SURVIVAL ANALYSIS OF AVERAGE TIME TO JUSTICE DELIVERY IN UPPER EAST AND UPPER WEST REGIONS OF GHANA.

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BEING A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF STATISTICS, FACULTY OF MATHEMATICAL SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF M.Sc IN APPLIED STATISTICS OF THE UNIVERSITY FOR DEVELOPMENT STUDIES.

JUNE 2010

DEDICATION

This work is dedicated to my family; Dad, Mum, She, Che, Lee, Leo and Allan for their love, support and sacrifices and also to Tony Tampah-Naah who has been with me through it all.

DECLARATION

I hereby declare that this dissertation is based on my own research and has been presented under the supervision of Dr. (Mrs.) Atinuke 0. Adebanji. It has not been submitted previously either wholly or partially for degree in University for Development Studies or anywhere else. Related works by others which served as a source of knowledge has been duly referenced.

Anzagra Lea — Signature — /0/16/,abit

Student — Signature — Date

I declare that I have supervised this student and that she has my permission to submit this dissertation for the award of a degree in M.Sc. Applied Statistics.

Certified by

Dr.(Mrs.) Atinuke 0. Adebanji

(Supervisor) Signature Date

I certify that this work was carried out independently by Anzagra Lea in the Department of Statistics of the Faculty of Mathematical Sciences as part of the requirement for the award of an M.Sc degree in applied statistics.

Certified by

.....

Dean (FMS) Signature Date

ACKNOWLEDGEMENT

My sincere thanks to the Almighty God for his abundant graces and mercies in my life and for bringing me this far.

My thanks also go to Dr. E. Oyetunji, Mr. Kazeem Gbolagade, Mr. Mamadou Lamine
Mr. Oman Akoto, Mr. Solomon Sarpong, Rev. Albert Luguterah and all Staff of the Statistics Department of University for Development Studies, Navrongo Campus for their relentless support through it all.

I am indebted to the registrars of the Wa and Bolgatanga District and Circuit Courts for their assistance during the data collection.

I owe special thanks to Lawyer Robert Tarter who took time off his busy schedule to explain most of the legal matters to me. And I am also grateful to Prof. K.S. Nokoe who has been a source of inspiration to me.

Finally my special thanks go to my supervisor Dr. (Mrs.) Atinuke 0. Adebanji who, despite her busy work schedule has supported me with the overall technical guidance I needed and who has gone the extra mile to ensure that I finish this project on schedule.

ABSTRACT

The right to a fair hearing within a reasonable time by a court when charged with a criminal offence and to a *speedy* and public trial in all criminal prosecutions are some of the basic rights guaranteed by the 1992 constitution of the Republic of Ghana. In this study, survival analysis was used to determine the average time to justice delivery for the upper east and west regions of Ghana both first collectively and as individual entities. Type of cases that last longer in courts and the average time the various courts spend on these cases was also determined. A model describing the contributory factors to the length of time a case stays in court was obtained and used in predicting the average time to justice delivery. Four major factors were found to contribute significantly to the average time to justice delivery. These were; the type of court handling the case, the type or nature of case, the occupation of the accused and the number of subsequent hearings. The average time a case stays in court or the average time to justice delivery using the derived model was found to be 103 days. Also, cases terminated faster in Upper East courts as compared to the Upper West courts. Civil cases tend to have shorter life spans than criminal cases.

TABLE OF CONTENTS

Dedication

Declaration ii

Acknowledgement iii

Abstract iv

Table of content

List of tables vii

List of figures viii

CHAPTER ONE

1.0 Introduction 1

1.1 The Ghanaian legal system 2

1.2 Problem statement 8

1.3 Aims and Objectives 9

1.4 The source of data 9

1.5 The variables 11

1.6 Definition of some selected variables 11

CHAPTER TWO

2.0 Statistics and the Law 13

2.1 Average time from arrest to sentence 14

CHAPTER THREE

3.0. Introduction to Survival Analysis 17

3.1 The History of Survival Analysis 17

3.2 Censoring 19

3.3 Equivalent Functions describing Survival distribution 20

3.4 Estimation of survival functions 23

3.5 Estimation of regression models 25

CHAPTER FOUR

4.0 Empirical Results 29

4.1 The estimation of the average time to justice delivery using KM approach 35

4.2 The modeling of the average time to justice delivery 48

CHAPTER FIVE

5.0 Summary 52

5.1 recommendation 54

Bibliography 55

Appendix 56

LIST OF TABLES

Table 4.1	Frequency Distributions by Region	30
Table 4.2	Frequency Distribution by Sex	32
Table 4.3	Frequency Distribution by Type of Case	34
Table 4.4	Summary of Time from the start of a case to finish (dur) for the entire data	39
Table 4.5	Summary of Censoring for the entire data	40
Table 4.6	Summary Statistics of Time from the start of a case to finish (dur) for the regions	41
Table 4.7	Summary of Censoring for the regions	42
Table 4.8	Test of Equality over regions	42
Table 4.9	Summary Statistics of Time from the start of a case to finish for the cases	42
Table 4.10	Summary of Censoring for the type of cases	43
Table 4.11	Test of Equality over type of cases	44
Table 4.12	Summary Statistics of Time from the start of a case to finish for the courts	44
Table 4.13	Summary of Censoring for the type of court	45
Table 4.14	Test of Equality over type of courts	45
Table 4.15	Summary Statistics of Time from the start of a case to finish for the cases in the courts	46
Table 4.16	Summary of Censoring for the cases in the courts	47
Table 4.17	Test of Equality over the cases in the courts	47
Table 4.18	Analysis of Maximum Likelihood Estimates for Cox regression	48
Table 4.19	Testing Global Null Hypothesis: BETA=0	49
Table 4.20	Analysis of Parameter Estimates for the parametric regression model	50

LIST OF FIGURES

Fig 4.1 The proportion of sex against the type of case

Fig 4.2 Plot of the survivor function for average time to justice delivery for the entire Data

Fig 4.3 Plot of the survivor function for average time to justice delivery for the two regions

Fig 4.4 Plot of the survivor function for average time to justice delivery for the type of cases

Fig 4.5 Plot of the survivor function for average time to justice delivery for the type of court

Fig 4.6 Plot of the survivor function for average time to justice delivery for the type of cases in the courts

Fig 4.7 Residual plot of gamma distribution

CHAPTER ONE

1.0 Introduction

There are rules governing every society and there are rights that every citizen is entitled to; for instance the fundamental human rights as guaranteed by the 1992 constitution of Ghana. When these rights are violated the individual may feel offended and hence seek to be fairly treated. Also, as we live in societies and relate with others, we owe certain duties and obligations to one another. When we fail to carry out such duties and obligations it may result in disputes and conflicts as one party may feel offended and hence seek redress through litigation.

Justice refers to treating people and populations fairly and allowing individuals to participate in society according to their abilities. It may be obtained in so many ways one of which is through the use of the legal system thus the court of law. Justice delivery may be described as the process of giving fair treatment to people or the act of using the legal system to punish people who commit crime or who violates the rights of others. Usually the cases sent to court are categorized into two namely; civil case and criminal case.

Civil law pertains primarily to the duties of private citizens to each other (http://www.america.gov). It can be grouped into five main categories; contract law, tort law, property law, the law of succession, and family law. In a civil case the court attempts to settle a particular dispute between the parties by determining their legal rights. The court then decides upon an appropriate remedy, such as awarding monetary damages to the injured party or issuing an order that directs one party to perform or refrain from a specific act.

Criminal law is concerned with conducts that are offensive to society as a whole. In a criminal case the court decides whether the defendant is innocent or guilty. A guilty defendant may be punished by a fine, imprisonment, or both and even death.

A crime is an offense against the state or a violation of obligations due the community as a whole and can be punished only by the state in the form of fine, imprisonment, or death (http://www.america.gov). An act is not automatically a crime because it is hurtful or sinful. An action constitutes a true crime only if it specifically violates a criminal statute duly enacted by Parliament, the legislature, or some other public authority. The sanctions of imprisonment and death cannot be imposed by a civil court or in a civil action (although a fine may be a civil or a criminal penalty) (http://www.america.gov).

1.1 The Ghanaian Legal System

The Ghana legal system is hierarchical in structure and there are currently 5 levels of courts: district courts, circuit courts, High Court, Court of Appeal, and Supreme Court. A 3-tiered appeal system exists within this 5-rung ladder, from the inferior courts to the High Court, from the High Court to the Court of Appeal, and from the Court of Appeal to the Supreme Court (1992 constitution) (http ://www. judicial .gov. gh).

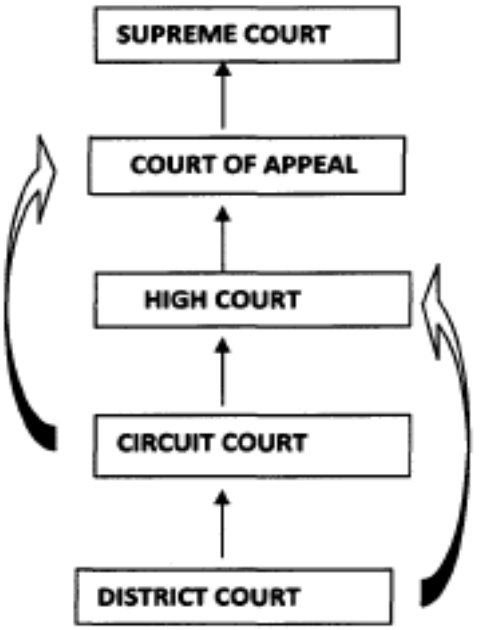

Fig 1: The Ghanaian Legal System

The Supreme Court is given power as the highest authority to interpret the Constitution and shall have final authority to say what the law is including determining whether any acts of Parliament or the President is in violation with the Constitution. It also handles appeal cases from the court of appeal and constitutional reviews. It is usually presided over by a minimum of five judges and a maximum of seven to ten judges usually depending on the nature of the case.

The Court of Appeal has the jurisdiction to hear appeals from any judgment of a Circuit Court in a civil cause or matter and in any matter in which jurisdiction is conferred on the Court under any other enactment. It is usually presided three judges and handles appeal cases from the High court (http://www.judicial.gov.gh).

The High Court has the power to enforce the Fundamental Human Rights and Freedoms under the Constitution. It has an original jurisdiction in all matters, appellate jurisdiction in a judgment

of the Circuit Court in the trial of a criminal case and appellate jurisdiction in any judgment of a District Court. It is usually presided over by a judge. Another type of the high court is the Fast Track Court. This is a fully automated high court thus it is well stocked with computers, speech and sound devices and so on, which enables it to fast track judgment.

In criminal matters, for example, high courts deal with three levels of violations: infractions (the least serious), misdemeanors (more serious), and felonies (the most serious). District courts of limited jurisdiction handle infractions and misdemeanors. They may impose only limited fines (usually no more than GHC 1,000) and jail sentences (generally not up to five years). In civil cases, these courts are usually limited to disputes under a certain amount, such as GHC 500. District court may handle preliminary matters in felony criminal cases. They often hold arraignments, set bail, appoint attorneys for indigent defendants, and conduct preliminary examinations. The case is then transferred to a trial court of general jurisdiction for such matters as hearing pleas, holding trials, and sentencing. (http://www.judicial.gov.gh)

Circuit court is not an appellate court but can take withdrawn cases. It is usually presided over by a judge and has an original jurisdiction in all matters. It has the power to enforce the Fundamental Human Rights and Freedom under the Constitution.

District court also known as a magistrate court has its jurisdiction limited to minor cases. These are usually presided over by magistrates; these are often not required to have any formal legal training.

Generally before a trial can be held, a series of procedures and events are required. Some of these stages are mandated by the Constitution, some by court decisions and others by legislative enactments. Custom and tradition often account for the rest. Although the exact nature of these procedural events varies for different countries/states there are similarities throughout the country. These procedures, however, are not as automatic or routine as they might appear; rather, the judicial system's decision makers exercise discretion at all stages according to their values, attitudes, and views of the world.

In the case of a civil trial, the person initiating the civil suit is known as the plaintiff, and the person been sued is the defendant or the respondent. In a typical situation, the plaintiffs attorney pays a fee and files a complaint or petition with the clerk of the proper court.

Once the appropriate court has been determined and the complaint has been filed, the court clerk will attach a copy of the complaint to a summons, which is then issued to the defendant. The summons may be served by personnel from the police's office, or a private process-service agency. The summons directs the defendant to appear before the court clerk within eight (8) days after the summon has been received and to file a response, known as a pleading, within fourteen (14) days. If the defendant does not do so, then he or she may be subject to a default judgment. Once the summons has been served on the defendant, a motion is filed by the defense attorney. Depending on the motion filed, the judge then makes a ruling on the motions.

Two types of motions are meant to clarify or to object to the plaintiffs petition. A motion to strike requests that, the court excise or strike, certain parts of the petition because they are prejudicial, improper, or irrelevant. A motion to make the complaint more definite asks the court

can be used against him or her in a court of law, that he or she has the right to the presence of an attorney, and that if he or she cannot afford an attorney; one will be appointed for him prior to any questioning."

Second, the magistrate will determine whether the accused is to be remanded (sent away from court to await trial which is to take place at a later date) on bail and, if so, what the amount of bail is to be or in prison custody especially in capital punishment cases for which the evidence of guilt is strong or if the magistrate believes that the accused will flee from prosecution no matter what the amount of bail. An alternative to bail is to release the defendant on recognizance, basically on a pledge by the defendant to return to court on the appointed date for trial, according to the section 96 (7) of the Criminal Procedure Code.

In minor cases the accused may be asked to plead guilty or not guilty. If the plea is guilty, a sentence may be pronounced on the spot. If the defendant pleads not guilty, a trial date is scheduled. However, in the typical serious (felony) case, the next primary duty of the magistrate is to determine whether the defendant requires a preliminary hearing. If such a hearing is appropriate, the matter is adjourned by the prosecution and a subsequent stage of the criminal justice process begins.

Basic Rights Guaranteed during the trial process includes; "In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial." The word speedy is emphasized so that an accused would not languish in prison for a long time prior to the trial or have the determination of his or her fate put off for an unduly long period of time. But how soon is speedy? Although this word has been defined in various ways by the Supreme Courts, in the U.S., Congress gave new meaning to the term when it passed the Speedy Trial Act of 1974

(http://www.america.gov). The act mandated time limits, ultimately reaching 100 days, within which criminal charges must either be brought to trial or dismissed. Most states have similar measures on the statute books, although the precise time period varies from one jurisdiction to another.

After the trials the court may now pronounce a sentence. Sentencing is the court's formal pronouncement of judgment upon the defendant at which time the punishment or penalty is set forth. The accused has the right to at least one appeal upon conviction of a felon.

1.2 Problem statement

In some parts of the world, time limits have been set within, which criminal charges must either be brought to trial or dismissed. This is to ensure that the right to a speedy and public trial in all criminal prosecutions is ensured. The U.S. Trial Act of 1974 mandated time limits, ultimately reaching 100 days, within which criminal charges must either be brought to trial or dismissed (http://www.america.gov).

However, this is not the situation in Ghana, Where "Concerns have been expressed most recently about the extent to which suspects are put on remand beyond their warrant periods. In some cases this exceeds their prison term they would have served if properly sentenced by the law courts" according to Justice Emile Short (the Head of the Commission on Human Rights and Administrative Justice).

This goes against the Basic Rights Guaranteed during the Trial Process which includes; "In all criminal prosecutions, the accused shall enjoy the right to a *speedy* and public trial." An accused person should not languish in prison for a long time prior to the trial or have the determination of his or her fate put off for an unduly long period of time. But how soon is speedy? What is the average time it takes for a sentence to be passed? What are the factors that affect the time it takes for a sentence to be passed?

1.3 Aim and Objectives

Aim

The main objective of this study is to model the average time to justice delivery.

Objectives

- To determine the average time to justice delivery in northern Ghana.
- To determine if the time to justice delivery vary between regions of northern Ghana.
- To determine if the nature of case affect the time it takes for a sentence to be passed.
- To determine if the type of court affect the time it takes for a sentence to be passed.
- To determine or model the average time from the time of arrest or filing of writ to first hearing.

1.4 The source of data

The Wa Circuit and District courts and Bolgatanga Circuit and District courts were sampled using convenience sampling. Secondary data on ten variables; datel (the date the case was first

reported or an arrest was made or the writ was filed), age, sex, religion, occupation, date 2 (the date the case was first heard in court), 'subsequent hearing (the total number of adjournments), date 3 (the date of last hearing to time or the date the sentence is passed) and remark, were obtained on the cases handled by these courts for the year 2009.

The district court has jurisdiction over the district and may impose only limited fines (usually no more than GI-10 5,000.00) and jail sentences (generally no more than five (5) years) whilst the circuit court has jurisdiction over the whole region and has no limitations to its fines and jail sentences. It however does not handle appeal cases. There are two fundamentally different types of court cases; civil and criminal cases (http://www.judicial.gov.gh).

Data was obtained on the civil and criminal cases, where the criminal cases are categorized into first degree felony, second degree felony and misdemeanor. Refer to appendix D for definitions. Data entry and preliminary analysis were done using the statistical software package for social scientist (SPSS) version 16.10. Further analysis was then done using SAS version 9.1.

The Wa municipality which is the regional capital had a population of 224,066 which made up 38.9% of the total population of the Upper West region (population & housing census report-2000). This population was estimated to have a growth rate of 1.7%, which implies that as at now the population should stand at about 674,092. Bolgatanga been the regional capital of the Upper East region had a population of 228,815 which was 24.9% of the total population of the Upper East region. With a growth rate of 1.1% the Upper East regional population is estimated to be around 1,021,299.

1.5 The variables

The study considered justice delivered the moment judgment is pronounced by the judge. Hence though justice delivery may depend on so many factors both measurable like age sex religion and so on and immeasurable factors (human factors) examples are delays due to unavailability of evidence, delay due to counselors and judges being indisposed, and even sometimes judicial breaks. The study only took into consideration the measurable variables and built a model based on these variables. These variables were; date 1 , age, sex, religion, occupation, date2, SUBH, date3 dur, dur2, dur3 and remark.

1.6 Definition of Some Selected Variables.

1. Type (nature of crime) is the type of case; the cases are categorized into civil and criminal cases.
2. Court is the type of court trying the cases. They are categorized into district and circuit courts.
3. Region refers to the region in which the trial is taking place. There are two regions; Upper West and Upper East regions of Ghana.
4. Age, which is the age of the accused, is classified into three; below eighteen (18) years which is the juvenile class, from eighteen to sixty years (18-60), thus the working class and above sixty years (60+) which is the retired class.
5. Sex of the accused (sex) is categorized into males and females.
6. Religion of the accused (religion) is categorized into Christian, Muslim and others.
7. Occupation of the accused (occupation) is categorized into seven (7); civil and public servant, trader, artisan, driver, farmer, unemployed and others (galamsay operators, etc).

8. Date l is the date a case is first reported to the police in the case of a criminal cases or the date a writ is filed in a civil case.
9. Date 2 is the date of the first hearing in court that is the day the case is first brought before the judge in the court of law.
10. Subsequent hearing (SUBH) is the number of times the case is heard prior to the last date or the number of times the case has been heard before a sentence is passed.
11. Date 3 is the date of the last hearing to the time of collection of data or the date a sentence is passed.
12. Remark on the case is categorized into three; pending, withdrawn or closed. The status (status) follows from the remark, if the case is pending or withdrawn at the time of study it is assumed censored and if it is closed it is considered not censored.
13. Dur is the total time the case takes to close or to the collection of the data (date3-date1).
14. Dur2 is the time it takes before the case is first heard in court (date2-datel)
15. Dur3 is the time between the first hearing and the pronouncement of judgment or to the collection of data (date3-date2).

CHAPTER TWO

LITERATURE REVIEW

2.0 Statistics and the Law

The concerns of Statistics and those of Law have little common ground, but in fact both disciplines address the same fundamental task: the drawing out of sound inferences from evidence.

Both Statistics and Law are faced with the problem of structuring and making sense of mixed masses of evidence. The modern technology of "Probabilistic Expert Systems" can be seen as an extension of the century-old "Wigmore chart" method, used by lawyers to organise the many items of evidence in a case and express the many kinds of relationship between them. This technology is now been used to provide a correct and efficient way of taking account of whatever limited evidence may be at hand, a task that could otherwise be impossible. An important area of application is the interpretation of DNA profiles taken from relatives when that of the suspect (in a criminal case) or putative father (in a paternity case) is unavailable.

The logic of probabilistic reasoning is applied to cases in law and its neglect or misapplication has led to serious errors and miscarriages of justice (Dawid, 2004). An instance is the well publicized series of recent cases in England related multiple SIDS deaths (Sudden Infant Death Syndrome) that had resulted in murder convictions. In one, a significant part of the evidence was the statement of a pediatrician that such cases would occur by chance only "once in over 73 million births". This calculation was based on an assumption that conditions such as SIDS did

not have any genetic or environmental component that might make it more likely that a SIDS death occurs where there has already been one such case in the family. Statisticians refer to this assumption as independence. There is a large body of medical research that suggests that the assumption is wrong here - while the causes of SIDS are still a mystery there is strong indications that some of the contributing causes are genetic.

In the initial trial the "one in 73 million births" claim was not properly refuted although the presiding judge did give a warning that "we do not convict people in these courts on statistics. It would be a terrible day if that were so." However the subsequent conviction led to outcry over the misuse of statistics - to a statistician the mistake was so patently obvious. This led to a campaign for an appeal, including an open letter from the Royal Statistical Society.

The second appeal was successful, but it must be said more due to the discovery that a medical witness had withheld evidence helpful to the defense. However the Court of Appeal did recognize that the inappropriate use of statistics may have contributed to the original verdict.

2.1 Average time from arrest to sentence

The studies made by the national statistics department of the ministry of justice United Kingdom (www.justice.gov.uk) to monitor the pledge by the Government in its manifesto in 1997 to halve the average time from arrest to sentence for persistent young offenders in England and Wales from 142 days in 1996 to 71days, were based on annual data collected from the police national computer over the period 1997 to 2007 and monthly data of 2008 of all cases sentenced in

magistrates' courts and the Crown Court in England and Wales that are recorded on the Police National Computer. The interval from arrest to charge was done using time series analysis.

The study reported the following;

- The average time from arrest to sentence for persistent young offenders (PYOs) in England and Wales was 57 days in 2008, down 8 days from 2007.
- The overall average time from arrest to sentence for cases sentenced in magistrates' courts was 47 days in 2008 down 10 days from the previous year. Cases sentenced in the Crown Court took an average of 206 days from arrest to sentence in 2008, down 1 day from 2007.

A similar study was made by Farzana Bari of the economics and statistics division of the ministry of justice and performance directorate in her majesty's court service. This study was also on criminal justice but considered both young and adult offenders. It also took into consideration the time intervals from offence or arrest to completion, from offence to charge or laying of information, from charge or laying of information to first listing and from first listing to completion. Farzana reported that;

- The average time from offence to completion for indictable cases was 111 days, a decrease from 115 days in June 2006.
- The average time from offence to charge or laying of information was 56 days, unchanged from June 2006.
- The average time from charge or laying of information to first listing was 8 days, a decrease from 10 days in June 2006.

- The average time from first listing to completion was 47 days, a decrease from 50 days in June 2006.
- There was an average of 2.1 adjournments for indictable/ triable either way cases, a slight increase from 2.0 adjournments in June 2006. The average length of adjournments was 23 days, a decrease from 24 days in June 2006. 31 per cent of cases were completed at first listing, a slight increase from 30 per cent in June 2006.

The study by the national statistics department of the ministry of justice United Kingdom considered only on persistent young offenders and only for closed criminal cases.

A similar study by Farzana Bari took into consideration both young and adult offenders and the time intervals, it only dealt with closed cases. Taking closed cases alone into consideration could produce biased results especially in a situation involving a large number of pending cases.

This study seeks to eliminate any form of bias that may be associated with excluding the pending cases by including them in the data. This warranted our use of survival analysis in this study as opposed to their use of time series analysis. In addition the study includes both young and adult offenders of civil and criminal cases.

CHAPTER THREE

SURVIVAL ANALYSIS

3.0. Introduction to Survival Analysis

The term "survival analysis" pertains to a statistical approach designed to take into account the amount of time an experimental unit contributes to a study. That is, it is the study of time between entry into observation and a subsequent event (Smith & Smith (2000)). Originally, the event of interest was death hence the term, "survival analysis." The analysis consisted of following the subject until death. The uses in the survival analysis of today vary quite a bit. It is extremely useful in studying many different kinds of events in both social and natural sciences, these include; time until onset of disease, time until stock market crash, time until equipment failure, time until earthquake, and so on (Allison (1995)).

The best way to define such events is simply to realize that these events are a transition from one discrete state to another at an instantaneous moment in time. ,Of course, the term "instantaneous", which may be years, months, days, minutes, or seconds, is relative and has only the boundaries set by the researcher (Allison (1995)).

3.1 The History of Survival Analysis

The origin of survival analysis goes back to mortality tables from centuries ago. However, it was not until World War II that a new era of survival analysis emerged (Allison (1984)). This new era was stimulated by interest in reliability (or failure time) of military equipment. At the end of the war these newly developed statistical methods emerging from strict mortality data research to

failure time research, quickly spread through private industry as customers became more demanding of safer, more reliable products.

As the uses of survival analysis grew, parametric models gave way to nonparametric and semi parametric approaches for their appeal in dealing with the ever-growing field of clinical trials in medical research. Survival analysis was well suited for such work because medical intervention follow-up studies could start without all experimental units enrolled at start of observation time and could end before all experimental units had experienced an event. This is extremely important because even in the best-developed studies, there will be subjects who choose to quit participating, who move too far away to follow, or who will die from some unrelated event.

The researcher was no longer forced to withdraw the experimental unit and all associating data from the study; instead techniques called censoring enabled researchers to analyze incomplete data due to delayed entry or withdrawal from the study. This was important in allowing each experimental unit to contribute all of the information possible to the model for the amount of time the researcher was able to observe the unit.

The last great strides in the application of survival analysis techniques has been a direct result of the availability of software packages and high performance computers which are now able to run these difficult and computationally intensive algorithms relatively efficiently.

Survival data has two common features that are difficult to handle with conventional statistical methods: censoring and time dependent covariates (time varying exploratory variables).

Censoring comes in many different forms and occurs for many different reasons. The most basic distinction is between the left and right censoring. An observation *T* is right censored if all you

know about *T* is that it is greater than some value *c* in this case *T* is the time of occurrence of

Symmetrically left censoring occurs when all you know about an observation on the variable *T* is that it is less than some value *c*. Case are left censored if they are terminated after the event occurs. There are various patterns of right censored data, these include; singly Type I censoring (Type I censoring), Type II censoring, and Random censoring (Allison (1995)).

One of the aims of survival analysis is to estimate causal or predictive models in which the risk of an event depend on covariates. Implying that, the measurement of the covariate must be present in the data. There are a number of approaches (methods) to survival analysis, these include; Kaplan-Meier estimators, log-normal regression, proportional hazard regression, life-tables, etc.

3.2 Censoring

Let *T* be the time of occurrence of some event e.g. passing of judgment and *c* be some value. An observation on the variable *t* is left censored if all we know about *T* is that it is less than *c (T* < c).thus it occurs mostly when the observation starts at a time when the event might have already happened or occurred to some individuals.

Similarly given *T* as the time of occurrence of some event e.g. passing of judgment and *c* as some value, an observation on the variable t is right censored if all we know about *T* is that it is greater than *c (T > c).* Thus cases are right censored because observation is terminated before

event occurs. Right censoring can further be categorized into three; singly type I, type II and random censoring.

Singly type I censoring is a situation where observations have the same and fixed censoring time. Thus an observation is singly type I censored if it is terminated at a specific time before the occurrence of the event.

Type II censoring occurs when observation is terminated after a pre-specified number of events have occurred.

Random censoring occurs when observations are terminated for reasons that are not under the control of the investigator. It can also be produced when there is a single termination time but entry times vary randomly across individuals. It is random because entry times are not under the control of the investigator. Example is our case; the investigator has no control over the time a crime is committed, and the individual enters the study immediately the case is first reported to or the person is first arrested for a crime he committed though they have the same censoring time which is the day the data was taken.

3.3 Equivalent Functions describing Survival distribution.

All the standard approach to survival analysis is probabilistic or stochastic (Allison (1995)). Thus, the times at which events occur (survival times) are assumed to be realizations of some random process. It follows that T, the event time for some particular individual, is a random variable having a probability distribution. The distribution of these survival times are can be characterized by three equivalent functions.

3.3.1 Survival function

The survival function gives the probability of surviving or been event-free beyond time t. it is given by;

$$S(t) = Pr(T > t) = 1 - F(t) \quad (3.1)$$

Where $F(t)$ is the cumulative density function *(c. d. f.)* of the variable *T*. thus the *c. d. f.* gives the probability that the variable is less than or equal to any value *t* that we choose. Mathematically the *c. d. f.* is given as;

$$F(t) = \int_{-\infty}^{t} f(t)dt \quad (3.2)$$

Since S(t) is a probability, it is bounded between 0 and 1, and since *T* cannot be negative, we know S(0) = 1 implying $f(t) = 0$ *for* $t < 0$.

3.3.2 Probability density function

For continuous variables, one common way of describing their probability distribution is the use of the probability density function(p. *d. f.)* denoted by *f* (t).this function is defined as;

$$f(t) = \frac{dF(t)}{dt} = \frac{-dS(t)}{dt} = -S'(t) \quad (3.3)$$

The p. *d. f.* is the derivative or slope of the *c. d. f.* and it corresponds to the distributional shape.

3.3.3 Hazard function

The hazard function describes the concept of the risk .of an outcome (e.g., death, failure, hospitalization) in an interval after time t, conditional on the subject having survived to time t. Thus, it is the instantaneous risk that the event will occur at time t it can also be defined as the probability that an event occurs in the small interval between t and t + At no matter how small *At* is, given that the event has not yet occurred at ·t ,divided by the probability that the individual survived beyond time t .

The hazard function, also termed the failure rate, the instantaneous death rate, force of mortality, seems to be more intuitive to use in survival analysis than the p.d.f. because it attempts to quantify the instantaneous risk that an event will take place at time t given that the subject survived to time t. It is mathematically defined as:

$$\lambda(t) = \lim_{\Delta t \to 0} \left[\frac{Pr\{t<T<t+\Delta t / T \geq t\}}{\Delta t} \right]. \qquad (3.4)$$

The hazard function is sometimes known as the conditional density function since in the absence of the conditional statement $T > t$, its definition is similar in definition to the alternative definition of the p. *d. f.*

$$f(t) = \lim_{\Delta t \to 0} \left[\frac{Pr\{t<T<t+\Delta t\}}{\Delta t} \right] \qquad (3.5)$$

The survivor function, the hazard function and the probability density function are equivalent ways for describing continuous probability distribution. Given any one of them, we can obtain the other two. The relationship between survivor function and probability

density function is indicated in equation (3.3). Another formula that expresses the hazard in terms of p. *d*. *f* . and survivor function is;

$$\lambda(t) = \frac{f(t)}{S(t)} \tag{3.6}$$

Substituting (3.3) into (3.6) yields;

$$\lambda(t) = \frac{d}{dt}\log S(t) \tag{3.7}$$

Making $S(t)$ the subject in (3.7) yields;

$$S(t) = \exp\left\{-\int_0^t \lambda(t)dt\right\} \tag{3.8}$$

Substituting (8) into (6) yields;

$$f(t) = \lambda(t)\exp\left\{-\int_0^t \lambda(t)dt\right\} \tag{3.9}$$

These formulas are useful in coming out with models for survival analysis. Hazard may be constant, increasing or decreasing.

3.4 Estimation of survival functions

Survival curves are useful for preliminary examination of the data, for computing derived quantities from regression models like the median survival time and for evaluating the fit of regression models (Allison (1995)). There are two methods for estimating the survivor functions; the life table and the Kaplan-Meier methods.

The **life table method** also known as the actuarial method is suitable for large data sets especially when they are grouped and the measurement of event times is crude.

Kaplan-Meier (KM) method also known as the product- limit estimator is the most widely used method for estimating survivor functions and is more suitable for smaller data sets. The Kaplan-

>

Meier estimator incorporates information from all of the observations available, both censored and uncensored, by considering any point in time as a series of steps defined by the observed survival and censored times. The survival curve describes the relationship between the probability of survival and time.

When there are no censored times or the observations are right censored (thus for $T < t$), the KM estimator is just the sample proportion of observations with event times greater than t. Thus if 75% of the observations have event times greater than 5, we have .5'(5) = 0.75. However for left censored data (thus for $T > t$), $g(t)$ is undefined.

Supposed there are k distinct event times, $t_1 < t_2 < \bullet\bullet\bullet < t_k$. At each time t_j, there are n_j individuals who are said to be at risk of an event. At risk means they have not experienced an event nor have been censored prior to time with censoring time t_i. If any cases are censored at exactly they are also considered to be at risk at t_i.let d_j be the number of individuals who die at time t_i. The KM estimator is then defined as;

$$\hat{S}(t) = \prod_{j:t_j \leq t} \left[1 - \frac{d_j}{n_j}\right] \quad \text{for } t_1 \leq t \leq t_k \qquad (4.0)$$

In words, the formula say that for a given time t, take all the event times that are less than or equal to t, for each of those event times, compute the quantity in the brackets, which can be

interpreted as the conditional probability of surviving up to time t_{i+i} given that one has survived to time t_i. Then multiply all of these conditional probabilities together.

In SAS, the product-limit survival estimates can be calculated using LIFETEST procedure (PROC LIFETEST) (Allison (1995)).

3.5 Estimation of regression models

3.5.1. Cox's Proportional Hazards Regression

The Cox model is a semi parametric model in which the hazard function of the survival time is given by

$$\lambda(t:\mathbf{x}) = \lambda_0(t)e^{\beta' \mathbf{x}(t)} \quad (4.1)$$

Where λ_0 *(t)* is an unspecified baseline hazard function, *x(t)* is a vector of covariate values, possibly time-dependent, and β is a vector of unknown regression parameters. The model is referred to as a semi parametric model since part of the model involves the unspecified baseline function over time (which is infinite dimensional) and the other part involves a finite number of regression parameters.

3.5.2. Parametric regression models

The method for maximum likelihood is used to estimate parametric regression models with censored survival data (Smith & Smith, 2000). It accommodates all types of censoring data. It

also enables us to test certain hypothesis about the shape of the hazard function. It is a linear regression model.

Let T_i be a random variable denoting the event time for the i^{th} individual in the sample, and let $x_{j1},\ldots\ldots x_{ik}$ be the values of k covariates for the same individual. The model is;

$$\log T_i = \beta_0 + \beta_1 x_{i1} + \bullet\bullet\bullet + \beta_k x_{ik} + \sigma\varepsilon_i \qquad (4.2)$$

Where ε_i is a random disturbance term, and $\beta_0 \ldots\ldots\ldots \beta_k$ and σ are parameters to be estimated.

In SAS, the maximum likelihood estimators of the parameters can be calculated using PROC LIFEREG if any of survival distribution functions of *T* is specified exponential, Weibull, log-logistic, log-normal and generalized gamma (Smith & Smith (2000)). By default, PROC LIFEREG models Y = *log (T)* when the first five models are specified, which leads to so called accelerated failure time models.

After generating the different parametric models, two approaches used to select the best model are described below. They are both based on the value of maximized log likelihood, which is computed by PROC LIFEREG.

3.5.2.1. The higher the value of maximized log likelihood, the better the model fits the data. However, we cannot simply select the distribution yielding the highest likelihood, because those distributions have different numbers of parameters: from one parameter for exponential and one-parameter extreme value to three parameters for generalized gamma and log-gamma. Although a higher likelihood means a better model for the observed data, a higher number of parameters cause weaker predictability for new cases. It is

3.5.2.2. The second approach is based on the likelihood ratio test and can be used for comparing nested models, such as exponential vs. Weibull, since the former is a special case of the latter with the scale parameter = 1; Weibull, which is a special case of gamma with the shape parameter = 1, vs. gamma; log-normal (a special case of gamma with shape parameter = 0) vs. gamma; and one-parameter extreme value vs. two-parameter extreme value. In general, if $k_1 > k_2$ and $LL(k_1)$ & $LL(k_2)$ are the maximum log-likelihoods of two models with all k_1 parameters and k_2 parameters not fixed by the null hypothesis, respectively, then, under the null hypothesis, $2[LL(k_1)-LL(k_2)]$ approximately follows a chi-square distribution with $(k_1 - k_2)$ degrees of freedom. For example, comparing gamma with Weibull, $k_1 - k_2 = 1$. Low (not significant for a chi-square distribution with 1 degree of freedom) values of $2[LL(k_1)-LL(k_2)]$ would suggest Weibull as a better choice over gamma.

After the selection of the best model and the estimation of its parameters, the survival distribution function (SDF) $S(t) = P(T > t)$ can be estimated for any t (even for t beyond the time frame of available data).

There are several reasons the parametric regression modeling was chosen to explain the effect of covariates on time until event. They include:

1. The PROC LIFEREG test the hypothesis about the shape of the hazard function and hence is easier to interpret unlike the PROC PHREG which gives only the nonparametric estimates of the survivor function, which can be difficult to interpret.
2. PROC LIFEREG also gives the shape of the survival distribution and also produces more efficient estimates (with smaller standard errors) than the PROC PHREG.

3. PROC LIFEREG automatically creates a set of dummy variables to represent categorical variables with multiple values. PROC PHREG requires you create such variables in the DATA step.

CHAPTER FOUR

RESULTS

The results of the descriptive statistics and survival analysis of data on the number of cases handled by the Wa and Bolgatanga Circuit and District courts for the year 2009 on the variables; datel, age, sex, religion, occupation, date 2, SUBH (the total number of adjournments or subsequent hearing), date 3 and remark are presented in this section. The results are presented as follows:

- The whole data.
- The two regions.
- The different types of cases.
- The different types of courts.

4.0 Empirical Results

The frequency distribution of the raw data is summarized in tables 4.1, 4.2 and 4.3. The percentages indicate the distribution of the variables (sex, age, religion, remark and occupation) classified by Region, Sex and Type or nature of case against the accused respectively.

Table 4.1 Frequency Distributions by Regions

		REGION		Total
		Upper West	Upper East	
		No. (%)	No. (%)	No. (%)
SEX	Male	122 43.7	157 56.3	279 76.4
	Female	15 17.4	71 82.6	86 23.6
	Total	13737.5	228 62.5	365 100.0
AGE	<18	4 57.1	3 42.9	7 2.0
	18 - 60	128 37.2	216 62.8	344 96.9
	>60	2 50.0	2 50.0	4 1.1
	Total	134 37.4	221 62.6	355 100.0
RELIGION	Christian	37 30.6	84 69.4	121 33.1
	Muslim	92 54.1	78 45.9	170 46.4
	Other	8 10.8	66 89.2	74 20.2
	Total	137 37.4	229 62.6	365 100.0
COURT	District	120 56.6	92 43.4	212 57.9
	Circuit	17 11.0	137 89.0	154 42.1
	Total	13737.4	229 62.6	366 100.0
REMARK	Pending	85 69.7	37 30.3	122 33.3
	Closed	50 20.9	189 79.1	239 65.3
	Withdrawn	2 40.0	3 60.0	5 1.4
	Total	13737.4	229 62.6	366 100.0
OCCUPATION	civil & public	20 52.6	18 47.4	38 11.0
	Trader	28 38.4	45 61.6	73 21.2
	Artisan	8 44.4	10 55.6	18 5.2
	Driver	8 44.4	19 55.6	27 7.8
	Farmer	39 52.0	36 48.0	75 21.8
	Unemployed	13 34.2	25 65.8	38 11.0
	Other	14 18.7	61 81.3	75 21.8
	Total	130 37.8	214 62.2	344 100.0

Table 4.1 shows that males constituted 76.4% of the accused persons. The age interval was between 18 to 60 years (which represented 96.9% of the total).

A larger number (57.9%) of cases were handled at the district courts and 42.1% were circuit court cases.

There were apparent regional differences in the patronage of district and circuit courts. Upper the other hand, the percentages were 43.4 and 89.0 for the district and circuit court respectively in the Upper East region.

A majority (65.3%) of the cases was closed but of the closed cases only 20.9% were from Upper West. On the whole 33.3% of the cases were pending and out of these, 69.7% of the total number of pending cases was from Upper West. A very small proportion (1.1%) of the total number of cases recorded was withdrawn.

Most of the accused (21.8%) were farmers followed by traders (21.2%) and the least were the artisans (5.2%).

Table 4.2 Frequency Distributions by Sex

		SEX				Total (%)	
		Male (%)		Femal (%)			
type of case	Civil	30	32.6	62	67.4	92	25.2
	Criminal	249	91.2	24	8.8	273	74.8
	Total	**279**	**76.4**	**86**	**23.6**	**365**	**100.0**
Court	District	141	66.8	70	33.2	211	57.8
	Circuit	138	89.6	16	10.4	154	42.2
	Total	**279**	**76.4**	**86**	**23.6**	**365**	**100.0**
Region	**Upper** West	122	89.1	15	10.9	137	37.5
	Upper East	157	68.9	71	31.1	228	62.5
	Total	**279**	**76.4**	**86**	**23.6**	**365**	**100.0**
Age	<18	7	100.0	0	0.0	7	2.0
	18-60	260	75.6	84	24.4	344	96.9
	>60	3	75.0	1	25.0	4	1.1
	Total	**270**	**76.1**	**85**	**23.9**	**355**	**100.0**
Religion	Christian	81	66.9	40	33.1	121	33.2
	Muslim	139	81.8	31	18.2	170	46.6
	Other	59	79.7	15	20.3	74	20.3
	Total	**279**	**76.4**	**86**	**23.6**	**365**	**100.0**
Occupation	civil/public	32	84.2	6	15.8	38	11.1
	Trader	44	60.3	29	39.7	73	21.3
	Artisan	16	88.9	2	11.1	18	5.2
	Driver	26	96.3	1	3.7	27	7.9
	Farmer	68	90.7	7	9.3	75	21.9
	Unemployed	31	81.6	7	18.4	38	11.1
	Other	44	59.5	30	40.5	74	21.6
	Total	**261**	**76.1**	**82**	**23.9**	**343**	**100.0**
Remark	**Pending**	89	76.4	32	26.4	121	33.2
	Closed	187	78.2	52	21.8	239	65.5
	Withdrawn	3	60.0	2	40.0	5	1.4
	Total	**279**	**76.4**	**86**	**23.6**	**365**	**100.0**

Table 4.2 shows the cross tabulation of sex with the other variables. It is realized that 74.8% of the total number of cases were criminal in nature. Of all the criminal cases reported, 91.2% of the accused were males. Of the remaining 25.2% civil cases, 67.4% of the accused were females as illustrated in fig. 4.1.

In the Upper West region a very small proportion (10.9%) of females constituted the accused as compared to Upper East region where the proportion is 31.1 %. This may be due to the fact that the Wa is predominantly a Muslim dominated town and as such the Muslim women are highly disciplined.

All of the accused juveniles were males. Of the males accused, drivers were the most, followed by farmers with the least in the group being the artisans. Among the females, traders were the most, with drivers as the least.

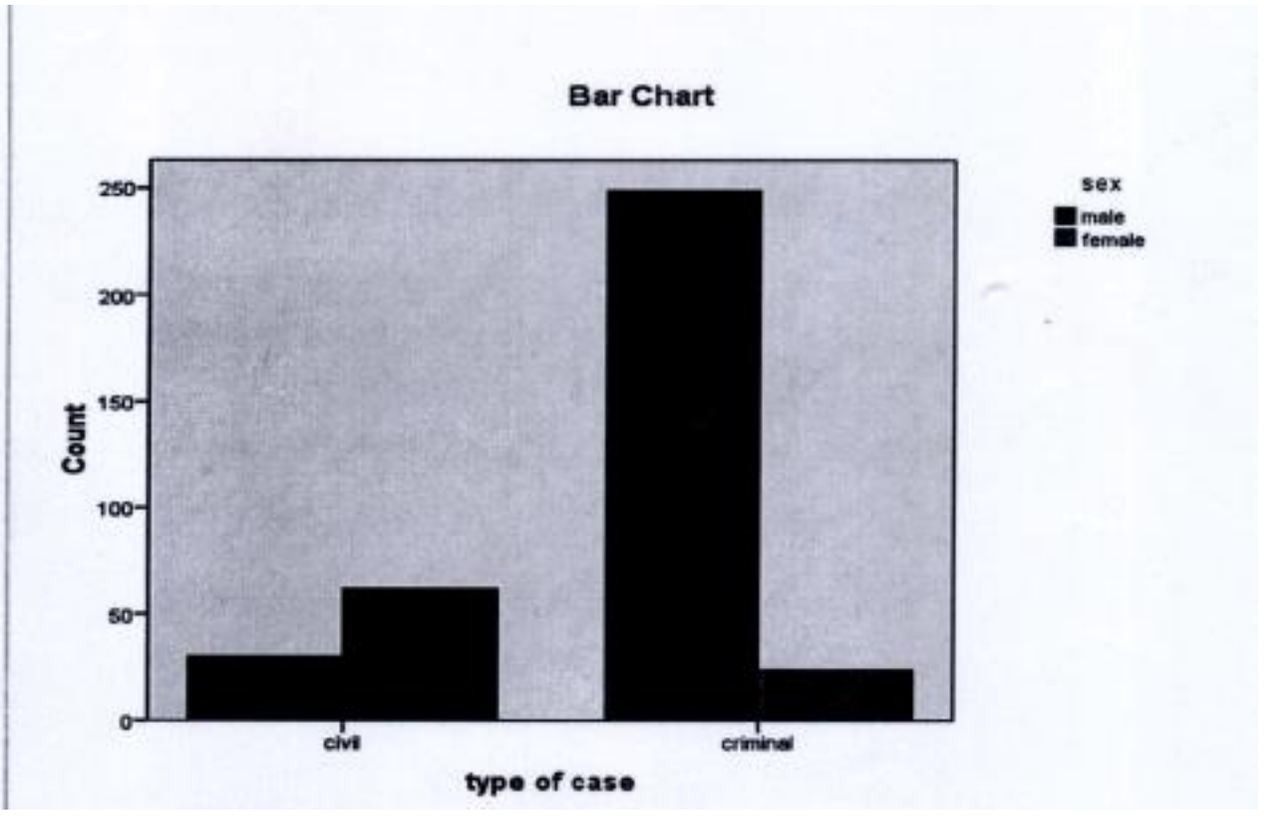

Fig 4.1 **Proportion of** sex **against the type of** case.

Table 4.3 Frequency Distributions by Type of Case

		Type of				Total	
		Civil		criminal			
Age	<18	0	0.0	7	100.0	7	2.0
	18-60	91	26.5	253	73.5	344	96.9
	>60	1	25.0	3	75.0	4	1.1
	Total	**92**	**25.9**	**263**	**74.1**	**355**	**100**
Religion	Christian	40	3.1	81	66.9	121	33.1
	Muslim	39	2.9	131	77.1	170	46.4
	Other	13	7.6	61	82.4	74	20.2
	Total	**93**	**5.4**	**273**	**74.6**	**366**	**100**
Occupation	Civil/public	10	26.3	28	73.7	38	11.0
	Trader	31	42.5	42	57.5	73	21.2
	Artisan	3	16.7	15	83.3	18	5.2
	Driver	1	3.7	26	96.3	27	7.8
	Farmer	3	4.0	72	96.0	75	21.8
	Unemployed	5	13.2	33	86.8	38	11.0
	Other	34	45.3	41	54.7	75	21.8
	Total	**87**	**25.3**	**257**	**74.7**	**344**	**100**
Court	District	93	43.9	119	56.1	212	57.9
	Circuit	0	0.0	154	100.0	154	42.1
	Total	**93**	**25.4**	**273**	**74.6**	**366**	**100**

Generally, criminal cases constituted 74.6% of the entire data as shown in Table 4.3 above. All the juvenile cases were criminal in nature. A good proportion (75%) of the cases against the accused within the pensionable age (60+) was criminal in nature. All the civil cases handled by the circuit courts were still pending and hence censored.

4.1 The Estimation of the Survival Time to Justice Delivery using the Kaplan-Meier (product limit) approach.

The Kaplan-Meier (KM) estimates give the probability of survival of the observations at particular points in time. The output of the PROC LIFETEST statement of SAS usually consists of *dur, survival, failure, survival standard error, number failed* and *number left*.

- *Dur* is the times; *survival* is the same as the KM estimates; and *failure* is one minus the KM estimate and is the probability of death prior to a specified time.
- The *survival standard error* is the estimated standard error associated with the KM estimates.
- *Number failed* is the cumulative number of cases that experienced the event prior to and including the point in time.
- *Number left* is the number of observations that have neither experienced the event nor been censored prior to each point in time. That is the size of the risk set at each point in time.

The KM estimator is defined for any time between 0 and the largest event or censoring time, just that it changes only at an observed event time. The survival probabilities are obtained using the SAS commands in appendix A.

The survival probability of a day for the entire data is 0.98 whilst that for a week is 0.90. Thus, there are very high chances that judgment will not be passed within the first week the case is reported.

Considering the regions separately as obtained by the SAS command two (2) of appendix A, it is realized that though the situation is not different, there is a high probability for the survival of cases for a week. It is a bit better in Upper East with this probability been 0.89 and slightly worse in Upper West with this probability been 0.93. This implies that, cases in Upper East are more likely to receive judgment in the first week than those in the Upper West (though chances are low with failure rate of 0.10). There is a very small chance (failure rate of 0.03) of obtaining judgment on the first day of reporting a case in Upper East and absolutely no chance (failure rate of 0) in Upper West.

Generally the probability that a sentence is passed on a case within a month after it has been reported or the probability of death in a month is 0.77. Thus, there are high chances that judgment will not be passed within the first month after reporting the case. This is still the case when both regions are considered separately though it is much better in Upper East (survival probability of 0.73) as compared to Upper West (survival probability of 0.83).

The average time for justice delivery from the data is 103days and this time varies across the regions with Upper West recording the highest of 184 days and Upper East recording the lowest of 86days. The average time for justice delivery is the time for which the survival probability of an individual is 0.50. Thus, the time before which, there are fifty- fifty chances of the cases coming to a close.

There is generally a low tendency for a case to run on for over a year (399 days) with survival probability of 0.12, which is the same as it was for 314 days. The situation is the same in the Upper East region where the probability of a case running up to 382 days is 0.04.

However, the tendency of a case running on for more than a year (399 days) in the Upper West region is 0.48, which is the same as it was at 184 days. This implies that, there are almost fifty-fifty chances that cases in the Upper West run on for up to 399 days.

Generally, it is observed that Upper West region had the highest survival probabilities as compared to Upper East in all the circumstances. Thus, cases in Upper East tend to close faster than those in Upper West. This can be attributed to a number of factors. These in clued;(1) the courts in Upper East region are better equipped than those in Upper West (2) both courts in Upper East region are very active as compared to the Upper West region where only one of the courts is active. The circuit court of the Upper West though not closed has not been very active due to the fact that the judge has been indisposed for some time, Hence some possible reasons for the cause of the delay in the passing of judgment in Upper West.

The SAS command three (3) in the appendix A gives an output on the survival probabilities for the various cases. The survival probability for a criminal case for a week is 0.89, whilst that for a day is 0.98. The survival probability for a civil case for a week is 0.97, whilst that for a day is zero (0). This implies that, there are better chances of a criminal case receiving judgment same day or a within a week of reporting than civil case. This can be attributed to the fact that the procedures for a civil case are much longer and hence take a longer time than for a criminal case. For a criminal case a person arrested whilst committing a crime is likely to be sentenced same day of arrest that is, if he/she is booked for court same day and there is substantial evidence. However, for a civil case, it is not possible to go through the whole procedure in one day and have judgment pronounced same day.

Civil cases however have better chances of ending or of having judgment passed within 1 to 3 month after been reported than criminal cases. The survival probability of civil cases for a month (30 days) is 0.73 whilst that for criminal cases is 0.78. The probability of judgment been pronounced within 3 months (90 days) of filing of writ for a civil case is 0.45. The probability of judgment been pronounced within 3 months (90 days) of arrest or reporting of case in a criminal case is 0.36. There are low chances (survival probability of 0.22) for criminal cases to run for 256 days as compared to civil cases.

The probability of passing judgment (probability of failure) on a case the same day it is reported in a circuit court is 0.04, whist that of a case in a district court is zero (0). Thus, though the chance of a case closing on the day the complaint is made in a circuit court is very slim, it is impossible in a district court. These results are obtained using the SAS command four (4) in the appendix A. The survival probability for a week (7 days) in a circuit court is 0.82 whilst that for a district court is 0.96. The probability for a case running on for more than a year in a circuit court is 0.01 whilst that for a district court is 0.33.

Comparing the survival of the type of cases (civil and criminal) in the district court as obtained from the SAS command five (5) in the appendix A, it is realized that civil cases survive better in district courts than criminal cases. The survival probability for a week for a civil case in a district court is 0.95 whilst that for a criminal case is 0.97; the survival probability for a civil case in a district court is 0.73 whilst that for a criminal case is 0.90. Thus, though there are low chances of judgment been passed a month after the case is reported, the chances are even slimmer for a criminal case in a district court with a probability 0.10.

It was also observed that criminal cases fared badly in district courts as compared to circuit courts. The survival probability of a criminal case for a week in a district court is 0.97 whilst that in a circuit court is 0.82. The probability of judgment been passed a month after reporting a criminal case in a district court is 0.10 whilst that for a criminal case in a circuit court is 0.46. This implies that, the chances are much higher for a judgment to be passed faster on criminal cases in circuit courts than in district courts.

It is almost impossible (with survival probability of 0.01) for a criminal case in a circuit court to run on for more than a year (399 days) after it is reported. However, there is a relatively high tendency for criminal cases to run for more than a year in district courts with a survival probability of 0.38. It was however realized that all civil cases reported in the circuit courts were pending and hence censored.

The summary statistics for the Time from the start of a case to fmish (dur) is given in the tables.

Table 4.4 Summary of Time from the start of a case to finish (dur) for the entire data

Quartile Estimates			
		95% Confidence interval	
Percent	Point Estimate	lower	Upper
75	230	179	310
50	103	81	123
25	35	27	42
Mean		Standard Error	
136.12		6.64	

Table 4.4 gives the summary statistics of the time variable dur which is the time interval from arrest to sentencing or from arrest to the censoring date for the data wholly. The 25th percentile,

which is the smallest event time for which the probability of judgment been passed earlier, is greater than 0.25 for this data, is 35 days.

The 75th percentile is 227 days and the 50th percentile which is also same as the median death time is 103 days. The median is 103 days with a 95% confidence interval of 81 to 121 days.

The estimated mean is 135 days and as noted on the output the mean is biased since there are censoring times greater than the largest event time. Hence the preferred measure of central tendency of this data is the median. Thus the average time to justice delivery for this data holding all variables constant is 103 days. Fig. 4.2 shows the survival distributions for the entire data.

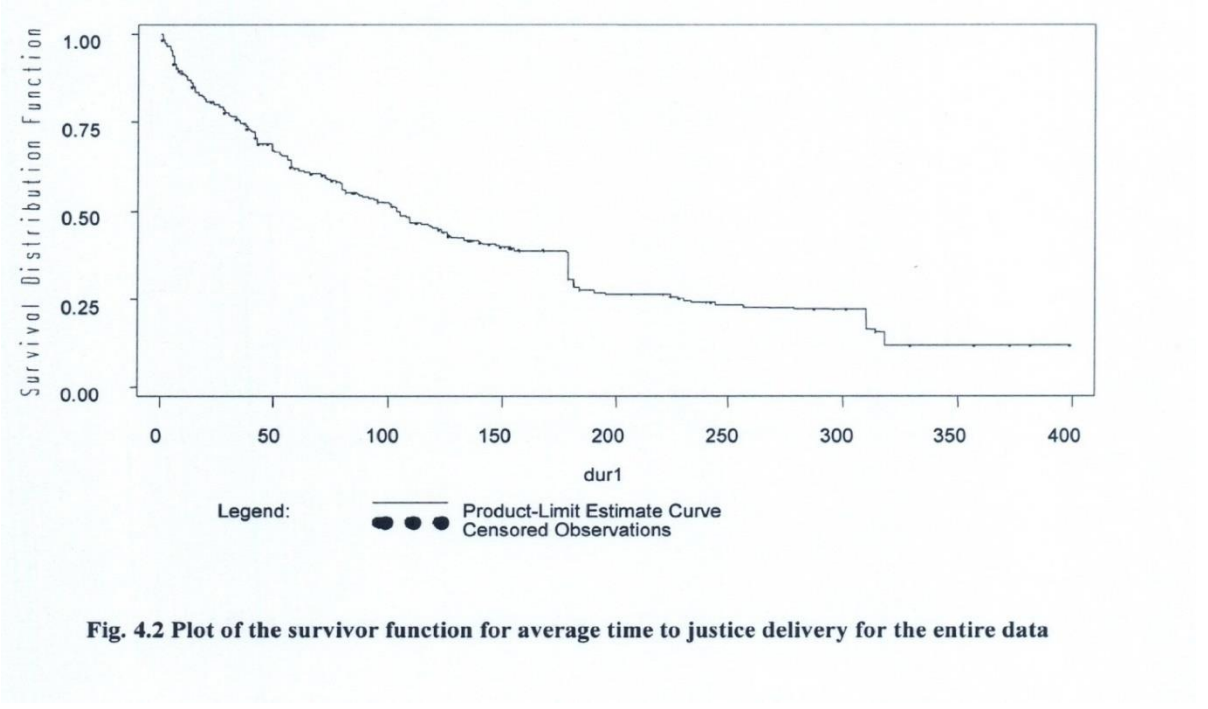

Fig. 4.2 Plot of the survivor function for average time to justice delivery for the entire data

Table 4.5 Summary of Censoring for the entire data

Total	Failed	Censored	%Censored
366	239	127	34.70

From Table 4.5, 34.70% of the cases in the entire data were censored.

Table 4.6 Summary Statistics of Time from the start of a case to finish (dur) for the regions

Quartile Estimates						
	Upper West Region			Upper East Region		
		95% Confidence interval			95% Confidence interval	
Percent	Point Estimate	Lower	Upper	Point Estimate	lower	upper
75	.	.	.	179	179	181
50	184	101	.	86	57	109
25	57	42	81	27	18	38
Mean		Standard Error		Mean	Standard Error	
123.02		6.84		114.87	7.08	

Table 4.6 gives the summary statistics for the time variable dur for Upper West and Upper East regions respectively. The 25th percentile for the Upper West region's data is 57 days whilst that for Upper East region is 27 days. The 75th percentile for Upper East region's data is 179 days whilst no value is recorded for the Upper West region. This is due to the fact that, the KM estimator for the Upper West's data never reached a failure probability greater than 0.55. The 50th percentile for the Upper West region's data is 184 days whilst that for Upper East region is 79 days. Fig. 4.3 shows the survival distributions for the two regions.

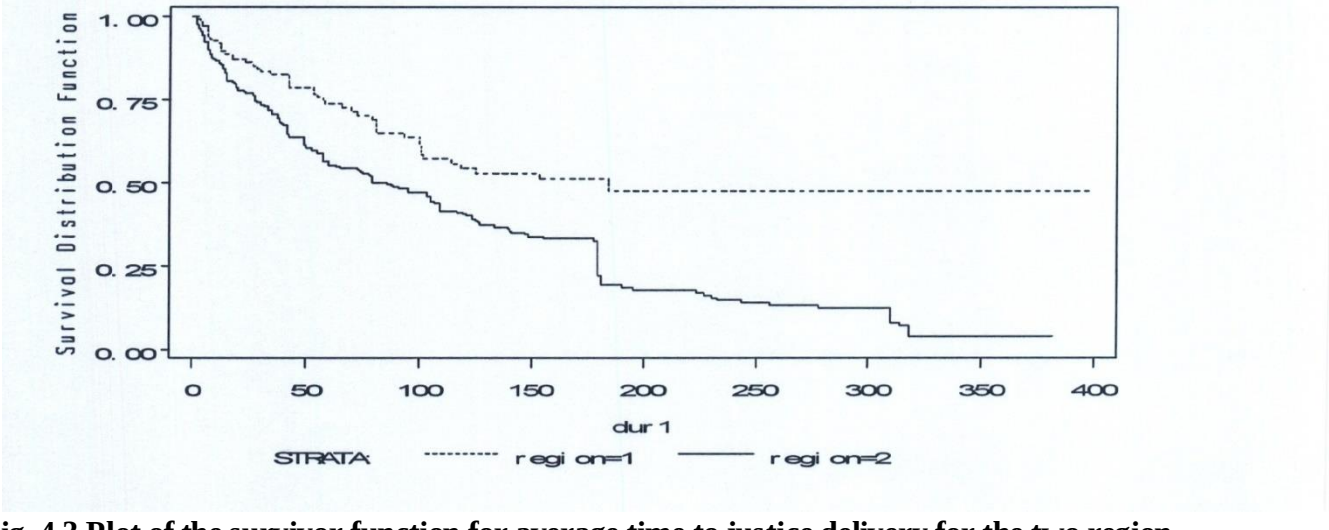

Fig. 4.3 Plot of the survivor function for average time to justice delivery for the two region

Table 4.7 Summary of Censoring for the regions

Stratum	Region	Total	Failed	Censored	%Censored
1	Upper West	137	50	87	63.50
2	Upper East	229	189	40	17.47
Total		366	239	127	34.70

From Table 4.7, it is realized that 63.50% of the total data obtained from Upper West region were censored whilst only 17.47% of the total data obtained from Upper East were censored. This explains the high figures recorded for Upper West region for the percentiles and the no value for the 75^{th} percentile.

Table 4.8 Test of Equality over regions

Test	Chi square	DF	Pr > Chi square
Log-Rank	25.7057	1	<.0001
Wilcoxon	13.2881	1	0.0003
-2Log(LR)	29.7478	1	<0001

Table 4.8 gives the test of equality over the regions. Here the log-rank, the Wilcoxin and the likelihood ratio test statistics are used to test for the equality over the regions. The results indicate the test is significant for the entire three test statistics used, since their p- values are less than 0.05 (the significance level). Thus, we conclude that, the average time to judgment vary from region to region.

Table 4.9 Summary Statistics of Time from the start of a case to finish for the types of cases.

Quartile Estimates						
	Civil Cases			Criminal Cases		
Percent	Point Estimate	95% Confidence Lower	Upper	Point Estimate	95% Confidence lower	upper
75	.	256	.	195	179	310
50	87	49	256	109	88	126
25	28	19	41	38	26	52
Mean		Standard Error		Mean	Standard Error	
129.57		11.97		135.90	7.42	

Table 4.9 gives the summary statistics for the time variable dur for types of cases (civil and criminal cases). The 25th percentile for civil cases is 28 days whilst that for criminal cases is 38 days. The 75th percentile for criminal cases is 190 days whilst no value is recorded for civil cases. The 50th percentile and hence the average time to justice delivery for civil cases is 79 days whilst that for criminal cases is 107 days. The means for the civil and criminal cases were reported as 129 and 134 days respectively. Fig. 4.4 shows the survival distributions over the type of cases.

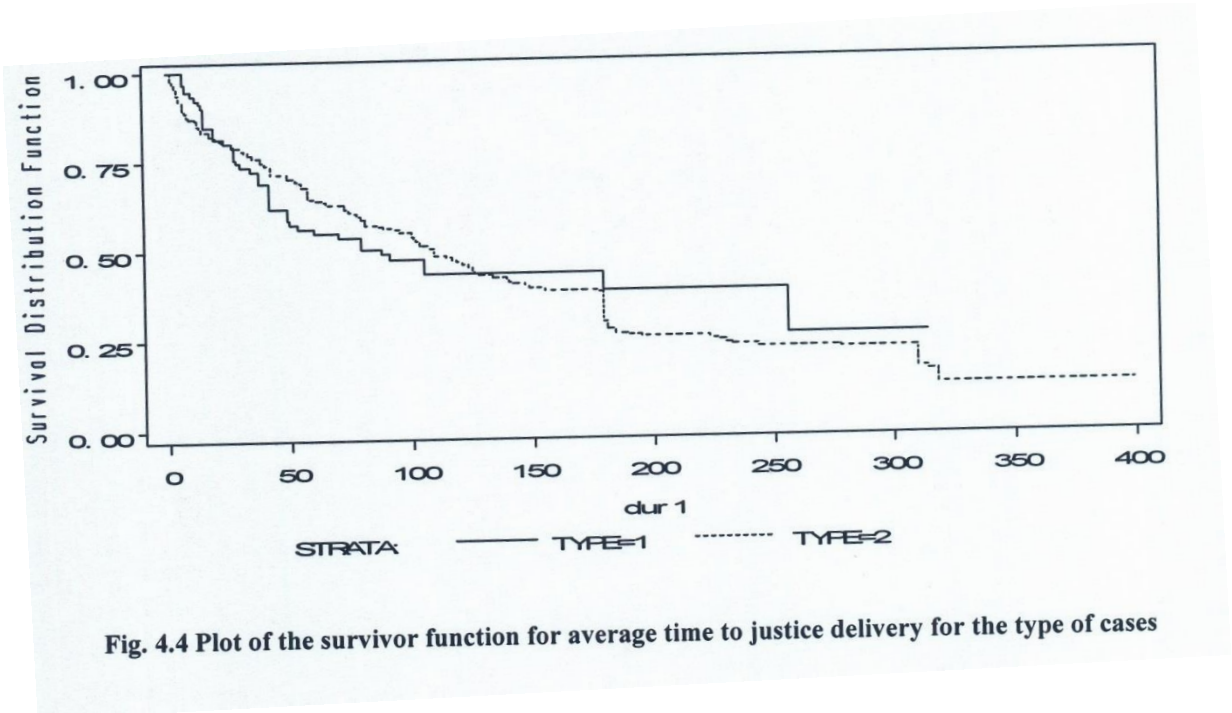

Fig. 4.4 Plot of the survivor function for average time to justice delivery for the type of cases

Table 4.10 Summary of Censoring for the type of cases

Stratum	type	Total	Failed	Censored	%Censored
1	Civil	93	51	42	45.16
2	Criminal	273	188	85	31.14
Total		366	239	127	34.70

Table 4.10 indicates that 45.16%% of all the total data on civil cases were censored whilst 31.14% of the data obtained on criminal cases were censored.

Table 4.11 Test of Equality over type of cases

Test	CM —square	DF	Pr > Chi square
Log-Rank	0.0143	1	0.9047
Wilcoxon	0.0914	1	0.7623
-2Log(LR)	0.0236	1	0.8779

From Table 4.11, the test of equality over the type of case yields p-values greater than 0.05 indicating that the test is not significant. Hence, the average time to judgment does not vary with the type of case.

Table 4.12 Summary Statistics of Time from the start of a case to finish (dur) for the courts

Quartile Estimates						
	District Court			Circuit Court		
		95%	Confidence		95%	Confidence
Percent	Point Estimate	Lower	Upper	Point Estimate	lower	upper
75	.	310	.	179	133	179
50	179	101	310	76	55	107
25	42	37	57	20	8	33
Mean		Standard Error		Mean	Standard Error	
172.51		10.18		103.98	7.84	

Table 4.12 gives the summary statistics for the time variable dur for types of courts (district and circuit courts). The 25th percentile for cases in the district courts is 42 days whilst that for cases in the circuit courts is 20 days. The 75th percentile for cases in the circuit courts is 179 days whilst no value is recorded for cases in the district courts. The 50th percentile and hence the average time to justice delivery for cases in the district courts is 179 days whilst that for cases in the circuit courts is 55 days. The means for cases in the district and circuit courts were reported as 170 and 103 days respectively. Fig. 4.5 shows the survival distributions over the type of courts.

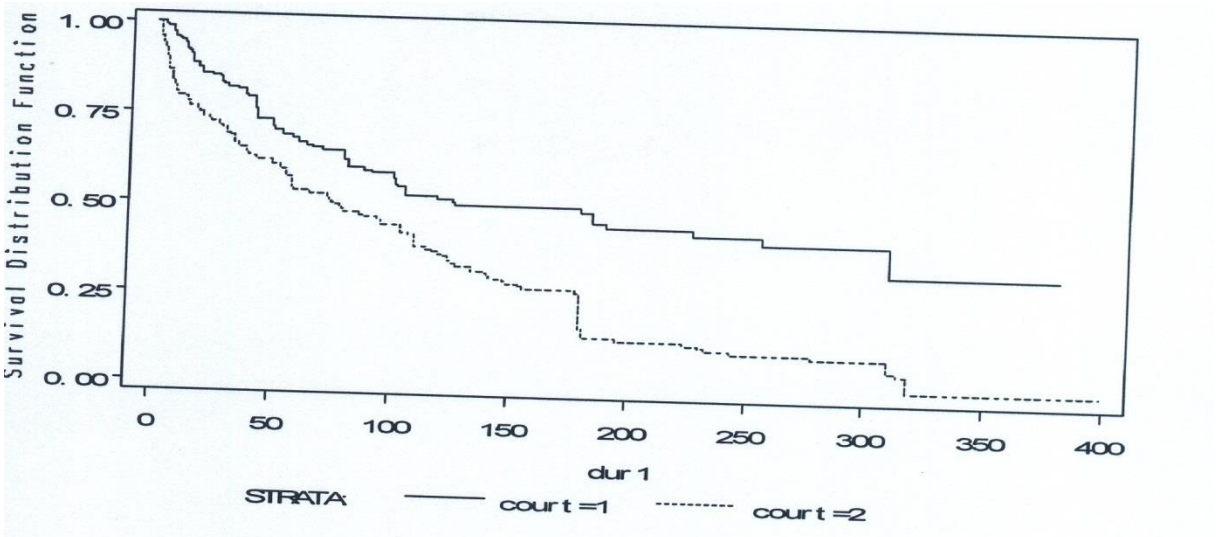

Fig. 4.5 Plot of the survivor function for average time to justice delivery for the type of court.

Table 4.13 Summary of Censoring for the type of court.

Stratum	Court	Total	Failed	Censored	%Censored
1	District	212	94	118	55.66
2	Circuit	154	145	9	5.84
Total		366	239	127	34.70

55.66% of all the cases from the district courts were censored whilst 5.84% of the cases from the circuit courts were censored as indicated by Table 4.13

Table 4.14 Test of Equality over type of courts

Test	Chi square	DF	Pr > Chi square
Log-Rank	33.3683	1	<.0001
Wilcoxon	19.9117	1	<.0001
-2Log(LR)	19.9117	1	<.0001

The test of equality over the type of court was significant. Hence, the average time to judgment vary from court to court as indicated in table 4.14.

Table 4.15 Summary Statistics of Time from the start of a case to finish (dur) for the cases in the courts

Quartile Estimates									
	civil cases in district courts			criminal cases in district courts			criminal cases in circuit courts		
Percent	Point Estimate	95% Confidence interval		Point Estimate	95% Confidence interval		Point Estimate	95% Confidence interval	
		lower	upper		lower	upper		lower	upper
75	.	256	.	.	310	.	179	133	179
50	87	49	256	227	125	.	76	55	107
25	28	19	41	79	53	101	20	8	33
Mean		Standard Deviation		Mean	Standard Deviation		Mean	Standard Deviation	
129.57		11.97		196.24	13.68		103.98	7.84	

Table 4.15 gives the summary statistics of the time variable dur for civil cases in a district court, criminal cases in a district court and criminal cases in a circuit court respectively. The 25th percentile for civil cases in district courts is 28 days, that for criminal cases in district courts is 79 days and that for criminal cases in circuit courts is 20 days. The 75th percentile for criminal cases in circuit courts is 179 days whilst no value is recorded for civil and criminal cases in district courts.

The 50th percentile, which is also the average time to justice delivery for civil cases in district courts, is 79 days, that for criminal cases in district courts is 227 days and for criminal cases in circuit courts is 76 days. The means for civil cases in district courts, criminal cases in district courts and for criminal cases in circuit courts were reported as 130, 193 and 104 days respectively. Fig. 4.6 shows the survival distributions over the type of cases against the various courts.

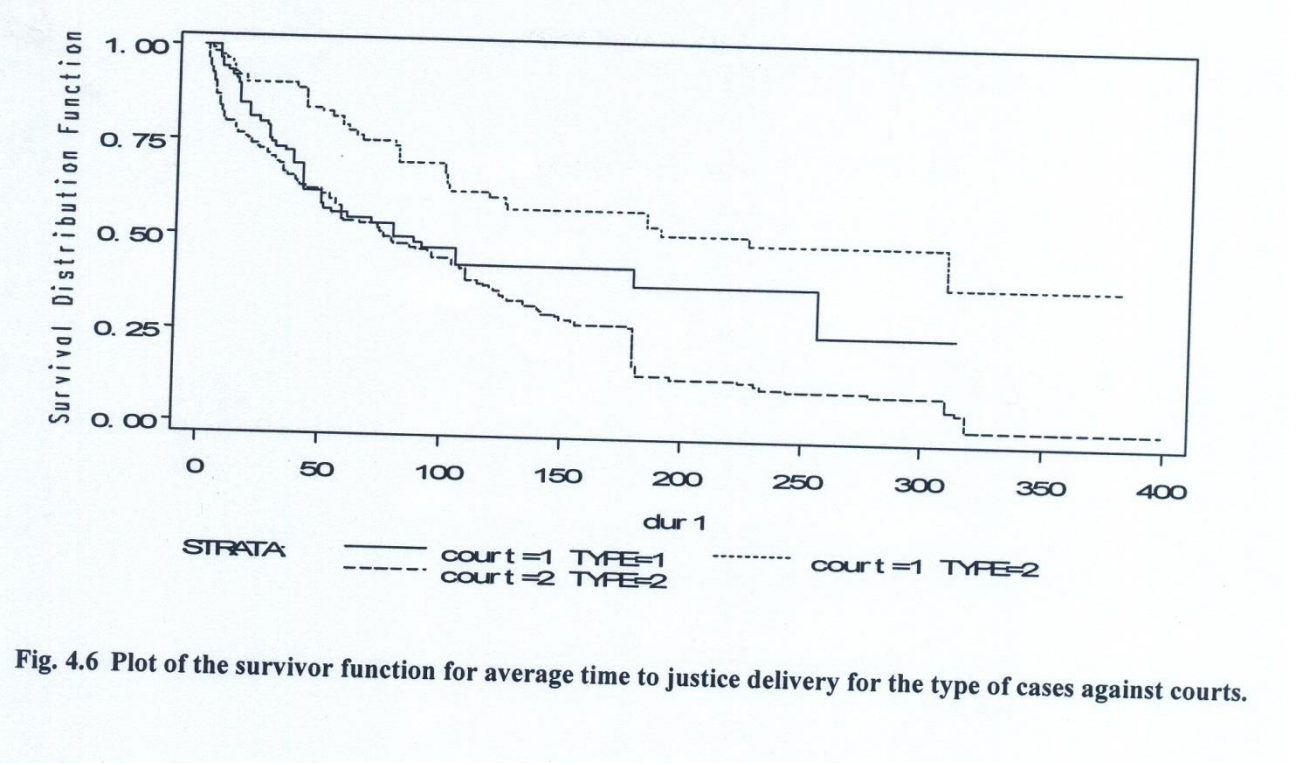

Fig. 4.6 Plot of the survivor function for average time to justice delivery for the type of cases against courts.

Table 4.16 Summary of Censoring for the cases in the courts

Stratum	Cases in court	Total	Failed	Censored	%Censored
1	civil cases in district courts	93	51	42	45.16
2	criminal cases in district courts	119	43	76	63.87
3	criminal cases in circuit courts	154	145	9	5.84
Total		366	239	127	34.70

Table 4.16 it is realized that 45.16% of all civil cases in district courts were censored, 63.87% of all criminal cases in district courts were censored whilst only 5.48% of criminal cases in the circuit court were censored. This explains why the survival probability for criminal cases in circuit courts is relatively shorter than that of both civil and criminal cases in district courts.

Table 4.17 Test of Equality over the cases in the courts

Test	Chi square	DF	Pr > Chi square
Log-Rank	41.6338	2	<.0001
Wilcoxon	27.9336	2	<.0001
-2Log(LR)	44.4173	2	<.0001

The test of equality over the type of court versus the type of case was significant and hence implies that the average time to judgment vary simultaneously with a change in both the type of case and court.

4.2 The Modeling of the Average Time to Justice Delivery.

In this study, the two models thus the parametric model (PROC LIFEREG in SAS) and the semi parametric or Cox regression (PROC PHREG in SAS) were used to identify the variables that contributed to the average time to justice delivery.

4.2.1. The Cox Regression Model (The PHREG Procedure)

The semi parametric or Cox regression model yielded the results displayed in appendix C. Out of the eight variables (sex, region, religion, court, type, occupation, subh and age) tested, the type of court (court), the type of case (type), the occupation of the accused (occupation) and the number of subsequent hearings (subh) were the only significant variables. Thus, these were the variables that significantly accounted for the length of time a case stays in court as shown in Table 4.18 below.

Table 4.18 Analysis of Maximum Likelihood Estimate for Cox Regression

Variable	DF	Parameter estimate	Standard Error	Chi-Square	Pr > Chi Square	Hazard Ratio	Variable Label
Occupation	1	-0.07000	0.03117	5.0422	0.0247	0.932	Occupation
Court	1	1.57986	0.19149	68.0661	<.0001	4.854	court
Type	1	-0.70871	0.22343	10.0614	0.0015	0.492	type
Subh	1	-0.20139	0.01752	132.075	<.0001	0.818	subh

Hence from Table 4.18 the Cox regression model for the study was;

$$\log \lambda(t) = —0.07000x_1 + 1.57986x_2 — 0.70871\ x_3 — 0.20139x_4$$

Where $\lambda(t)$ is the hazard

x_1 is the occupation of the accused

x_2 is the court of the trial

x_3 is the type/nature of the case

x_4 is number of subsequent hearings

$$\lambda(_t) = _e\ -0.07000x_1+1.57986x_2 —0.70871\ x_3-0.20139x_4$$

Table 4.19 Testing Global Null Hypothesis: BETA=0

Test	Chi-square	DF	Pr > Chi square
Likelihood Ratio	210.2119	4	<.0001
Score	184.8565	4	<.0001
Wald	169.7335	4	<.0001

Table 4.19, above consist of tests on independence of the average to justice delivery from the covariates with the null hypothesis; H_0: $\beta_i = 0$, $i = 1,2,3,4$. The test is significant, which implies that the average time to justice delivery depends on at least one of the covariates.

4.2.2. The Parametric Regression Model (The LIFEREG Procedure)

For the parametric regression, though there are so many survival distributions which were tried the gamma distribution fitted best since it had the highest log-likelihood of -390.1917615 and also satisfied the issue of parsimony of variables as compared to the other distributions. The results are displayed in appendix B.

Just like the semi parametric model four variables out of the eight variables tested were significant thus accounted for the average time to justice delivery. These were; the type of court

(court), the type of case (type), the occupation of the accused (occupation) and the number of subsequent hearings (subh) as shown in Table 4.20.

Table 4.20 Analysis of Parameter Estimates for the parametric regression model

Parameter	DF	Estimate	Standard Error	95% confidence Limits		Chi-Square	Pr > Chi Square
Intercept	1	5.0434	0.2814	4.4918	5.5950	321.14	<.0001
Occupation (civil)	1	-0.3226	0.2285	-0.7705	0.1252	1.99	0.1579
Occupation (trader)	1	-0.6294	0.1856	-0.9931	-0.2657	11.50	0.0007
Occupation (artisan)	1	-0.4905	0.2977	-1.0740	0.0931	2.71	0.0995
Occupation (driver)	1	-0.9834	0.2433	-1.4602	-0.5066	16.34	<.0001
Occupation (farmer)	1	-0.2836	0.2003	-0.6761	0.1090	2.00	0.1568
Occupation (unemp)	1	-0.7525	0.2224	-1.1883	-0.3167	11.45	0.0007
Occupation (others)	0	0.0000	.	.	.	.	.
Court	1	-1.1896	0.1586	-1.5004	-0.8788	56.28	<.0001
TYPE	1	0.4249	0.1857	0.0609	0.7888	5.23	0.0221
SUBH	1	0.1875	0.0139	0.1602	0.2147	181.39	<.0001
Scale	1	0.9249	0.0616	0.8117	1.0539		
Shape	1	0.5893	0.1618	0.2723	0.9064		

From Table 4.20 the following parametric regression model can be obtained;

Log y = 5.0434 - 0.6294x_{12} - 0.9834x_{14} - 0.7525x_{16} - 1.1896x_2 + 0.4249x_3 + 0.1875x_4 Where y is the average time to justice delivery

x_{12}, x_{14} or x_{16} thus trader, driver or unemployed is the occupation of the accused

x_2 is the court of the trial

x_3 is the type/nature of the case

x_4 is number of subsequent hearings

The parametric regression model for the average time to justice delivery follows a gamma distribution and is given as;

$$y = {}_e5.0434 - 0.6294x_{12} - 0.9834x_{14} - 0.7525x_{16} - 1.1896x_2 + 0.4249x_3 + 0.1875x_4$$

From the model it can be deduced that controlling for other covariates; the average time to justice delivery for cases in the circuit court was 229% less than those in the district court whilst that for criminal cases was 52% greater than that for civil cases. However, every additional hearing was associated with a 21% increase in the average time to justice delivery. Also, the average time to justice delivery for traders was 47% less than others, that for drivers was 62% less than others whilst that for students and unemployed was 53% less than others.

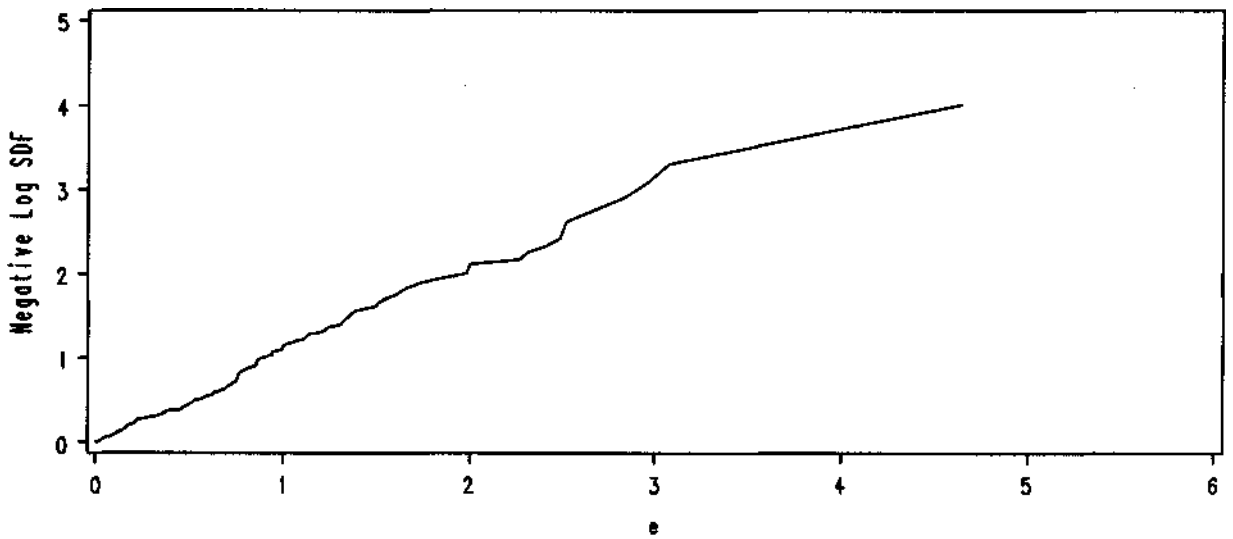

Fig 4.7 Residual plot of gamma distribution.

Fig 4.7 above is a residual plot of the gamma distribution, this is a test of the fitness of the model using the Cox-Snell residual plot which indicates the model fitted is correct since the residuals have an exponential distribution with parameter $A = 1$ and the resulting graph is a straight line with slope of 1 and an origin 0.

CHAPTER FIVE

SUMMARY AND RECOMMENDATION

5.0 Summary

The study sought to determine the average time it takes for judgment to be passed on a case after it has been reported or after a complaint has been made (average time to justice delivery) for the entire data, for the various regions ,courts, types of cases and the cases in the courts. It also sought to come out with a model to determine the average time to justice delivery.

The preliminary analysis in this study showed males constituted 76.4% of the accused persons. It also indicated that most (65.3%) of the cases were closed with very few (1.1%) of them withdrawn. The rest (33.6%) were pending and hence censored. However, most (69.7%) of the pending cases were from Upper West region. This accounted for the high survival time (184 days) associated with the cases from the Upper West regional courts.

Criminal cases constituted 74.8% of the cases reported. There were apparent differences in the sexes of the accused in the various cases. The majority (91.2%) of the accused persons in the criminal cases reported were males, whilst the majority (67.4%) in the civil cases reported were females. This may be due to the fact that males are more aggressive in life than females and hence are more likely to commit crimes.

The study also revealed that the overall average time to justice delivery is 103 days. This time varied across the regions with Upper West recording the highest of 184 days and Upper East recording the lowest of 86 days. Thus, cases in Upper West tend to keep longer in obtaining judgment than those in Upper East.

This was due to the fact that most of the data from the Upper West region was censored. Thus, most of the cases were still pending as at the time of data collection. This was attributed to factors such as the poorly equipped nature of the Upper West regional courts and the in disposal of the judge of the Upper West circuit court judge for some time.

The probability of a case closing within a day or a week after it is being reported for criminal cases was small (failure rates of 0.02 and 0.11 respectively). This was however better than that of a civil case ,where there was no chance(failure rates of 0) of the case ending on the same day and a relatively smaller chance(failure rates 0.03) of it ending a week after the filing of writ. However, the average time to justice delivery for civil cases was 79 days whilst that for criminal cases was 107 days. This can be attributed to factors such as; delays in finding evidences and so on.

In general, cases survive longer in district courts (with survival time of 179 days) than in circuit courts (with survival time of 55 days). This may be due to the fact that one of the circuit courts was in active.

The average time to justice delivery for civil cases in district courts was 79 days, that for criminal cases in district courts was 227 days and for criminal cases in circuit courts was 75 days. It was however realized that all civil cases reported in the circuit courts were still pending at the time of data collection and hence censored.

The parametric model (PROC LIFEREG in SAS) was chosen over the semi parametric or Cox regression (PROC PHREG in SAS)) since; it tested the hypothesis about the shape of the hazard

function and hence was easier to interpret unlike the PROC PHREG which gave only the nonparametric estimates of the survivor function, which could be difficult to interpret.

Though so many survival distributions were tried, the gamma distribution fitted best since it had the highest log-likelihood. The variables that accounted for the average time to justice delivery were; the type of court (court), the type of case (type), the occupation of the accused (occupation) and the number of subsequent hearings (subh).

From the model it was deduced that controlling for other covariates; the average time to justice delivery for cases in the circuit court was 229% less than those in the district court. The average time to justice delivery for criminal cases was 52% greater than that for civil cases controlling for other covariates. However, every additional hearing was associated with a 21% increase in the average time to justice delivery. This may be attributed to the fact that higher number of subsequent hearings was associated with complex cases such as; rape, defilement, murder, etc., most of which were still pending and hence censored.

Also, the average time to justice delivery for traders was 47% less than others, that for drivers was 62% less than others whilst that for students and unemployed was 53% less than others.

5.1 Recommendation

Further research on this study is recommended because the data for this study was obtained from only the circuit and district courts of the regional capitals of the Upper West and Upper East regions of Ghana, which may not reflect the true picture of the situation nationwide.

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APPENDIX

A. The SAS commands for obtaining The Product-Limit Survival Estimates are as follows;

1. For the entire data;

   Proc lifetest data=sasuser.lea plots=(ls 11s) graphics;
   time dur*status(0);
   run;

stratifying the SAS command one (1) above for region, type of case, type of court, and for both type of case and court yields the product limit survival estimates for the various regions, cases courts and the various cases in courts and their commands are given below in 2,3 and 4

2. **Proc lifetest** data=sasuser.lea plots=(ls 11s) graphics;
   time dur*status(0);
   strata region;
   run;

3. **proc lifetest** data=sasuser.lea plots=(s) graphics;
   time dur*status(0);
   strata type;
   run;

4. **proc lifetest** data=sasuser.lea plots=(s) graphics; time
   dur* status(0);
   strata court;
   run;

5. **proc lifetest** data=sasuser.lea plots=(s) graphics;
   time dur*status(0);
   strata court type;
   run;

B The LIFEREG Procedure

1. Model Information

Data Set	SASUSER.LEA	
Dependent Variable	Log(dur)	dur
Censoring Variable	status	status
Censoring Value(s)	0	
Number of Observations	333	
Noncensored Values	215	
Right Censored Values	118	
Left Censored Values	0	
Interval Censored Values	0	
Name of Distribution	**Gamma**	
Log Likelihood	-386.4717225	

Number of Observations Read	366
Number of Observations Used	333
Missing Values	33

Algorithm converged.

Type III Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
occupation1	1	5.9559	0.0147
age1	1	0.3560	0.5507
RELIGION	1	0.1650	0.6846
region	1	1.4173	0.2339
SEX	1	1.8143	0.1780
court	1	35.3461	<.0001
TYPE	1	2.7737	0.0958
SUBH	1	156.9480	<.0001

Analysis of Parameter Estimates

Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	3.8816	1.0504	1.8228	5.9404	13.65	0.0002
occupation1	1	0.0725	0.0297	0.0143	0.1308	5.96	0.0147
age1	1	0.2617	0.4386	-0.5980	1.1213	0.36	0.5507
RELIGION	1	-0.0362	0.0891	-0.2108	0.1384	0.16	0.6846
region	1	-0.2101	0.1765	-0.5559	0.1358	1.42	0.2339
SEX	1	0.2578	0.1914	-0.1173	0.6330	1.81	0.1780
court	1	-1.1459	0.1927	-1.5237	-0.7682	35.35	<.0001
TYPE	1	0.3890	0.2336	-0.0688	0.8468	2.77	0.0958
SUBH	1	0.1832	0.0146	0.1545	0.2119	156.95	<.0001
Scale	1	0.9767	0.0628	0.8611	1.1078		
Shape	1	0.5297	0.1573	0.2214	0.8379		

2.

Model Information

Data Set	SASUSER.LEA	
Dependent Variable	Log(dur)	dur
Censoring Variable	status	status
Censoring Value(s)	0	
Number of Observations	333	
Noncensored Values	215	
Right Censored Values	118	
Left Censored Values	0	
Interval Censored Values	0	
Name of Distribution	**Weibull**	
Log Likelihood	-390.4083931	

Number of Observations Read	366
Number of Observations Used	333
Missing Values	33

Algorithm converged.

Type III Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
occupation1	1	6.7035	0.0096
age1	1	0.5046	0.4775
RELIGION	1	0.5225	0.4698
region	1	1.5381	0.2149
SEX	1	1.0150	0.3137
court	1	40.8761	<.0001
TYPE	1	4.4447	0.0350
SUBH	1	127.9360	<.0001

Analysis of Parameter Estimates

Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	4.0660	1.0359	2.0356	6.0964	15.41	<.0001
occupation1	1	0.0727	0.0281	0.0177	0.1278	6.70	0.0096
age1	1	0.3069	0.4320	-0.5398	1.1536	0.50	0.4775
RELIGION	1	-0.0630	0.0872	-0.2339	0.1079	0.52	0.4698
region	1	-0.2057	0.1659	-0.5308	0.1194	1.54	0.2149
SEX	1	0.1893	0.1879	-0.1790	0.5576	1.01	0.3137
court	1	-1.1621	0.1818	-1.5184	-0.8059	40.88	<.0001
TYPE	1	0.4811	0.2282	0.0338	0.9284	4.44	0.0350
SUBH	1	0.1681	0.0149	0.1389	0.1972	127.94	<.0001
Scale	1	0.8717	0.0466	0.7850	0.9679		
Weibull Shape	1	1.1472	0.0613	1.0332	1.2738		

3.

Model Information

Data Set	SASUSER.LEA	
Dependent Variable	Log(dur)	dur
Censoring Variable	status	status
Censoring Value(s)	0	
Number of Observations	333	
Noncensored Values	215	
Right Censored Values	118	
Left Censored Values	0	
Interval Censored Values	0	
Name of Distribution	**Exponential**	
Log Likelihood	-393.4868549	

Number of Observations Read	366
Number of Observations Used	333
Missing Values	33

Algorithm converged.

Type III Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
occupation1	1	6.2932	0.0121
age1	1	0.3936	0.5304
RELIGION	1	0.2843	0.5939
region	1	2.2113	0.1370
SEX	1	1.0577	0.3037
court	1	35.5958	<.0001
TYPE	1	3.2216	0.0727
SUBH	1	113.9609	<.0001

Analysis of Parameter Estimates

Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	4.2226	1.1728	1.9240	6.5213	12.96	0.0003
occupation1	1	0.0804	0.0321	0.0176	0.1433	6.29	0.0121
age1	1	0.3062	0.4881	-0.6505	1.2629	0.39	0.5304
RELIGION	1	-0.0527	0.0987	-0.2462	0.1409	0.28	0.5939
region	1	-0.2829	0.1902	-0.6557	0.0900	2.21	0.1370
SEX	1	0.2191	0.2130	-0.1985	0.6367	1.06	0.3037
court	1	-1.2399	0.2078	-1.6472	-0.8325	35.60	<.0001
TYPE	1	0.4705	0.2621	-0.0433	0.9842	3.22	0.0727
SUBH	1	0.1750	0.0164	0.1429	0.2071	113.96	<.0001
Scale	0	1.0000	0.0000	1.0000	1.0000		
Weibull Shape	0	1.0000	0.0000	1.0000	1.0000		

Lagrange Multiplier Statistics

Parameter	Chi-Square	Pr > ChiSq
Scale	7.8416	0.0051

4.

Model Information

Data Set	SASUSER.LEA	
Dependent Variable	Log(dur)	dur
Censoring Variable	status	status
Censoring Value(s)	0	
Number of Observations	333	
Noncensored Values	215	
Right Censored Values	118	
Left Censored Values	0	
Interval Censored Values	0	
Name of Distribution	**Lognormal**	
Log Likelihood	-392.4353893	

Number of Observations Read	366
Number of Observations Used	333
Missing Values	33

Algorithm converged.

Type III Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
occupation1	1	4.7911	0.0286
age1	1	0.3374	0.5613
RELIGION	1	0.2113	0.6457
region	1	0.9706	0.3245
SEX	1	2.5266	0.1119
court	1	32.8743	<.0001
TYPE	1	2.1066	0.1467
SUBH	1	213.6159	<.0001

Analysis of Parameter Estimates

Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	3.6536	1.1053	1.4873	5.8199	10.93	0.0009
occupation1	1	0.0711	0.0325	0.0074	0.1348	4.79	0.0286
age1	1	0.2680	0.4614	-0.6364	1.1724	0.34	0.5613
RELIGION	1	-0.0436	0.0949	-0.2296	0.1424	0.21	0.6457
region	1	-0.1900	0.1929	-0.5680	0.1880	0.97	0.3245
SEX	1	0.3210	0.2019	-0.0748	0.7168	2.53	0.1119
court	1	-1.2078	0.2107	-1.6207	-0.7950	32.87	<.0001
TYPE	1	0.3566	0.2457	-0.1249	0.8381	2.11	0.1467
SUBH	1	0.1902	0.0130	0.1647	0.2157	213.62	<.0001
Scale	1	1.1169	0.0554	1.0135	1.2309		

5.

Model Information

Data Set	SASUSER.LEA	
Dependent Variable	Log(dur)	dur
Censoring Variable	status	status
Censoring Value(s)	0	
Number of Observations	333	
Noncensored Values	215	
Right Censored Values	118	
Left Censored Values	0	
Interval Censored Values	0	
Name of Distribution	**LLogistic**	
Log Likelihood	-386.443526	

Number of Observations Read	366
Number of Observations Used	333
Missing Values	33

Algorithm converged.

Type III Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
occupation1	1	4.9736	0.0257
age1	1	0.2601	0.6101
RELIGION	1	0.0007	0.9795
region	1	1.2688	0.2600
SEX	1	2.4278	0.1192
court	1	28.6000	<.0001
TYPE	1	2.0960	0.1477
SUBH	1	185.7389	<.0001

Analysis of Parameter Estimates

Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	3.6244	1.0100	1.6448	5.6040	12.88	0.0003
occupation1	1	0.0675	0.0303	0.0082	0.1268	4.97	0.0257
age1	1	0.2177	0.4268	-0.6189	1.0543	0.26	0.6101
RELIGION	1	0.0023	0.0877	-0.1697	0.1742	0.00	0.9795
region	1	-0.2076	0.1843	-0.5689	0.1536	1.27	0.2600
SEX	1	0.2830	0.1816	-0.0730	0.6391	2.43	0.1192
court	1	-1.0766	0.2013	-1.4712	-0.6820	28.60	<.0001
TYPE	1	0.3295	0.2276	-0.1166	0.7756	2.10	0.1477
SUBH	1	0.1916	0.0141	0.1640	0.2191	185.74	<.0001
Scale	1	0.6050	0.0347	0.5407	0.6769		

6.

Model Information

Data Set	SASUSER.LEA	
Dependent Variable	Log(dur)	dur
Censoring Variable	status	status
Censoring Value(s)	0	
Number of Observations	333	
Noncensored Values	215	
Right Censored Values	118	
Left Censored Values	0	

Interval Censored Values	0
Name of Distribution	Gamma
Log Likelihood	-386.5540497

Number of Observations Read	366
Number of Observations Used	333
Missing Values	33

Algorithm converged.

Type III Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
occupation1	1	5.7993	0.0160
age1	1	0.3332	0.5638
region	1	1.4555	0.2277
SEX	1	1.8360	0.1754
court	1	37.3842	<.0001
TYPE	1	2.7664	0.0963
SUBH	1	158.7062	<.0001

Analysis of Parameter Estimates

Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	3.8531	1.0539	1.7876	5.9187	13.37	0.0003
occupation1	1	0.0710	0.0295	0.0132	0.1288	5.80	0.0160
age1	1	0.2549	0.4416	-0.6105	1.1203	0.33	0.5638
region	1	-0.2127	0.1763	-0.5583	0.1329	1.46	0.2277
SEX	1	0.2598	0.1918	-0.1160	0.6357	1.84	0.1754
court	1	-1.1599	0.1897	-1.5318	-0.7881	37.38	<.0001
TYPE	1	0.3890	0.2339	-0.0694	0.8474	2.77	0.0963
SUBH	1	0.1836	0.0146	0.1550	0.2121	158.71	<.0001
Scale	1	0.9783	0.0624	0.8634	1.1085		
Shape	1	0.5255	0.1556	0.2205	0.8304		

C

The SAS System

The PHREG Procedure

1.

Model Information

Data Set	SASUSER.LEA	
Dependent Variable	dur	dur
Censoring Variable	status	status
Censoring Value(s)	0	
Ties Handling	BRESLOW	

Number of Observations Read	366
Number of Observations Used	333

Summary of the Number of Event and Censored Values

Total	Event	Censored	Percent Censored
333	215	118	35.44

Convergence Status

Convergence criterion (GCONV=1E-8) satisfied.

Model Fit Statistics

Criterion	Without Covariates	With Covariates
-2 LOG L	2170.080	1964.580
AIC	2170.080	1980.580
SBC	2170.080	2007.545

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	205.5004	8	<.0001
Score	187.5370	8	<.0001
Wald	167.6459	8	<.0001

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq	Hazard Ratio	Variable Label
occupation1	1	-0.07782	0.03230	5.8044	0.0160	0.925	occupation1
age1	1	-0.42678	0.48911	0.7614	0.3829	0.653	age1
RELIGION	1	0.09692	0.10091	0.9226	0.3368	1.102	RELIGION
region	1	0.11561	0.19265	0.3601	0.5485	1.123	region
SEX	1	-0.19565	0.21317	0.8424	0.3587	0.822	SEX
court	1	1.45313	0.21879	44.1120	<.0001	4.276	court
TYPE	1	-0.74359	0.27137	7.5084	0.0061	0.475	TYPE
SUBH	1	-0.19816	0.01843	115.5814	<.0001	0.820	SUBH

D

Definitions

Civil cases have to do with disputes over the rights and duties that individuals and organizations legally owe to each other. Examples of these include; Land case, recovery of money or property, recovery of hospital expenses, and damage for pain, suffering, loss of income and disfigurement,

rent issue, compensation of marriage, ejection of tenant, cost of action and general damages for breach of contract.

Criminal cases arise when the government seeks to punish an individual for an act classified as a crime by state legislature. They are categorized into first degree felony, second degree felony and misdemeanor.

Felonies are crimes of serious nature punishable by a fine and more than one year of jail time served in a state prison.

First degree felony include; abetment of crime, rape, murder, defilement, unauthorized possession of arms, robbery and smuggling,

Second degree felony include; attempt to commit crime, stealing, possession of narcotics, conspiracy to commit crime, Illegal electricity connection, causing road obstruction, unlawfully receiving, possession of forged documents, possession of fake notes, unlawfully dealing in ammunitions.

Misdemeanors are minor offenses or petty crimes that may be punishable by a fine and less than a year of jail time in a local prison. These offenses include; offensive conduct, assault, carrying offensive weapons, hindrance of inquest, been on premises for unlawful purpose, attempted suicide.

Capital crimes are the most severe type of crimes and can be punishable by life imprison or even death. First degree murder is the most common capital crime.

Juvenile crimes are crimes involving minor defendants.