat{p}_n) \end{bmatrix} \quad (4.15)$$

where $\hat{p}_i$ is the estimate of its logit and the matrix

$$\mathbf{I}(\hat{\beta}) = \mathbf{X'VX} \quad (4.16)$$

is called the information matrix. The diagonal elements of the inverse of $\mathbf{I}(\beta)$ represent the variances of the coefficients and the off-diagonal elements are the covariance between two coefficients. The estimated standard error of the estimated coefficients are given by

$$se(\hat{\beta}) = \left[\hat{\sigma}(\hat{\beta}j)\right]^{1/2} \text{ for } j=0,1,2,\ldots,p. \quad (4.17)$$

Under the null hypothesis that the p coefficients for the covariates in the model are equal to zero, the distribution of G given in equation (4.12) will be chi-square with P degrees of freedom.

The Wald statistics in multiple regression are obtained from

$$\mathbf{W}=\hat{\beta}'(\mathbf{X'VX})\hat{\beta} \quad (4.18)$$

The Wald statistic is distributed as chi-square with k+1 degrees of freedom under the hypothesis that each of the k+1 coefficients is equal to zero. Tests for the k coefficients

are obtained by eliminating the relevant row (first) and column (first) from the information matrix.

A statistic that is used to look at the partial correlation between the dependent variable and each of the independent variable is the R statistic. A positive value of R indicates that as the variable increases in value so does the likelihood of the event occurring. If R is negative, the opposite is true. Small values of R, near to zero, indicate that the variable has a small partial contribution to the model.

$$R = \pm \sqrt{\frac{W - 2K}{-2LL(0)}} \quad \text{Re}[-1,1] \tag{4.19}$$

where k is the degrees of freedom for the variable.

4.1.3 Assessing the Fit of the Model

Suppose we have fitted a model to a set of data and found that the coefficients are significant. The question that follows is: Are the estimated values obtained using the model 'close' to the observed? This is referred to as the goodness-of-fit test.

The commonly used methods of goodness-of -fit test in logistic regression are the Pearson chi-square, the deviance and the classification table.

As in other regression methods residual is the difference between the estimated and observed value. The two important types of residual in logistic regression analysis are the

Pearson residual and the deviance residuals. The Pearson and deviance residuals are defined, respectively by

$$r(y_j, \hat{p}_j) = \frac{y_j - \hat{p}_j}{\sqrt{\hat{p}_j(1-\hat{p}_j)}} \tag{4.20}$$

and

$$d(y_j, p_j) = \pm\left\{2\left[y_i \ln\left(\frac{y_j}{\hat{p}_j}\right) + (1-y_j)\ln\left(\frac{1-y_j}{1-\hat{p}_j}\right)\right]\right\}^{1/2} \tag{4.21}$$

where,

$$\hat{p}_j = \exp\left[\frac{\hat{g}(x_j)}{1+\exp(\hat{g}(x_j)}\right] \tag{4.22}$$

where $g(x_i)$ is the estimated logit and $\hat{p}_j$ the estimated value.

The summary statistics based on the Pearson residual is the chi-square statistic

$$X^2 = \sum_{j=1}^{J} r(y_j, \hat{p}_j)^2 \tag{4.23}$$

where j is the number of covariates. Whereas, the summary statistic based on the deviance residual is the deviance that is given as,

$$D = \sum_{j=1}^{J} d(y_j, \hat{p}_j)^2 \tag{4.24}$$

The distribution of the statistics X^2 and D under the assumption that the fitted model is correct in all aspects is chi-square with J- (k+1) degrees of freedom.

The classification table is the result of cross-classifying the outcome variable, y, with a dichotomous variable whose values are derived from the estimated logistic probabilities. To obtain the derived dichotomous variable we must define, a cut point, c, and compare each estimated probability to c. If the estimated probability exceeds c, then we let the derived variable be equal to 1, otherwise it is equal to zero. In this approach, estimated probabilities are used to predict group membership presumably, if the model predicts group membership accurately according to some criteria, then this is thought to provide evidence that the model fits the data properly.

Hosmer and Lemeshaw (1989) argue that the classification table is not a good measure of the goodness of fit. In finding the probability of misclassification the expected error rate is a function of the magnitude of the slope but not necessarily the fit of the model. They conclude that model may be correct and fit the data even if the classification is poor. Classification is, also, sensitive to the relative size of the two component groups and will always favor classification into the larger group, a fact that is also independent of the fit of the model. They added that another disadvantage of using probability of misclassification, as a criterion is that it reduces a probabilistic model where outcome is measured on a continuum to a dichotomous model where predicted outcome is binary.

4.1.4. Logistic Regression Diagnostics

To get a clear understanding of what regression diagnostics is let's start with an elementary example that any layman knows. Suppose that we prepare a party to which

100 persons are to be invited. Then we prepare food that suits for the guests both culturally and religiously in general. But when the 100 individuals came to our invitation we may come across a person or two or three persons who have special problem like diabetics, gastritis and the like. If such persons therefore, may not be able to eat the kind of food we serve, should we send them back because they could not eat the type of food we served, or are we going to prepare the special kind of food suitable for their health or age? Or, even is it possible to make some changes in our food to suit for those persons? What are the consequences of sending our guests back or providing them the food that does not suit them?

In the same sense, after fitting a model to a number of observations and assured the overall significance of the model, the next question is, can the characteristics of each and every observation be correctly represented by the equation? And, if in case we find an observation which the fitted model cannot represent correctly are we going to discard that observation or make some modification in the model? What is the effect of removing such an observation on the overall significance of the model and/or on the estimates of the coefficients? Such questions are dealt with regression diagnostics and influences.

This is what many researchers ignore when building models to their data. There are different statistical models built in criminology. For example, Sampson and Laub (1997) have built some logistic regression and OLS models to the Gluecks data collected during

1950; however, the only significance they tested was that of the coefficients. Nothing is described if their models fit for each and every observation in the data.

The important building blocks of logistic regression diagnostics are the residuals defined by (4.20) and (4.21) and the leverage to be defined now. Let X and V be the matrices as defined in (4.14) and (4.15) respectively, then the quantity

$$\mathbf{H} = \mathbf{V}^{1/2}\mathbf{X}(\mathbf{X}'\mathbf{V}\mathbf{X})^{-1}\mathbf{X}'\mathbf{V}^{1/2} \qquad 4.25$$

is called the **hat** matrix and its j^{th} diagonal element denoted by h_j is called the leverage. The leverage can be interpreted as a measure of distance only when the estimated probability lies between 0.1 and 0.9 (Hosmer and Lemeshaw, 1989).

Other residuals derived from r_i, d_i and h_j are the standardized Pearson residual, the change in coefficients, the decrease in value of chi-square and the change in deviance due to the deletion of an observation with covariate pattern x_j.

The standardized Pearson residual for covariate pattern x_j is

$$zres_i = \frac{r_i}{\sqrt{1-h_i}} \qquad (4.26)$$

The change in the estimate of $\hat{\beta}$ due to the deletion of observation x_j is given by

$$\Delta\hat{\beta}_i = \frac{zresi^2 h_i}{1-h_i} \qquad (4.27)$$

The decrease in the value of the Pearson chi-square statistic, due to deletion of the observation with covariate pattern x_j, is

$$\Delta X_i^2 = (zresi)^2 \tag{4.28}$$

The change in deviance statistic due to the deletion of the observation with covariate pattern xj is

$$\Delta Di = \frac{d_i^2}{1-h_i} \tag{4.29}$$

The Cook's distance given by

$$Ci = \frac{Zres_i^2 h_i}{(1-h_i)^2} \tag{4.30}$$

is a measure of the influence of a case. It tells us how much deleting a case affects not only the residual for that case, but also the residual of the remaining cases.

The covariate patterns that are poorly fit have large values of Δxi^2, Ci, and or ΔD_i and those covariate patterns having a remarkable influence on the estimated parameters have large values of $\Delta\hat{\beta}_i$. How large the values should be determined by purpose of the analysis and subject matter specialist. The most commonly used visual checking of the logistic regression diagnostics is by plotting

(1) ΔX_i^2 Versus $\hat{p}i$

(2) ΔD_i versus $\hat{p}i$

(3) $\Delta\hat{\beta}_i$ Versus $\hat{p}i$

(4) Cook's distance Vs $\hat{p}i$ and identifying the observations which appear too far from the most observations. After we see the influence of deleting such outlying observation(s) we decide either to delete the observation or retain it. The final model that we use for interpretation should be the one which passed through all these processes, viz., test for coefficient, goodness-of-fit, and regression diagnostics and influence tests.

4.1.5. Variable Selection

When we build a model for a given data set we should try to represent the data with small number of variables with optimum information. Thus the number of variables that should be included in the final model should be selected carefully. There are different procedures of variable selection. One of these is a stepwise regression procedure. In stepwise regression procedure variables are entered into or removed from the regression step by step. If we start with a model containing only the constant and then go on by adding one variable, two,..., until no variable can be added to the model the procedure is called Forward Selection. On the other hand, if all variables are entered into the model and then the variables are removed from the model one by one until no variable can be removed from the model the procedure is called **Backward Elimination** procedure. Backward Elimination is preferred when it is intended not to miss any important variable. In Backward Elimination variables are removed from the model on the basis of how large change they bring in the Pearson chi- square. The **Backward conditional** stepwise selection procedure is based on the probability of the likelihood ratio statistic based on conditional parameter estimates.

4.1.6. Interpretation of the coefficients

Interpretation of the coefficients in logistic regression is based on what is called the *odds-ratio*. For an independent variable that takes on only the values 0 and 1, the value of the dependent variable is either (1) or (0). The value of the dependent variable is either p (1) or p (0) depending on whether x takes on a value 1 or 0. Then, the odds of the outcomes present among the individuals with x= 1 is defined as $\frac{p(1)}{1-p(1)}$ and the odds of the outcomes being present among individuals with x=0 is defined as $\frac{p(0)}{1-p(0)}$.

The log of the odds is called the logit, and given as

$$g(1) = \ln\left[\frac{p(1)}{1-p(1)}\right] \tag{4.31}$$

and

$$g(0) = \ln\left[\frac{p(0)}{1-p(0)}\right] \tag{4.32}$$

The odds ratio is the ratio of the odds for x=1 to the odds for x=0 and is given by

$$\psi = \frac{\frac{p(1)}{1-p(1)}}{\frac{p(0)}{1-p(0)}} \tag{4.33}$$

and

$$\ln(\psi) = \ln\left(\frac{\frac{p(1)}{1-p(1)}}{\frac{p(0)}{1-p(0)}}\right) = g(1) - g(0) \qquad (4.34)$$

is called the logit difference.

The odds- ratio can also be given in terms of the coefficients as

$$\psi = e^{\beta 1} \qquad (4.35)$$

In general the odds ratio is the factor by which the odds change when the independent variable increases by one unit. If β is positive, this factor will be greater than 1, which means that the odds are increased; if β is negative, the factor will be less than 1, which means that the odds are decreased. When β is 0, the factor equals 1, which leaves the odds unchanged.

4.2. Results and Discussions

The logistic regression analysis with Backward (Conditional) variable selection procedure was applied to the data giving the following results. As the different types of crime have different nature an attempt has been made to fit a model for each of the common crime categories. Hence, the discussions will be made for each of the crime categories, and finally for all of the categories when considered together. Different models have been also built for the two strata. We would also like to notice that mental sanity/ stability was not

considered in the regression since there has been no individual with mental problem in the sample.

4.2.1. All types of Crimes for all the selected zones.

When all types of crimes are considered together, for all the selected zones, the most important determinants of criminality are found to be age, sex, zone difference and economic status as represented by the type of defense consul

As it can be seen from Table 4.1 (b) the probability of being criminal is higher for female than male. Borena and Ilu Abba Bora zones are significantly negatively related to criminality. The sign of age is negative for quadratic term and positive for the cubic term. That is, criminality increases with age up to some age interval, then it comes down for the next age interval and again attempts to rise but stabilizes at the higher ages.

The variable defcon, which was used as a proxy to the measure of economic status of the offenders has a negative coefficient showing that criminality when seen in general, is negatively related to poverty. This may seem to contradict the theories and empirical studies that relate criminality with poverty. But culture and religion may also prevent the individuals from committing crime more than being rich.

The model adequacy was checked using the likelihood ratio test, the classificaation probablities, and the plot of Cook's distance against the predicted probabilities. The model

chi-square is 98.526 with 12 degrees of freedom. This is found to be significant. The classification table (Table 4.1(a)) also shows that the probablity of correct classification is 655 for noncriminals, 58% for criminals and 60% for all individuals. This is to mean that the model predicts 123 as crimnals among the actually observed 351 noncriminals, and predicts 254 as noncriminals from 597 acually observed criminals. Adding the diagonal elements 228 and 343 of this classification table gives the total number of individuals that are correctly classified by the model. On the other hand adding the diagonal elements 123 and 254 gives the number of individuals who are wrongly classified to other groups by the model.

The plot of Cook's distance against the predicted value (See Figure (a), Annex II) shows that the plots were found to be random adng most of the Cook's distance values are small, confiming that the model can be taken to fit each and every observation.

Table 4.1. Logistic Regression Results for All Types of Crimes for all the Selected Zones.

a. The Classification Table

		PREDICTED		
OBSERVED		NONCRIMINAL	CRIMINAL	PERCENT CORRECT
	NONCRIMINAL	228	123	64.96%
	CRIMINAL	254	343	57.45%
			OVERALL	60.23%

b. Variables in the Equation

VARIABLE	β	WALD	DF	SIG	R	EXP(β)
X2	-0.8551	3.4638	1	0.0627	-0.0342	0.4253
ZONE		55.2488	6	0.0000	0.1857	
ZONE(1)	3.7366	6.6713	1	0.5754	0.0000	41.9569
ZONE(2)	-0.7635	6.4596	1	0.0110	-0.0596	0.4660
ZONE(3)	-0.1831	0.3927	1	0.5309	0.0000	0.8327
ZONE(4)	-1.9422	36.2960	1	0.0000	-0.1654	0.1434
ZONE(5)	0.1966	0.8519	1	0.3560	0.0000	1.2173
ZONE(6)	-0.3369	2.2562	1	0.1331	-0.0143	0.7140
AGESQR	-0.0018	20.2245	1	0.0000	-0.1205	0.9982
AGECUB	2.42E-05	17.1642	1	0.0000	0.1100	1.0000
DEFCON	-0.7329	7.4535	1	0.0063	-0.0659	0.4805
CONSTANT	3.3651	28.8567	1	0.0000		

4.2.2. Crimes Particular to Government Authorities

Occupation and age of the offender significantly determine criminality for this category. As it can be seen from Table 4.2 (b), criminality increases with age. That is, for an increase of one year, the probability of being criminal increases 2.1587 times. The probability of being criminal is higher for the persons whose occupation is farmer as compared to others.

It may be argued that, as one gets older the probability that he/she commit crime is expected to decrease. In fact, it should also be remembered that many people work very honestly at the early years of his/her appointment or employment. The accessibility to power and public property is also less probable at the earlier years of employment or appointment. The more one stays in administrative or other positions in an organization, the more he/she learns the strategies and tactics of participating in corruption just as he/she learns good things. The case obtained from this analysis may occur when learning of the bad habits overtook learning the good habits.

The significance of the occupation farming in this crime category may also arise from the fact that government authorities in the rural areas serve with no salary, and the lack of knowledge of modern management system. Some authorities might also lack the interest to serve their people and country, but facilitate their own lives.

Describing the causes of corruption in Nigeria, Andreski (1968) as cited in Adeyemi (1992) says:

> "... *The excessive financial burden attendant up on the responsibility of a well-placed African family man is also recognized as a strong factor in the etiology of corruption. Among other things, such a person is expected to help to pay for the education of the children of his poorer relatives, provides fists and defray the costs of (family and community ceremonies, including) funerals... As he cannot meet such extensive obligations out of his salary he*

is compelled to squeeze bribes, embezzle public funds, take take-offs and so on..."

Thus engagement in corruption is more likely for those who serve with no or very small salaries.

Table 4.2. Logistic Regression Results for Crimes particular to Government Authorities.

a. THE CLASSIFICATION TABLE

OBSERVED	PREDICTED		
	NONCRIMINAL	CRIMINAL	PERCENT CORRECT
NONCRIMINAL	29	13	69.04%
CRIMINAL	19	87	80.08%
		OVERALL	78.38%

b. Variables in the equation

Variable	β	Wald	df	Sig.	R	Exp(β)
X1(age)	0.7695	11.5645	1	0.0007	0.2327	2.1587
X2(sex)	-0.89136	0.2223	1	.6373	0.0000	0.0001
Occupcat(1)	1.8172	1.3047	1	0.0066	0.1746	0.1546
Logx1	-34.436	12.9167	1	0.0003	-0.2487	0.000
Constant	104.3325	10.3437	1	0.0013		

The model chi-square is 59.398 with 6 degrees of freedom and it is highly significant. The classification table (Table 4.2 (a)) also shows that the model correctly classifies 78.38% of

the individuals. The plot of the Cook's distance against predicted values (See Figure (b), Annex II) shows that there is no evidence of outliers and the Cook's distnce values are small confirming that adequacy of the model for each and every observation.

4.2.3. Murder Including Attempt and Grave Willful Injury

Age and zone difference significantly determine criminality of this group.

The coefficient of age in its linear term is negative (Table 4.3b) showing that the probability of being criminal decreases as age increase. While the positive sign of the quadratic term may indicate higher probability to be criminal at the lower ages, and lower probability of being criminal at the middle age and again a rise of criminality at the higher ages. The coefficient of the cubic term of age is negative. That is criminality for this crime category can be considered to be higher at the lower ages, then goes down to some age interval, then attempts to rise, but stabilizes and decreases at the higher ages.

The zone category shows negative relation of criminality for Ilu Abba Bora.

The model Chi- square is 53.447 with 15 degrees of freedom and is highly significant. The classification table (Table 4.3a) also the supports this fact showing that 73.17% of the individuals are correctly classified by the model. The plot of the Cook's distance against the predicted values (see Figure c, Annex II) again shows that the model is found to fit each and every observation.

Table 4.3. Logistic regression Results for Murder including attempt, and grave Willful Injury:

a. THE CLASSIFICATION TABLE

OBSERVED	PREDICTED		
	NONCRIMINAL	CRIMINAL	PERCENT CORRECT
NONCRIMINAL	93	57	62.00%
CRIMINAL	86	297	77.55%
		OVERALL	73.17%

b. **Variables in the equation**

VARIABLE	β	WALD	DF	SIG	R	EXP(β)
X1	-0.2068	3.2115	1	0.0731	0.0437	0.8112
X14	-0.5818	2.3194	1	0.1278	-0.0225	0.5589
ZONE		27.7182	6	0.0001	0.1575	
ZONE(3)	0.1030	0.0921	1	0.7615	0.000	1.1085
ZONE(4)	-1.5312	20.0284	1	0.000	-0.1687	0.2163
ZONE(6)	-0.4070	1.8527	1	0.1735	0.0000	0.6656
AGESQR	0.0047	2.9466	1	0.060	0.0387	1.0047
AGECUB	-3.5E-5	2.9922	1	0.0837	-0.0396	1.000
CONSTANT	-2.1488	0.0306	1	0.8611		

4.2.4. Theft and Robbery

For this crime category, criminality is significantly determined by age and zone difference .

The relation of age with criminality is the same as that of murder including attempt and grave willful injury. Offenders in Ilu Abba Bora and North Shawa have significantly higher probability of being criminal of this category as compared to others..

The model chi- square is 110.127 with 15 degrees of freedom and highly significant. The classification table (Table 4.4a) also supports this fact showing that the model correctly classifies 93.57% of the individuals. The plot of Cook's distance against the predicted probabilities (see Figure d, Annex II) again shows that the model is found to fit each and every observation.

Table 4.4. LOGISTIC REGRESSION RESULTS FOR THEFT AND ROBBERY

a. THE CLASSIFICATION TABLE

OBSERVED	PREDICTED: NONCRIMINAL	PREDICTED: CRIMINAL	PERCENT CORRECT
NONCRIMINAL	47	2	95.92%
CRIMINAL	5	48	90.57%

OVERALL 93.57%

b. Variables in the equation

VARIABLE	β	WALD	DF	SIG	R	EXP(β)
X1	-140.008	5.7056	1	0.0169	-0.1620	0.0000
DEFCON	-24.2311	0.0080	1	0.9287	0.0000	0.0000
X3	4.4741	2.2691	1	0.1320	0.0437	87.7180
X14	-11.9752	0.0401	1	0.8413	0.0000	0.0000
ZONE		4.6141	4	0.3292	0.0000	
ZONE(1)	-10.1571	0.0046	1	0.9459	0.0000	0.0000
ZONE(3)	-25.3633	0.0643	1	0.7999	0.0000	0.0000
ZONE(4)	8.4187	4.5527	1	0.0329	0.1344	4.531
ZONE(5)	9.8284	4.3275	1	0.0375	0.1284	1.8552
AGECUB	-0.0135	5.4385	1	0.0197	-0.1560	0.9866
AGESQR	2.1233	5.6027	1	0.0179	0.1567	8.3585
X1LOG	1424.175	5.7497	1	0.0165	0.1629	
CONSTANT	-2188.67	5.0614	1	0.0245		

At this juncture it is important to appreciate the improvement in model adeqaucy by studying different types of crimes separately.

4.2.5. East -Of -Rift-Valley Oromiya (Stratum1)

The regression result for stratum1 shows that criminality is significantly determined by age and the type of the defense consul used by the offender to defend his/her case. The

probability of being criminal rises up to some ages and again attempts to come down but follows cubic curve which is extended to the right at the age intervals in which the probability of being criminal equals that of being non-criminal (see Table 4.5b).

The sign of the defcon (defense consul) is positive, and its odds-ratio equals to 2.1222 which shows that the probability of those offenders for whom government assigned public defense consul to be criminal is 2.1222 times that of those who employed their own private defense consul, in this sub-region.

Thus, if we take the type of defense consul as a measure of economic status, it can be concluded that poverty is one of the factors that induce individuals to commit crimes in East of Rift Valley Oromiya.

The model chi-square is 58.743 with degrees of freedom 6 and it is found to be highly significant. The classification table (Table 4.5a) also shows that 65.41% of the indiviudals are classified correctly by the model. The plot of Cook's distances against the predicted probabilities (see Figure e, Annex II) again confirms the adequacy of the model for each and every observation.

TABLE 4.5. **LOGISTIC REGRESSION RESULT FOR STRATUM 1**:

a. THE CLASSIFICATION TABLE

OBSERVED	PREDICTED		
	NONCRIMINAL	CRIMINAL	PERCENT CORRECT
NONCRIMINAL	112	19	85.50%
CRIMINAL	82	79	49.07%
		OVERALL	65.41

b. **VARIABLES IN THE EQUATION**

VARIABLE	β	WALD	DF	SIG	R	EXP(β)
AGESQR	-0.0028	8.2336	1	0.0041	-0.1246	0.9972
AGECUB	4.31E-5	7.4566	1	0.0063	0.1165	1.0000
DEFCON	0.7525	7.6290	1	0.0057	0.1184	0.0011
CONSTANT	6.1505	0.2318	1	0.6302		2.1222

4.2.6. West of Rift Valley Oromiya

For this sub- region many variables jointly contribute to the criminality of individuals. Criminality is significantly related to the type of defense consul, level of education, place of residence, and the interaction between levels of education and sex.

As it can be seen from Table 4.6b(first row and seventh column), the probability of being criminal is 7.8779 times as high for the offenders who used the public defense consul as compared to the offenders that used the private defense consul to defend their cases. The

probability of being criminal is higher for the better educated as compared to both the illiterate and the offenders with elementary education. Again, the probability of being criminal for rural dwellers is significantly less than that of the urban dwellers. This result supports the theories and empirical studies that conclude crime as an urban phenomenon. The interpretation of the relation of criminality with age is the same as that of stratum 1.

The model chi-square is 53.447 with 15 degrees of freedom and found to be highly significant. Table 4.6a in addition shows that the probability of correct classification is 61.59%. The plot of Cook's distance against the predicted values (see Figure f, Annex II) indicates that the model seems to fit the data properly.

Table 4.6 **LOGISTIC REGRESSION RESULT FOR STRATUM 2**:

a. THE CLASSIFICATION TABLE

OBSERVED	PREDICTED: NONCRIMINAL	PREDICTED: CRIMINAL	PERCENT CORRECT
NONCRIMINAL	122	95	56.22%
CRIMINAL	157	282	64.24%
			OVERALL 61.59%

b. **Variables in the Equation**

VARIABLE	β	WALD	DF	SIG	R	EXP(β)
DEFCON	2.0641	3.1028	1	0.0782	0.0364	7.8779
EDCLS		3.8201	2	0.1481	0.0000	
EDCLS(1)	-3.2701	3.5393	1	0.0599	-0.0430	0.0380
EDCLS(2)	-1.8991	2.4818	1	0.1152	-0.0241	0.1497
X14	-0.7293	2.7892	1	0.0949	0.0308	0.4622
AGESQR	-0.0017	12.9634	1	0.0003	-0.01147	0.9983
AGWCUB	2.23E-5	10.526	1	0.0012	0.1012	1.0000
X2X6	-1.0133	3.6389	1	0.0564	-0.0444	0.3630
X14X4	0.2134	2.5276	1	0.1119	0.0252	1.2379
CONSTANT	16.4959	0.8083	1	0.3686		

Summary and Recommendations

Crime is one of the serious social problems. It is caused by other problems and again causes other problems. Therefore, it should be prevented. To prevent crime, however, requires knowing what its causes are.

The main objective of this study is identifying the determinants of criminality through studying the personal and socio-economic characteristics of the offenders whose cases were decided by the higher courts of Oromiya in 1997/98. To reach this goal the combined stratified-two-stage sampling procedure and the method of logistic regression analysis has been used to collect and analyze the crime data.

In the sampling procedure followed the region was first divided into two sub-regions, strata in statistical term, and from each stratum three zones were selected. From these selected zones the criminal cases decided at the higher courts during the year 1997/98 were selected using systematic sampling procedure. The resulting sample size for the six selected zones consists of 606 criminals and 361 non-criminals that had been in prisons up to the decision date.

The report of this study is organized in four chapters. In chapter I, the general description of the region, objectives of the study, literature review and scope of the study were given. Chapter II solely dealt with the method of data collection, in general, and their application for the crime data. In chapter III the description of the variables used in the study were

given along with some preliminary data analyses that facilitate the logistic regression analysis of chapter four. Chapter IV dealt with the method of logistic regression and the discussions of the results for the crime data. Finally, the summary of the last chapters and some conclusions and recommendations are given.

The results of the analysis show that age is the most important determinant of criminality in all types of crimes. Economic status is also the important determinant of criminality in the selected zones.

For all crimes and all the selected zones the most important determinants of criminality are age, sex, economic status and the zone differences.

For stratum1, namely, East of Rift Valley Oromiya, age and economic status are found to be the most important factors of criminality. For West of Rift Valley Oromiya, on the other hand, the most important factors of crime are economic status, level of education, place of residence and level of education again through sex difference.

For the crimes particular to government authorities the most important factors of crime are occupation and age. For murder including attempt and grave willful injury the most important factors of crime are the zone differences and the age of the offenders. For theft and robbery criminality is significantly determined by age and zone differences.

These results call for attentions to the following points: -

1. Unemployment is found to be insignificant in all the cases. However, the literature links criminality with it. If this finding is not against the literature, further investigations should be undertaken on problems such as underemployment.

2. The court data we used for the study does not contain information on the offenders' religion and ethnicity. Courts might have their own reason to ignore such information. But, these factors should have been included in the court files, as they are the most important element through which the conflict/culture conflict and strain theories of the causes of crime are explained.

3. Borena and Ilu Abba Bora zones are found to be negatively related to criminality when all types of offenses are considered together. But, Ilu Abba Bora zone is significantly positively related to theft and robbery. The negative relation with criminality for Borena zone is also of important consideration. Although, it cannot be concluded by this research that the lowest probability of criminality for this zone is due to the culture, it can be taken as a good indication of the importance of a comparative study of the causes of crimes in the zones.

4. The court files also lack information concerning the victim. Had there been such information it would have been possible to find the economic costs of crime in the region.

5. Studying different types of crimes separately is also recommended as onsidering them together may disturb the model.

6. Creating the means in which the livelihood of the people is improved and the government authorities obtain training on modern management and love for the people are also recommended by this research.

7. Although the number of male offenders greatly over exceeds that of the female 'femaleness is found to be positively related to criminality (see Table 4.1b). Therefore, due attention should be paid to the life of the female such as access to opportunities.

8. As this is limited to studying the characteristics of the individuals accussed of committing crimes it is also recommended that a study that include the individuals who have never been accused of committing crimes should be undertaken by those who afford the budget for the study.

In general, every attempt has been made to include all the important personal and socio-economic characteristics of the offenders to study the determinants of criminality. Hopefully, the findings of this research may help in developing policies for the reduction of crime in our country and countries of similar standard. The results may also serve as a basis for further researches.

References

1. Adeyemi A.A (1992), **Corruption in Africa, A Case Study of Nigeria**, in Criminology in Africa 1992.
2. Agnew R. (1997), **Foundation for a General Strain Theory of Crime and Delinquency**, In Criminal Theory 1997.
3. Braithwaite J. (1997), **Poverty, Power, white-collar Crime and the Paradoxes of Criminological Theory**, in Criminal Theory 1997.
4. Burton et al. (1997), **Reconsidering Strain Theory: Operationalization, Rival Theories, and Adult Criminality**, in Criminal Theory 1997.
5. Cochran W.G (1977), **Sampling Techniques**, 3rd ed., Wiley.
6. Cohen J. and Cohen P (1983), **Applied multiple Regression/ Correlation Analysis for the Behavioral sciences**, 2nd ed.
7. Cox D.R and Snell E.J (1989), **Analysis of Binary Data**, 2nd ed., Monographs on Statistics and Applied Probability 32.
8. Cressey (1969), **Causes of Crime**, in International Encyclopedia of the social Sciences, Macmillan company and the free press, vol. 3, New York.
9. CSA (1996), **The 1994 Population and housing Census of Ethiopia, Results for Oromiya**.
10. Europa Yearbook (1985).
11. Everitt (1992), **The Analysis of Contingency Tables**, 2nd ed., Monographs on Statistics and applied probability 45.

12. Grasmick H.G et al. (1997), **Testing The Core Empirical Implications Of Gotfredson And Hirschis General Theory Of Crime**, in Criminal Theory 1997.

13. Haberman J.S (1978), **Analysis of Qualitative Data**, Vol. 1 Introductory Topics, Academic Press, Inc., New York.

14. Hosmer D.W and Lemeshaw S. (1989), **Applied Logistic Regression**, Wiley.

15. ILO (1995), African Employment Report.

16. Maddala G.S (1983), **Limited Dependent and Qualitative variables in Econometrics**, Economic Society Monographs No.3, Cambridge University Press.

17. Mendelson W. (1992), **Supreme Court State Craft the Rule of Law and Men**, 2nd ed., IOWA State University.

18. Messner S.F. and Golden R.M (1997, **Racial Inequality And Racially Disaggregated Homicide Rates: An Assessment Of Alternative Theoretical Explanations**, in Criminal Theory 1997.

19. Nagin D.S. and Paternoster R. (1997), **Enduring Individual Differences and Rational Choice Theories of Crime**, in Criminal Theory 1997.

20. Nsereko N. (1992), **Victims of Crime and Their Rights**, in Criminology in Africa 1992.

21. OPDEB (1996), The Regional State Of Oromiya, **Statistical Abstract**.

22. OSC (1996).

23. Reckless W.C (1961), **The Crime problem**, 3rd ed. Appleton- century-Crofts, Inc, New York.

24. Sampson R.J. and Laub J.H. (1997), **Urban Poverty And Family Context Of Delinquency, A New Look At Structure And Process In Classic Study**, in Criminal Theory 1997.

25. Shaidi L.P (1992), **Traditional, Colonial And Present- Day Administration Of Criminal Justice**, In Criminology In Africa, United Nations International Crime And Justice Research Institute, Publication No. 47.

26. Sharp et al. (1990), **Economics of Social Issues**, 9th ed., Richarn D. Irwin Inc.

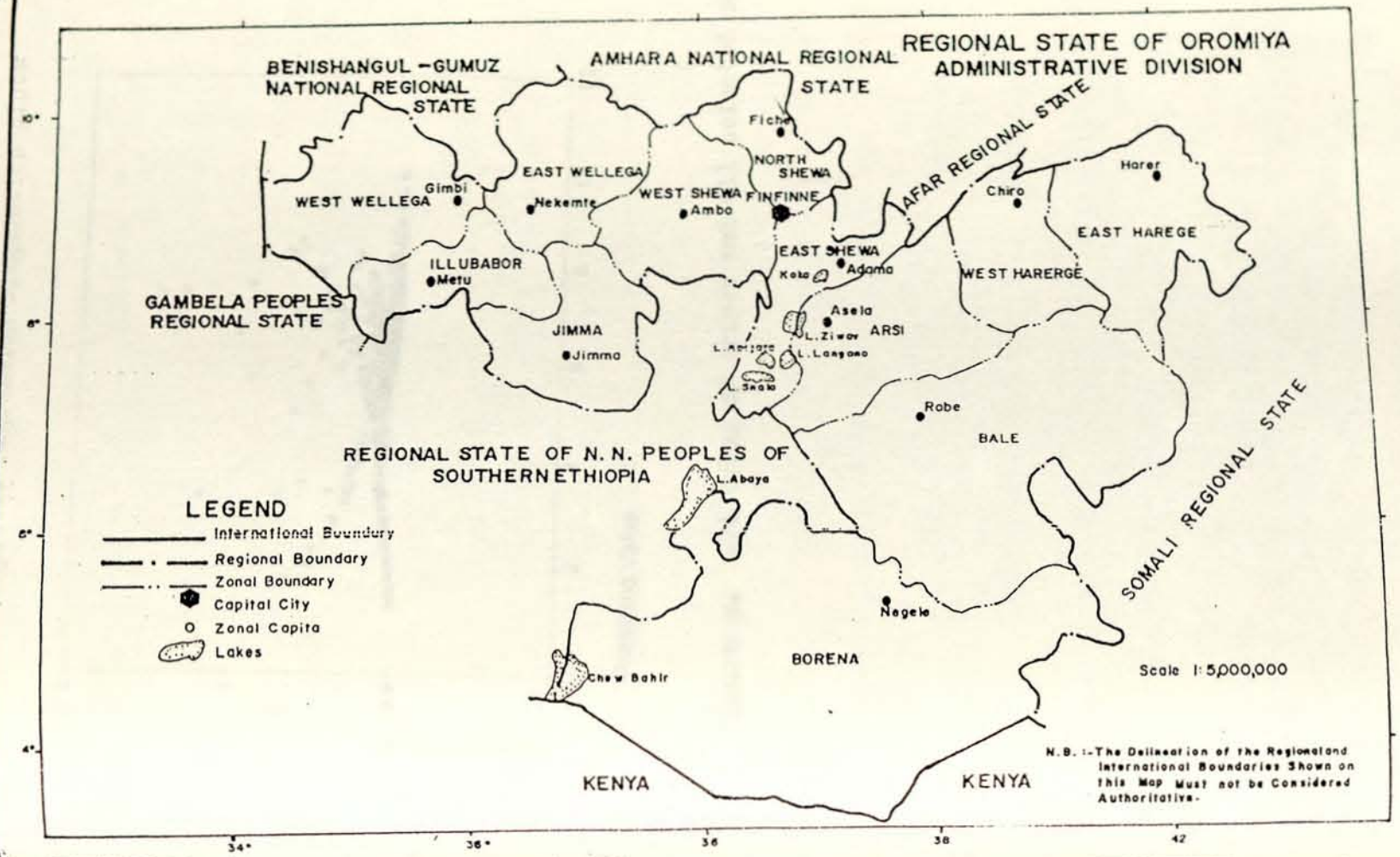
27. Singh D. and Chaudhary F.F (1986), **Theory and Analysis of sample Survey Designs**, Wiley.

28. Thornton R.Y and Endo K. (1992), **Preventing Crime In America And Japan, A Comparative Study**, M.E, Sharpe Inc.

29. Tryfos P. (1996), **Sampling Methods for Applied Research, Text and Cases**, John Wiley and sons, Inc, New York.

30. World Bank, **The World Economic Indicator of 1998**.

Figure 1.1


BENISHANGUL – GUMUZ NATIONAL REGIONAL STATE
AMHARA NATIONAL REGIONAL STATE
REGIONAL STATE OF OROMIYA ADMINISTRATIVE DIVISION
AFAR REGIONAL STATE
Fiche
NORTH SHEWA
EAST WELLEGA
WEST WELLEGA
Gimbi
Nekemte
WEST SHEWA
Ambo
FINFINNE
Harer
Chiro
EAST HAREGE
EAST SHEWA
Kela
Adama
WEST HARERGE
ILLUBABOR
Metu
GAMBELA PEOPLES REGIONAL STATE
Asela
ARSI
JIMMA
Jimma
L. Ziway
L. Langano
L. Shala
Robe
BALE
REGIONAL STATE OF N. N. PEOPLES OF SOUTHERN ETHIOPIA
L. Abaya
SOMALI REGIONAL STATE
LEGEND
International Boundary
Regional Boundary
Zonal Boundary
Capital City
Zonal Capita
Lakes
Negele
BORENA
Chew Bahir
Scale 1:5,000,000
N.B. :-The Delineation of the Regionaland International Boundaries Shown on this Map Must not be Considered Authoritative-
KENYA
KENYA
10°
8°
6°
4°
34°
36°
36
38
42

Annex II Logistic Regression Diagnostics plots

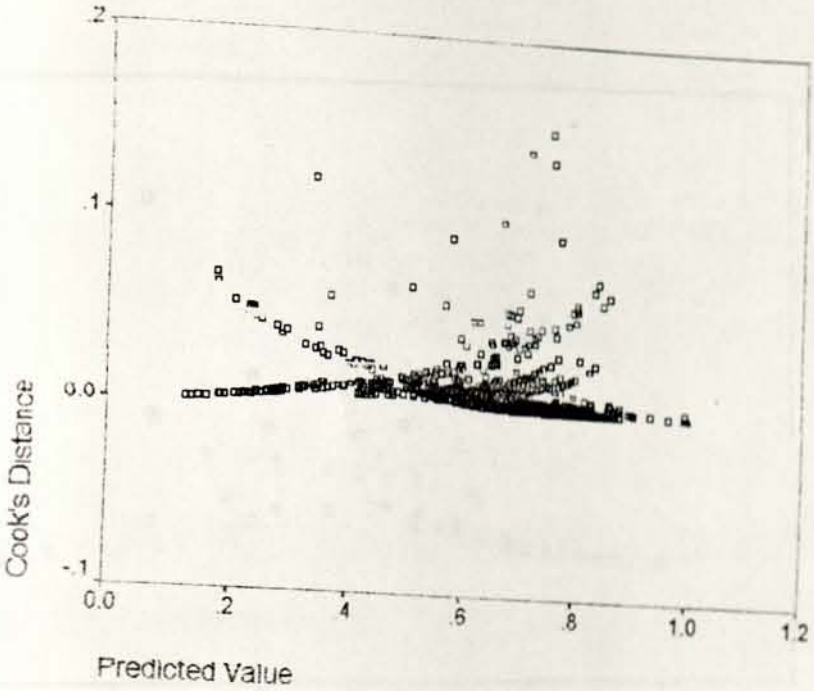


Figure a. All types of crimes and all selected zones

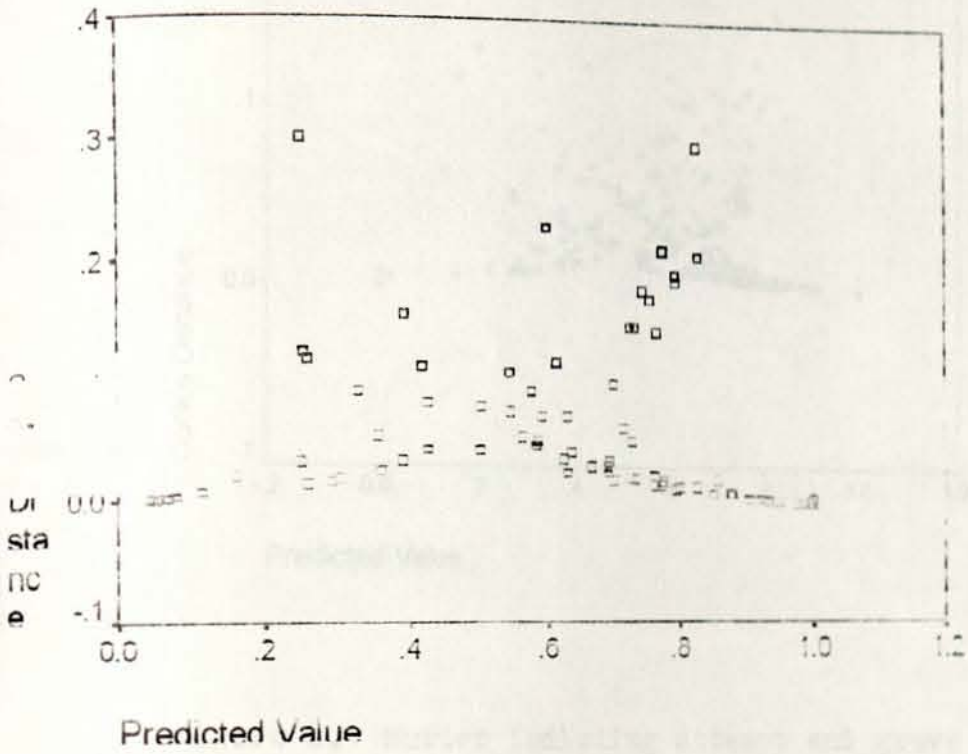


Figure b. Crimes Particular to government authorities

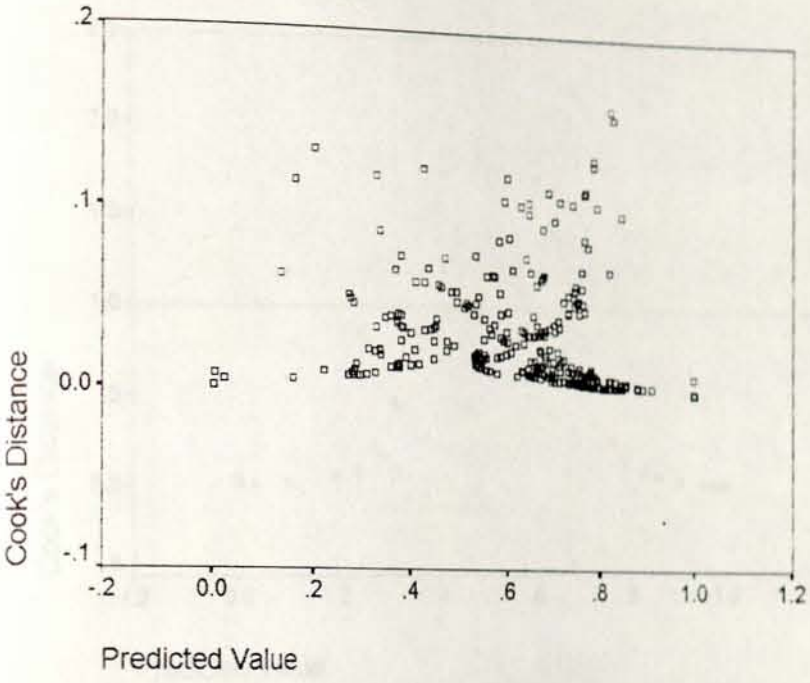


Figure c. Murder including attempt and grave willful injury

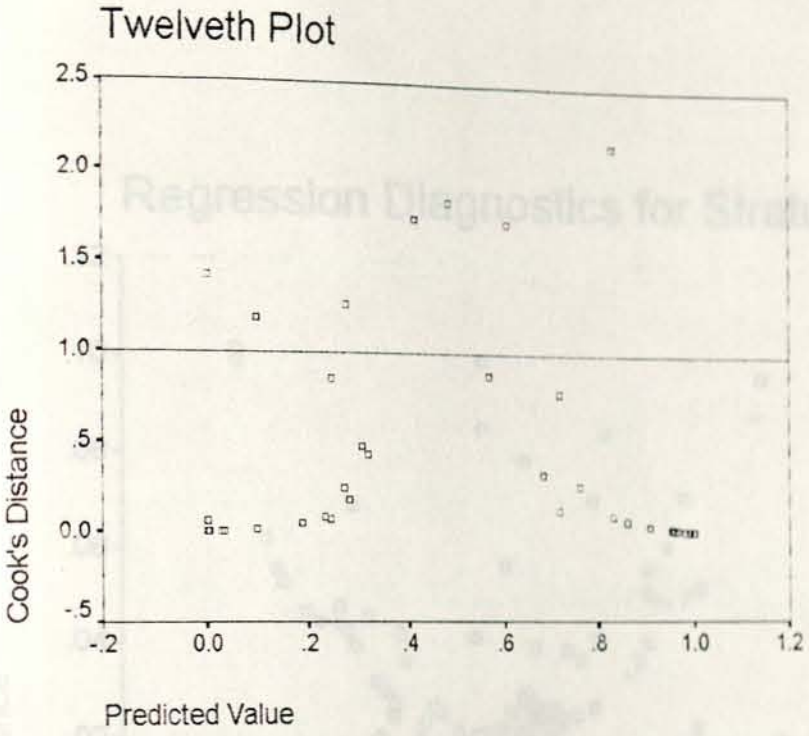


Figure d. Theft and Robbery

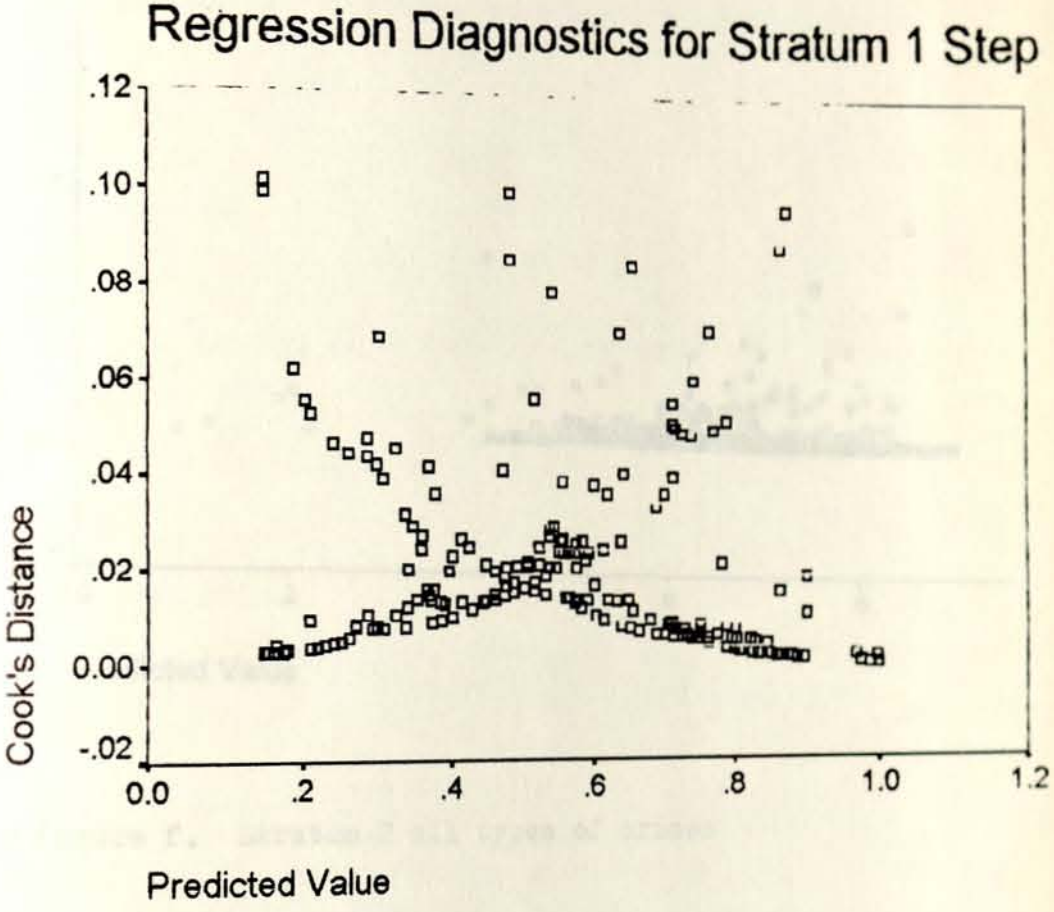


Figure e.

Stratum 1 all types ofcrimes

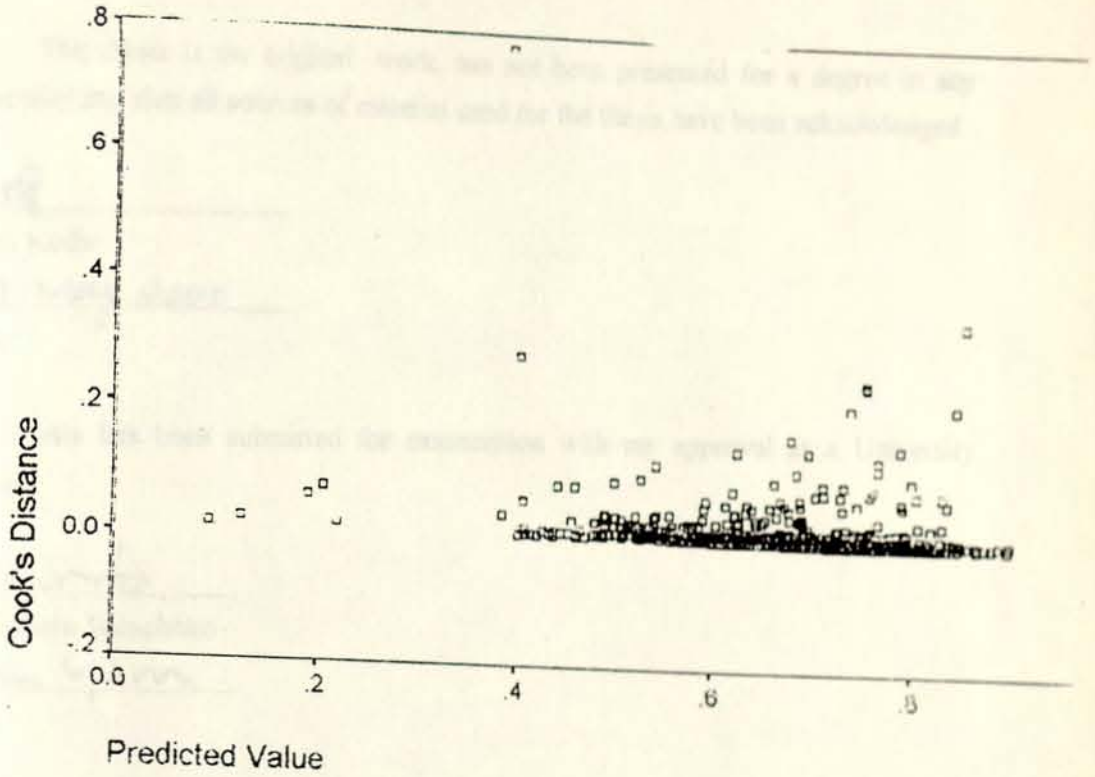


Figure f. Stratum 2 all types of crimes

Declaration

The thesis is my original work, has not been presented for a degree in any University and that all sources of material used for the thesis have been acknowledged.

Adem Kedir

17, May 2000

Date

This thesis has been submitted for examination with my approval as a University advisor

Dr. Eshetu Wencheko

June 6, 2000

Date