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The Implementation of Deterrence: A Multi-Approach Assessment of the Impact of Recent Changes in Anti-Drunk Driving Legislation on Reducing Alcohol-Involved Fatalities

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THE IMPLEMENTATION OF DETERRENCE: A MULTI-APPROACH ASSESSMENT OF THE IMPACT OF RECENT CHANGES IN ANTI-DRUNK DRIVING LEGISLATION ON REDUCING ALCOHOL-INVOLVED FATALITIES

by

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Josef R. Soper, D.P.A.

Western Michigan University, 1985

The objective of this study is to determine if anti-drunk driving legislation, enacted between January 1979 and December 1983, has significantly reduced the number of alcohol-involved traffic fatalities.

At the macro-level, 60 consecutive months of alcohol-involved fatality data were requested from the 50 states and the District of Columbia. Sixteen states supplied the requested data. The Box-Jenkins technique for interrupted time-series analysis was used to determine if a change in the state's drunk driving law impacted the frequency of alcohol-involved fatalities in that state. Results are discussed in relation to the statewide impact of anti-drunk driver legislation.

At the micro-level, alcohol-involved arrest and fatality data were collected for all counties in Michigan. Counties were first aggregated on the basis of traditional population groupings (e.g., urban, and rural) and analyzed using the interrupted time-series approach.

The next level of analysis involves determining if a relationship exists between changes in the frequency of alcohol-involved fatalities and preparations made by criminal justice agencies

prior to implementation of the new law. A survey, based on Edwards' (1980) four prerequisites to implementation, was sent throughout Michigan to all County Sheriffs and Prosecutors, District Court Chief Judges, and the Chief of Police in the largest city in each county. Survey responses were analyzed in terms of whether activities surrounding implementation of the new law were consistent with Edwards' model. Counties were also reaggregated on the basis of responses to key questions and analyzed by interrupted times series technique to determine if indentifiable implementation activity was related to changes in the frequency of alcohol-involved arrests or fatalities.

At the state level, with the exception of California, alcohol-involved traffic fatalities did not decline significantly following changes in anti-drunk driving statutes. Further detailed evaluation in Michigan, based upon county level aggregation, uncovered a statistically significant reduction in Michigan's Wayne county SMSA. When counties were aggregated on the basis of criminal justice officials' perception of whether the law has been effective, a statistically significant reduction in alcohol-involved fatalities was found in a thirteen county area.

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Josef R. Soper

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CHAPTER I

PROBLEM STATEMENT AND BACKGROUND

The Problem

Alcohol has functional, dysfunctional, and even deadly effects. One of the most highly visible alcohol-related problems involves drunk drivers. Despite society's best efforts, it is possible for the otherwise non-dangerous individual to become intoxicated and operate a motor vehicle in such a way as take his or her own life or the lives of others. In light of such a "sobering" declaration and with the understanding that this should be prevented, the question then becomes whether changes in anti-drunk driving laws, properly implemented, reduce the probability of an alcohol-involved traffic fatality. It is this question that this document attempts to address. This first chapter discusses the effects of drinking and driving, provides an overview of the study and discusses the role of each of the later chapters.

Anti-drunk driving laws are an integral part of the overall scheme to reduce intentionally the negative effects of consuming alcohol until impaired and then driving an automobile. Such laws are explicit policies, made by the legislative branch of government to protect the general welfare of all citizens. The executive branch, specifically law enforcement, and the judiciary are responsible for implementing the law and administering the sanctions.

The law is said to operate on two levels. First, laws are a public statement to all citizens that drinking alcohol <u>and</u> opera-

ting of a motor vehicle in an impaired state are forbidden. This is intended to deter citizens from breaking the law. While laws are not generally reported verbatim in the media, there is usually some discussion of the law and its intended impact. Furthermore, the populace will be informed that there are severe penalties for violation of the law. A second level of deterrent effect is suposed to be produced by the actual imposition of such penalties when it is discovered that citizens have ignored the warning. Both of these levels, when combined, supposedly deter law breaking. The overall objective of the law, through the exercise of deterrence, is the reduction of alcohol-involved fatalities.

The basic research question is whether such laws do significantly reduce alcohol-involved fatalties. In order to answer this question, time-series data were collected from states which have recently changed their drunk driving laws. Box-Jenkins interrupted time-series analysis was used to determine if the law reduced the number of fatalities after its implementation. Statewide analysis was conducted for fourteen states, including Michigan.

A simplistic model of the process can be characterized by three sequential components:

Policy Change ⟶ Implementation ⟶ Results

A change in public policy is intended to accomplish some specific end. Before this can happen, that policy change must somehow be incorporated into the operations of the responsible agencies. In the end, there should be some measurable result to evaluate the

value of the policy change.

Implementation is the critical link between policy change and getting results. At a minimum, successful implementation requires some level of understanding of the law. This understanding will help the implementor(s) determine if additional resources are needed, if standard operating procedures are adequate, and whether the assistance of outside agencies may be necessary. In the case of anti-drunk driving legislation each criminal justice agency may have had to convert legislative language into standard operating procedures, seek additional resources, and engage in interagency communications. For example, law enforcement should use whatever new provisions are made to enhance their ability to detect and apprehend drunk drivers (e.g., checklanes or lowered blood alcohol levels); prosecutors should actively pursue additional charges against arrested drunk drivers (e.g., habitual offender penalties); and courts should impose the newer, more severe, penalties. These actions may bring about a reduction in alcohol-involved traffic fatalities.

The process of alcohol consumption to drunk driving conviction is presented in Figure 1. The logical activities which would seem most likely to produce or give rise to deterrence are presented on the right. Each of the alternative actions which would undermine the desired deterrent impact are presented on the left. It is this process by which the anti-drunk driving laws operate and might control behavior.

The deterrent effect of the law operates most strongly at

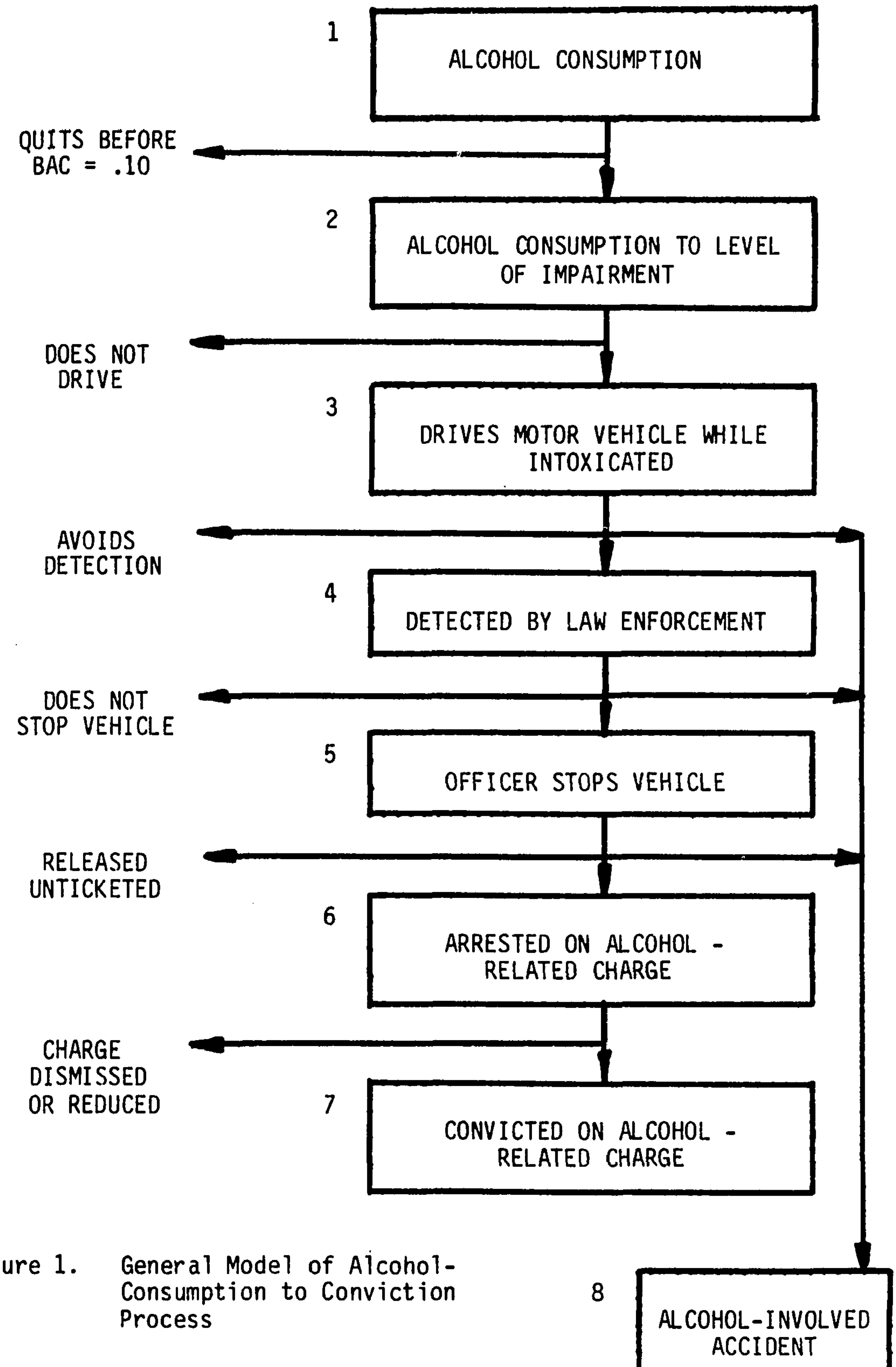


Figure 1. General Model of Alcohol-Consumption to Conviction Process

the first three stages of the process. In other words, the driver can decide _not_ to drink until impaired. However, if he/she drinks until impaired, then the next decision involves deciding _not_ to drive while intoxicated. The third stage is included because the fear of apprehension may instead force the intoxicated driver to drive slowly on an alternative route home, one that will probably have less traffic on it and thus reduce the chance of an accident. It might then be argued that even though the fear of apprehension did not prevent driving while intoxicated, it certainly was instrumental in preventing an alcohol-involved fatality.

The stages involving detection by law enforcement (4 and 5) deserve separate attention because they are the weakest links in the deterrence chain. Before drivers are able to develop a healthy fear of apprehension, a noticeable number must be apprehended. In other words, it is assumed that some people are deterred from drinking and driving because they fear apprehension, but it is not known if they objectively calculate the chances while sitting in their favorite tavern. This group, however, is not really important. The critical group is comprised of drivers who have driven home intoxicated time after time and have never been apprehended, as well as those who have been stopped by the police only to be told to drive home carefully. Their personal experiences have created the impression that the law may be honored more in the breach than in the practice. Even if law enforcement officers undertook to arrest every drunk driver they stop, the question of how many additional drivers must be stopped before there is an impact remains unanswered. Becasue

there is an identifiable level of recidivism among drunk drivers, it is safe to assume that even if all of them were somehow apprehended at once and convicted, the experience would not deter all of them from drinking and driving again.

Stages 6 and 7, involving arrest and conviction as well as the decision to stop a vehicle, reflect standard operating procedures within the criminal justice system. If there is considerable emphasis placed on stopping drunk drivers, then patrol officers are probably rewarded for increasing the number of such drivers that they apprehend. The final stage speaks to the activity of prosecutors and judges and whether they reinforce law enforcement efforts. Law enforcement officers will invest their efforts elsewhere if prosecutors plea bargain good drunk driving arrests or if judges fail to impose more severe penalties. Both of these actions probably undermine the morale of law enforcement and may indicate to the apprehended driver that this offense is really not serious.

Before apprehended drunk drivers believe that the offense is serious, there must be a better than average chance that they will be detected, arrested, charged, and suffer some type of memorable punishment. If this is to happen, the entire criminal justice system must be committed to enforcing the law, and thereby visibly persuade potential offenders that neither quarter will be given nor mercy shown.

Given the existing criminal justice system and the then-current levels of drunk driving, is it likely that a new anti-drunk driving law truly had an effect? First this study snalyzes the changes

in alcohol-involved traffic fatalities in fourteen states. Second, a micro-level analysis basis of Michigan analyzes changes at the county-level. Third, changes in fatalities are evaluated, at the county-level, based on criminal justice officials' perceptions on the effectiveness of the new law.

Scope of the Study

It is beyond the scope of this research to investigate whether each component of the system is indeed dealing more strictly with apprehended drunk drivers under the new law. However, this may be possible in the future. Michigan's new law mandates that disposition possible in the future. Michigan's new law mandates that disposition and sentencing data be collected on each convicted drunk driver and be maintained by the Michigan State Police. Chapter II provides a review of the current literature dealing with alcohol abuse and control, as well as deterrence and implementation theory. Chapter III explains the methodological approaches used in the study, including a basic explanation of interrupted time-series analysis. Chapter IV covers the macro-level, or statewide, data analysis. A more detailed explanation of interrupted time-series analysis, including ARIMA model development, is presented. Micro-level, or county-level, data analysis is accomplished in Chapter V. Analysis of the application of implementation theory is also dealt with in this chpater. Chapter VI is the conclusion and a discussion of future research and policy applications.

CHAPTER II

REVIEW OF THE LITERATURE AND THEORY

Introduction

Any discussion of controlling the adverse effects of alcohol must be placed in the proper historical context and in the context of previous studies in this area. This chapter attempts to first provide a clear discussion of the historical contexts and research perspectives. Next the chapter discusses alcohol consumption and its consequences. After that, the discussion moves into the consideration and review of efforts to control consumption and its consequences. The discussion then concentrates on deterrence and implementation, the main bodies of theory which are important to the control of alcohol-related automobile accidents through legal means. Finally, the closing sectio n attempts to integrate these lines of discussion into a perspective that will guide the research conducted here.

Historical Periods and Perspectives

Control of alcohol generally dates back, with only varying degrees of success to the Code of Hammurabi, formulated over 4,000 years ago (Harper, 1904). In this century the United States has experienced two Constitutional amendments, an unending stream of federal and state legislation and regulatory rules seeking increased control over alcohol.

A review of the history of alcohol use in the United States

can be divided into three dominant periods and two subsidiary perspectives (Room, 1974; Rorabaugh, 1979). The first period covers roughly the initial 150 years of colonial tradition which held that drinking and drunkenness were not only typical behavior but were certainly nothing at all to be alarmed about. Drinking appeared to be a community affair and was apparently under fairly close control (Weiner, 1980). When drinking was condemned, the grounds were usually religious and fault was found in the defective moral character of the drunk. This being the case, there was no need to control or restrict alcohol, but simply, and publically, to discipline and chastise the drunkard.

Following the colonial period, there was the temperance era which lasted approximately the next 150 years up to the first decade of the twentieth century. Increased sophistication in medical research began to accumulate information that underscored the debilitating effects of alcohol abuse. The shift from blaming the drinker to discovering that alcohol was toxic and addictive was marked by an extreme swing to demanding that the government curb the evil "demon rum" before society was destroyed. Most of the legislative efforts of this era were directed at regulating the distribution and consumption of alcohol -- and of course the unsuccessful attempt by Constitutional amendment to outlaw it permanently in this country.

The United States is currently in the midst of the third era -- alcoholism -- and it shows few signs of ending soon. Here neither the drink nor the drinker are held up to public obliquy. Alcohol is

considered an appropriate social device, but it is understood that when abused it causes exceptionally destructive behavior. Alcoholism is to be "treated" as a disease and the alcoholic is not considered weak-willed, but simply sick. This era can be characterized as much by what is unknown about alcohol as by that which was thought to be true. While there are many who profess to be able to cure alcoholism, and, in all fairness, they appear to succeed sometimes, theoretical approaches still disagree as to why some people are more easily addicted to alcohol than others.

In addition to the three dominant periods just presented, there are two other themes worthy of note. Following the repeal of prohibition, alcohol policy was influenced by an organization which called itself the Association Against the Prohibition Amendment. This group did not believe that alcohol itself was the problem, but rather the aggressivemarketing of alcohol. Thus, alcohol problems could be controlled by governing the terms and conditions on which alcohol was available for general consumption. The intent was to promote temperate drinking practices. Out of the efforts of this group and its ideas came the development of the so-called "ABC laws" (Alcoholic Beverage Control laws). Many of these laws and regulations are currently used to control tavern hours, licensing, and alcohol content of drinks.

The last perspective is that of public health. The public health perspective focuses on the health consequences of alcohol use (e.g., cirrhosis of the liver and traumatic deaths) as the most visible negative impact of alcohol. This shifts public attention on

alcohol abuse away from blaming heavy drinkers and concentrates it on the drinking habits of the general population and the consequences of these habits. The value of this shift is important because: (1) The objective results (death and permanent injury) are plainly apparent and demand attention; (2) the evidence of alcohol's contribution is well-documented; (3) we generally prefer that people live longer; and (4) social intervention in health problems enjoys a long, and somewhat turbulent, history in this country. And while each of these four points is true of alcohol abuse generally, they require careful discussion and consideration before being applied to drunk driving fatalities. Regarding the first point, many of the people who perish have absolutely no opportunity to protect themselves. For example, we can all take certain precautions to prevent burglary (e.g., locking all doors or windows, or leaving lights on), assault (avoid dark alleys or other undesirable locations in the city), or automobile theft (do not leave the car unattended with keys in the ignition). There does not appear to be any reasonably effective way of avoiding drunk drivers. Some studies have attempted to estimate the total number of drunk drivers apprehended out of the total on the highway. The estimates are not in complete agreement. Beitel, Sharp, and Glauz (1975) estimated that 1 in 200 are detected and stopped, but Borkenstein (1975) places the probability at 1 in 2,000. Using this latter estimate, would mean that if 50 drunk drivers were arrested in one night there were probably 100,000 drunk drivers on the highway! However, this does not necessarily mean that avoiding driving on those days or peak

hours, that involvement in an alcohol-involved fatality will be avoided. The second point, that alcohol is the clear culprit in these many thousands of deaths seems, at first obvious. However, the statistics actually referred to alcohol-related deaths, not alcohol-caused deaths. There does not appear to be any research currently, but it would certainly be worthwhile knowing how many alcohol-involved fatal crashes would have happened in the absence of alcohol. Presently, once alcohol is discovered in either driver, the accident becomes alcohol-involved and, while the conversion is not intentional, the incident becomes alcohol-caused. In the case of alcohol-involved fatalities, point two could be rewritten to substitute "presence" for "contribution".

The third point is difficult to argue with. There are various statistical arguments that can be made which appear to significantly reduce the problem of alcohol-involved traffic fatalities. For example, one such argument suggests that compared to other causes of death, motor vehicle accidents, alcohol notwithstanding, can be made to appear as rare events. According to the Michigan Department of Health, motor vehicle accidents were responsible for less than 5% of all deaths involving persons under 64 years of age in 1982. Restricting the age group to under 44, in order to reduce the bias created by age-related causes of death, the proportion increases to 11%. For all of the 75,536 recorded deaths in 1982, barely 2% involved motor vehicles. If half of all motor vehicle fatalities involved alcohol, then just over 1% of all deaths in Michigan, in 1982, involved drunk drivers.

While such statistical arguments are not intended to diminish the impact of alcohol abuse, the so-called "rare event" argument is part of what might be referred to as the statistical accounting model. According to this model, the alcohol-induced event is considered only on its own merits and incidental impacts are ignored. In other words, when a drunk drivier is killed, that is the beginning and end of the accounting. The competing paradign, officially known as premature mortality, analogizes the alcohol-induced event to a pebble dropped into a pond. The resulting ripples impact beyond the act itself. Under this model, the same drunk driver sets off a chain reaction beginning with his/her immediate family and friends, moving through fellow-workers, and finally impacting the general fabric of the community.

While the statistical accounting model is appealing from the standpoint that it is neat and precise, the premature mortality model is obviously much more accurate in its overall estimation of the negative impacts of alcohol abuse on society. One problem with using this model in empirical research is the comparatively imprecise nature of the estimate. To remedy this probelm, proponents of the premature mortality model have developed a statistical representation of the damage done in the form of "years of potential life lost." This is based on the difference between death at age 65 and actual age at the time of death. The younger the victim, the greater the number of years lost. This statistic makes more sense when quantifying the loss to society when an individual dies earlier than would normally be the case.

In consideration of the forth point, we must ask, "Is drunk driving a health problem?" It is obviously true that people die under circumstances involving the immoderate use of alcohol. Others would say it is the failure of the criminal justice system to prevent such activity in the first place that puts society at risk. They would say the consumption of alcohol, even to the point of incapacitation, is not necessarily a health problem. Extreme reliance and chronic alcoholism are health problems. In order to support the general idea that drunk drivers are a public health problem, beyond the nonintoxicated people they kill and injure, some would say that it must be demonstrated that alcohol-involved fatalities involve primarily chronic problem drinkers and rarely, if ever, the reveler who has inadvertently overindulged.

Others would argue that the continuing high level of alcohol-related deaths is evidence of an extreme need for more intensive public health education. Most alcohol problems do not arise from the activities of a small group of chronic users, but from the drinking habits of the general population.

Alcohol Consumption and Its Consequnces

For most people, short-lived infrequent periods of intoxication do not create substantial harm (Calahan, Cissin, and Crossley, 1969). Many people regard drinking as beneficial: A harmless, pleasant indulgence when feeling overwhelmed by recent events or as a way of turning an ordinary event into a celebration. If it were not for the obvious fact that an identifiable group of drinkers

go substantially beyond simple enjoyment, alcohol consumption would probably draw little attention.

The current knowledge about drinking practices is based largely on sample surveys of households in the general population (Johnson, Armor, Polich, and Stambul, 1977, Clark and Midanik, 1980). Virtually all of the comprehensive studies are post-World War II vintage. In addition, because the data are based on self-reports, the precision of the studies may be suspect with respect to how accurate and truthful respondents are about their drinking, how willing and able they are to report what they know about their own drinking, how skillfully the survey instrument is designed, and how adequately the sample represents all drinkers (Midanik, 1980).

Approximately one-third of all drinking-age Americans abstain from alcohol entirely; one-third consider themselves "light drinkers" (up to three drinks weekly); one-quarter fall into the "moderate drinker" (up to two drinks daily) category; and the remaining one-tenth are heavy drinkers, consuming between two and ten drinks daily (Johnson et al., 1977; Clark and Midanik, 1980). Room and Roizen (1973) compared self-report survey results with official alcohol sales figures and estimates that alcohol consumption is underreported by perhaps as much as one-third. In contrast, Moore and Gerstein (1981) compared figures from surveys conducted several years apart and determined that the proportions displayed above are fairly stable. Since we know that at least one-third of the population are abstainers and about ten percent are probably drunk for relatively long periods of time (binges), a gray area is left in

accounting for the remaining sixty percent.

Polich and Orvis (1979) have developed some survey data using Air Force personnel which provides information about the relationship between daily consumption and number of "drunk days". As expected, the frequency of drunkenness is highly correlated with total consumption and it would also appear that drinkers who consume 1.0 - 3.0 ounces per day have proportionately more drunk days than the very light or very heavy drinkers. This is partly explained by the authors who suggest that moderate to heavy drinkers tend to mass their drinking in binges rather than spacing it out evenly over time.

Alcohol becomes a major contributing factor to negative consequences when, in its absence, everything would have been fine. Some consequences depend upon an unfortunate combination of drunkenness and a dangerous environment. Others involve situations where expected behavior is altered by alcohol and causes irresponsible or unacceptable reactions to events. Figure 2 provides a reasonably simple view of how the major factors -- drinking practices (e.g., consumption) and physical and social environment -- combine to contribute to the consequences (Moore and Gerstein, 1980). This is demonstrated in rather spectacular fashion when an obviously intoxicated individual attempts to drive an automobile. Only hours before the individual began drinking, driving was almost second nature and did not require serious concentrated effort.

Alcohol does not simply effect the person drinking but, like ripples in a pond, extends outward and touches the lives of others.

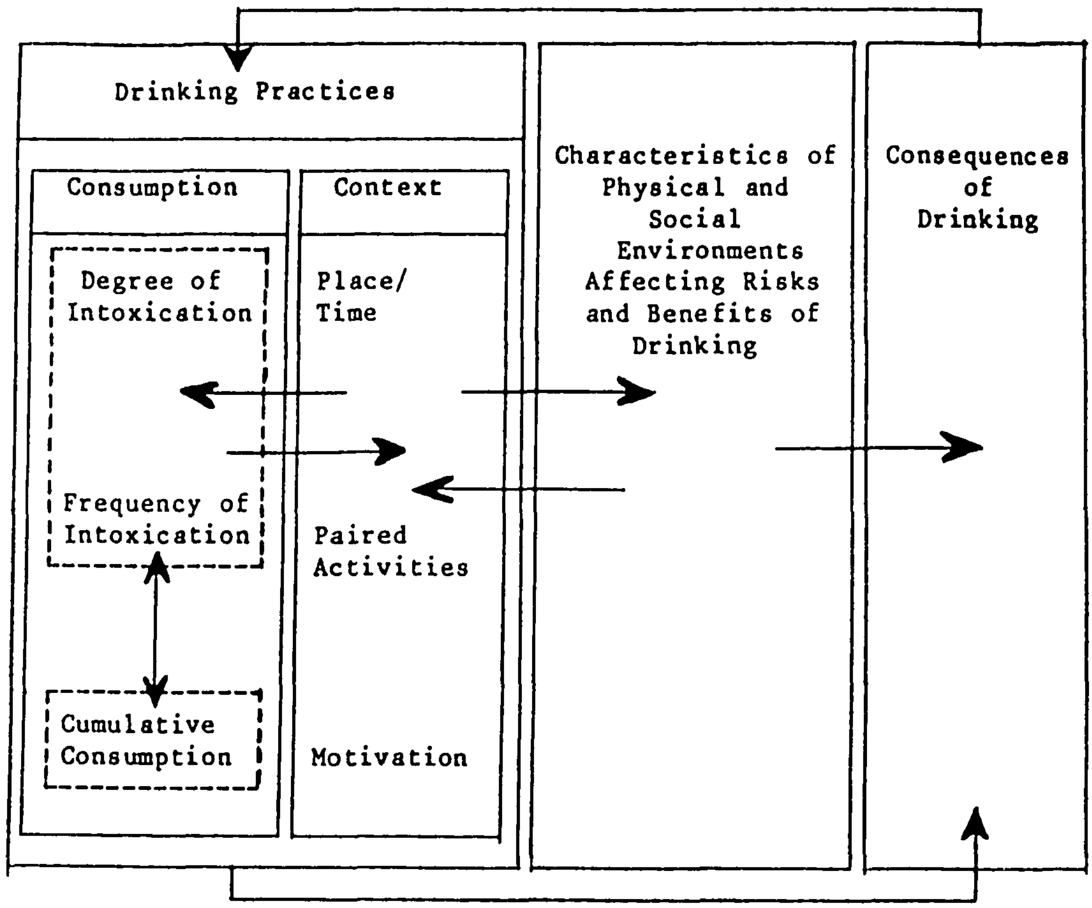


Figure 2. Schematic View of the Relationship between Drinking and Consequences of Alcohol.

Source: Moore, M.H. & Gerstein, D.R. Alcohol and public policy: Beyond the shadow of prohibition, p 18

Aside from the drinkers themselves, there are people who are intimately connected to or dependent on the drinker. And, of course, there are those among the general population who may come into contact with the drinker. Within each of these groupings the drinker can have serious impact. For example, personal health

consequences include liver, heart, and brain damage for the excessive drinker, as well as accidents and assaults that may befall other persons. There are wide-spread economic consequences; expenditures on alcohol certainly impact the drinker and his/her family, especially if money is not plentiful. For society at large, expenditures are frequently translated to law enforcement, medical care, education, and welfare. Changes in worker productivity eventually impact tax revenues. Finally, the social fabric is damaged because of the inability of the drinker to discharge properly his/her various roles (e.g., husband/father, wife/mother, and employee), and this may eventually impact a greater portion of society if stronger governmental intervention must be imposed.

Having listed the many and various relationships impacted by alcohol, the task of deciding which effect should be the focus of a concentrated policy effort becomes difficult. The use of empirical evidence can be somewhat helpful if frequency and magnitude are the standard measure (e.g., the number who die of alcohol-induced cirrhosis, alcohol-involved criminal assaults, families divided because of a divorce over alcohol-related problem, or victims of alcohol-related automobile crashes). Gerstien (1981) found strong support for estimating 20,000 to 25,000 deaths annually from alcohol-induced cirrhosis of the liver. Reed (1981) estimates that there are about 12,000 traffic fatalities annually that are <u>causally</u> attributable to, not "associated with", drunken driving and just under $500,000,000 in property damage as well. Medical expenditures resulting from alcohol abuse and alcoholism are placed

roughly at $10 billion annually (Berry and Boland, 1977). Other social costs associated with alcohol abuse are not very reliably estimated, as, for example, in the case of lost worker productivity.

Many effects depend upon the degree of intoxication. At very high levels of blood alcohol content (BAC above .30), the drinker can die of acute alcohol poisoning. Between .15 and .30 BAC, the drinker does not risk death due directly to the alcohol; however, he or she is so inattentive and clumsy that an otherwise benign environment becomes life threatening. At even lower levels the drinker may be slightly clumsy, but this is the level at which the psychological mood is most favorably affected (Mello, 1972). The research generally agrees that, other things being equal, as the degree of intoxication increases, so too does the degree of risk created in an otherwise non-harmful environment. (Moskowitz and Murray, 1975; Mortimer and Sturgis, 1975; and Kalant, LeBlanc, Wilson and Homatidis, 1975).

Certain effects depend upon how often an individual drinks to the point of being drunk or how much time they spend at, or as noted above, a non-healthy BAC. The chance of being drunk in the wrong place at the wrong time increases in direct proportion to the frequency with which one achieves and remains at a .15 and above BAC. It also seems well established that the total quantity of consumed alcohol has important independent effects. For example, severe liver damage is caused by the quantity consumed rather than by any particular method of consumption.

Alcohol Control

Inasmuch as government has assumed the responsibility for maintaining and promoting the public health and safety, then a major part of the task of containing the harmful effects of alcohol rests there too. Such measures are generally initiated through the law-making power vested in the legislative branch, implemented by the organizations of the executive branch, and ultimately enforced through the courts.

Prevention policies, which are quite different from treatment services, include: (a) taxes on alcohol, (b) regulation on the availability of alcohol, (c) liability rules to make bartenders and party hosts more responsible for their guests' safety, (d) improved enforcement efforts against drunk driving, (e) educational programs that concentrate on the unsafe drinking practices, and (f) the redesign of environments unfriendly to drinkers.

Prevention policies can be divided more or less neatly into three categories. First, there are those policies that regulate the terms of commercial availability, and thus seek to influence the overall consumption of alcohol. Second, there are policies which attempt to reduce the hostility of the surrounding environment and make the world a safer place in which to be drunk. Finally, there is the use of publically sanctioned force to restrict what is unsafe or inappropriate. These policies are generally written in the form of laws which permit enforcement officials to restrain individuals who would, uncontrollably perhaps, harm themselves or others by

engaging in activities made dangerous and life-threatening after consumption of alcohol. Drunk driving laws are included in this category.

Historically, alcoholic beverages have been closely regulated and subjected to relatively high taxes. Alcohol was first subject to taxation in the United States in 1791. Indeed, a liquor excise tax was the first internal revenue law enacted by Congress under the Constitution (Hu, 1950). The present alcohol regulatory scheme is based on the premise that orderly commercial trade and maintenance of tax revenues are most important to the general economy. Additionally, the government attempts to promote temperance and protect the public from the adverse consequences of drinking by making alcohol more expensive and thus restricting sales (Hu, 1950).

Prohibition itself was a failure. It also unfortunately left behind an enduring distrust in the use of ABC laws as preventive instruments. Prohibition did reduce alcohol consumption in the United States (Warburton, 1932) and even had a slight effect on alcohol-related health problems (e.g., cirrhosis of the liver), but it also encouraged many people openly to violate the law. Although it is difficult to prove, Prohibition may have left a legacy which gives tacit approval to violation of alcohol control legislation and associated prevention efforts. In an interview study with ABC administrators (Medicine in the Public Interest, 1979), the general consensus was that they felt their primary, if not exclusive, purpose is regulation of alcohol and this is not in any way related to public health or anything remotely associated with temperance.

Moore and Gerstein (1981) conclude at one point that the real lessons of Prohibition are:

> 1. Drinking customs in the United States are strongly held and resistant to frontal assault. It is well beyond the will or capacity of government ever to eradicate the customary demand for alcoholic beverages.
>
> 2. A criminal network emerges -- if not instantly, then within a few years -- if production and sale of alcoholic beverages are outlawed. The prices and extent of criminal supply depend on the degree of public support for the law and the resources devoted to law enforcement.
>
> 3. The quantity of alcohol consumption and the rates of problems varying with consumption will, however, be markedly reduced by substantial increases in real price and reductions in the ease of availability. (p. 63-64)

A fundamental tenet of economics states that if the cost of something is increased enough, demand will begin to decrease. An increase in alcohol taxes or a general reduction in availability should affect consumption of alcohol. Most of the evidence marshalled to support the influence of market forces on heavy drinking relies on the distribution of alcohol consumption. Two studies (Skog, O.J., 1971; Popham, Schmidt, and DeLint, 1976) are combined by Bruun et al. (1975) to provide a fairly definitive statement:

> 1. A substantial increase in mean consumption is very likely to be accompanied by an increased prevalence of heavy users.
>
> 2. If a government aims at reducing the number of heavy consumers, this goal is likely to be attained if the government succeeds in lowering the total consumption of alcohol .... As the distribution of consumption is highly skewed, a substantial proportion of the total amount drunk by a population is consumed by heavy drinkers, so that a sizeable reduction in total consumption will not occur unless some of the heavy drinkers reduce their consumption. (p. 45)

As was pointed out earlier, alcohol has a long history of being a taxed commodity. In 1907, for example, alcohol tax revenues constituted 80% of all federal revenue. This figure had shrunk to 10% at the beginning of World War II and today accounts for slightly less than 1% (Hyman, Zimmerman, Guriol, and Helrich, 1980).

The most direct test of the relationship between tax based increases in alcohol prices and their impact on drinking patterns was conducted by Cook (1981) through examination of changes in liquor taxes in 30 license states between 1961 and 1975. There was an attempt to discover whether price increases reduced consumption, as well as test whether there was an impact on highway crash fatalities and deaths due to cirrhosis of the liver. The results suggested that as taxes increased, liquor consumption decreased, highway fatalities dropped and cirrhosis deaths fell significantly.

Since World War II there has been an increase in the amount of alcohol purchased for off-premises (e.g., home) consumption as opposed to that consumed on-premises (e.g., restaurants and taverns). Federal, state and local governments regulate off-premise consumption in at least two ways. First, they control the number and location of outlets. Second, the operation of such outlets is closely regulated as to hours of operation, purchase limits per customer, and prohibited sales to inebriated customers. Attempts have been made to determine whether outlet density has any effect on drinking behavior (Hartford, Parker, Pautler, and Wolz, 1979; and Smart, 1977), but none has been established. It may be some time before a thorough analysis is accomplished on the impact of alcohol

sales in food stores and other general merchandizing outlets, but such availability should certainly be researched.

On-premise drinking establishments are as closely regulated as off-premise sales -- at least on paper. Typically the regulations or laws extend to such stipulations as hours of operations, minimum drinking age, zoning restrictions (e.g., not near public schools or churches), a requirement that food be served, and an obligation not to serve persons who have become too intoxicated. Mosher (1979) summarizes the use of civil liability law to promote caution on the part of tavern owners:

> 27 states and the District of Columbia impose some type of dram shop liability or servers of alcoholic beverages.... Most states with dram shop liability under common law have as a matter of social policy established that commercial servers of alcoholic beverages have a broad obligation to protect the public from injuries caused by their intoxicated or underaged patrons. (p. 782)

From a control standpoint, the issue becomes one of deciding how many establishments shall be entitled to serve alcohol and, more importantly, enforcement of regulations to ensure safety for the general population.

From a public safety and health standpoint, minimum age restrictions reflect the general notion that drinking tends to be harmful to the young and impairs their decision-making capacity -- at least with respect to driving. Age restrictions have been hotly debated for many years and the current trend favors returning the minimum drinking age to twenty-one. Part of the impetus for the many states following this trend has been the federal government's

insistence that future highway improvement funding go only to states that have reinstated the 21 year minimum drinking age. The evidence is quite compelling that in states which have lowered their drinking age, there is an increase in alcohol-involved automobile crashes involving the under-21 age group. Furthermore, in those states subsequently raising their minimum age, there has been a significant reduction in alcohol-involved highway crashes including this population (Williams, Rich, Zador, and Robertson, 1975; and Douglass, 1979).

Environmental Risk

Environmental risk is probably the most passive approach to reducing the damage caused by excess alcohol consumption. It is based on the premise that if society cannot ensure that people will refrain from excessive drinking and they will not exercise due regard for the safety of themselves and others, then the solution is to protect these and other people from their actions. The reverse side of this argument is known derisively as "making the world safe for drunks." It tends to evoke a certain public outrage to the effect that anyone who is foolish and undisciplined enough to get drunk should get his or her just deserts. In defense of the environmental position, it should be noted that the world would not only be made safe for drunks but, more importantly, safe from drunks. When someone drinks too much -- either rarely or regularly -- the created hazards go beyond threatening only the drinker. There are innocent lives at risk. Mandatory passive restraints in automobiles, for

example, are intended to protect passengers and sober drivers, as well as drunk drivers.

The physical impairment caused by excessive alcohol are really not so different from those due to fatigue, absent-mindedness, anger, previous minor injuries, or momentary distraction. There is little dispute that alcohol intoxication beyond a specified minimum level makes people clumsy, inattentive, and reduces their ability to make sound judgments about their environment. For this reason, alcohol is directly implicated in a certain proportion of injuries and fatalities due to burns, drownings, falls, and operation of mechanical equipment -- especially automobiles. It would seem logical that the severity of alcohol-induced ineptness could be significantly reduced by creating a physical environment which is more forgiving of inept behavior, alcohol-induced or not. This includes safer crash rails, break-away signs and light poles, and obstruction-free roadsides.

One area which is only recently gaining attention is the development of an attitude that the social environment should be manipulated to reduce alcohol-induced problems. For example, the intervention of third-parties to keep an intoxicated individual from engaging in dangerous activities (e.g., keeping an intoxicated friend or guest from driving; training bartenders to act the same way with respect to intoxicated patrons; or routine checks by supervisors to ensure the employees do not appear to be operating machinery while they are intoxicated) would certainly seem appropriate intervention strategies. By creating an atmosphere that

focuses attention on incapacitated people, a certain percentage of drunks and innocent bystanders will be safer.

Deterrence

In the model being proposed here, deterrence is assumed to be part of the criminal law, and when a law is implemented, deterrence becomes active. Deterrence is not directly referred to in any criminal statute, but it is assumed that many people will choose to avoid the unpleasant consequences and this contributes to the law's effectiveness.

Deterrence is only one of four goals generally ascribed to the criminal law, the others being retribution, incapacitation, and rehabilitation. Retribution is the punishment function of the law and is intended to prevent future acts by assigning blame and inflicting some measure of unpleasantness on persons who violate the law. Incapacitation restricts the offender's movements, frequently as part of the punishment, and thus prevents commission of new offenses. There are levels of incapacitation, ranging from loss of various privileges to capital punishment. Convicted drunk drivers are frequently punished this way through suspended or restricted licenses, on the theory that such action will prevent future drunk driving episodes. Rehabilitation refers to the application of education and/or treatment to offenders in order to change their motivation to engage in further criminal acts.

A distinction should be made between general and specific deterrence. In the first, the objective is to threaten punishment

on the general population, thus influencing potential violators to refrain from lawbreaking activities. General deterrence is expected to affect the behavior of all persons, regardless of whether they have ever committed the offense. Specific deterrence refers to the effect of punishment inflicted upon apprehended offenders and is expected to make them more sensitive to the legal consequences of their behavior.

For our purposes, the short-term threat component of general deterrence will be referred to as simple deterrence. In other words, the goal would be to measure the short-term impact of changes in anti-drunk driving laws on the frequency of alcohol-involved fatalities. The active components of simple deterrence, which make it work are certainty, severity, and swiftness. The greater the perceived eventual penalty, and the more swiftly it is administered, the greater the deterrent effect of the threat. Chambliss (1966), as well as Zimring and Hawkins (1973), speculated that social and psychological characteristics of potential offenders, such as age, sex, income, and attitudes, would modify the deterrent effect of legal sanctions. This would suggest that different people will react to the threat of punishment differently. Some will be deterred, others will be less affected, and some will consider the threat an invitation to take the chance.

Consistent with many of these authors, Jones and Joscelyn (1978) summarize four factors that they deemed of primary importance to the deterrence process:

1. Characteristics of the target population;
2. Nature of the behavior to be prevented;
3. Target population's knowledge of the presence of the deterrent threat;
4. Credibility of the deterrent threat to the target population. (p. 111)

Individual and subgroup variations in the target population will certainly cause differences in the overall reaction to threats of punishment. Poor subjects for the deterrent effects of the law includes impulsive persons (Zimring and Hawkins, 1973), individuals who have different perspectives on the risk of actual apprehension (Joscelyn and Jones, 1972) and those willing to take risks (Raiffa, 1968). To the extent that the target population is composed of such individuals, then it is possible that the results will be skewed in the direction of that group's preference.

In the present study, factors three and four are probably more important than one and two. The credibility of the threat can be measured objectively through increased enforcement activity. Along with increased arrests comes the obligation to follow through with more severe punishment. If the threat becomes hollow because punishment is lacking, then the entire enterprise may suffer. Voas (1975) states that the credibility of a deterrent threat turns on two major factors: the probability of apprehension and processing defendants to the point of actually imposing a severe penalty. He indicates that the probability of apprehension is directly related to the:

1. Number of arrests in relation to licensed drivers;
2. Number of convictions in relation to arrests; and

3. Level of public information provided. (p. 22)

All of these add to the deterrent quality in the law. For example, if the number of arrests increases sharply, then it can be argued that more people will know that arrest is possible. The same relationship holds for increased convictions. Public information, on the other hand, acts as a deterrent by telling people that the first two are more likely to occur. Even if the chances of arrest and conviction have not really changed, the impact of a public information campaign may be the same.

Deterring Drunk Drivers

Historically, and certainly logically as well, deterring drunk drivers has been a topic of scholarly discourse in the United States since the realization that the automobile was not simply a passing fancy. Over 75 years later the world is still seeking ways to keep drunks out of automobiles or, failing that, removing them from the highways. Most official government energy is directed at deterring individuals from drinking and driving. In other words, if we can reduce the amount of drunk driving that takes place, there will be a corresponding decline in traffic accidents. The most widely used countermeasures are based on the philosophy of general deterrence and are expressed through the visible enforcement of anti-drunk driving legislation.

Measurable effectiveness has been found in programs based on general deterrence which raise the driver's perceived risk of

detection while driving drunk. This is accomplished most often by a visible increase in law enforcement activity specifically directed at drunk drivers. The classic example is the British Road Safety Act of 1967. The law itself specified that any driver with a BAC in excess of .08% was considered guilty per se. Furthermore, police were given the power to require pre-arrest roadside tests for motorists who they believed to be intoxicated, but who had not violated other laws. Of equal importance was that when the act was passed into law, it was accompanied by a great deal of publicity which Jones and Joscelyn (1978) have suggested was partly responsible for its initial success. Ross (1973) found that almost immediately there was a positive and dramatic impact which translated into a 16% reduction in accidents and a 23% reduction in fatalities. Moreover, the proportion of drivers who registered above the legal limit of .08% BAC dropped from 27% to 17% (Comptroller General of the United States, 1979). Ross (1973) used interrupted time series to evaluate the impact, which he attributes directly to the law, and describes the post-intervention period as follows:

> Unfortunately, there are many signs that the initial effect of the legislation is diminishing. Although there are problems in speculating on what would have happened in the absence of the legislation, the significant changes in the slope of the casualty rate curve ... suggests that the saving achieved ought to be regarded as temporary. This conclusion is bolstered by the fact that blood analysis of fatalities shows that the initial drop in the percentage with an illegal alcohol concentration, from 25% in 1967 to 15% in 1968, was progressively diminished and the percentage has now returned to its former level. (p. 75)

According to the Comptroller General (1979) the percentage

of drivers killed in England and Wales in 1975, who had a BAC above .08%, had reached 36%, substantially above the pre-1967 level. The explanation offered by Ross (1973), as well as by Sobey and Codling (1975), has generally been well received and simply points to the well orchestrated publicity campaign as having convinced many that the risk of detection had become quite high. As time went on, however, people either discovered first-hand that nothing had really changed, or that early law enforcement enthusiasm waned, thus actually reducing the chance of apprehension. As a follow-up to the Road Safety Act, the Cheshire County Police in Great Britain inaugurated a program requiring a roadside breathalyzer for all drivers pulled over during "drinking hours". There was an immediate decrease in accidents; however, the effect disappeared within a month of ending the publicity (Ross, 1975). Buikhuisen (1972) found that increased enforcement and more severe penalties were less than completely effective in reducing alcohol-involved accidents.

Carr, Goldberg, and Farbar (1975) studied the 1969 change in Canadian anti-drunk driving legislation and concluded that there was no significant decrease in alcohol-involved traffic fatalities after passage of a new and tougher law. There was an initial drop in fatalities of 6% during the first year; however, in the three years following, there were increases of 9%, 2%, and 15% respectively. There was also a significant increase in police administered breathalyzers, although it was not stated as to whether more arrests resulted or if the breathalyzer was simply used more often in routine traffic stops.

In the United States, a report released in 1968 (United States Department of Transportation) gave official recognition, and therefore political weight, to the fact that even moderate drinking and driving are strongly associated with increased crash risk. Out of this official recognition of the problem came the federally funded ($78 million, plus matching state and local contributions) Alcohol Safety Action Programs (ASAP). From the point of view of the deterrence model, the major features of the ASAP program were increased patrol and improved handling of offenders through the courts. In other words, changes were made in order to increase the certainty of apprehension and conviction, along with increasing the speed of processing. Unfortunately there was no effort made to increase the penalties, thus leaving severity out of the traditional deterrence equation (certainty - swiftness - severity). Each of the thirty-five ASAP programs was independently evaluated and, with few exceptions, most were considered successful at significantly increasing the probability of apprehending drunk drivers. This was accomplished partly through ASAP financed police patrols and sensitization of regular patrols to drunk drivers. The time period used as the control series unfortunately coincided with the 1973 fuel crisis, which probably had a much greater impact on the accident rate nationwide than could be reasonably expected from an ASAP type intervention. According to the final evaluation (Department of Transportation, 1979), after controlling for seasonality, the fuel crisis, and the 55 m.p.h. speed limit, the data from twelve of the
crisis, and the 55 m.p.h. speed limit, the data from twelve of

the ASAP sites showed a statistically significant decline in nighttime crashes. The ASAP project provided confirmation that vigorous and coordinated enforcement of existing laws can reduce alcohol-involved crashes.

In the Australian state of Victoria, a law was passed in 1976 which permitted law enforcement officers to subject a defendant driver to a breathalyzer absent any suspicion of alcohol influence. Initially there was little use made of the law; however, in 1977 there were two periods of intense patrol activity related to apprehending intoxicated drivers. Cameron, Strang, and Vulcan (1980) conducted a fairly elaborate evaluation of the project. The findings support traditional deterrence-based expectations. There were significant reductions in nighttime fatal crashes and serious casualty crashes, as well as driver fatalities with high blood-alcohol levels. The perception of possible detection and apprehension also increased in 1977, but increased more in 1978. No attempt was made to measure the persistence of the effects to determine if, like the British Road Safety Act, all returned to pre-intervention status after a suitable time period.

In mid-1978, the French enacted legislation similar to that found in Scandinavian countries which provided for breath testing of large numbers of drivers through the use of roadblocks. It is assumed that such a technique created a greater certainty of apprehension. The results were rather startling: less than 0.5% of the "alcohol tests" were positive in several provinces, and in Paris, zero. While it may be somewhat premature to claim that the motoring

French had quit drinking entirely, the results do give one pause. Ross, et al. (1982) reports that deterrence -- based on interrupted time series analysis of alcohol-involved fatalities -- was indeed achieved during the early months of the law's existence. This statistically significant impact lasted approximately one year and saved an estimated 700 lives. By the end of 1979 the probability of an alcohol-related crash had returned to pre-intervention levels.

In 1969, project R.I.D.E. (Reduce Impaired Driving in Etobicoke) was initiated in Toronto, Canada. Police established roadblocks at over one hundred locations which were chosen on the basis of visibility, frequency of crashes, and the probability of encountering drinking drivers. In the first twelve months of the project, 132,000 cars were stopped. As Vingilis and Salutin (1980) report, data collection was badly handled and much of the data were either inappropriate or poorly defined. Statistically, the results were non-significant. The bright spot was a survey conducted which revealed that drivers in the general geographical area were much more conscious of risking detection than respondents in the control samples elsewhere than Toronto. This suggests that the threat of apprehension can be measured and may have had some impact.

The Netherlands law of 1974 is substantially more severe than most other countries. That the proscribed BAC level is only .05%, compared to .10% in the United States and .08% in Great Britain. The penalties were also generally considered quite severe, in terms of both fines and jail sentences. Noordzij (1977) reports that passage of the new law was accompanied by extensive publicity.

Furthermore, the number of prosecutions for drinking-and-driving doubled to 20,000 for the first year. Both are sufficient to express the serious nature of the offense and demonstrate that the government is quite serious about punishing apprehended offenders. Blood alcohol level data were gathered on weekend nights by means of roadside surveys in 1970, 1971, and 1973. In 1974, similar surveys were conducted before the law changed and for several weeks thereafter. The same data were collected again in 1975 to provide a a basis of determining whether pre-intervention BAC's had returned - as happened in Great Britain (Ross, 1975). The difference between the pre-intervention year and the year when the law passed subsequently is one that would be predicted by the deterrence model. In other words, the proportion of drivers evidencing BAC's at or above the legal limit decreased in 1974 and there was some residual effect apparent in 1975. Noordzij (1977) concluded that the law had been effective and that it probably reduced fatal crashes by approximately 35%. One major methodological flaw pointed out by Ross (1975) was the historical influence of the oil crisis in late 1973. While drinking habits may not have been altered noticeably by the worldwide shortage of oil, there is no doubt that driving practices changed.

The Transport Amendment Act of 1966 established for New Zealand authorities a procedure for taking blood samples from accused drivers. Further changes were made in 1969 with respect to BAC and mandatory blood samples. In the first full year under the new law, there were nearly 5,000 drunk driving prosecutions. By 1975 the

rate had steadied at roughly double the pre-intervention annual total. Most interesting is the fact that the successful prosecution rate reached 97% by 1975 -- strongly suggesting that certainty of conviction was almost guaranteed. Hurst's (1978) overall evaluation of the program, however, was negative primarily because accurate pre-intervention data were not available and the manner of reporting crashes changed substantially just eight months before the law became effective. The actual change in the proportion of alcohol-involved crashes changed only slightly between years and was not statistically significant. It should be noted that there was some pre-intervention publicity; however, it did not remotely resemble that which preceded the British Road Safety Act.

In general then, the literature on the deterrent effects of anti-drunk driving interventions suggests that increased enforcement frequently produces a decline in alcohol-involved fatalities. However, if enforcement efforts are relaxed, alcohol-involved fatalities appear to return to the pre-intervention level within a brief period of time.

Implementation

The deterrent quality of the law must somehow be given objective expression. Traditionally and statutorily, the various agencies which comprise the criminal justice system (i.e., law enforcement, prosecution, judiciary, and corrections) have been collectively responsible for implementing the provisions of the criminal law.

Newly enacted criminal laws are assumed to be self-implementing

because they are usually only refinements of existing laws and the involved actors supposedly know what to do. There is rarely any obvious planning before the law takes effect. A law requires that the general population refrain from doing some specified act and that, it would appear, requires little advance planning. The ease or difficulty with which the criminal justice system actually implements the provisions of a new law may be entirely different. Individual agencies may have to change enforcement or prosecutorial policy, and sentencing decisions may also require change. To the extent that the justice system supports the legislative intent and commits itself to the effort, it is expected the law will succeed or fail. In order for criminal justice agencies to properly implement the legislature's intent, it should follow some general guidelines or be aware of the factors that contribute to successful implementation.

Edwards (1980) outlines what he considers the four critical factors for successful implementation. They are: communication, resources, disposition, and bureaucratic structure. Communication must be clear, accurate, and consistent. Vague or ambiguous instructions or policies permit, or even force, people to draw their own conclusions about what policymakers actually wanted. It does not matter how clear instructions are if it is physically impossible to carry them out due to inadequate resources. The absence of a positive disposition toward implementation of the policy may also render the attempt futile. Bureaucratic structure may be unable to implement the policy or, more likely, unwilling to carry through.

The more complex the policy, the greater the need for coordination of effort. A cursory analysis of the present problem -- reduction of alcohol-involved highway fatalities -- reveals that each of these factors is indeed present and critical.

In the first instance, the legislature "communicated" its intent through the passage of a law. The details concerning how to accomplish the objectives were absent from the law. Secondly, neither the state legislature nor the local governmental unit were offered additional resources to increase the availability of police officers, vehicles, prosecuting attorneys, judges, or jail facilities in order to enhance the effort. Thirdly, the disposition toward increased enforcement and stronger penalties are not always well received. Despite the overwhelming and almost universal contempt for drunk drivers, especially if they cause death or serious injury, society is not ready to react with quite the same vengeance as in the case of murders, rapists, or child molesters. Edwards (1980) notes that the general disposition of those who are responsible for implementation may differ markedly from those make policy.

Finally, the bureaucratic structure of the justice system is resistant to change, especially when initiated by non-criminal justice agencies. Small changes can be made from inside with some ease; however, externally mandated changes are up against formidable opposition. Church (1980) discusses the success of the justice system at dampening the impact of reform by describing a condition they refer to as the "local legal culture". This can be best summarized as the sum of all mutually agreed upon formal and

informal arrangements for conducting the day-to-day business of the criminal justice system. Attempts to alter the status quo are ignored or subverted.

Pressman and Wildavsky (1973), in their assessment of the Economic Development Administration's employment development project in Oakland, California, indicate that there is no increased probability of success even if everyone generally supports the program to be implemented. They suggest that as the number of actors whose cooperation is necessary increases, the chances of success decrease. Simpler programs, or those broken into discrete component parts, have a slightly better chance of success if this is accurate. The authors go on to outline several reasons why, even if everyone agrees that a project is a good idea, it often fails to survive implementation.

The first reason is direct incompatibility with other commitments. This is generally valid in the area of law enforcement. It is impossible, or extremely difficult, to patrol highways (where one is more likely to encounter a drunk driver) and simultaneously to act as a deterrent to burglary by cruising slowly through target neighborhoods. This also falls under the heading of resource allotment. Second, and closely related, is a preference for other programs. Certainly no criminal justice official will publically admit to the futility of attempting to apprehend drunk drivers. Instead they simply "starve" such unwanted programs administratively by failing to provide resources or "moral" support for the idea.

The great majority of studies exploring implementation use

fairly complex, statutorily created programs as their subject matter (Pressman and Wildavsky, 1973; Browning, Marshall, and Tabb, 1980; and Ripley, 1972). Laws that create such comprehensive undertakings also generally provide procedures, resources, and goals. In other words, the legislative mandate that created such programs as Model Cities, Law Enforcement Assistance Adminstration, Tennessee Valley Authority, and Comprehensive Employment and Training Act were all enacted with detailed instructions, which were more or less mandatory.

Anti-drunk driving laws, as well as virtually all other penal statutes, only specify that it is unlawful to operate a motor vehicle if intoxicated beyond a certain limit. Such laws do not specify who is responsible for detecting the offense and the law certainly does not provide resources for maintaining, much less increasing, detection efforts. There are no standards against which an agency can measure its performance. In most of the programs just cited, certain "targets" (e.g., levels of employment, production of electricity, or reclamation of blighted urban areas) are specified as goals in the legislation that also makes available billions of dollars to implement the program and thus meet the objectives. Perhaps one reason this is absent here is that the criminal justice system is already "in-place" and has a reasonably well-developed operation. It is also responsible for enforcing the law. Therefore, the legislature need only create the penal statute and assume enforcement will occur in the usual fashion. On the positive side, this approach permits flexibility in implementing

the law. At the same time there will also be confusion and dispute over who is responsible for the end result.

The "program" to reduce alcohol-involved fatalities has existed since the first law was passed and that law neither specified goals nor offered resources. "New laws" really only modify the existing law. Resources, organizational capacity, and initiative are frequently assumed to exist wherever they are needed. In the case of anti-drunk driving laws, the legislature assumes that the criminal justice system will use the law to reduce alcohol-involved traffic fatalities.

Strictly speaking, implementation is supposed to happen after laws have been passed which create some program, policy, or other tangible benefit. There are supposed to be clearly delineated groups of activities that follow clearly stated instructions and, eventually, achieve pre-determined goals. According to Ripley and Franklin (1982), implementation encompasses many different activities. First, the agencies designated by law for administering the program must acquire the needed resources. This is frequently made easier through legislative appropriation of sufficient funds. Second, agencies must interpret and plan. Using the language of the law, they create directives, regulations, and program plans, some of which are already part of the law. Third, the agencies must organize their activities and attack the workload. Finally, agencies deliver benefits or restrictions to the target groups.

Most criminal justice system agencies, collectively and individually, operate along these same lines. Law enforcement, if it

decides to increase detection, must frequently secure additional resources. Application of the law requires interpretation by law enforcement, prosecutor, and the courts. The system was designed and has developed over the years in such a way that the components are frequently inconsistent with each other intentionally. If successful enforcement requires completely new procedures, then agencies may have to rewrite their standard operating procedures. Such reorganization will usually be minimal because the overall "program" of law enforcement has been in effect for a long period of time. If progress toward some valued objective (e.g., saving lives) is assumed to be unhampered by the very nature of the law itself, then responsibility for failure (e.g., no decrease in the loss of lives) must be somewhere in the factors comprising implementation.

Ripley and Franklin (1982) condense what they consider the five most salient characteristics of implementation into a single statement:

> Implementation processes involve many important actors holding diffuse and competing goals and expectations who work within a context of an increasingly large and complex mix of government programs that requires participation from numerous layers and units of government and who are affected by powerful factors beyond their control. (p. 9)

There are two general methods for assessing implementation. First, there can be a determination of whether those responsible for implementation are complying with the procedures, restrictions, and other "rules" in the statute. The second method, based on the statement above, is to focus on what is happening and why. Given

the inevitable array of participants and the associated problems of intergovernmental conflict, it is perhaps amazing that such laws are successfully implemented -- meaning that there is a measurable impact in the specified direction. Pressman and Wildavsky (1979), it should be recalled, suggest that even in the absence of conflict, the greater the number of agencies and actors involved, the lower the probability of success. Ripley and Franklin (1982) estimate that there are 15 major "clusters" of potential implementors on three levels (federal, state, and local) with respect to domestic policies. In the case of state-initiated laws, such as drunk driving, federal involvement can be safely ignored. That leaves, however, seven groups of officials. At the state and local levels there are governors and mayors, the state legislature and city councils, department heads, interest groups, and the judiciary. In the case of drunk driving legislation, actors from each group have been actively involved in development of the law itself and its implementation. Once the law passed, implementation shifted to the responsible officials at the local level: law enforcement, prosecution, and judiciary. If a request was made, city councils become involved in deciding if such additional resources should be made available to the requesting agency, but that would be the extent of their participation. The only other opportunities for city council involvement is under circumstances where the state law requires the enactment of local ordinaces that correspond to the state law.

To agency directors at the local level falls the task of actually giving expression to the legislative mandate. Their

interpretation of the resources needed to accomplish the unstated, or at least uncodified, wishes of the legislation and, therefore, the public may be greatly at odds with what the mayor and city council deem appropriate. By the same token, certain local citizen groups (e.g., Mothers Against Drunk Driving) will condemn anything less than maximum visible effort by criminal justice system officials. Courts occupy a unique position in this scheme. They are responsible for implementation of the law because courts are uniquely empowered to impose criminal sanctions. Conversely, they must also ensure that the law is not so zealously implemented that personal liberty and freedom suffers. The same citizen groups that alternately criticize and applaud law enforcement efforts will react similarly to judicial actions.

As mentioned earlier, there are no codified goals and objectives involved in anti-drunk driving laws. In contrast, for example, the Model Cities program of 1966 (Ripley, 1972) specified certain measurable objectives (e.g., provide services to inner city residents or bring economy to existing neighborhood programs), as did the Comprehensive Employment and Training Act (e.g., serve the economically disadvantaged or subsidize private businesses). The law in question here only makes mandatory an alcohol assessment to determine if the defendant has a serious drinking problem. Implementation of this single feature has probably caused more argument than any other provision of Micigan's new law. Judges objected to the mandatory nature of assessment. They argued that it would slow the process, thus diluting the swiftness of imposing punishment. Further-

more, there were no guidelines in the statute to indicate whether the assessment should be considered as mitigating or aggrevating circumstances at sentencing. Last, but by no means least, when courts decided that they would simply designate their own "in-house" assessment agent (to reduce turn-around time and probably avoid friction between judges and "outside" agencies), they were told that any assessment agent shall be licensed by the state. This requirement underscores the earlier discussion about conflict between levels of government.

Successful implementation of anti-drunk driving legislation, defined as resulting in a significant and lasting decrease in alcohol-involved traffic fatalities, requires interagency interdependence. In order to guarantee due process, the criminal justice system has its own internal series of checks and balances. For example, law enforcement must be reasonably careful when effecting an arrest or the prosecutor will be unable to secure a conviction at trial. The prosecutor, in turn, must do a credible job, following fairly intricate rules of criminal procedure, of presenting the case in court or the judge is obligated to release the defendant. In turn, the judge must be careful when deciding the issue of guilt because that decision will frequently be challenged under current appellate procedures. Ideally, the end will be accomplished through increased vigilance by law enforcement, vigorous but not overzealous prosecution, and the imposition of severe but fair penalties. All of these steps are necessary to create an unmistakable threat of being surely and swiftly punished if caught driving

while intoxicated. As fewer and fewer people engage in drunk driving because more and more people are certain they will be caught, the prbability of alcohol-involved fatalities should diminish.

The following scenarios reflect situations under which legislative goals may be thwarted because one of the actors fails to cooperate in a goal-oriented fashion:

1. Law enforcement does not believe that its existing resources should be reassigned to concentrate on apprehending drunk drivers. It believes that other services are of equal importance to the community, even if those services do not specifically involve traditional law enforcement activity.

2. The prosecutor does not believe that the public good is served if an increased number of drunk drivers are prosecuted. The real reason being that his/her office is understaffed thus forcing them to go to trial with ill-prepared cases.

3. The judiciary believes that the new penal sanctions are excessive and that a treatment-oriented approach will eventually net more positive results; therefore, it imposes sentences which are not substantially different from those imposed under the old law.

There are also some positive scenarios:

1. Law enforcement recognizes the strong public support for increased arrests and voluntarily reassigns officers from less-productive activities.

2. The prosecutor also recognizes the political value associated with a "get tough" approach to drunk drivers and is less

willing to engage in plea bargaining. After all, drunk drivers have no organized lobby.

3. Judges may also decide that "treatment" is used too often to avoid jail and begin to impose such punishment for the benefit the drunk driver and the protection of society.

Each of the above situations is part of the entire process of implementing the new law. There is really no bargaining over the substantive aspects of the law. Yet, because each component in the system retains much of its inherent discretion, the legislature is unable to clearly dictate actual operational implementation. The new law provides a definition of what constitutes the prescribed behavior; other laws command the various components of the system to act as a violator passes into their domain. There are procedural laws and rules which collectively prescribe how any law, including the one discussed here, is to be applied so that the requirements of due process are met. Even some of these are open to varying interpretations and may defeat the original legislative goal.

Successful implementation of the new law depends on whether each component of the system changes its standard operating procedures (SOPs) and, more importantly, on the explanation it gives for adopting deviations that do not follow the so-called "letter of the law". There is discretion exercised at all points of the justice system process and, therefore, a distinct opportunity for the result to be other than what policymakers expect. If individual law enforcement officers retain discretion over whether to investigate erratically driven automobiles and, having decided to

stop such an automobile, the officer can still decide whether or not to arrest the driver, assuming some violation is evident. Prosecutors have exercised the traditional right of nolle prosequi, meaning the decision not to prosecute. In virtually all states this decision is unreviewable and cannot be overruled by other prosecuting authorities or judges. Finally, the judiciary retains complete discretion over imposing penalties.

Although it would be possible to examine how one component of the system implemented the new law, that might only be of marginal use. Implementation of the law in such a fashion as to reduce alcohol-involved fatalities requires that each agency execute that portion of the law for which it is responsible. The policymaker's objective and the independent nature of the justice system requires that the law address each component in order to achieve the desired result. The Edwards (1980) model primarily deals with single agencies acting in response to some externally created policy change. Successful implementation of the drunk driving law under scrutiny here requires interorganizational cooperation and coordination. Analyzing and understanding the activities and motives of a single component would not help explain implementation of the law across the system and, therefore, would probably not be very powerful in analyzing changes in alcohol-involved fatalities.

In a recent article, O'Toole and Montjoy (1984) provide the beginnings of a theoretical framework for analyzing implementation
beginnings of a theoretical framework for analyzing implementation
from an interorganizational perspective. Their intent was to create

several general models which might help explain why policy implementation fails when exposed to a multi-agency environment. The authors present three general categories of interdependence models: pooled, sequential, and reciprocal. In the first, each agency follows its part of the mandate but avoids interaction with other involved agencies. Next, each agency makes its contribution in a more or less assembly line fashion. Finally, in a purely reciprocal arrangement, agencies not only act individually on the objective, but with each other as well. Such an interactive arrangement would impact the actions of other agencies.

In order for the justice system to fit neatly into the Pooled model, there would have to be almost complete independence between the components of the system: one agency could carry out its part of the mandate without affecting, or being affected by, other agencies. In fact, it seems possible under this model that agencies could do their part and not even know of other agencies' existence. The justice system obviously does not work in this fashion. Part of the underlying theory of deterrence relies on each component knowing and understanding what each of the others have done or are supposed to do.

Both the sequential and reciprocal models have much to offer in understanding the justice system. The sequential model is distinguished by its accurate depiction of the system as a whole in that any interruption in the processing by any component alters the process stops with the decision not to arrest, not to prosecute, or to dismiss the charges. The reciprocal nature of the process is

apparent when agencies must accommodate each other to achieve the common goal intended by the policymakers. There is much to be said for Edward's (1980) notion of predisposition and the impact that it has on the actors in the various components agencies. At first it might appear that the process is indeed sequential; however, as the bargaining and gameplaying emerge, the reciprocal nature of implementation becomes devious. For example, if law enforcement believes that increased prosecution of drunk drivers will reduce fatalities, it must have the cooperation of the prosecutor's office and such cooperation may have real costs, including additional personnel to process cases. The prosecutor may believe that longer jail sentences create a stronger deterrent. To accomplish this end, there will have to be more arrests (reallocation of resources for law enforcement) and persuading the judiciary to actually impose more severe sanctions. Conversely, the judiciary may see a solution in adopting a treatment-oriented approach and must persuade the prosecutor not to oppose diversion of convicted drunk drivers into treatment settings. Finally, the public, whose safety is certainly at issue, will have its say in the bargaining process through various special interest groups, as well as the election process. After all, judges, prosecutors, and sheriffs are elected and must eventually face the electorate.

A diagram of the complex reciprocal interrelationships between the involved agencies is presented in Figure 3. For the most part, much of the day-to-day interaction is confined to the justice system components. The three outside components, citizen groups,

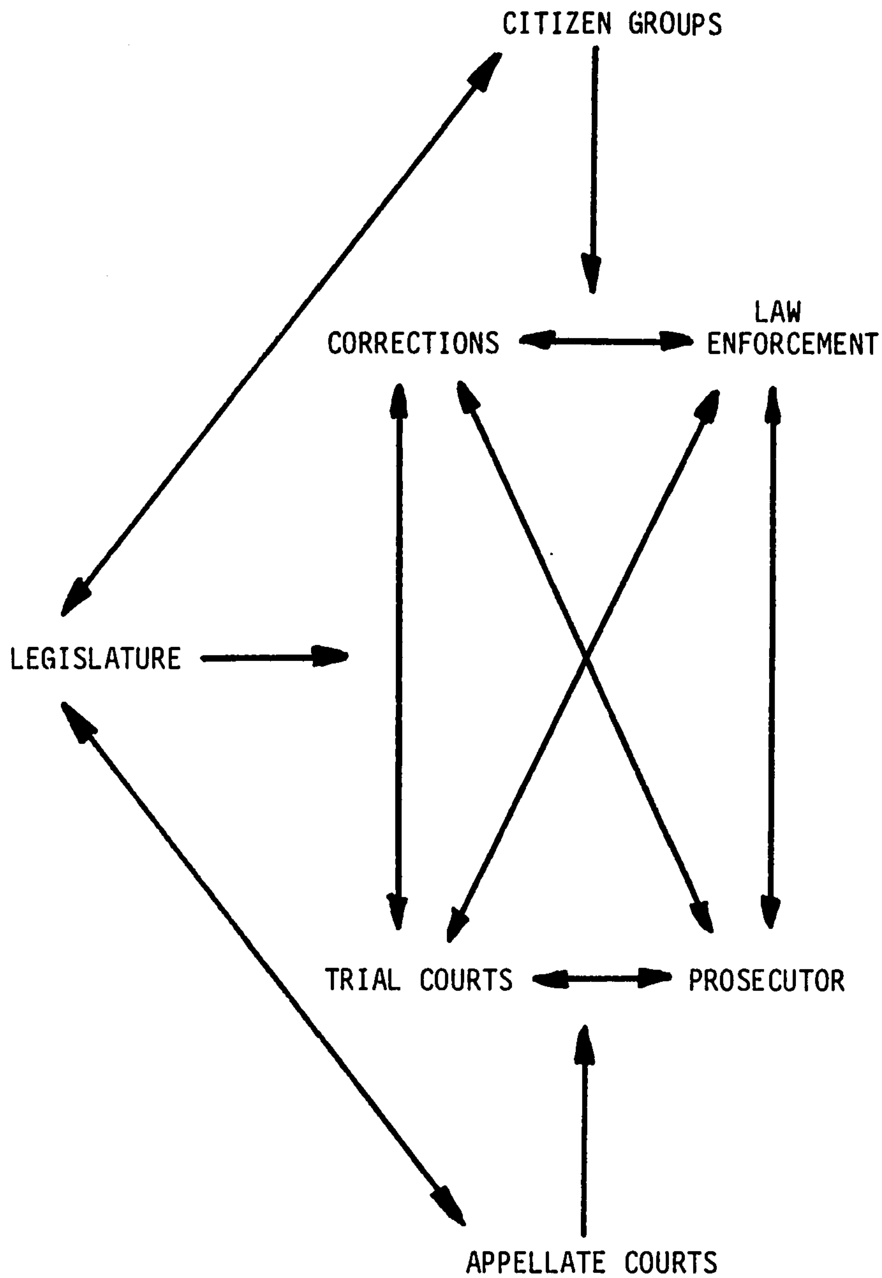


Figure 3. Reciprocal Interdependence Model for the Criminal Justice System

the state legislature, and appellate courts, must also be considered. Citizen groups (such as Mothers Against Drunk Driving) apply direct pressure to individual parts of the justice system, as well as to the original policymakers (e.g., elected legislators). The state legislature, on the other hand, sets the original policy for the justice system by creating new laws or altering existing laws which the criminal justice system must enforce, and by which it must operate. The citizen groups influence the legislature through application of various kinds of pressure, including elections. Appellate Courts, although technically part of the justice system, are represented here outside the system, since they are not generally involved in the day-to-day administration or implementation of laws, particularly at the "street level". Appellate courts interpret the law and thereby modify the original legislative intent. Appellate court impact on the legislature is two-fold: first, indirectly through changes in the application of the original legislation and, second, directly by forcing the legislature to re-evaluate its policymaking and perhaps modifying it. There is no border around the four components of the justice system. This is intended to show that each can exert influence and in return be influenced by outside factors. For example, judges, prosecutors, sheriffs and chiefs of police may meet with various citizen groups to discover how they feel about the new drunk driving law. It is also an important way for officials to really discuss the law with citizens. At these meetings the "sides" can be either proactive or reactive, or a mix of these approaches. In the first case, justice system leaders

in more progressive communities may coordinate such meetings and actively solicit attendance by the community. Reactive meetings generally occur in places where people have had to complain until the justice system responds.

O'Toole and Montjoy (1984) also offer the sequential model, Figure 4, but it is difficult to conceive of the criminal justice system strictly adhering to the rules underlying a rigid, step-by-step, process. It is true on one level that each step in the process requires that the preceding step by initiated, not necessarily completed, before the subsequent action can begin. For example, prosecution is impossible absent an arrest and adjudication cannot be accomplished without a case to prosecute. However, the system becomes reciprocal because each component is able to exert some influence on the other components. Prosecutors, through plea bargaining policy may effect the types of offenses law enforcement concentrates on. Judges will impact plea bargaining practices based on whether they will accept the guilty plea.

Integration

There are three basic, identifiable factors which are always present in an alcohol-involved traffic fatality: Alcohol, Automobile, and Driver. The first has been discussed with respect to control models and its contribution to the overall problem. Absent the driver, an automobile is not likely to be involved in an accident. This leaves the driver as the key "actor" in the process. Figure 5 shows the interrelationship of these components, with the shaded

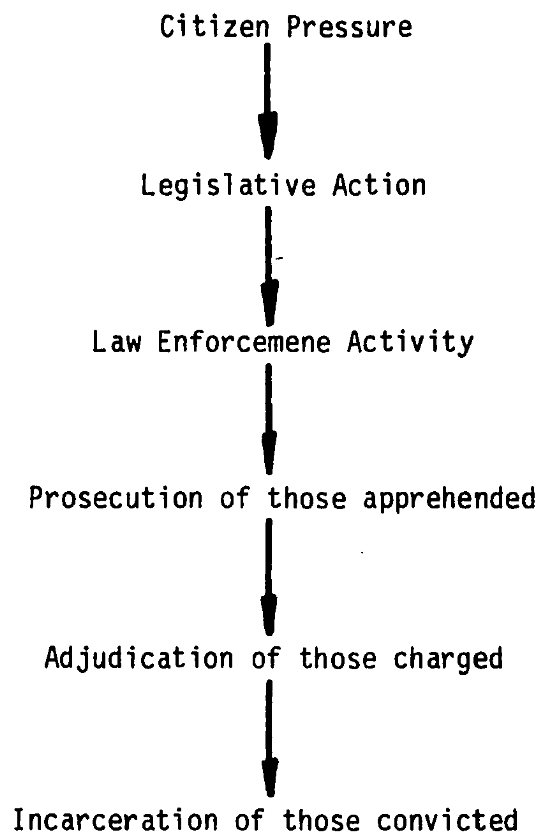


Figure 4 Sequential Model for the Criminal Justice System

area of the diagram representing that point where formal control mechanisms must be concentrated in order to prevent an alcohol-involved accident.

History has thus far demonstrated that the outright control of alcohol consumption is far from perfect and may not be appropriate to the reduction of alcohol-involved traffic fatalities. The only remaining approach is to reduce the likelihood that the driver will make alcohol part of an activity that, in the absence of

alcohol, is generally controllable and non-lethal. It is the introduction of alcohol as part of the operation of a motor vehicle which totally upsets an otherwise benign activity; therefore, controls must operate on the relationship between alcohol and driver. The other major option is to make the external environment safe for the drunk driver who is not deterred from drinking and driving.

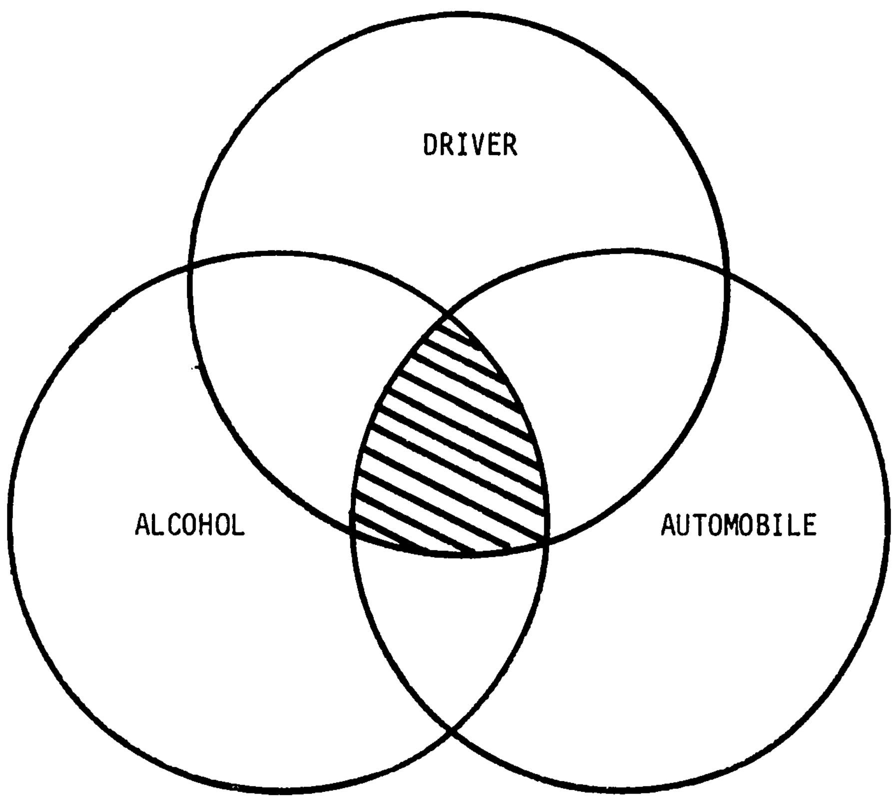


Figure 5 The Interrelationship Model for the Major Components in Drunk Driving Policymaking.

Jones and Joscelyn (1978), in a systematic review of the literature, show that there continues to be a significant alcohol-crash relationship in the United States. Specifically, they highlight the following findings:

1. Nearly one-half of the drivers in all traffic fatalities were legally too intoxicated to drive (BAC was .10% or greater);
2. Many injured drivers were also intoxicated;
3. More than one-third of all pedestrian fatalities involved individuals whose BAC exceeded .10% ; and
4. While the actual number of alcohol-related crashes caused by alcohol is unknown, it has been well-established that the risk of a serious crash is extremely high when the driver's BAC exceeds .10%. Furthermore, most basic driving skills are significantly impaired when the BAC reaches or exceeds .10%. (p. 187)

Recent research from the medical field suggests furthermore that the proportion of dead drivers with detectable levels of alcohol in their system is perhaps closer to 80 - 90% (Chapman, 1985). These data are routinely collected by pathologists during autopsies of automobile crash victims and are therefore not merely a matter of professional judgment but scientific fact. If these proportions are verified nationwide, then the problem of alcohol-related traffic fatalities could easily be classified as epidemic, or worse, pandemic.

It can be assumed that the privilege to own and operate a motor vehicle is not likely to change significantly. Furthermore, better control over the distribution of alcohol will not soon return to the draconian measures imposed by Prohibition. Successful reduction of alcohol-related traffic fatalities depends on deterring individual

from drinking <u>and</u> driving. Drivers must at least refrain from drinking beyond the point where driving ability is sufficiently impaired. Logically there do not appear to be other alternatives readily available.

Summary

Once an anti-drunk driving law has been enacted, the law should be implemented in such a fashion as to cause a reduction in alcohol-involved traffic fatalities. Actual implementation may follow the traditional model offered by Edwards (1980) or the more recent reciprocal interdependence model proposed by O'Toole and Montjoy (1984). Each model details a specific arrangement that contributes to the success of the policy or program being implemented.

In either case, if there is no visible evidence of deterrence (i.e., reduced alcohol-involved fatalities) following implementation of the law, then it maybe concluded that the law was not properly implemented. However, if there is evidence that the law was implemented according to either of the proposed models and there is still no evidence of deterrence (i.e., reduced alcohol-involved fatalities), then it may be assumed that the law exerted little or no deterrent effect.

CHAPTER III

METHODOLOGY

Introduction

The major research question is whether changes to existing anti-drunk driving laws reduce alcohol-involved traffic fatalities. A secondary question is whether implementation of such laws is related to their impact on alcohol-involved fatalities. The answer to each question requires a different methodology; therefore, this study achieves triangulation through the use of different methodologies and seeks to assess the effectiveness of the law and its implementation in the reduction of alcohol-involved traffic fatalities. The first method, interrupted times-series analysis, is used to evaluate the impact of statutory changes in fourteen separate states. The interrupted time-series methodology is applied in greater detail in Michigan, to analyze impact in individual counties in Michigan. Finally, a cross-sectional analysis using a survey instrument was used to measure implementation of the new law at the county level in Michigan. The results of the implementation survey are used to evaluate two different types of implementation models for application to the criminal justice system.

Legal Intervention Research

There is a small but growing literature in the area of legal intervention research. Those working in the field have attempted to

develop a model which suggests that such research is unique and requires special methodological considerations.

Brown and Crowley (1979) provide a concise discussion of the general methodology utilized in legal impact research. They also point out the problems. First, there is frequently a lack of appropriate data. Any behavior or activity which is not regularly recorded in public records is difficult, if not literally impossible, to trace. In research involving the exercise of law enforcement discretion, especially the decision to arrest, there is virtually no verifiable information routinely collected concerning those drivers stopped and released. Such data would certainly be useful when discussing individuals actually arrested because then, at least, something would be known about their cohorts (e.g., those released with only a warning). Yet nothing would be known about those who escape detection entirely.

The second shortcoming discussed is the lack of clarity and agreement on major concepts. Recidivism is particulary troublesome depending upon whether one chooses rearrest or reconviction as the threshhold definition. Deterrence, a major concept in drunk driving studies, can also be defined accurately in more than one way. Furthermore, when combined with the first problem, lack of data, it is difficult to determine with certainty, the number of people actually deterred. Another of the major concepts in the present study is implementation. Briefly, it might be argued that there is a continuum of activities which define, by degrees, how justice agencies may ideal with implementation of the law:

1. Recognize that a law was changed;

2. Attempt to understand how the law changed and how it affects the agency;

3. Try to incorporate necessary operational changes based on the law; and

4. Ensure that other agencies make needed operational changes.

Each of these steps represents a progressive attitude from doing nothing (number 1) toward aggressive implementation of the law (number 4). Considerable research is needed to determine what distinguishes one agency's approach from another.

The third major obstacle according to the authors involves the assumption that there is a causal link between the law and the behavior being investigated. The researcher must be able to show that the behavior did or did not occur in the absence of the law and, furthermore, effectively eliminate competing explanations of what may have caused the changes. Again, in the present case, one must give due consideration to media coverage, changes over time in attitudes toward alcohol, and changes in other laws such as the minimum drinking age or tavern hours of operation.

A fourth problem noted by the authors involves the assumption that the target behavior will show some change immediately upon implementation of the law or not at all. In the case of drunk driving arrests, all law enforcement agencies may have been slow in altering operational procedures to concentrate on traffic patrol. A delay in procedural changes may be brief or the changes may never be

made. If there is a delayed effort, some statitistical analyses would show that there was no impact and that the effort was for naught. The time series methodology permits testing for both delayed implementation and delayed impact. There may be legitimate reasons for the delay, such as equipment shortages or unmet training needs.

The last point the authors touch on is created by a culmination of the first four points: the problem of interpreting the obtained results. If there is no significant change in the target behavior, has the law been a failure? Or if there was a change, was the law responsible? Obviously one of the major requirements for answering this question is more complete and accurate data, coupled with a robust statistical technique. Of equal importance is the limited applicability of a pure experimental approach. For example, it is not practical, and certainly of questionable ethical character, to apply a law to one experimental group and not to another control group, especially when the consequences are as grave as they are here. The closest possible approximation is studying anti-drunk driving campaigns and programs launched in specific cities. Even under these circumstances, the potential for contamination is great. The required technique here combines all that is applicable from the experimental area with the practical modifications necessary in the truly non-experimental setting. Each of the concerns raised by Brown and Cowley (1979) will be examined in light of the investigation.

Data Validity

It is important that issues surrounding the integrity of the data be thoroughly discussed. National data on criminal offenses is of two types: (1) FBI Uniform Crime Reports (UCR, 1985) and (2) Criminal Victimization Surveys. UCR data are further divided into subcategories: (a) major crimes, which include homicide, rape, robbery, aggravated assault, burglary, larceny, and auto theft; and (b) minor crimes, which include 20 subcategories ranging from minor assaults to parking violations and drunk driving. Victimization surveys do not collect data dealing with drunk driving; therefore, by default, UCR-type data are all that is available.

Virtually all law enforcement agencies in the United States collect crime statistics according to the longstanding FBI methodology. The data supplied for this study came from individual agencies that collect and record crime statistics in generally the same way. Cressey's (1970) critical comments on UCR statistics are representative of those who argue that the data are not very good:

> 1. Statistical data on true crime rates cannot be compiled because it is impossible to determine accurately the amount of crime in any given locality at any particular time. Many crimes are not discovered.
>
> 2. The "indexes" do not maintain a constant ratio with the true crime rate because the whole cannot be accurately specified.
>
> 3. Variations in conditions affecting published records of crimes makes it foolhardy to compare crime rates in different jurisdictions and in different years. (p. 55)

The UCR program has been in operation for over 50 years and has

been subjected to all manner of analysis during that time. As intervening factors have been identified, the FBI has included factors which appear to affect the volume and type of crime occurring from place to place nationwide (Federal Bureau of Investigation, 1985). That list presently includes:

> 1. Population density and the size of the locality and its surrounding area;
> 2. Variations in composition of the population, particularly age structure;
> 3. Stability of population with respect to residents' mobility and transient factors;
> 4. Economic conditions, including job availability;
> 5. Cultural conditions, such as educational, recreational, and religious characteristics;
> 6. Climate;
> 7. Effective strength of law enforcement agencies;
> 8. Administrative and investigative emphasis of local law enforcement;
> 9. Policies of other components of the criminal justice system, (i.e., the prosecutorial, judiciary, corrections, and probation);
> 10. Attitudes of the citizenry toward crime; and
> 11. Crime reporting practices of the citizenry. (p. 10)

The list would certainly appear to be exhaustive, but there will doubtless be additional factors added as research progresses. Several of the above factors would appear to apply instinctively to drunk driving and alcohol-involved fatalities.

There will probably always be questions raised as to the validity and reliability of crime statistics regardless of how they are collected. However, in the case of drunk driving there is not likely to be much error in the reporting of an alcohol-involved fatality, especially if confirmed during the course of an autopsy. Drunk driving arrests are probably less immune from reporting

error. The use of advanced technology to detect alcohol certainly increases the chances of positively identifying drunk drivers. Unfortunately there is still the problem of detecting and stopping all alcohol-impaired drivers in order to know how many are actually on the highways at any given time. In the absence of knowing the total actual number of drunk drivers on the highway, it is impossible to know whether an increased rate of apprehension is significant. In other words, if it were somehow known that there are 2,000 drivers legally impaired by alcohol actually on the highway at 2:00 am every Sunday morning, then it would be possible to express the significance of a 20% increase in drunk driving arrests at 2:00 am on Sunday mornings in terms of how many drunk drivers were not apprehended. Another problem is exactly how can a 20% increase in arrests be accomplished. Are additional officers or more sophisticated detection methods needed? Or both?

According to Reiss (1980) much of the empirical research in criminology is based on explaining changes in crime rates, and much of the research evaluating law enforcement or criminal justice programs depends upon measuring changes in crime rates. Any change in the prevalence of offenders in a population comes about largely as a consequence of changes in the replacement rates for a population of offenders. Changes in entry or exit from a population of offenders or of the age of onset and desistance from a population certainly effect replacement rates within that population.

There are several sources of change which affect replacement rates. First, changes in the size of both cohorts or of cohorts

at risk in the population affect the prevalence of offenders in a population if the probabilities of age at the onset of criminal activity and individual rates of criminal offenses are constant. Even when the prevalence rate for a cohort remains constant, any increase or decrease in the size of that cohort may change the prevalence of offenders in the total population.

Second, while it is understood that changes in the length of the offender's career may have an effect on the crime rate, it is also true that changes in age at the onset of the career can also affect the replacement rate of offenders in the population. Third, changes in the number, size, degree of openness, composition, and territory of social networks may affect the prevalence of offenders in a population. Such changes affect the potential for recruitment of offenders from the general population. It is difficult to know where drunk drivers are recruited from except that they are licensed drivers and employed. This finding suggests that as the economy improves, so too does the likelihood of additional drunk drivers taking to the highway. Some evidence exists to support this hypothesis. The National Highway Traffic Safety Administration (NHTSA, 1983) indicates that total highway fatalities may be closely linked to changes in the economy. When the economy improves, people are financially more able to drive their cars more often and thus increase the probability of being involved in a traffic accident. Conversely this theory would have people driving less when the economy worsens because their money will be otherwise exhausted on necessities. The NHTSA study indicates that alcohol-involved

fatalities do not appear to be adversely affected by the economy. Unfortunately the data were not broken down by state; thus, it is possible that aggregation of economic changes and alcohol-involved fatalities nationwide masked changes in some states where the hypothesis might have been proved.

Crime incidence rates are affected by changes in individual crime rates. Riess (1980) discusses three major types of change in this area. There are, first, changes in opportunities to commit crimes which can lead to changes in individual crime rates. Obviously the opportunity to drink and drive is more likely to lead to an alcohol-involved fatality than engaging in either drinking or driving separately. Sufficient funds are required to own and operate a motor vehicle, as well as the excess funds necessary to permit becoming drunk at the local tavern. Second, changes in the size or structure of the offending group can alter the group and, therefore, an individual member's rate of offending. There does not appear to be any research to support the notion that drunk drivers are a cohesive, informal group. But it is something to consider as the offense is treated with greater severity and as more people are apprehended and subjected to official scrutiny. It is possible that if "labeling" were to occur, convicted drunk drivers might seek the protection of an informal group and thus effectively oppose efforts to change their behavior.

Finally, changes in the size and composition of crime networks will affect an individual's rate of offending. Again, it would not appear that the average drunk driver is part of any criminal

network except to the extent that a certain percentage are part of the population of chronic alcoholics.

Design Validity

Brown and Cowley's (1979) concerns about conceptual clarity and validity of causal linkages corresponds to extensive social science examination of potential threats to research validity. Cook and Campbell (1979) present four major categories of reseach design validity: (1) internal validity; (2) statistical validity; (3) external validity; and (4) construct validity. Each is discussed below in the context of the present research.

Internal validity refers to the degree of certainty one has that the experimental or independent variable was actually responsible for the observed changes in the dependent variable(s). In other words, if we observe that 100 drunk drivers per month are arrested during each of the observations before the law is changed, and only 50 per month are arrested on each of four subsequent observations, we might conclude that the law "caused" the change. External validity refers to the extent to which the results can be generalized to other subjects, settings, and experiments. When internal validity is increased there will be a decrease in external validity due to the additional controls imposed. Campbell and Stanley (1966) and Kratochwill (1978) thoroughly discuss the nine factors that impact on internal validity.

1. History: This refers to events that occur at approximately the same time as the independent variable is introduced and may be

partly responsible for the changes in behavior subsequently observed. For example, if law enforcement patrol policy shifts from traffic enforcement to burglary prevention at about the same time as the drunk driving law is changed, the apparent "reduced" incidence of drunk drivers may be wrongly attributed to the law. If the experimenter plans the observations so as to control partly for such confounding factors, the effect of history can be somewhat controlled. It is important to note that historical factors may not always be obvious.

2. Maturation: Subjects' age and, in so doing, change enough to alter subsequent observations. Minimizing time delays and monitoring subjects closely can control some of the interference. However, in the present study, lengthy time periods are required for time-series analysis.

3. Testing: When tests are used as the measurement device, there will be a certain amount of posttest improvement that is due to exposure to the test during the pretest phase. In-person observations may also alter subjects' behavior enough to threaten the validity of the results.

4. Instrumentation: Unreliable or inconsistent measurement devices can create apparent "changes" where none actually exist. Standardized and normed tests are more reliable. One of the factors in traffic fatality research is the time period between the crash and death. Some states have changed the time period from one year to six months, while still others have reduced the time to thirty days. This could create a bias if such a change occurred during the

time period under study and if a large enough proportion of fatalities occurred during a time when they would have been considered crash-related.

5. Multiple-Intervention Interference: With a single N -- multiple intervention design -- there is the possibility of one intervention impacting the effect of subsequent interventions. This can happen in two ways. First, where there is a continuous intervention design, even though the same intervention is introduced each time, the impact of second, third, and perhaps additional interventions may build upon the first thus amplifying the effect. Sometimes this is intentional -- behavior modification operates on this theory. Second, if the interventions are intentionally varied, then the interaction between them will be important, because of possible confounding of results.

6. Instability: Natural variation in the data series may lead the researcher to conclude wrongly that the "change" was due to the independent variable. For example, if arrest rates fluctuate more or less randomly within a certain range, the conclusion that <u>any</u> change is experimentally derived may be incorrect.

7. Changes in Experimental Unit Composition: In any experiment where $N > 1$ there is always the possibility that some subjects will drop out -- either voluntarily by leaving or as a result of injury or death. To the extent that a significant proportion of the group becomes unavailable, the study may have to be abandoned. This is especially true with the $N=1$ design. In the present study there is certainly the likelihood that some subjects will drop out

permanently as victims in drunk driving accidents. However, it is also assumed that they will be replaced almost immediately by other "players" in the general population.

8. Reactive Interventions: The establishment of some intervention that is based on the unusual characteristics of the baseline data may not be easily studied. When a program is established to respond to some perceived "crisis", once the crisis has passed, there may be no way of evaluating the effectiveness of the intervention. Some anti-drunk driving campaigns may be included here -- especially those launched following a spectacular local area accident.

9. Selection and Interaction of Selection: In a design that involves two or more groups, there may be a problem if the groups are formed prior to the experimentation. Membership in the groups may be due to factors that interact with the intervention in both unknown and unknowable ways.

Most of the threats to internal validity in the present study can be grouped under the headings of either history or multiple-interaction interference. For example, those characterized as history include:

1. Anti-drunk driver campaigns. These may be part of introducing the new law or may occur independently. In either case it is difficult to determine whether some drivers avoided drinking and driving because of the law itself or because of the considerable additional media attention.

2. Election year for county prosecutors and/or judges. This

consideration is especially prevelant now that a strong "grass roots" anti-drunk driver lobby has been created nationwide. Such organizations as MADD (Mothers Against Drunk Drivers) will draw public attention to criminal justice officials who appear to be "soft" on drunk drivers. Public pressure can be effectively marshalled against such officials. This pressure will often result in actions that are inconsistent with what would happen under natural circumstances. For example, penalties may become harsher in order to reduce public pressure and not because offenders deserve severe sentences.

3. Budget reductions that effectively limit the extensiveness of patrol activities at the local or state level. For example, the Michigan State Police were restricted to a specific radius of patrol during Fiscal Year 1981. Many argue that this effectively reduced their ability to reduce traffic fatalities on Michigan highways.

4. Federal and state court cases decided during the study period that significantly altered some aspect of drunk driving enforcement. This includes changes in probable cause to stop a vehicle and the types of evidence admissible in drunk driving cases.

5. Severe jail and prison overcrowding problems. When the Federal courts become involved in state and local correctional institutions and order reductions in prisoner populations, the likelihood of drunk drivers being sent to jail at all might diminish to some extent because they are not considered heinous criminals. The greater deterrent effect of the law will certainly be weakened

under such conditions.

Combinations of multiple-interaction and historical effects include:

1. Changes in local law enforcement policies that are not directly related to enforcement of drunk driving laws. For example, changing the emphasis from traffic enforcement (where drunk drivers are more likely to be encountered) to residential burglary prevention, which effectively removes officers from highways will impact the likelihood of apprehension.

2. Extensive media coverage of a spectacular alcohol-related accident or criminal offense. When additional media attention is directed at apprehending and punishing drunk drivers, criminal justice officials will feel obligated to apprehend more drivers and impose more severe sanctions on the ones who are caught.

3. Changes in prosecutorial policy. Each prosecutorial agency develops standard operating procedures for handling various types of offenders. Some may permit routine "bargaining" to lesser offenses. For example, if an individual charged with drunk driving is a first-time offender, the prosecutor may agree to let him/her plead guilty to driving-while-impaired, an offense carrying a less severe penalty. Such a policy may also be used if there are too many cases to prosecute effectively in court. So, on one hand, the policy can be used to temper justice with mercy, while on the other, it becomes a labor-saving mechanism.

4. The development of new treatment methodologies or the opening of new facilities for the treatment of alcohol abuse. In

the absence of such alternatives in the past, prosecutors and judges may have felt that there was little sense in processing some offenders. After all, if nothing constructive can be done with the individual, why bother?

The only threat that appears to result solely from multiple-interaction effects is that of changes in other laws which may be alcohol-related, such as minimum drinking age or sale of alcohol by the glass on Sunday. In the present study, for example, the increase in the minimum drinking age to twenty-one in late-1978 may have had an impact on fatalities in a specific age group. That impact would carry through into the overall alcohol-involved fatality rate. It would also seem reasonable that the impact would have smoothed out by April, 1983.

The second general threat, statistical conclusion validity, deals with the control of random error or the use of the wrong statistical technique, thus invalidating the research conclusions. Validity here is essential for establishing that there is true covariation between the operationalized concepts under study. Furthermore, covariation is one of the basic requirements for establishing a casual relationship.

There are a variety of threats to statistical conclusion validity. First, the statistical technique may not be powerful enough to detect the presence of covariation. Because sample size is related to statistical power, the use of all known observations over an extended period of time, as in the present study, should help to increase the chances of detecting covariation. This study used

the Box-Jenkins transfer function method for evaluating intervention impact (Box and Jenkins, 1976), which is part of the time-series analysis procedure available in the BIOMED statistical package. It is considered to be one of the most robust statistical treatments available for analyzing time-series data.

A low level of reliability in the measures can also constitute a threat to statistical conclusion validity. If the measure does not consistently measure what it is intended to measure, the standard error is inflated and existing covariation may be obscured. The principal control in the present study was the use of aggregate outcome measures. If the data collected had been based upon individual drivers or accidents, then there might have been a problem. This type of threat is a problem when analysis is based upon particular data collection subsystems, such as counties or individual law enforcement agencies. The impact of random irregularities in local jurisdictions over time is minimized when data are aggregated at the regional or national levels. This is hopefully true in the present study where aggregation at the state level will cancel out any random error at the county level. Identification of systematic patterns or trends may be somewhat more accurate when inferred from aggregated data. The reverse side of this problem is aggregation bias. Here the sought-after impact exists in isolated places but is obscured when the data are aggregated.

The major point to this study is the impact of the intervention. Low reliability at, and after, the point of intervention threatens interpretation of the findings. If there is a high degree of random

error in the manner in which the intervention is implemented from month to month, there is not likely to be true covariation between the intervention and the dependent time-series. In the present study one of the issues that will be addressed is that of implementation intensity. For example, when a law goes into effect (intervention), it may not be agreed as to whether it should be enforced to the maximum from the first day forward. Perhaps some jurisdictions are slower to implement than others. In the present study, the intervention is tested for both immediate and gradual impact. This should account for both types of agencies.

Cook and Campbell (1979) identify the last two general threats as "random irrelevancies in the experimental setting" and "random heterogeneity of respondents". In the first instance, the threat stems from all of the "other" influences that might impact the frequency of accidents that are not explicitly defined in the analyses. Some of these influences have been controlled by specification of systematic trends, seasonal, and other autocorrelation components present in the dependent variables. Again, the differential impact of these factors was controlled through the use of aggregate data across all jurisdictions in each state. Once again, this causes problems for analysis at the micro-level of individual jurisdictions (e.g., counties and large metropolitan areas). It should also be noted that there are at least two different perspectives depending on which level is selected. At the macro-level, it is the overall reduction in alcohol-involved traffic fatalities; at the micro-level (i.e., county) it is the fashion in which the law

was implemented and the relationship between implementation and changes in alcohol-involved fatalities.

The final threat is the "random heterogeneity of respondents", or the random error associated with sampling of subjects from the target population. As already noted, the present study did not use a sample of known alcohol-involved fatalities, but rather all such fatalities. To the extent that some fatalities were never reported, they were lost. However, it is not likely that a significant number of such fatalities are lost entirely. It is more likely that some alcohol-involved fatalities are recorded as non-alcohol accidents. There does not appear to be any research estimating this particular rate of error.

External validity answers the following question: assuming that it can be confidently concluded that there is a causal relationship between the focal variables, to what extent is this causal relationship generalizable across persons, settings, and times? One of the major threats to external validity is the interaction of selection and treatment. Generalization of findings to some subgroups in the general population will not be possible. For example, analysis of sex or by age group are frequently lost in overall aggregation. To the extent that some identifiable subpopulation may be more significantly impacted by the law, the present study attempts to identify the existence of such an impact at the local level. If a significant intervention effect can be found in one part of the state, when there was no significant statewide impact, this would support the theory that significant findings can be lost if data are aggregated.

Given differing characteristics of law enforcement agencies and laws in different states, it would be misleading to attempt to generalize Michigan's findings to other states or even other jurisdictions within Michigan. The best that is possible in the present study is to make visual comparisons between states based on the plotted time-series data and make note of any dissimilarities.

The interaction of setting and treatment represents the second major type of threat to external validity. Generalizability is limited because the implementation effects may be due to the particular socio-cultural setting. Although explored in the present study there are separate levels of analysis possible, each somewhat more global than the one before. At the county level, it is possible to evaluate the extent to which contiguous counties, presumably exposed to the same intervention at the same time, react differently. In other words, what happens to the relative incidence of alcohol-involved fatalities in two bordering counties (e.g., Kent and Muskegon), as compared to two physically separated counties (e.g., Macomb and Kent), or two entirely dissimilar counties (e.g., Schoolcraft and Wayne)? If the setting exerts enough influence to vary the results of the implementation, the threat to external validity must be taken seriously. Another level is that of aggregated counties within a state. In the present study this will be done on the basis of population and perception of the law's overall impact. At the next level, across states, it is possible to evaluate the relative impact of changes in the fourteen intervention states and determine whether the character of the intervention is the same in

each state. Again, if the impacts are all substantially in agreement, it might be concluded that the impact is independent of its surroundings -- at least at the aggregate level.

The final interaction that poses a threat to external validity is that of history and intervention. If the intervention occurred during especially unique historical circumstances, then the findings might be of limited value both within and outside the experimental setting. By comparing several states, all experiencing the same general experimental treatment, this particular threat will be easier to identify and control. Furthermore, by collecting data across an extended time period, unusual trends in the data will hopefully become visually obvious and can then be controlled statistically.

Construct validity, the last general category of research design validity, deals with clear specification of the concepts under study. If the concepts are not easily understood, "public safety" versus "alcohol-involved fatalities," then it may be difficult to establish a causal relationship. Cook and Campbell (1963) identify two closely related biases at work against construct validity. The first is "mono-operation bias" and the other "mono-method bias". The use of single indicators, in mono-operational bias, prevents an assessment of convergent validity, or, put differently, the extent to which different measures of the same concept achieve the same result. Methodologically this is referred to as between-methods triangulation. In the present study only one measure of alcohol involvement was used and that is based on official

determination by law enforcement in the case of an arrest or medical authorities in the case of an autoposy A more complicated question at the county level is when did the justice system begin implementation of the new law. It is assumed that a thorough determination of local impact requires multiple indicators: arrest, prosecution, and conviction rates. The present study considers only arrests and alcohol-involved fatalities.

There is a potential threat to construct validity, which Cook and Campbell (1979) refer to as "confounding constructs and level of constructs". This source of invalidity occurs when there is uneven implementation and/or measurement of only one subset of all possible levels of the outcome variable. One of the intentions of this study is to evaluate the implementation of the law at the local jurisdiction level. The theory is that the difference in the outcome measure, alcohol-involved fatalities, is directly related to the manner in which the law was implemented by agencies at the local level. It is expected that jurisdictions with significant decreases in alcohol-involved fatalities exhibited a greater investment in preparing for and implementing the new law.

A threat is also contributed by the interaction of some intervention occurring at approximately the same time the new law takes effect. Representative of this threat would be a change in the legal drinking age. Michigan made its last change in 1978 and there may have been a residual impact in the 1979 data series. Adequate research exists to indicate that an identifiable proportion of alcohol-related fatalities involve drivers under the age of 21

of alcohol-related fatalities involve drivers under the age of 21 (Douglass, Filkins, and Clark, 1974; Douglass, 1979; Cucchiro, Ferreira, and Sicherman, 1974). Closely linked to other known interventions, are the unknown -- or unknowable -- variety. This category includes changing economic conditions, shifts in the age of the driving population, and changes in driving habits. The problem with such factors is that it is difficult, if not impossible, to determine when they took effect. This is particularly true of changing economic conditions. Other types of changes include "shifts" that occurred over time and with subtly. The advantage to using the change in the law is that it simply happened, all at once, at the stroke of midnight on March 31, 1983. But the effective date of the law and when the impact occurred could be very different.

Triangulation

Triangulation involves the combination of different methodologies in the study of a single problem. It's purpose is to moderate or eliminate challenges to validity by approaching the research question from multiple perspectives.

Denzin (1978) argues that multiple researchers, each using a different methodology, are inferior to a single researcher using multiple methodologies. First, each research method provides a different view of reality. This can be likened to holding a prism up to the light and then moving it to bend the light to create varying colors. If each time the prism is turned someone different views the resulting light, then a complete understanding of the

prism's impact will not easily be developed. In alcohol abuse research, some researchers study price controls, others investigate off-premise sales. While each may reference the work of the other, the referenced method or approach is not an integral part of each study. If both methodologies were combined in the study of public consumption, a new dimension, heretofore missed, would presumably evolve. The second point stressed by the author is application of multiple methods. Each researcher injects his/her own set of values, biases, and assumptions into the research design. This tendency cannot be overcome by simply understanding the technical aspects of the methodology used, but would require a complete and total understanding of the person who did the research. In the area of alcohol abuse research personal motivation is likely to attract people with widely varying opinions on alcohol and its impact on society. Assuming that this problem cannot be controlled in any consistent fashion, then the best alternative is to use multiple methodologies and evaluate whether the results generated by each approach are consistent.

There are four basic types of triangulation according to Denzin (1978). They are triangulation by (a) data, (b) investigator, (c) theory, and (d) method. The last is pertinent here, specifically "between-method" triangulation. While the opposite, "within-method", involves the use of a single methodology, such as a survey, in different ways, triangulation between-method requires that different methods be applied to the same question. The combination of dissimilar methods is considered more effective and accurate than the

within-methods approach (Denzin, 1978; Webb, 1966).

In order to use the between-method approach, the researcher must consider the requirements and limitations inherent in the technique. First, the method must be well suited to the research problem. In the present study, the analysis of changes in a trend, especially over a long time period, can best be evaluated by the use of time-series analysis. Time-series either smoothes out the disturbance created by atypical data points or permits accurate identification of those points. Once identified such data irregularities can be omitted. This technique works best when there are only a few extreme scores. The other methodological technique involves use of a survey to establish how local agencies implemented the new law and how effective they believed it was in reducing alcohol-involved fatalities. This is a cross-sectional design measuring individual perceptions at a single point in time. Those agenices indicating a strong belief that the law had been significantly effective were aggregated and their perception was tested by intervention analysis. The combination of methods permits comparison of the actual effect and the perception of the effect by those presumably responsible for creating it.

Methods should be selected with their theoretical relevance in mind. To study an activity, such as alcohol-involved fatalities, whose occurrence shifts over time and appears to occur randomly, time-series is probably the only effective technique available. The cross-sectional approach uses only a small portion of the overall picture from which to draw conclusions. This can create distortion.

For example, on the one hand, if each of the months immediately surrounding the date of impact experienced unusual fatality activity, then statistical conclusions would be misleading. On the other hand, implementation activities are not going to change because respondents were asked their opinion after the implementation had occurred. It is also not likely that their opinion of the law's effect will change much. Based on these points, it seems that the combination of methods will work. The combination of methods chosen are an appropriate means of measuring the two types of activities and provide different perspectives from which to approach the problem. Hence time-series analysis was used to assess patterns of alcohol-related fatalities and cross-sectional analysis was used to examine the implementation process.

Quasi-Experimental Design

Scientifically acceptable analysis of an intervention requires a technique that rules out competing explanations of the dependent variable (i.e., the effect or result). The classical experiment provides the best opportunity to keep external influences at a minimum. This method of comparing the relative effectiveness of a treatment would involve the random assignment of subjects to different treatment groups. In the present study that would involve selecting two separate jurisdictions and manipulating the enforcement of the law. This would have to involve two conditions: First, the complete absence of any law prohibiting drinking and driving; and second, that there be no enforcement of an existing law, regard-

less of the consequences.

The most commonly applied methodology is correlational analysis using natural variations in actual events. For example, a researcher might find that states with higher imprisonment rates (a measure of certainty) or longer sentences (a measure of severity) also have lower average crime rates. This would be substantiated by a high positive correlation between the independent variables (e.g., certainty and severity) and a decrease in the dependent variable, the crime rate. Statistical controls are used to counter the influences of such demographic variables as urbanization, race, sex, and income, because real controls are impractical. Cook's (1977) review of many such studies reveals strong support for the deterrence model with respect to traditional criminality, especially for certainty of arrest and severity of the penalty. The methodology has been subjected to considerable criticism by Blumstein, Cohen, and Nagin (1978) because of errors created by technical problems in measuring the crime rate, confounding of incapacitation with deterrence, and the possibility that level of crime affects sanctions imposed -- not the other way around. Correlational analysis has been little used in the study of traffic laws. The exception appears to be Votey's (1978) study of Scandinavian anti-drunk driving laws.

Macro-level and Micro-level Analysis

At the macro-level, the statewide impact of anti-drunk driving laws is evaluated through the use of interrupted time-series analysis

across 14 states.

At the micro-level of analysis, also using interrupted time-series, the impact of the same intervention is evaluated from the perspective of a single state, Michigan. Data analysis at the micro-level used alcohol-involved data that were aggregated on a standardized census basis (e.g., urban, suburban, and rural). While the second phase of the micro-level analysis also used interrupted time-series to evaluate post-intervention impact, counties were aggregated on the basis of survey results which asked questions concerning how criminal justice agencies implemented the new law in their jurisdictions. This speaks directly to the issue of whether agency implementation is related to the impact of the law.

Time-Series Analysis

The non-equivalent multiple time-series design addresses the greatest number of alternative explanations for a hypothesized relationship where even modest controls are not possible. The technique evolved out of frustration experienced by researchers who were faced with problems of establishing controls for "one-shot case studies" and "one group pretest/posttest" designs. Without real life controls, the generalizability of the results is also suspect.

The observations may be actual or they may be surrogates, such as total arrests for a given month as an indicator of actual crime events. The intervention is defined as a non-random, discrete event with identifiable characteristics. While the intervention may not always be a true experimental independent variable, it is still

necessary to define it precisely. Using typical time-series notation (Campbell and Stanley, 1966), observations are designated by "0" abd the intervention is shown as an "I":

$$0_1 \quad 0_2 \quad 0_3 \quad 0_4 \quad I_1 \quad 0_5 \quad 0_6 \quad 0_7 \quad 0_8$$

$$0_1 \quad 0_2 \quad 0_3 \quad 0_4 \qquad\quad 0_5 \quad 0_6 \quad 0_7 \quad 0_8$$

Each "0" represents the number of actual alcohol-involved fatal accidents for each month in a series and "I" represents a change in the anti-drunk driving law in the state being studied. Following the intervention (I) are more monthly observations of alcohol-involved fatalities. The second row of notation represents a time series that experienced no change in penalties relative to drunk driving during the same time period as the first series. Parallel time series data permits comparison of the two data sets -- one experiencing a statutory change, the other experiencing no change -- to determine whether the change made a significant impact on alcohol-involved fatalities while controlling for random changes over time.

The most objective measure of whether the law has been successful is a significant decrease in alcohol-involved fatalities following implementation of the new law. Furthermore, alcohol-involved arrests provide an objective measure of any changes in the volume of drunk drivers being brought into the criminal justice system. An increase in alcohol-involved arrests would indicate increased law enforcement activity. That activity, regardless of the underlying

motivation, is assumed to deter the average person from engaging in the proscribed behavior. Classical deterrence theory would hypothesize that an observed reduction in alcohol-involved fatalities results from one of two conditions: 1) Individuals tempted to drink and drive are deterred from even trying and thus do not expose others or themselves to a possible accident, and 2) increased activity by law enforcement conveys the impression that there is a significantly greater chance of being detected if one drinks and drives. If there were a significant decrease in alcohol-involved fatalities and a significant increase in alcohol-involved arrests at the same time, this would be strong evidence that the classical deterrence model works.

Time series analysis offers a methodology for evaluating change produced in nonrandomly selected groups, by events where the researcher has system outcome measurements across time which are beyond the researcher's control. In order to measure the effectiveness of an intervention, it must first be determined that there has been a change, and that the indicated event is probably the cause. Inasmuch as the experimenter has no control over assignment of individuals to "experimental or "control" groups in the traditional sense, time series analysis provides a sound methodological approach for evaluating the change between them in the absence of such controls. The method is particularly useful in *ex post facto* research when the intervention was entirely unplanned, such as following natural disasters or political revolutions. Additionally, time series allows evaluation of an intervention impact which may not be readily

obvious at one single point in time, but instead becomes obvious over time as the effect accumulates. As will be seen in the present study, it is important to be able to measure gradual change. The design focuses on the entire process over time rather than one discrete or cross-sectional outcome measure which might present an inaccurate picture of the real impact. Time series also directs the researcher's attention at the entire historical pattern surrounding the process under examination and permits discussion of that overall pattern as part of the intervention analysis.

In time series analysis, an "experimental" effect is said to occur when a noticeable fluctuation in the series, visually or statistically, appears following the intervention. The fluctuation must differ significantly from the level of the series prior to the intervention. All random and seasonal variations must be removed from the raw series in order to assess clearly the magnitude and direction of the change. The experimental effect is recognized only _if_ all competing alternative explanations have been eliminated.

The traditional procedure for selecting the most appropriate Autoregressive Integrated Moving Average (ARIMA) model for a particular time series is presented if Figure 6. The first stage in the process involves estimating a likely model based on some preliminary observations of the raw (undifferenced) series. An attempt is then made to confirm the applicability of the selected model through statistical estimation. Next, the parameter estimates developed in stage 2 are more rigorously tested until they are found to be satisfactory, not necessarily perfect, but "good enough". Accor-

ding to stage 3, if the model does not meet the standard statistical requirements, the process must be initiated over. Until the best model is developed, it is pointless, if not counterproductive, to evaluate the impact of any intervention.

At the fourth stage, intervention must be hypothesized to have occurred in a specific fashion, for example, immediately or gradually. While the statistical procedures may well confirm that something did happen to the series, the researcher must be satisfied that what is demonstrated statistically did actually happen. For example, the statistical results may indicate that following the intervention, the intervention, there was a 30% decline in fatal traffic accidents. Returning to the plotted series and looking at the actual data, the researcher may discover that there appears to be no visible decrease. In this example, the mathematical conditions of time series analysis were met, but the statistical analysis does not accurately reflect reality. At this point the researcher begins the model development all over.

According to Hartmann et al. (1980), visual analysis of changes in time series data is generally considered unreliable for two reasons. First, the "experimental" effect may be small or otherwise difficult to detect, and second, the observations may be serially dependent. In the first instance, one or more of the following occurs: (1) The results of the visual analysis will be statistically unreliable; (2) baseline trends are difficult to separate from experimental effects; and (3) the human eye has considerable difficulty distinguishing between experimentally

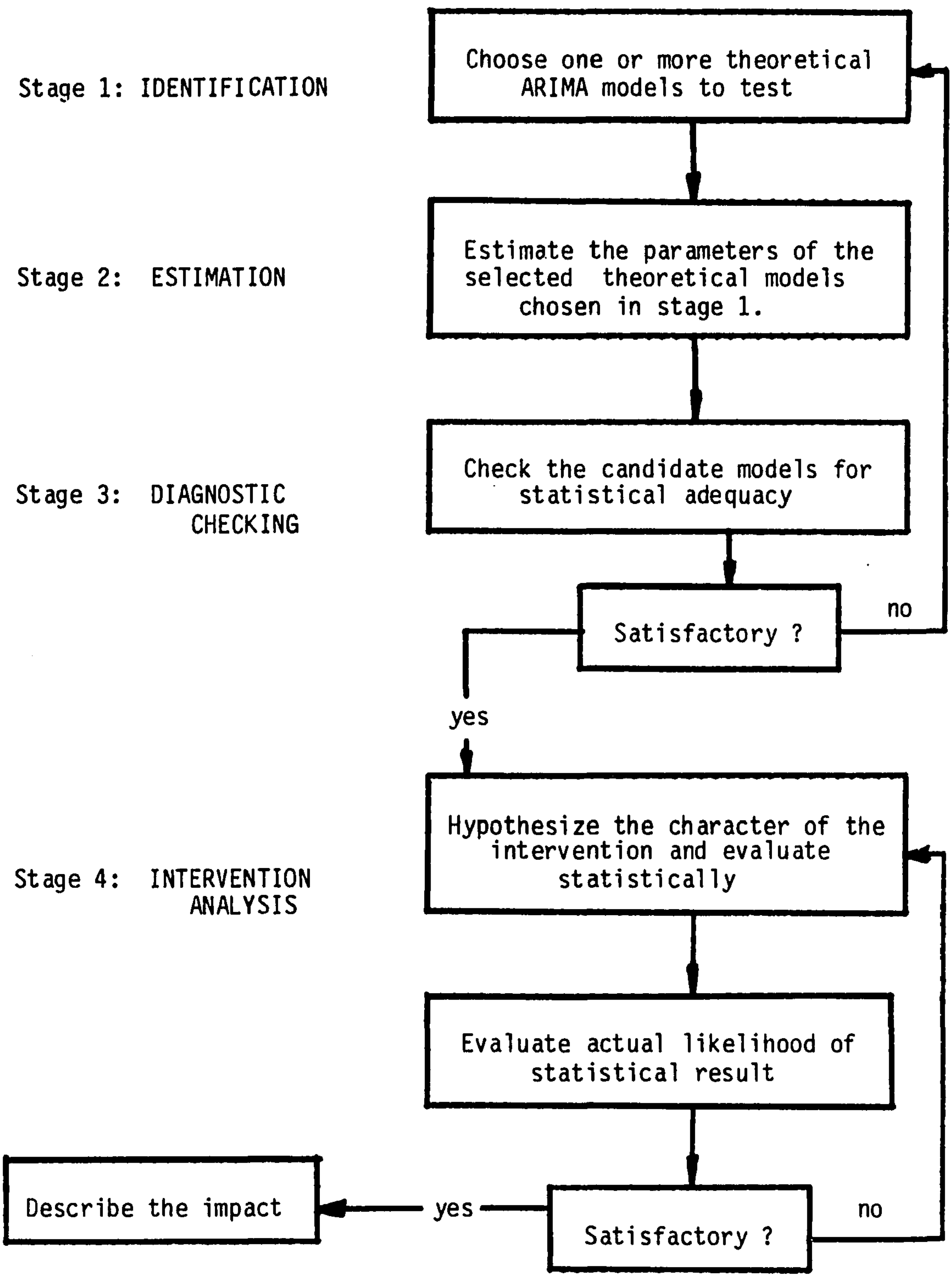


Figure 6. Four Stage Process for ARIMA Model Development.

derived and random events when scores are highly variable. This last point becomes obvious through inspection of plotted raw time series (see Appendix B, p 226 , for example). However, Granger and Newbold (1977) make an argument that visual inspection of the original data series is important and is as useful as any other procedure because visual inspection can help determine if there is a seasonal pattern in the series. A quick visual analysis will usually reveal a seasonal pattern. Knowing at least this much helps to direct the analyst in determining whether to include seasonal coefficients in the model development process.

The second major problem, serial dependency, is much more subtle. Briefly stated, because of serial dependency, temporally ordered observations in a time series may not be statistically independent and lack of understanding about that relationship can cause problems. Jones and Joscelyn (1978) indicate that when measures are serially dependent, visual analysis will agree <u>less</u> often with statistical analysis.

The type and magnitude of serial dependency is assessed by calculation of autocorrelations (ACF) and partial autocorrelations (PACF) between observations in a series. Each correlation is referred to as a "lag". A "lag-1 ACF" is computed by pairing the first with the second observations, the third with the fourth, and so on. The lag-2 ACF then pairs scores that are two intervals apart; lag-3 uses pairs that are three intervals apart, until the series is exhausted. Although reliance on lags beyond N/4 ACF is not recommended (Box and Jenkins, 1976), the ACF plots presented in

the various appendices are extended to lag-30 in order to be certain that there were no aberrations late in the series. This is particularly important in the present study because in some states the experimental intervention occurs closer to the end of the series than the beginning, and any significant statistical activity beyond the recommended N/4 lags might adversely impact accurate assessment of the intervention.

There are three basic properties in an observed time-series: (1) The observed series is stationary or nonstationary, and if the latter, there will be a degree of "differencing" required to produce stationarity; (2) the order of the autoregressive component; and (3) the order of the moving average component. The model becomes integrated when various combinations of all three are used to generate a stationary time-series. A "stationary" time series is defined as one in which the series remains in equilibrium around a constant mean level, although its oscillations around that mean need not be random. If the series is not stationary, with visible evidence in the ACF or PACF of significant correlations between points in the series, then successive degrees of differencing must be applied until the resulting series either becomes stationary or is as close as possible. A raw series may be linear (1,3,5,7,9, etc.), quadratic (1,4,9,16,25,36, etc.), or possessed of some random progression. Stationarity requires that the structure and parameters of the series not change as a function of time. ARIMA is a predictive statistical technique and, as such, assumes some kind of regularity or stability in the data. It should also be noted

of regularity or stability in the data. It should also be noted that the data need not be overly stable. This condition is referred to as the need for weak stationarity and is necessary in order to permit detection of small but significant fluctuations that would be overwhelmed if the model were made overly stationary.

Development of a data series with no identifiable trend begins with visual inspection of the undifferenced time series. There may be up to three parameters in the final white noise ARIMA model, and each is usually represented by a p, d, or q: "p" stands for Autoregressive (AR); "d" for Differencing; and "q" for Moving Average (MA). According to Glass, Willson, and Gottman (1975) it is more important to identify _d_ correctly than _p_ or _q_. Under- or over-differencing is to be avoided. Differencing causes each pair of values to be subtracted from each other until there is a resulting series of identical values. In the earlier example, the linear series would be made stationary after a single differencing: 2 = (3-1), 2 = (5-3), 2 = (7-5), 2 = (9-7). The quadratic trend would require a second-order differencing (differenced twice): 3 = (4-1), 5 = (9-4), 7 = (16-9), and then 2 = (5-3), 2 = (7-5) and extending the trend until only 2's result. The order of these processes denotes the number of prior observations that are included as terms in the systematic portion of the observations' stochastic or error component. Inspection of ACF after each differencing will show whether the series is being under- or over-differenced. The former leaves residual dependence between observations that would have been absent otherwise. When over-differenced, for example, the lags

"explode" and the series resembles an upside down Christmas tree, with its "branches" made of extreme lag correlations alternating positive/negative and decaying very slowly. Regardless of whether the order of differencing used just before this one made the series stationary, and in this case it obviously did not, it is time to stop increasing the differencing component and begin concentrating on the AR and MA components. A model exhibiting a white noise raw series (undifferenced) would have the following notation: ARIMA (0,0,0). If there is either an AR or MA component in the series, the number of such components will be noted by use of 1, 2, or 3. For example, if a series were a "second-order moving average, with no seasonal component", it would appear as ARIMA (0,0,2). It should also be noted that the order of differencing may be influenced when AR or MA components are added to the model. All of the factors in a model interact and thus the influence of each changes with the introduction of additional components or altering the factoring of existing components. This basically means that a parameter estimate meeting the specified criteria (i.e., nonredundant and a significant t-score) may be altered and have to be removed with the introduction of an additional component meant to suppress significant residual ACF spikes. While it may appear that there is no upper limit on the magnitude of these orders, there is some research which suggests that there may be some limits. Glass, et al. (1975) discovered that only 2% of 100 studies using time-series analysis had more than one autoregressive term. Furthermore, McCain and McCleary (1979) reported that they did not find a single "mixed" process,

which is one containing both autoregressive and moving average components. Over half of the series studied by Glass, et al. (1975) required no differencing and only 6% required differencing beyond the first-order

In the process of determining acceptable models, McCleary and Hay (1980) indicate that parameter estimates must be significant and stationary. The BIOMED (Dixon, 1983) package produces the parameter estimates for each order of each model component and the accompanying t-statistic. A significant t-statistic does not always guarantee an acceptable white noise model -- the residual ACF must also be inspected to ensure there are no significant lags, especially the first two (lag-1, lag-2) and the seasonal lags (lag-6, lag-12, and lag-24). One other indicator of model inadequacy is a parameter estimate that is greater than .90. This excessively high estimate, according to McCleary and Hay (1980), indicates parameter redundancy, making the model useless even if there are no significant lags (white noise) in the residual ACF.

Cross-Sectional Analysis

The implementation survey utilized in this study provided data used in the cross-sectional analysis. The questions asked in the survey solicited information on the degree of preparation engaged in at the local level prior to April 1, 1983, the date that the new anti-drunk driving law became effective. The survey was designed around Edwards (1980) implementation model and sought information about Communication, Resources, Disposition, and Bureau-

cracy. The results from the survey explain what, if anything, local criminal justice agencies did in preparation for the new law. This is important because of the theoretical position being advanced in this study that if a law is to be effective, the responsible agency must engage in identifiable preparatory activity. Such activity can include requesting additional resources; attending interagency meetings with others who will be involved in implementation; and changing standard operating procedures.

In the present study, the relationship between the outcome variables would appear thus:

Implementation ⟶ Arrests ⟶ Fatalities

Ideally, this model is interpreted to mean that local criminal justice agencies engaged in implementation activities, then increased the number of alcohol-involved arrests which eventually reduced the number of alcohol-involved fatalities. For purposes of survey analysis, Rosenberg (1968) would suggest that this model represents two distinct relationships. First, implementation influences the law enforcement arrest rate, which also impacts the prosecutor and the courts. Second, the increased arrest rate influences the number of alcohol-involved fatalities in that jurisdiction. While the arrest rate is directly influenced by implementation activities, a reduction in alcohol-involved fatalities is considered the result of the deterrent effect of increased enforcement activity. Analysis of survey data is therefore restricted to

the implementation/fatality relationship and to the issue of implementation alone. Going beyond that to a cause and effect relationship would require being able to completely eliminate any competing explanations about changes in the fatality rates.

Alcohol-involved arrest data were not available for each county and can only be used on a statewide basis. However, it is important to note that the arrest variable can be both independent and dependent. In the implementation/arrest relationship it is the dependent variable, or result, and in the arrest/fatality relationship it becomes the independent, or causal, variable. This would present some problems when explaining the statistical relationships between variables. It might also cause some confusion as to exactly when an independent variable is independent and when it is not.

Whenever the relationship between two variables is characterized as asymmetrical, it must be considered cause/effect. Because of the generally unfavorable reaction to the term "causality", Rosenberg (1968) prefers a term which is similar but permits greater explanatory variation: Determination. This is defined as the <u>necessary connection</u> between two variables. The key criterion for understanding the direction of determination is <u>susceptibility to influence</u>. In other words, it is entirely possible that the number of arrests will be impacted by the individual implementation strategies used in each agency. However, it is difficult to imagine how the reverse might be true.

There are two factors involved in deciding the direction of influence: (1) the temporal sequence, and (2) the alterability of

the variables themselves. Intuitively, we recognize that something which happened later cannot be responsible for what has already happened. In the case of the present study, it is unlikely that any actual change in arrests after April, 1983 could have had any impact on agency preparation prior to that date. Although the temporal sequence of activities can be easily dealt with, the same is not true of the alterability of the variables. Examples of fixed independent variables include sex, age, race, and national origin. None of the variables in the present study are fixed or unalterable. In fact, there is a distinct probability that some element of reciprocity may enter into this equation and violate certain logical assumptions. For example, if there is emphasis locally to arrest and jail all detected drunk drivers, the resulting decline in fatalities may eventually result in fewer arrests. This might happen for two reasons. First, law enforcement may have successfully removed a majority of drunk drivers from the highways, and thereby thereby substantially reduce the chances of an alcohol-involved fatality. The other possibility is that the visibly increased arrest activity may have frightened the drinking-and-driving population into abstaining. Regardless of the reason, the result is the same. Furthermore, before the result can be achieved, law enforcement must actively become involved in applying the law.

The relationship just discussed is generally referred to as disposition/response. The deterrent effectiveness of the law itself as well as the activities of criminal justice agencies, rely heavily on the disposition of people to avoid the unpleasant conse-

quences of detection, arrest, and conviction. If the disposition is exactly as just hypothesized, then the response should be equally accurate and there will be fewer alcohol-involved fatalities.

Up to this point the relationship between independent and dependent variables has appeared closed and immune from outside influences. The relationship is really no more immune than time-series analysis or any of the other quasi-experimental designs. There are three sets of variables defined by Rosenberg (1968) as critical to an accurate interpretation of this methodology. They are: (1) extraneous and component variables; (2) intervening and antecedent variables; and (3) suppressor and distorter variables.

An extraneous variable creates a statistically significant relationship where none actually exists. In other words, if there were a significant relationship between increased arrests and a reduction in alcohol-involved fatalities, the explanation might easily lie in the fact that the economy was generally poor and people did not drive their automobiles as much. Identification of extraneous variables does not necessarily counter their influence. If practical, actual data should be gathered in order to explain precisely the degree of influence exerted by the suspect variables. In some cases this may be impractical or impossible. Consider the issue of drunk driving arrests. One of the many unknown facts is exactly how many drunk drivers are actually on the highway at any point in time. This factor, if known, would certainly help determine what the probability of arrest actually is for this offense. Furthermore, if this number were known, the practicality of attemp-

ting to arrest all drunk drivers could be calculated and translated into an actual plan. It should be added parenthetically that the plan may be impossibly expensive to actually realize.

To say that the general social attitude toward alcohol control contributes to alcohol abuse is accurate. However, research efforts are not generally assisted by that declaration. "General social attitude" is considered a component variable and, as such, is composed of many individual factors such as sex, age, race, and income. While controlling for component variables is possible, it certainly complicates any research project. The present study did not attempt to control for component variables.

The next set of influential variables are intervening and antecedent. Intervening variables are characterized as a consequence of the independent variable and as a determinant of the dependent variable. Put differently, the intervening variable may be the real cause of the effect, but was dormant until influenced by the original independent variable. In the present study, if a local police department added several police officers immediately before the new law became effective, any subsequent change in arrests many perhaps have been more likely due to increased manpower. The increase in manpower, in order to be a truly intervening variable, must have nothing to do with the new law or its intended effect. Similarly, the completion of a new outer beltline, which diverts traffic away from the downtown streets, would effectively reduce downtown traffic and perhaps change the probability of fatal crashes. Again, the highway was not planned to coincide with the change in the law.

Controlling for all intervening variables in a quasi-experimental design is virtually impossible because most of the traditional experimental controls are absent due to impracticality. For example, it is impossible to divert all potentially drunk drivers to one highway and then vary the condition of law enforcement officers observing them. Delivery of the independent variable is certainly outside of experimental control.

Antecedent variables, unlike intervening variables, always occur sequentially prior to the introduction of the independent variable. This variable may enhance or subdue the effect of the independent variable. Consider as an example the fact that many states have been returning the minimum drinking age to 21 years. If such a change occurred immediately prior to the effective date of the new law, the effect on arrests and fatalities would probably be noticed if researchers were looking for it. Intervening variables can, and do, occur anywhere during the time period under study, but antecedent variables occur only *a priori*. Time series analysis provides an opportunity to detect the presence of either variable if, as in the case of the antecedent variable, sufficient data are available to begin prior to its introduction. If not, then the researcher can only speculate about the effect.

The last two variables that can adversely affect data analysis are referred to as suppressor and distorter variables. The first weakens a relationship and may cause it to drop from statistical significance. A distorter variable is particularly troublesome because it causes the interpretation to be precisely the opposite of

what is actually the case. Both variables are characteristically independent variables. For example, we could hypothesize that larger police departments will produce a greater increase in alcohol-involved arrests because they are better organized and equipped than smaller departments. When tested, though, the results come back exactly the opposite. One major reason might be that there are many small police departments in the suburbs surrounding larger cities. It is a simple task to deploy officers at strategic locations and arrest drunk drivers on their way home. These same small departments may also have slightly larger per capita operating budgets because of the general affluence of the suburban communities they serve.

Summary

This study attempts to deal with the general research challenges inherent in social science and criminal intervention research by employing triangulation of research design based on careful selection of appropriate methodology. Time-series analysis was used extensively because of it's robustness. Cross-sectional analysis provided a measure of differences within the population. Macro-level and micro-level analysis provided additional perspectives from which to view the research question.

CHAPTER IV

MACRO-LEVEL INTERVENTION ANALYSIS

Introduction

In this section, 60 consecutive months of alcohol-involved fatality data from sixteen states are analyzed through the use of interrupted time-series analysis. Fourteen of the states experienced an identifiable change to their drunk driving statutes during the time period under study, January 1979 through December 1983. Using the month that the law changed as the intervention point, statistical tests are performed to determine whether there was a significant reduction in alcohol-involved fatalities following the change in the law.

Michigan data are is used to explain the development of the interrupted time-series model. The Michigan data will be analyzed in greater detail in the next chapter. The ARIMA models for the fourteen intervention states, although not presented, were all developed through the same process. (They are documented in Appendix B). Two of the sixteen states, Texas and Oregon, are included for comparison pruposes. According to available sources, neither state experienced a change in its laws during the time period under study. At the same time, both states supplied the appropriate time-series data so that they could serve as control states.

In 1983 the National Highway Safety Traffic Administration (NHSTA) released a report which, to date, provides the most complete

analysis of recent changes in drunk-driving legislation in all 50 states and the District of Columbia. The principal objective of the NHSTA study was to detail each state's statutory penalties for drunk driving, then conducted telephone interviews to determine in those penalties were actually being imposed. Generally it was found that sanctions mandated by state statutes were not imposed as prescribed in the laws because individual jurisdictions frequently interpreted legislative language differently. For example, a mandatory one-day-in-jail term was interpreted as the "day" that the drunk driver was apprehended and held prior to appearing in court. This is frequently referred to as "credit for time already served" and is usually not what the legislature intended.

There are several interesting findings of particular importance in the NHSTA study. For example, many respondents indicated that there was fairly broad-based popular support for stringent, mandatory penalties. On the other hand, however, was the general finding that the penalties actually imposed were less severe than those provided by law. The study determined that many respondents felt that consistent media exposure, public information and education campaigns enhanced the deterrent effect of the sanctions, although little other evidence was provided to substantiate these claims. Most respondents also felt that there has been a general decline in alcohol-involved fatalities since enactment of new legislation. Along with the decrease in fatalities, respondents usually indicated that there had also been an increase in drunk driving arrests and subsequent convictions. Respondents also suggested that while

general operating costs had risen in many jurisdictions, funding to meet these new obligations had not been forthcoming.

Many of the above "conclusions" were not empirically substantiated in most states because statewide data were not available. The most recent change in Michigan's drunk driving law includes a requirement that arrest, conviction, and sentencing data be collected statewide by the Michigan State Police. An adequate data base is in the process of being developed.

For the purposes of the present study, the NHSTA material also provided current information on whether states had made recent changes to their drunk driving laws. The study provided the names and addresses of all individuals who were contacted by NHSTA to provide the necessary data. This provided a means of requesting time-series data from all states.

A letter was prepared (see Appendix A, p. 208) and sent to at least one representative in each state and the District of Columbia requesting data identical to that already collected for Michigan. A total of 40 (78%) states responded; however, only 16 of 51 jurisdictions (31%) (including Michigan) were able to supply complete data in time-series form. Many states had to be eliminated because some or all of the data were aggregated on an annual basis or the data were unavailable for part or all of the specified time period from January 1979 through December 1983. Those not responding within a reasonable period of time received a follow-up letter (see Appendix A, p.209). Fourteen of the sixteen states supplying data had experienced changes in their drunk driving laws during the

time period under consideration, according to the NHSTA study. The remaining two are included for comparative purposes.

Table 1 provides the monthly range and average for alcohol-involved traffic fatalities for all of the states used in this study. The column on the extreme right, "percent alcohol-involved", is derived by dividing average alcohol-involved fatalities by average total fatalities and multiplying by 100.

Generally speaking, the absolute frequency of alcohol-involved fatalities appears to correspond closely to density of state population with California highest and Alaska lowest. However, this relationship dissolves with respect to the proportion of total fatalities which are alcohol-involved, with California and Alaska evidencing virtually identical proportions: 49.8% and 50% respectively. While this might suggest a relationship between population density or licensed drivers, that may not be the case. In the 1982 Fatal Accident Reporting System (FARS) report, data are presented which permit comparisons between states on the basis of total licensed drivers, total square miles of land area, which allows computation of fatalities per 100,000 drivers and fatalities per 1,000 square miles. On the other hand, California does possess the largest number of licensed drivers (16,299,376); however, it ranks 28th in fatalities per 100,000 drivers and 13th in fatalities per 1,000 miles (28.3). Conversely, Alaska has have the lowest number of licensed drivers (320,719) but ranks 18th in fatalities per 100,000 drivers (32.7) and is absolutely last in fatalities per 1,000 square miles (.2).

Table 1

Range, Monthly Average, and Overall Proportion of Alcohol-Involved Fatalities for All States, January 1979 through December 1983.

	RANGE	MONTHLY AVERAGE	PERCENT ALCOHOL-INVOLVED
ALASKA	0 - 13	4	50.0%
ARIZONA	16 - 44	27	37.5%
CALIFORNIA	133 - 261	189	49.8%
IOWA	1 - 39	21	43.8%
LOUISIANA	12 - 38	24	26.4%
MASSACHUSETTS	9 - 45	22	37.3%
MICHIGAN	34 - 95	65	55.1%
MISSOURI	6 - 45	24	27.6%
MONTANA	1 - 28	13	59.1%
NEBRASKA	1 - 27	12	44.4%
NEVADA	2 - 25	14	53.8%
NEW MEXICO	11 - 43	28	66.7%
OREGON	4 - 40	21	46.5%
SOUTH DAKOTA	0 - 16	8	57.7%
TEXAS	57 - 129	85	29.2%
WASHINGTON	14 - 77	42	57.5%

While this is certainly suggestive of a relationship, it is based on only two states. In order to test more completely the idea that there may be a statistical relationship between fatalities, licensed drivers, and land area, a correlation was computed between each of the three factors. Data for each state and the District of Columbia were taken from the 1982 FARS report. The correlation between total fatalities and total licensed drivers is almost perfect ($r = .95$, $p = <.001$). There was no statistically significant relationship between total fatalities and total square miles ($r = 0.18$, n.s.), thus suggesting that a fatal accident is independent of the total square miles in which it may occur. Finally, there appears to be no relationship between total licensed drivers and total square miles ($r = 0.08$, n.s.). This suggests that fatalities may be independent of the total number of licensed drivers <u>and</u> the total area across which they are dispersed.

The stability of alcohol-involved fatalities over time is important to time-series analysis. Extreme fluctuations between data points may render the technique useless or produce badly skewed results. Table 2 presents the proportion of alcohol-involved fatalities across five years, for each state in the study. The single greatest shift between any two adjacent years was a 13% increase in Arizona between 1982 and 1983. Only two other states experienced shifts equal to or greater than ten percent: Iowa between 1982 and 1983 and Nebraska between 1981 and 1982. Except for these three <u>comparatively</u> substantial fluctuations, the proportion of alcohol-involved fatalities between years is steady.

Table 2

Annual Percentage of Alcohol-Involved Fatalities, by Year, for Each State, 1979 - 1983.

	1979	1980	1981	1982	1983
ALASKA	56.0	54.0	56.0	55.0	40.0
ARIZONA	37.0	37.0	36.0	34.0	47.0
CALIFORNIA	46.0	48.0	53.0	52.0	51.0
IOWA	44.0	40.0	45.0	39.0	49.0
LOUISIANA	26.0	28.0	29.0	27.0	22.0
MASSACHUSETTS	37.0	43.0	38.0	31.0	34.0
MICHIGAN	54.0	57.0	56.0	56.0	51.0
MISSOURI	26.0	27.0	28.0	30.0	29.0
MONTANA	50.0	59.0	63.0	63.0	58.0
NEBRASKA	37.0	40.0	50.0	39.0	43.0
NEVADA	53.0	47.0	53.0	62.0	55.0
NEW MEXICO	64.0	67.0	67.0	64.0	65.0
OREGON	48.0	45.0	46.0	48.0	45.0
SOUTH DAKOTA	58.0	54.0	62.0	58.0	51.0
TEXAS	29.0	30.0	29.0	29.0	28.0
WASHINGTON	58.0	63.0	59.0	58.0	52.0

The next level of analysis involves concentrating on the effect of the change. Table 3 shows the absolute number of alcohol-involved fatalities for twelve months before and after the change in each state's law. Texas and Oregon are omitted from Table 3 because they are non-intervention states.

Table 3

Change in Total Alcohol-Invovled Fatalities 12 Months Following the Intervention Within the Period 1979 - 1983

	12 MONTHS BEFORE	12 MONTHS AFTER	PERCENT CHANGE
ALASKA	54	57	+ 6.0 %
ARIZONA	298	254	- 15.0 %
CALIFORNIA	2,480	2,148	- 13.0 %
IOWA	235	224	- 5.0 %
LOUISIANA	273	223	- 18.0 %
MASSACHUSETTS	188	207	+ 10.0 %
MICHIGAN	718	634	- 12.0 %
MISSOURI	274	264	- 4.0 %
MONTANA	180	143	- 21.0 %
NEBRASKA	117	106	- 9.0 %
NEVADA	150	178	+ 19.0 %
NEW MEXICO	365	350	- 4.0 %
SOUTH DAKOTA	83	90	+ 8.0 %
WASHINGTON	594	619	+ 4.0 %

Although the fourteen intervention states presented here do not constitute a majority of the population, the overall trend suggests a decrease in alcohol-involved fatalities after the passage of anti-drunk driving legislation. Five of the states showed an increase in such fatalities, while nine showed a decrease. Either change could have been the result of changes in such factors as (a) accident reporting methods, (b) legal minimum blood alcohol levels, (c) elapsed time between accident and death in order to be counted as an alcohol-involved fatality, and (d) the number of licensed drivers on the highways. A technique is required which can control much of the random and systematic fluctuations in the data. If such fluctuations can be controlled, then perhaps the true impact of the law can be evaluated and discussed. The method selected is the Box-Jenkins interrupted times series procedure.

The procedure used to develop an ARIMA model for each of the fourteen intervention states was discussed thoroughly in Chapter III (Methodology). First the raw time-series was graphed, then an undifferenced ACF and PACF were developed for each state. The data were differenced as much as possible without introducing additional error; the theoretical ARIMA model is specified; and finally a white noise model is judged to be parsimonious and adequate. In Appendix B (p 225) there is the plotted raw time-series for Michigan alcohol-involved fatalities, the parameter estimates for the white noise model and the parameter estimates for both hypothesized implementation/impact methods (i.e., immediate implementation with gradual impact, as well as gradual implementation with gradual impact) for

each state. A brief discussion is presented here of the plotted raw time-series and results of the intervention analysis for each state.

Before presenting the individual state results, it is necessary to explain how the final paramenter estimates were developed. The Michigan data are used for this example. Two ARIMA models are developed for Michigan, one for alcohol-involved arrests and the other for alcohol-involved fatalities. No other state was able to supply arrest data, therefore, an interstate comparison is not possible.

Model Development

As each model is tested, those components which failed to achieve statistical significance or were far too high were dropped from the equation. The final white noise model must have parameter estimates which have significant t statistics. There must be no indication of parameter redundancy, and there should not be any significant correlations within N/4 lags. While N/4 is not an absolute rule, ACFs and PACFs beyond N/4 become increasingly unstable because they are based on fewer and fewer observations.

Eventually, by eliminating unstable parameter estimates, white noise models were developed. For alcohol-involved arrests, the best parameter estimates is:

$$\phi_1 = -.3558 \text{ with a t statistic } = -2.87 \quad (.01) \quad (df = 57)$$

The model is an ARIMA (1,1,0) $(0,1,0)_{12}$. This model requires

two sets of notation because of the seasonal component involved. Such models are generally written as ARIMA $(p,d,q,)(P,D,Q,)_s$, where the "s" is the length of the periodic interval; "P" is the order of the seasonal autoregressive component; "D" is the number of times the series is differenced by length "s" to achieve a stationary mean; and "Q" is the order of the seasonal moving average component This model is defined as a first-order autoregressive model, with second-order differencing -- one of which is seasonal. Differencing was applied twice, first by length = 1 and then by length = 12 in order to achieve stationarity. In the Michigan data, as well as some of the other states, there were single lags that could not be suppressed, despite repeated attempts. Utilizing the test for stationarity cited by Glass et al. (1975) for (p = 1)

$$-1 < \phi_1 < 1$$

and substituting the appropriate parameter estimates, this model is found to be stationary and can thus be subjected to intervention analysis:

$$-1.0000 < -0.3558 < 1.0000$$

The significant spike must be evaluated in the context of the entire series to ensure that the model is indeed stationary. Failure to do so would leave some residual doubt about the integrity of the ARIMA models. McCleary and Hay (1980) indicate that while the ACF white noise model process is expected to be consistently

zero, at the .05 level of significance there may be two or three significant spikes by chance alone. In both Michigan models, there was a single significant spike. Quite often, the spikes only barely achieve statistical significance at the .05 level, but it is better to test whether the entire residual ACF is non-stationary, significantly different from white noise, and the Q statistic is recommended for this purpose:

$$Q = N \sum_{i=1}^{k} (ACF(i))^2$$

with df = k-p-q-P-Q. This statistic is distributed approximately the same as Chi-Square and therefore uses the Chi-Square table found in any basic statistical text to determine significance. If the overall ACF residual is significantly different from white noise, then the entire model must be rejected. On the other hand, a non-significant Q statistic would mean that the proposed model is stationary and the two or three significant spikes are the product of random fluctuations in the series. Although it is not mentioned by McCleary and Hay (1980), it is assumed that the significant spikes would have to be low correlations; otherwise, the Q statistic would achieve significance. Computation of the Q statistic requires that each individual residual ACF between lags-1 and -25 be squared and the sum of the squared correlations multiplied by the total observations in the series. Granger and Newbold (1977) recommend that a minimum of 20 lags be used in the computation process.

that a minimum of 20 lags be used in the computation process. McCleary and Hay (1980) feel that the use of 25 lags permits analysis of any seasonal variations that may occur at lags 12 and 24. Twenty-five lags are used here. The Q statistic was applied to the residual ACFs for alcohol-involved arrests:

$$Q = (72)\,(.1457)$$
$$= 10.4904$$
$$df = 25 - 1 - 0 - 0 - 0 - 0$$
$$= 24$$

After consulting a table of chi-square values, it can be determined that the criterion score at the .05 level is 36.415; therefore, we fail to reject the null hypothesis and consider the entire series stationary. When the result is non-significant, it can be concluded that the significant correlation is a random abberation and should not adversely effect intervention analysis.

The same ARIMA model development procedure was next used in developing the ARIMA model parameter estimates for alcohol-involved fatalities:

$$\phi_1 = -.3241 \text{ with a t statistic } = -2.79 \; (.01) \; (df = 52)$$

$$\phi_{12} = .3474 \text{ with a t statistic } = 3.05 \; (.01)$$

This model, expressed in model notation, is an ARIMA $(1,1,0)(1,0,0)_{12}$

This model also requires two sets of notation. Taken together, they

indicate that this is a second-order autoregressive model, differenced only once, with a seasonal component as part of the autoregressive component.

Similar to the arrest series, there was a significant correlation which resisted repeated attempts to suppress it. Each attempt disrupted either the other stable parameter estimates or the t-scores in the model summary. Perhaps it is best to consider an observation by Box and Jenkins (1976) when discussing the imperfect relationship between actual and theoretical autocorrelation functions. They state that "detailed adherence to the theoretical autocorrelation function cannot be expected in the estimated function."

The ideal ACF evidences no significant correlations, at least for the first N/4 lags, but preferably throughout the entire series. While virtually all authors on the subject agree that significant correlations in the first two lags or at identifiable "seasonal" lags (e.g. 6, 12, 18, 24, etc.) must not be ignored, there is no indication that single isolated correlations will disrupt the stability of the series. The test for stationarity in the fatality model is slightly different because the autoregressive component is second-order (p = 2):

$$-1 < \phi_2 < 1$$

$$\phi_1 + \phi_2 < 1$$

$$\phi_2 - \phi_1 < 1$$

and substituting the appropriate values, it can be concluded that the model for this series is stationary and can be used in the intervention analysis:

$$-1.0000 < .3474 < 1.0000$$

$$-0.3241 + 0.3474 < 1.0000$$

$$0.3474 - (-0.3241) < 1.0000$$

Becasue there is a significant spike at lag-5 (Appendix B, p.213), the Q statistic is applied to the residual ACF for alcohol-involved fatalities in order to evaluate overall stationarity. The result is:

$$Q = (68)(.4632)$$

$$= 31.3976$$

$$df = 25 - 1 - 0 - 0 - 1 - 0$$

$$= 23$$

Again, the criterion score (35.172) needed to reject the null hypothesis at the .05 level was lacking. This series can also be considered stationary. The conclusion here is that the significant lag in the series is simply a random aberration and not evidence of some systematic process in the series that will cause problems interpreting the intervention analysis.

Intervention Analysis

In this part of the study the objective is to determine whether there has been a significant change in either alcohol-involved

fatalities or arrests as a result of a change in a state's drunk driving law. Both measures are direct, therefore, the problems associated with surrogate measures are absent. In the Michigan portion of this study it is also hypothesized that the probability of being arrested for drunk driving increased following the change in the law, and that this increased chance of apprehension would eventually reduce the number of drunk drivers on the highways. Furthermore, a reduction in the absolute number of actual drunk drivers would be expected to cause a reduction in alcohol-involved fatalities. National data show, for example, that alcohol is involved in over half of all motor vehicle fatalities. Therefore, if fewer drivers operate their vehicles while intoxicated, there should to be a reduction in the probability of encountering a drunk driver on the highway.

McCleary and Hay (1980) indicate that an intervention is best hypothesized as a binary condition: "0" equals pre-intervention status and "1" represents the introduction of the intervention. They also discuss the possibility of gradual implementation and/or impact, as well as immediate impact, with eventual return to pre-intervention levels. The BMDP (1983) version of the Box-Jenkins technique provides the ability to evaluate the impact of a specified intervention from several varying perspectives. In the present study, the most logical are (a) immediate total implementation with a gradual impact over time; and (b) gradual implementation and gradual impact.

Under the simplest set of conditions, program <u>and</u> impact would

take effect totally at the very moment of intervention. This is analogous to a well-functioning light switch: "Off" is the pre-intervention ("0") condition and "On" represents the post-intervention ("1"). The light is completely on or off immediately upon movement of the switch. This has also been referred to as a "zero-order" intervention (McCleary and Hay, 1980). That intervention, which takes effect completely at the point of introduction but evidences impact gradually over time, probably best characterizes the hypothesized implementation of new laws. In the present study, Michigan changed its drunk driving law on April 1, 1983. Because drunk driving has been illegal since the late 1930's, it could be argued that this is not really a zero-order intervention, but the further enhancement of an existing prohibition. Such analysis is beyond the scope of the present study, but does impact how the results will be interpreted.

On the assumption that this most recent change is significantly different from prior changes in the law, impact (reduction in alcohol-involved fatalities) is also being hypothesized as gradual or first-order from the date of the most recent change (April 1, 1983). In the case of fatalities, for example, it is hypothesized that deterrence requires increased visible evidence (arrests) which, in turn, creates a credible threat and thus reduces the likelihood of drinking and driving. Alcohol-related arrests provide a measure of whether law enforcement reacted to the enhancement of penalties under the new law by making significantly more arrests on and after April 1, 1983. An immediate increase in arrests would mean that the

impact was zero-order. A gradual change over time signals a first-order intervention model. If there is a significant increase in arrests but no accompanying change in the frequency of alcohol-involved fatalities --expected to be a decrease -- it may be justifiably concluded that the increase in arrests was ineffective at reducing fatalities.

McCleary and Hay (1980) indicate that if there are no substantive issues involved, then the selection of one impact model over another, assuming significant t-scores, should be based on whichever evidences the lowest residual mean square (RMS). By "substantive issues" they appear to suggest that the researcher should be able to determine that the statistical results make intuitive sense. For example, if the model with the lowest RMS hypothesizes a result that is entirely beyond belief, then the researcher should go to the next most promising intervention model.

For Michigan the intervention analysis was initially hypothesized as a zero-order implementation, with a first-order impact for both arrests and fatalities. It makes intuitive sense to conceive of the process as a delayed reaction. In other words, while it is true that at midnight on March 31, 1983, the new law would be fully operational one minute later, it is equally true that all drunk drivers would not be immediately apprehended, much less promptly prosecuted. The fact that there continue to be alcohol-involved fatalities following implementation suggests empirically that the law did not function as a perfect deterrent. Deterrence theory would further suggest that the passage of time, coupled with actual

evidence of increased enforcement effort, would eventually reduce alcohol -involved fatalities. A first-order transfer function -- or gradual impact model -- is required.

While visually it appears that there was a significant increase in alcohol-involved arrests and no apparent change in alcohol-involved fatalities after the new law became effective, it requires statistical analysis to determine whether this is accurate. Using the ARIMA models developed above, the hypothesis that there would be immediate implementation with gradual impact was evaluated for both data series:

Alcohol-involved Arrests

ϕ_1 = -.3431 with t statistic = - 2.71 (.01) (df = 55)

ω_0 = - 270.2891 with t statistic = - 0.80 (n.s.)

δ_1 = 1.0013 with t statistic = - 10.32 (.001)

Alcohol-involved Fatalities

ϕ_1 = - .3026 with t statistic = - 2.52 (.02) (df = 50)

ϕ_{12} = .3512 with t statistic = 3.03 (.01)

ω_0 = 14.7912 with t statistic = 1.12 (n.s.)

δ_1 = - .4659 with t statistic = - 0.73 (n.s.)

The non-significant result for alcohol-involved fatalities is consistent with visual analysis of Michigan's raw time series (see

Appendix B, p 211). Applying the same hypothesis to alcohol-involved arrests. Visually there was a significant impact. But the statistical analysis of an immediate implementation with gradual impact was not sifnificant. One of the parameter estimates violates the rule of stationarity for immediate impact and therefore could not be used. When the intervention was hypothesized as gradual implementation and gradual impact a statistically significant effect was found. There was apparently a delayed impact in the increase of arrests. Looking at the raw time-series data in Appendix B, (p.216) it is apparent that approximately four months passed before an obvious increase in arrests occurred. Hypothesizing that there was gradual implementation <u>and</u> gradual impact is consistent with the significant visual impact. The parameter estimates confirm the hypothesis that alcohol-involved arrests increased significantly but in delayed fashion after the change in the law:

ϕ_1 = -.4854 with t statistic = - 4.16 (.001) (df = 54)

ω_0 = 592.1175 with t statistic = 3.11 (.01)

δ_1 = .8083 with t statistic = 7.96 (.001)

Because both of the parameter estimates are significant, it is possible to compute the asymptotic or immediate, as well as gradual, change in alcohol-involved arrests after the implementation of the law:

$$\text{Asymptotic change} = \frac{\omega_0}{1 - \delta_1} = \frac{592.12}{1 - .8083}$$

$$= 3088.9 \text{ additional alcohol-involved arrests}$$

Using the gradual change model it is also possible to estimate the cumulative change for the first five months following the change in the law:

$$= \omega_0 \left(1 + \delta_1 + \delta_1^2 + \delta_1^3 + \delta_1^4 + \delta_1^5 \right)$$

$$= 592.12 \, (1 + .8083 + .6533 + .5281 + .4269 + .3450)$$

$$= 2226.6 \text{ additional alcohol-involved arrests}$$

By the asymptotic process there was an immediate increase of 3,088 arrests; however, the impact is realized gradually as seen through the use of the second model where 72% (2,226) of the increase occurs in the first five months following implementation. Both models demonstrate a significant increase in alcohol-involved arrests and there is visual confirmation (see Appendix B, p.216). It is also noteworthy that the real increases did not begin to appear until several months after implementation. The series does begin to drop back down but appears unlikely ever to return to its pre-intervention level.

On the possibility that alcohol-involved fatalities may have behaved the same way, with both gradual implementation and impact, the following parameter estimates were made:

ϕ_1 = - .3714 with a t-statistic = - 3.21 (.001) (df = 49)

ϕ_{12} = .3480 with a t-statistic = 2.92 (.01)

ω_0 = .1712 with a t-statistic = 0.16 (n.s.)

δ_1 = 1.2713 with a t-statistic = 2.19 (.05)

Unfortunately, the significant parameter estimate fails to meet the stationarity test:

$$-1.0000 < 1.2713 < 1.0000$$

McCleary and Hay (1980) indicate that the asymptotic and gradual change statistics should be calculated and then compared. This permits the researcher to assess which of the results is most likely to be correct. Calculations from the raw data show that there were actually 1700 additional arrests between April and August 1983. The asymptotic estimate is 3,088 and the gradual change estimate is 2,226. The latter estimate would appear to be additional confirmation that the new law did indeed behave as hypothesized, with gradual implementation and gradual impact. The number derived from the asymptotic estimate is simply too high to be realistic.

Results Summary for States

Having developed the Michigan model and explained the process, there is no need to repeat the exercise with each of the remaining states. The following is a brief synopsis of the results of the

intervention analysis performed for each state. The complete parameter estimates for each state appear in Appendix D. References to "prior laws" or "previous statutes" are based on the NHSTA study.

Alaska

In October 1978, Alaska instituted mandatory sentencing for all convicted drunk drivers. This change became effective three months prior to the beginning date of the series in the present study. With the available data only, there is no reliable way of determining what impact this earlier change may have had on the subsequent series. It is safe to assume that some effect was introduced into the series. The state legislature, in September 1982, further strengthened the 1978 law, and this intervention is evaluated in this study. The only visible change appears to be a sharp increase in the number of alcohol-involved fatalities during the summer months (see Appendix D, p.221). The parameter estimates are non-significant, thereby establishing that there was neither a significant immediate, nor a gradual, impact following the implementation of the law.

Arizona

As the visual analysis shows in Appendix D (p.226) alcohol-involved fatalities showed a visible reduction immediately following the July 1982 changes in Arizona's drunk driving laws. Prior to the intervention the series was already slowly, but visibly, declining

and within five months after the change began to increase. After the intervention, fatalities peaked higher than any of the three preceding years and this may have been partly responsible for the lack of statistically significant post-intervention impact.

California

In January 1982, according to the NHSTA study, California significantly enhanced drunk driving penalties. Visual analysis shows a distinct change in the overall character of the series in the post-intervention phase. Compared to other states, the ARIMA model for California is one of the most parsimonious, requiring only two differencings before stabilizing into white noise. ARIMA intervention analysis indicates the law had a significant effect in reducing alcohol-involved fatalities and under the hypothesized condition of a gradual implementation and gradual impact, both parameter estimates are statistically significant. Using the gradual impact formula, there appears to have been a decline of 232 alcohol-involved fatalities in the first five months following the intervention. In a state the size of California, this may not be considered a significant reduction in absolute numbers; however, it does represent almost 11% of the alcohol-involved fatalities in the twelve month period following the intervention (see Table 3, supra).

Iowa

A number of changes were made to Iowa's drunk-driving laws

in July 1982. Despite the legislative effort, there was no significant change in the incidence of alcohol-involved fatalities. It is possible that the occasional high monthly frequencies, referred to as "outliers" and evident in January and February 1982 as well as July 1983 (see Appendix D, p.236) altered the series. This seems unlikely inasmuch as the entire series, excluding those two months, appears remarkably stable and consistent over time.

Louisiana

Stricter penalties were part of the January 1982 law change in Louisiana. Visual analysis confirms that the trend in numbers of alcohol-involved fatalities decreased (see Appendix D, p.241). As distinctly different as the post-intervention series appears, there was no statistically significant impact. The stability of the change could be better evaluated by adding 1984 data to the series and thus providing a more extensive post-intervention base.

Massachusetts

During the time period under study, Massachusetts made changes to its laws effective September, 1982. Visually, it is apparent that alcohol-involved fatalities have been declining steadily since late 1980 and have stabilized at a rate substantially lower than 1979 and 1980 (see Appendix D, p.246). Statistically the change was non-significant.

Missouri

Missouri, in August, 1982, also enhanced its penalty structure. However, this does not appear to have reduced the likelihood of an alcohol-involved fatality. The ARIMA model for Missouri was the most parsimonious of all states because it was white noise without any differencing at all (see Appendix B, p.252). This means that if there were an impact from the law, it should have been detected statistically. There was no significant impact.

Montana

In October 1981, Montana modified its drunk driving legislation to include mandatory minimum sentences. Similar to Missouri and California, Montana has a simple ARIMA model (see Appendix B, p.257), requiring only a single differencing. Although there is a visual decline in alcohol-involved fatalities (see Appendix B, p.255), the change is non-significant. Within four months of the intervention, alcohol-involved fatalities reached their lowest point during the entire series. Thereafter, the frequency returned to pre-intervention levels, even exceeding them in mid-1983. There was no statistically significant impact.

Nebraska

Nebraska, in July 1982, instituted mandatory minimum sentences and increased its fines to reduce alcohol-involved fatalities. While the series did develop a different post-intervention pattern

toward the end of 1982, it appeared visually to return to pre-intervention status by the end of 1983 (see Appendix B, p.260). The impact parameter estimates were not statistically significant for both intervention hypotheses, (see Appendix B, p. 263-264), even though visually there appeared to be a change.

Nevada

Another state instituting mandatory minimum sentencing was Nevada in July, 1982. Aside from the December, 1983 low, the post-intervention pattern does not appear to have been altered appreciably from pre-intervention levels (see Appendix B, p.265). This is supported by the absence of significant or stable parameter estimates.

New Mexico

New Mexico provides one of the longest post-intervention series and, therefore, there is little pre-intervention material to analyze. For example, there may have been significant fluctuations in 1977 or 1978, prior to the period under study. There is a slight downward trend throughout 1980, and, therefore extremely low fatality rates for February in each of three consecutive years -- 1981, 1982, and 1983 (see Appendix B, p.270). It would appear that the downward trend began in 1980, following the change in the law and leveled out in 1983. Statistically, there was no impact generated by the change in the law.

South Dakota

South Dakota revised its drunk driving laws in July 1982. Visual analysis suggests that something happened to the series in late 1981 because the entire series appears to "drop" noticeably when compared to the pre-intervention series (see Appendix B, p.278). There is a visual reduction in alcohol-involved fatalities following the intervention. The impact parameter estimates were not statistically significant.

A statewide program involving increased enforcement and public awareness was in effect during the summer and fall of 1981. According to a report released by the Governor's office, time-series analysis was to assess the impact and there was a 75% increase in drunk driving arrests and a 27% decrease in alcohol-involved fatal and injury accidents. The actual impact on alcohol-involved fatalities alone is obscured by being aggregated with alcohol-involved injury data. For example, South Dakota averages approximately eight alcohol-involved fatalities per month according to Table 1. When compared to an overall average of 100 alcohol-involved fatalities and injuries per month, it is apparent that such aggregated data obscures the impact on fatalities. In the Governor's report itself, the visual time-series for arrests behaves almost identically to Michigan's arrest data. Unfortunately, the report did little with the arrest data and presented it only in frequency form.

Washington

The last of the intervention states, Washington, changed its law in January 1980 and enacted stricter penalties and mandatory minimum sentences. As was the case in New Mexico, there is little pre-intervention information, and this paucity of data makes conclusions about the post-intervention series questionable. Visually the series has been in a steady decline since late 1980. Statistically the law had no effect (see Appendix B, p.285).

Oregon and Texas

Oregon and Texas are presented for comparison purposes and as control states. In the case of Oregon, there does not appear to be anything in the raw time-series (see Appendix B, p.275) to distinguish it from any of the intervention states. The only unusal charateristic is the January 1983 data point and the fact that the trend becomes obviously flatter for the balance of 1983. Texas presents nothing unusual in its raw time-series (see Appendix B, p.283) other than a general increase in alcohol-involved fatalities from 1979 until late-1982. Absent the intervention points in the other states, there is very little to distinguish one state from the other.

Discussion

The fourteen states just discussed represent 27% of all the states, including the District of Columbia, and account for 29% of

all licensed drivers and 28% of all traffic fatalities in 1982. Furthermore, most of the major regions of the United States are represented: (1) Northeast (Massachusetts); (2) South (Louisiana and Missouri); (3) Midwest (Michigan, Iowa, and Nebraska); (4) Southwest (Arizona, Nevada, and New Mexico); (5) West (California, Washington, South Dakota, and Montana); and (6) Non-continental (Alaska). Such representation would argue strongly against any bias created by the absence of regional representation.

The fact that there were varying intervention points for different states during the overall time-series is important too. This permits some control over the effect of pre- and post-intervention trends. But it also reduces the value of comparing states with identical intervention dates Where pre-intervention is extremely brief (e.g., New Mexico), it is difficult to know what the pre-intervention series looked like and what effect this may have had on the post-intervention series. But a lengthy post-intervention series in some states allows analysis of delayed impact that is otherwise be unavailable in those states where, instead, the pre-intervention series is lengthy.

Summary

With only one state, California, registering a statistically significant post-intervention impact on fatalities, it must be concluded that anti-drunk driving laws have very little impact on reducing alcohol-involved traffic fatalities at the statewide level.

CHAPTER V

MICRO-LEVEL ANALYSIS AND IMPLEMENTATION SURVEY

Introduction

Sometimes aggregated data can hide extremes. In this case the author considered that the data which showed no impact on Michigan fatalities might, when dissaggregated, reveal some impact. Two alternative explanations worth considering are (a) variable impact by geographic region and (b) the way in which the law is implemented at the local level. To test the first possibility, Michigan data were aggregated by county into four distinct population groups. The Bureau of the Census' Detroit Standard Metropolitan Statistical Area (SMSA), which includes Wayne, Oakland and five other heavily populated counties, made up the first grouping. Three other groups were also created: Upper Peninsula, outstate SMSA, and rural/urban. The same process of ARIMA model development and intervention analysis that was discussed in detail in Chapter IV, was accomplished for each of these areas.

In the second case, a survey (see Appendix F) was used to determine what, if anything, criminal justice officials had done to implement the new law. The survey results served two purposes. Responses to the first eleven questions are discussed in terms of current implementation models. Question 12 asked respondents to indicate whether the new law had reduced alcohol-involved fatalities in their jurisdiction. On the theory that respondents might be

correct, and thus reveal those jurisdictions where the law had had a significant impact, a group of counties was re-aggregated on the basis of positive responses to this impact question. The resulting time-series was also tested using the ARIMA process and intervention analysis.

There are three other questions on the survey. Two are used to explore the applicability of an implementation model referred to as reciprocal interdenpendence. The last question was open ended and requested that respondents list, in their own words, each step of their own implementation process. Results from this question are discussed in terms of relating agencies that perceived an impact and actually engaged in identifiable implementation activities.

Aggregation by Population

Michigan is a large and diverse state. From the previous chapter it is known that there was no significant statewide impact. However, it is possible that there may have been localized impact at the county level. To test this theory, alcohol-involved fatality data were collected for each of the 83 counties and aggregated into four multi-county areas. Comparing counties individually might have been statistically unreliable and misleading. For example, small changes in the absolute number of fatalities could have resulted in a misleading statistical conclusion. For example, a decrease in fatalities from 4 to 2 would be interpreted as a 50% decline, while an opposite increase would suggest a 200% rise. Many areas of the state have few, if any, alcohol-involved fatalities -- sometimes

for many consecutive months. Only the larger metropolitan counties (Wayne, Oakland, and Kent, for example) experienced enough alcohol-involved fatalities to completely avoid empty cells. Each of the areas and the counties included therein are listed in Appendix C. The first grouping, SMSA-1, is based on the 1980 Bureau of the Census designation of seven counties, all in the southeastern corner of the state, as the Detroit Standard Metropolitan Statistical Area (SMSA). The second group, SMSA-2, represents sixteen outstate urban counties. Upper Penninsula (U.P.) counties are grouped separately because of their geographical isolation. The last category, RURAL/LP, is composed of the counties in the upper half of the lower penninsula, as well as several largely rural counties on the Ohio and Indiana border.

Table 4 displays the total actual alcohol-involved fatalities, by year, for each geographical grouping of counties and the proportion each contributes to the state total. As alcohol-involved fatalities have declined between 1979 and 1983 (-29%), the proportion within each category has remained somewhat stable. The proportion of population and alcohol-involved fatalities appear to be related, though not perfectly proportionate. For example, SMSA-1 contains one-half of the state's population, and accounts for 40% of the alcohol-involved fatalities. The Upper Peninsula has 3% of the state's population in its 15 counties but represented only 8% of all alcohol-involved fatalities in 1983.

Monthly arrest data, by county, were not reliably collected by the Michigan State Police until 1982; therefore, it is not possible

to accomplish ARIMA intervention analysis for alcohol-involved arrests on a state-wide basis.

Table 4

Comparison of Alcohol-Involved Fatalities, in Michigan, by Multi-County Grouping, 1979 - 1983.

	1979	1980	1981	1982	1983
SMSA-1	342	358	330	289	252
percent	(38%)	(40%)	(40%)	(41%)	(40%)
SMSA-2	273	258	218	200	180
percent	(30%)	(27%)	(27%)	(28%)	(28%)
U.P.	44	40	45	37	30
percent	(5%)	(4%)	(6%)	(5%)	(8%)
RURAL/LP	242	244	222	185	174
percent	(27%)	(27%)	(27%)	(26%)	(27%)
TOTAL	901	900	815	711	636

Table 5 provides fairly persuasive evidence that the post-intervention change in arrest rates was equally substantial for all four geographical groupings, with an average increase of just over 30%. The decrease in alcohol-involved fatalities in the Upper Peninsula, while not substantial in terms of absolute numbers, is

Table 5

Changes in Alcohol-Involved Arrests and Fatalities, by Multi-County gGouping, Before and After the Intervention, 1979-1983

	12 months BEFORE	12 months AFTER	Percent Change
SMSA-1			
Arrests	26,030	35,286	+ 35.6 %
Fatalities	284	254	- 10.6 %
SMSA-2			
Arrests	15,979	20,906	+ 30.8 %
Fatalities	197	189	- 4.0 %
U.P.			
Arrests	1,676	2,187	+ 30.5 %
Fatalities	40	27	- 32.7 %
RURAL/LP			
Arrests	10,907	13,867	+ 27.1 %
Fatalities	197	163	- 17.3 %
OVERALL			
Arrests	54,592	72,246	+ 32.3 %
Fatalities	718	633	- 12.0 %

a rather impressive decrease of 37%, but in absolute terms this represents only 13 fewer fatalities. When the analysis is statewide, such a significant decrease may be masked by the more conservative changes in other areas. The largest population areas evidenced the lowest overall decrease following the intervention. The significant increase in arrests statewide is reflected equally in each geographical sub-area, with the greatest increase occurring in the area of highest population density.

Intervention Analysis

The same basic steps in the development of an ARIMA model were performed on the aggregated county data. The first stage was accomplished through estimation of a preliminary model by visual inspection of the undifferenced (raw) series (see Appendix D, p.293). Parameter estimates were developed through visual inspection of the undifferenced ACF (see Appendix D, p.294) until a "best fit" evolved. The final parameter estimates need not be perfect, but must meet certain statistical requirements. These initial parameter estimates, referred to as "white noise" models, are fully presented in Appendix D, p.295).

Finally, the type of hypothesized intervention must be tested. The first step involves looking at the plotted raw series and developing an impression of what happened in the post-intervention phase. For each of the four data sets analyzed here, the raw series figures are presented in Appendix D. The vertical line in 1983 identifies the April 1, 1983 intervention. From such visual

inspection, the intervention and its impact may be hypothesized. The intervention itself might be hypothesized as immediate -- meaning that the intervention was in full force on the first day of the post-intervention phase, or gradual -- meaning it was introduced gradually overtime until eventually reaching full strength. Each of the four aggregated models was tested for this type of intervention effects.

Results

For alcohol-involved fatalities, none of the four aggregated ARIMA models matched the statewide model precisely. The overall statewide model is an ARIMA $(1,1,0)(1,0,0)_{12}$, or, first-order autoregressive model with an annual seasonal component, requiring a single differencing. Three of the aggregated county models turned out to be autoregressive models but they were slightly more complicated. The SMSA-1 model is an ARIMA (2,2,0), or, second-order autoregressive, requiring two differencings. Both the autoregressive and differencing components required a factor of "3". This suggests perhaps a quarterly trend in the series. The SMSA-2 model is virtually identical to that developed for SMSA-1 with the exception that an additional seasonal autoregressive factor is necessary, thus making it an ARIMA $(1,2,0)(1,0,0)_6$. This model possesses an auto-autoregressive seasonal trend. Visual inspection of the plotted series (see Appendix D, p.298) appears to verify this difference between the two series. For example, there are frequently multiple peaks for each year in the SMSA-1 series. This is not the case for

for SMSA-2, where there is generally only a single identifiable peak. The remaining lower peninsula counties, RURAL/LP, also fit the ARIMA $(1,2,0)(1,0,0)_6$ model with the seasonal autoregressive component. In this case the six month peak is readily identifiable in the plotted series. This peak may be the result of increased tourist traffic during summer months of July and August, followed by the usual end-of-year drop. RURAL/LP is comprised mostly of those lower peninsula counties north of a line from Muskegon to Bay counties.

The anomalous model is that developed for the Upper Peninsula (U.P.) which turned out to be a second order moving average model ARIMA (0,0,2), suggesting that the trend in this area is different from the rest of the state with respect to alcohol-involved fatalities. A moving average model is generally associated with a strong seasonal trend. It is not known why the seasonal trend in SMSA-2 and RURAL/LP were not moving average models. One possibility is that the seasonal trend in the Upper Peninsula were much stronger than in the lower peninsula. Visual inspection of the raw time series (see Appendix D, p 308) reveals that the winter months -- when travel conditions may range from undesirable to impossible -- have the lowest number of alcohol-involved fatalities. The influence of severe weather would appear strongest in the upper peninsula as opposed to other parts of the state.

In the final step, intervention analysis was performed on each of the aggregated series. The two hypothesized intervention strategies were the same used at the statewide level: (1) Immediate

implementation with gradual impact and (2) gradual implementation with gradual impact. Under the first condition, the law is considered totally and completely implemented on the first day of the post-intervention phase (e.g., April 1, 1983) and will have a gradual impact as time passes. Under the second condition, it is assumed that although the law is completely in effect on the first day, there will be a delay in implementation. By definition, then, there will be a gradual impact.

Of the four geographical divisions, the intervention analysis was non-significant in SMSA-2, U.P., and RURAL/LP. In the Detroit area (SMSA-1) there was a significant decrease in alcohol-involved fatalities. These seven counties contribute approximately 40% of all alcohol-involved fatalities statewide. In the raw time-series (see Appendix D, p 293) there is a visually obvious change in the overall trend following the intervention. Whereas there were extremely high months in many of the years prior to the intervention, there are none following April 1, 1983. The intervention parameters are as follows:

ϕ_1 = -.4803 with t statistic = -4.57 ($p = < .001$)
ϕ_3 = -.6573 with t statistic = -8.45 ($p = < .001$)
ω_0 = 10.3530 with t statistic = 1.91 ($p = < .05$)
δ_1 = -.8661 with t statistic = -5.77 ($p = < .001$)

The actual reduction in alcohol-involved fatalities can be calculated using the gradual impact model:

$$= \omega_0 (1+ \delta_1 + \delta_1^2 + \delta_1^3 + \delta_1^4 + \delta_1^5)$$

and substituting the appropriate values:

$$= 10.35\ (1+ 2.36)$$

$$= 34.74 \quad \text{fewer alcohol-invovled fatalities}$$

According to Table 5, there were 254 alcohol-involved fatalities during the twelve month period following the intervention. If annualized for a twelve month period, the above five month reduction of 35 alcohol-involved fatalities translates into 60 for twelve months, or 24%.

The SMSA-2 area displays a post-intervention series that is virtually identical to the pre-intervention series, at least as far back as the end of 1981 (see Appendix D, p 298). It would also appear that the series has stabilized after being in a fairly steady state of decline since 1980. But no significant decline is indicated after the intervention. While the extreme peaks evident in the pre-intervention series for RURAL/LP are substantially attenuated in the post-intervention series, the change was not sufficient to achieve statistical significance. Similar to RURAL/LP, the extreme months in the U.P series have been flattened by the intervention. This effect, while not significant, is worthy of note. Perhaps the law has lowered some of the traditionally higher months and, while this does not register as statistically significant, it does change the overall character of the time series.

Implementation Survey

Introduction

A survey instrument was used to evaluate how the law was implemented locally. After a detailed analysis of the survey findings, the results are applied to the county level grouping of fatality data in an attempt to determine if there is any relationship between how the law was implemented and whether there was a significant decline in alcohol fatalities.

There are three major steps in the anti-drunk driving process: (1) detection and arrest; (2) charging and prosecution; and (3) determination of guilt and sentencing. These steps can be consolidated and renamed as enforcement, prosecution, and adjudication. The actors who engage in these three activities are sheriffs and police, prosecuting attorneys, and judges, respectively. Any attempt to evaluate how the criminal justice system deals with a particular offense or offender requires the representation of each group at each step in the process. Each part of the criminal justice system is involved in some phase of implementing drunk driving legislation. Law enforcement detects and apprehends. Prosecutors must decide whether formally to charge those persons arrested by law enforcement and be prepared to prove that charge before the bar of justice. Courts must impose a sentence which will prevent deter the apprehended defendant from commission of additional offences.

Methods

To understand the perceptions of each group of actors involved in the implementation of this law, a questionnaire (Appendix F) was developed to specifically evaluate how criminal justice agencies implemented the new drunk driving law. Implementation can be viewed from several perspectives. Two are directly involved here. First, there is the traditional single-agency approach (Edwards, 1980) which identifies the crucial factors of communication, allocation of resources, authority, and dispostion. The other implementation model used here is referred to as reciprocal interdependence (O'Toole and Montjoy, 1984) and directs attention at interagency activities that promote cooperative implementation efforts. The survey questions were designed to elicit information from respondents that would correspond with the major factors in each of the two models.

In the case of Edwards' model, questions addressed the areas of communications, resources, disposition, and bureaucracy. There is some overlap in the factors and this will be discussed later. For the reciprocal-interdependence model, respondents were asked to rank-order criminal justice agencies, for example, police and courts, which most aided or hindered successful implementation. On the assumption that there might be other important influences not specifically associated with agencies, respondents were also asked to rank-order factors, for example, the law itself or public attitudes toward alcohol, which aided or hindered implementation of the law. Respondents were also asked to estimate how effective the law

had been in reducing alcohol-involved fatalities in their jurisdiction. The responses to this question permitted identification of those agencies where an actual impact was perceived. Time-series analysis was used to verify whether respondents were correct in their estimation. Finally, an open-ended question was included and required respondents to list, chronologically, individual steps that they took to implement the law.

Due to the relatively small number of subjects in each group, it was possible to send a questionnaire to all Michigan Sheriffs (N = 83), Prosecuting Attorneys (N = 83), District Court Chief Judges (N = 108), and the Chief of Police for the major city in each county (N = 74). A total of 348 questionnaires were mailed along with cover letter (Appendix E, p 314) stating the reason for the study, guaranteeing confidentiality, and explaining how non-respondents would be contacted in the follow-up phase. After it appeared that the first return had peaked, a follow-up letter (Appendix E, p 315) was sent to all non-respondents.

All subjects were asked an initial qualifying question as to whether they were in their present position on April 1, 1983, when the new law took effect. It is reasonable to assume that the person in charge of an organization would be responsible for initiating, or be involved in, most implementation activities within their own organization. Furthermore, they would be the logical contact for other agency representatives. If they were not in the top position on April 1, 1983, they were asked to return the questionnaire uncompleted. This technique ensured that the person who

naire uncompleted. This technique ensured that the person who actually completed the survey would have an personal recollection of what happened in his or her agency with respect to implementation of the new law and would not have to rely on the memory of others. While this method did not appear to substantially decrease the number of respondents in three of the groups, a relatively lower proportion of judges completed the questionnaire, as shown in Table 6.

The problem with the judicial response rate was probably created in part by the requirement that the Chief Judge in April 1983 must still have been the Chief Judge in April 1985 -- when the survey was mailed. As directed by the Michigan Supreme Court, the judges of each individual District Court shall elect one of their own to serve as Chief Judge for a two-year term. The election must take place in November of each odd-numbered year. Therefore, such elections took place eight months after the new drunk driving law took effect, and the survey arrived eight months before the next election. This could have had an impact if there was a substantial turnoverin chief judges, but the extent to which this is a factor is unknown. As can be seen, the overall response rate was a respectable 82%, and 68% included usable responses.

Table 7 presents each of the first eleven questions and the corresponding implementation concept as developed by Edwards (1980). Under Edwards' model, the first factor is communication (COM). Those responsible for implementation of a policy must first know about the policy and, second, know what they are supposed to do.

Questions 1 and 2 speak initially to this factor by asking respondents to evaluate the volume and clarity of information which they received.

Table 6

Percentage Breakdown of Michigan Criminal Justice System Implementation Surveys Returned and Completed, 1983.

	Total Mailed	Returned		Completed	
		Total	Percent	Total	Percent
POLICE	83	71	86%	56	79%
SHERIFFS	74	64	86%	47	73%
JUDGES	108	88	81%	40	45%
PROSECUTORS	83	64	77%	51	80%
TOTAL	348	287	82%	194	68%

Question 4 is a communication question which asks whether respondents perceived a requirement for additional training. If so, such a requirement may have resulted from material communicated to them. Question 11 is also communication oriented -- but on a local level. Here, respondents are asked to estimate the frequency with which local implementers -- including themselves -- gathered to discuss implementation of the new law. Question 8 also attempts to measure local level communication between justice agencies. While

question 11 addresses the matter quantitatively by asking how often agency representatives met, question 8 looks at the qualitative side and asks how well agencies coordinated their efforts. This is a communication question in that coordination requires communication.

There are five questions which address resources (RES). Edwards argues that no matter how clearly the requirements of the policy are communicated, implementers will be unable to accomplish the policymakers' goals without the required resources. An assumption not pursued here is that additional resources would actually be needed to implement the new law - it is possible that most agencies simply incorporate additional duties into the existing budget framework. Question 3 deals with authority as a resource. A high score (e.g., "much additional authority") would suggest that the respondent feels the new law has indeed created additional resources to combat drunk driving. Questions 6 and 7 deal with the expenditure of resources before and after the new law became effective. If the law did require that additional personnel time, for example, be invested to accomplish implementation, then more resources would certainly be needed. The more traditional resource questions are numbers 9 and 10. Respondents were asked to estimate the percentage budget increase needed to implement the new law and then to indicate the actual budget increase they received. An underlying assumption is that respondents actually requested the increase that they estimated in question 9. There is no way of knowing the answer. The magnitude of the discrepancy between these questions might serve as a fairly reliable indicator of whether additional

TABLE 7

Question and Matching Factor(s) From Edwards' Implementation Model as Applied to the Michigan Criminal Justice System, 1983

	FACTOR (1)			
	COM	RES	DIS	BUR
1. Prior to April 1, 1983, approxi-imately frequently did you receive information about the new OUIL law?	X			
2. How clearly were the requirements of the new law communicated to you?	X			
3. How much additional authority does the new OUIL law provide to you for dealing effectively with drunk drivers?		X		
4. To what extent did you believe the new OUIL law required additional training of your personnel to insure successful implementation?	X			
5. To what extent was training actually provided prior to implementation?			X	
6. Some OUIL cases are handled by routine procedures. Others require extra processing. BEFORE implementation of the new OUIL law, what percentage of drunk driving cases would you estimate required additional processing?		X		X
7. AFTER implementation of the new OUIL law, what percentage of drunk driving cases would you estimate required additional processing?		X		X
8. In your geographical area, how well do other agencies in the criminal justice system coordinate the handling of drunk driving cases with your agency under the new OUIL law?	X		X	

Table 7 - continued

	FACTOR(1)			
	COM	RES	DIS	BUR
9. By what percentage should your operating budget have increased to effectively implement the new OUIL law?		X		
10. In reality, by what percentage did your operating budget increase to implement the new law?		X		
11. Within your jurisdiction, meetings to discuss implementation of the new OUIL law were held:	X		X	

(1) COM = Communication; RES = Resources; DIS = Disposition; BUR = Bureaucracy

might serve as a fairly reliable indicator of whether additional resources were actually required by agencies to accomplish implementation. This also assumes that existing resources were somehow unequal to the new task and, furthermore, that the implementors were aware of the discrepancy a priori.

The third component of this model is disposition (DIS) and, according to Edwards', even if implementors know what they are supposed to do, how to do it, and have adequate resources to see it through, nothing will be accomplished if those responsible have little desire to carry out the implementation. Question 5 addresses disposition by asking the extent to which training was actually

provided. This rests on the idea that because nonmandatory training was available from various legitimate sources (e.g., Michigan State Police, Prosecuting Attorneys' Association of Michigan, and the Michigan Sheriffs' Association), officials favorably disposed toward implementing the new law would probably avail themselves of the training opportunity. In question 8, an above average response would suggest a preference for coordination between agencies, which would indicate a favorable disposition toward implementation of the new law. Finally, if respondents indicated the occurrence of an above average number of meetings to discuss implementation, this would also suggest support for the new law. Isolation and nonparticipation are considered consistent with a lack of support for the law or at least indicate a feeling that the law will not reduce the problem.

The final component in implementation is bureaucratic structure (BUR). Of the four components in Edwards' model, this is the most difficult to evaluate, although it is important in explaining implementation with in the criminal justice system. Questions 6 and 7 measure the change in "SOPs" (standard operating procedures) required to process drunk drivers under the requirements of the old and new law. To the extent that there is a significant before/after difference, then it may be argued that the new law has forced implementing agencies to alter existing procedures and this, of course, is not always welcome.

Results

Each question was originally scored along a continuum divided into increments of .2 (0.0, 0.2, 0.4, ... 9.4, 9.6, 9.8, 10.0), but this resulted in too many empty cells in the crosstabulation. Since it was crucial to crosstabulate by the four types of respondents, scores were reaggregated to avoid statistical error. Specifically, scores were put into groups of below average, average, and above average to avoid violating one of the major conditions of chi-square analysis that requires there be no fewer than five expected cases per cell. Correlation matrices were computed using raw, unaggregated scores, however.

Questions 1,2,4,8,11, presented in Table 8 are the communication questions. In question 1 there is the issue of how often did pertinent material find its way to the implementors. Of equal importance is how clear and understandable the received material was. While there was not an extremely high volume of material (29% indicated above average), the material appears to have explained clearly the requirements of the new law (64% scored clarity above average). There were no significant differences between groups of respondents (Sheriffs, Police Chiefs, Prosecutors, and Judges) on either question 1 χ^2(df=6, N=194)= 6.16712, n.s. or question 2 (df=6, N=194)= 3.73894, n.s.).

Question 4 also deals with the clarity of the new law and material related to training. A relatively high proportion (48%) scored below average in perceiving that additional training was

Table 8

Implementation Questions Grouped Under
Implementation Factor Communication

1. Prior to April 1, 1983, approximately how frequently did you receive information about the requirements of the new OUIL law?

Never .... More Than Ten Times

	below average	average	above average
Police	31	10	15
Sheriff	30	8	9
Judge	19	6	15
Prosecutor	22	11	18
TOTAL	102 (53%)	35 (18%)	57 (29%)

2. How clearly were the requirements of the new OUIL law communicated to you?

Not At All .... Very Clearly

	below average	average	above average
Police	12	10	34
Sheriff	12	8	27
Judge	5	5	30
Prosecutor	9	9	33
TOTAL	38 (20%)	32 (17%)	124 (63%)

Table 8 - continued

Implementation Survey Questions Grouped Under
Implementation Factor Communication

4 To what extent did you believe the new OUIL law required additional training of your personnel to insure successful implementation?

No Extent .... To A Great Extent

	below average	average	above average
Police	26	9	21
Sheriff	22	6	19
Judge	20	5	15
Prosecutor	25	8	18
TOTAL	93 (48%)	28 (14%)	73 (38%)

8. In your geographical area, how well do other agencies in the criminal justice system coordinate the handling of drunk driving cases with your agency under the new OUIL law?

Not Well..Very Well

	below average	average	above average
Police	12	5	39
Sheriff	15	9	23
Judge	5	4	31
Prosecutor	5	7	39
TOTAL	28 (19%)	25 (13%)	132 (68%)

TABLE 8 - continued

Implementation Survey Questions Grouped Under Implmentation Factor Communication

11. Within your jurisdiction, meetings to discuss implementation of the new OUIL law were held:

Never .... Very Often

	below average	average	above average
Police	34	13	9
Sheriff	37	3	7
Judge	26	5	9
Prosecutor	30	15	6
Total	127 (65%)	15 (19%)	31 (16%)

required under the new law. No significant differences between groups respondents, however, was found $\chi^2(6, N=194) = 0.6127$, n.s.

Before agencies are able to coordinate their efforts effectively, they must be willing and able to communicate. Question 8 indicates a strong perception that many agencies actually do coordinate in the handling of drunk driving cases under the new law (68%). The lack of significant differences suggests that coordination may be perceived at about the same level by the four groups of respondents. Following question 8 closely is question 11 which deals with respon-

dents' estimates of the frequency of meetings held prior to implementation of the new law. If there was a high degree of coordination between agencies, meetings were not commonplace, because only 16% indicated an above average frequency and 66% indicated below average. If both questions 8 and 11 are accurate, then it may be the case that there is coordination between agencies; however, meetings are not necessarily held for planning or implementation.

Questions 3, 6, 7, 9, and 10 in Table 9 all deal with resources and resource allocation. Question 3 addresses authority as a resource and asks respondents whether the new law provided them with additional authority to deal with drunk drivers. There are statistically significant differences across the four groups, χ^2(df=6, N=194)= 4.29644, n.s., and a majority of respondents (59%) indicated that they perceived the additional authority conferred to be above average. This suggests that the law may have had some additional deterrent capacity, at least as perceived by the criminal justice system. It is also true that much of the publicity and media exposure referred to the new law as "tough" and further suggested that violators would be dealt with harshly.

Questions 6 and 7 combine the resource and bureaucracy factors. Drunk driving cases that developed before the new law was passed did not appear to use a significant proportion of an agency's resources. Only 12% of the respondents indicated that an above average percentage of past drunk driving cases required additional processing. This appears to be equally distributed across the four respondent types. Question 7 reveals that, after the new law became effective,

Table 9

Implementation Survey Questions Grouped Under Implementation Factor Resources

3. How much additional authority does the new OUIL law provide to you for dealing effectively with drunk drivers?

No Additional Authority .... Much Additional Authority

	below average	average	above average
Police	15	8	33
Sheriff	10	8	29
Judge	15	3	22
Prosecutor	15	5	31
TOTAL	55 (28%)	24 (12%)	115 (59%)

6. Some OUIL cases are handled by routine procedures. Others require extra processing. BEFORE implementation of the new OUIL law, what percentage of drunk driving cases would you estimate required additional processing?

0 Percent .... 100 Percent

	below average	average	above average
Police	42	7	7
Sheriff	39	3	5
Judge	29	5	6
Prosecutor	41	4	6
TOTAL	151	19	24
	(78%)	(10%)	(12%)

Table 9 - continued

Implementation Survey Questions Grouped Under
Implementation Factor Resources

7. AFTER implementation of the new OUIL law, what percentage of drunk driving cases would you estimate required additional processing?

0 100
Percent   Percent

	below average	average	above average
Police	32	6	18
Sheriff	29	7	11
Judge	7	2	31
Prosecutor	24	15	12
TOTAL	92 (47%)	30 (16%)	72 (37%)

9. By what percentage should your operating budget have increased to effectively implement the new OUIL law?

0 100
Percent   Percent

	below average	average	above average
Police	49	5	2
Sheriff	36	3	8
Judge	34	3	3
Prosecutor	47	3	1
TOTAL	166	14	14
	(86%)	(7%)	(7%)

Table 9 - continued

Implementation Survey Questions Grouped Under
Implementation Factor Resources

10. In reality, by what percentage did your operating budget increase to implement the new law?

0 Percent ....100 Percent

	below average	average	above average
Police	54	2	0
Sheriff	47	0	0
Judge	38	1	1
Prosecutor	51	0	0
TOTAL	190 (98%)	3 (2%)	1 (<1%)

a substantial change occurred, and 37% of all respondents indicated that drunk driving cases now require an above average level of processing. While all agencies generally shifted toward the "increased processing" side of the scale, the overwhelming majority of this change apparently occurred in the courts. In the pre-implementation phase only six judges fell into the above average category in their perception that additional processing was required. That figure changed to 31, or a 400% increase under the new law. There are statistically significant differences across the four groups

χ^2 (df=6, N=194)= 43.63319, p = .0001.

Questions 9 and 10 deal with the traditional budget issues. Competition for scarce resources has always been a problem in the criminal justice system because all of the agencies receive their funding from the same source; local tax revenue. Respondents were asked to estimate what percentage their own budgets should be increased in order to implement the new law, as well as estimating the percent increase they actually received. All respondents were consistent in estimating that little was needed in the way of additional resources, although sheriffs seemed slightly more convinced that additional resources would be needed. Statistically there were no differences between groups χ^2 (df=6, N=194)= 10.37848, n.s. Realistically though, the more important aspect of this question is whether there were actual budget increases made available to individual agencies to actually help defray the expenses of implementing the new law. Using the raw data from the surveys, it would appear that a majority within each group of respondents received little additional funding.

Disposition is evaluated through question 5. Having established in question 4 that there was indeed some belief that the new law did or would require additional training, 14% of the respondents felt the need was average, 48% indicated the need for training to be below average, and 38% indicated the need to be above average. Question 5 shows that the follow-through on training was fairly equal across groups χ^2 (df=6, N=194)= 9.4866, n.s. While a few respondents made drastic shifts in their responses (e.g., answered

extremely low on question 4, and then extremely high on question 5), most were fairly consistent in their perceptions and actions. For example, 38% believed that there was an above average need for training under the new law and 38% actually provided training at an above average level prior to implementation. These respondents appear to have a reasonably firm commitment to training. But if training is somehow associated with increasing the chances of apprehending a drunk driver and thereby preventing a potential fatality, then almost half of the law enforcement respondents appeared not to pursue training.

TABLE 10

Implementation Survey Questions Grouped Under Implementation Factor Disposition

5. To what extent was training actually provided prior to implementation?

None .... Quite A Lot

	below average	average	above average
Police	27	4	25
Sheriff	19	9	19
Judge	24	3	13
Prosecutor	24	11	16
TOTAL	94 (49%)	27 (13%)	73 (38%)

The intensity of interagency coordination was explored in question 8. This is considered both a disposition and bureaucracy factor. A high level of perceived coordination would suggest a generally favorable disposition toward the law. The results are encouraging and statistically significant across the groups χ^2(df=6, N=194)= 13.42904, p = < .03, with 68% scoring agency coordination as above average. A companion question, number 11, asked about the frequency of interagency meetings to discuss implementation of the new law. What is particularly interesting is that while a majority appear to believe that there was considerable interagency coordination, based on question 8, it was apparently accomplished in the absence of formal meetings. Overall 86% of the respondents indicated that the frequency of meetings was below average. Although judges appeared to gravitate toward the lower end of the meeting frequency scale, the differences between groups were not significant χ^2(df=6, N=194)= 10.37848, n.s.

Questions 6 and 7 address the bureaucratic component of the implementation model presented by Edwards. Assuming that question 7 measured the required additions to SOPs for each respondent's agency, then it can certainly be argued that the new law did indeed cause operational changes. While respondents agree in question 6 that drunk drivers generally were not a problem before the new law took effect, χ^2(df=6, N=194)= 2.23445, n.s., there is a statistically significant disagreement in question 7 on the same issue following implementation of the law χ^2(df=6, N=194)= 43.63319, p = <.0001.

The questions used in the implementation survey were developed to address all four of the implementation factors presented by Edwards (1980). One issue is the extent to which these implementation factors are related to each other. Edwards would appear to argue that they would be related to one another and to implementation effectiveness. In the next tables we will measure the extent of intercorrelation and correlation with perceived effectiveness. Correlation analysis was performed for each of the groups of questions which pertained to each of the factors in Edwards implementation model. This was done to determine what level of interrelationship might exist between questions. This is also useful later when correlation analysis is discussed in terms of how each of the first eleven questions relates to the perceived effectiveness of the law.

In Table 11 the communication correlation matrix is presented first. The strongest correlation is between the frequency with which information was received (question 1) and the clarity of the information received (question 2). Referring to Table 8, supra, the correlation is predicted by the obvious percentage distinctions. There is also a strong relationship between clarity of information and coordination between agencies (question 8). Those agencies perceiving that the information received was clear about the law's requirements, also felt strongly that there was above average coordination between agencies in the handling of drunk driving cases under the new law. The significant correlation between questions 8 and 11 appears somewhat contradictory. On the

Table 11

Correlation Matrices for Each of Four Implementation Components in the Edwards Model.

Communication

	Q-11	Q-8	Q-4	Q-2
Q-1	.1905	.1090	-.0055	.4178
p	.004	.065	.470	.000
Q-2	.0713	.2174	.0699	
p	.162	.001	.166	
Q-4	.2129	.1136		
p	.001	.057		
Q-8	.2695			
p	.000			

Resources

	Q-10	Q-9	Q-7	Q-6
Q-3	.0165	.0643	.0337	.1722
p	.410	.186	.320	.008
Q-6	-.0099	.1793	.4872	
p	.445	.006	.000	
Q-7	.1641	.1579		
p	.011	.014		
Q-9	.3029			
p	.000			

Disposition

	Q-11	Q-8
Q-5	.4017	.1958
p	.000	.003
Q-8	.2695	
p	.000	

Bureaucracy

	Q-7
Q-6	.4872
p	.000

one hand, there is a large proportion (68%) of the respondent sample indicating that above average agency coordination exists; but on the other hand, virtually the same proportion (65%) indicate that meetings to discuss implementation were held at a below average rate. One possible explanation is that special meetings were unnecessary because agencies are somehow able to coordinate their activities. Perhaps this happens in the course of everyday communication and interaction.

There are several significant correlations in the matrix dealing with resources. For example, questions 6 and 7, which deal with the before and after case processing activities, are correlated. As expected, the correlation between the two budget questions was significant. In general, the higher the amount of resources that the respondent felt was needed, the more he or she reported getting. It would be interesting to know how many agencies actually made formal requests for additional resources specifically to assist in the implementation of the new law.

The disposition of an agency to support or pursue implemenation of the new law was translated into concrete activities. Question 5 addressed training; question 8 spoke to coordination; and question 11 probed pre-implementation meetings. Each was significantly correlated with the other. The relationship between all three questions suggests that agencies willing to promote additional training also perceive above average interagency coordination, as well as an above average number of pre-implementation meetings. The relationship between questions 6 and 7, which deal with general

operating procedures and therefore appear to fit the bureacracy factor, indicates a strong relationship between before and after case processing requirements. This finding would suggest that criminal justice agencies are able to evaluate their work load after a policy change. In a prospective arrangement, it might interesting to ask officials to predict the level of additional work a proposed law might require. Such information might prove useful in drafting the final version of the law.

Questions 13 and 14 attempt to shed some light on implementation from the reciprocal interdependence perspective. Implementation of an anti-drunk driving law is not accomplished in a single action carried out by one agency. It is, if anything, a process which operates through cooperation and coordination. But not all agencies cooperate equally. The diagram for this particular model was presented earlier (see Figure 2).

The method of tabulation for questions 13 and 14 used a simple summation of the total number of times that a given participant or factor was checked by respondents. That participant or factor checked by the largest number of respondents became number one, the next highest number two, and so forth. In case of a tie, each factor was given the same rank.

Table 12 presents a rank-ordering of respondents' selection of participants who aided (A) and hindered (H) implementation of the law. In the overall picture, respondents frequently selected themselves as those participants who most aided implementation. inasmuch as it was their responsibility statutorily, this is not

Table 12

Rank Ordering Of Participants Identified by Respondents as Aiding (A) or Hindering (H) Implementation

PARTICIPANT	RESPONDENTS Police		Sheriff		Judge		Prosecutor	
	A	H	A	H	A	H	A	H
Appellate Courts	7	2	6	2	8	2	7	1
Chiefs of Police	3	8	4	7	7	7	5	6
Citizen Groups	5	6	4	5	6	4	4	6
Correctional Agencies	9	5	7	4	5	5	8	4
Defense Attorneys	8	1	8	1	2	1	7	2
District Court Court Judges	4	3	5	3	3	8	3	3
Patrol Officers	2	7	3	8	4	5	2	5
Prosecutors	1	6	1	6	1	3	1	7
Sheriffs	6	4	2	9	5	6	6	5

surprising. Respondents were unanimous in their selection of prosecutors as the participants who most aided implementation of the new law. Patrol officers appear to place second. This may be due to the fact that they are responsible for detecting drunk drivers and eventually testifying in court. To the extent they are well-trained and generally competent, they are valuable in the execution of the law.

Defense attorneys received the fewest votes for aiding implementation, and they were followed by the Appellate Courts. There is a certain amount of logic to this arrangement. In the first place, defense counsel's obligation is to his/her client and securing their release. It is, therefore, reasonable that those responsible for enforcement of the law would perceive defense counsel as a threat to their successful implementation of the law. The one exception is that most District Judges ranked defense attorneys as the second most helpful participants. This may be due to judges' perceptions that there should be fairness in the process and defense counsel looks after their client's best interest. Appellate Courts are in a position to reverse or nullify what law enforcement and prosecution consider valid convictions, thus causing these agencies to complain that criminals are set free on "technicalities.". Mistakes made by enforcement agencies that lead to such reversals might be the fault of inadequate training or simple lack of experience with the new law. It is interesting to note that police, sheriff and prosecutor all placed district judges third on the hindering list. The district

court is also required to dismiss or modify charges due to technicalities raised by defense counsel, thereby certainly not making them popular with law enforcement officials or prosecutors.

Table 13, using the same groups of respondents, deals with factors that either aided or hindered implementation of the law. The law itself was clearly the top choice in aiding its own implementation. This suggests that the law and associated information made the process of implementation easier for respondents. The existence of public pressure is evident by the second most important factor: public attitudes toward drunk drivers. Although judges apparently perceive that there is greater interagency communication than law enforcement, such communication emerges as the third most frequently cited factor overall.

Considerable support for Edwards' (1980) typology on implementation is found in the top three factors hindering implementation. The most important hinderance was competition for resources. This was followed by public attitudes toward alcohol abuse generally and finally, the standard operating procedures of other agencies. The first and third factors are part of the Edwards' model and the second might be construed as contributing to an agency's disposition toward enforcement. For example, if alcohol abuse is tolerated at a fairly high level in the community, that might frustrate attempts by enforcement agencies to deal effectively with the problem and thus adversely impact the agency's disposition. Interagency communication appears to be less of a problem for judges and prosecutors than for law enforcement officials. Conversely, standard operating proce-

Table 13

Rank Ordering of Factors That
Aided (A) and Hindered (H) Implementation

Factors	Respondents							
	Police		Sheriff		Judge		Prosecutor	
	A	H	A	H	A	H	A	H
The Law Itself	1	7	1	7	1	4	1	7
Competition for Resources	8	1	7	1	6	2	8	1
Public Attitudes Toward Drunk Drivers	2	4	2	6	1	6	2	2
Standard Operating Procedures in Other Agencies	7	5	6	4	5	1	6	3
Technology	3	6	3	7	4	3	5	5
Other Existing Laws	6	6	8	5	6	3	7	4
Communication Between Key Actors in the Criminal Justice System	4	3	5	2	2	5	3	6
Public Attitudes Toward Alcohol Abuse Generally	5	2	4	3	3	4	4	2

dures present a very severe problem to judges and prosecutors, but are obviously less troublesome to law enforcement. There was apparently some internal dispute between prosecutors over public attitudes toward drunk drivers -- it is ranked second as both aiding and hindering. This may be as much a function of local community attitudes as it is the perception of judges and prosecutors.

Reciprocal Interdependence Model

Returning to the O'Toole and Montjoy's (1984) reciprocal interdependence model and its application to the criminal justice system, the results just presented in Tables 12 and 13 provide a rough estimate of the strength and direction on interagency cooperation. For example, appellate courts (see Table 13) were viewed as strong negative force by respondents, as were Defense Attorneys and District Judges. From such simplistic analysis, Figure 7 (supra) was developed and presents the original model with positive (+) and negative (-) indicators based on whether that participant generally aided or hindered implementation.

In this preliminary model,.there are more negative symbols than positive in Figure 7. In some cases, one group saw another as positive, but the reciprocal perception was not positive (e.g., see the relationship between the prosecutors and district judges). The positive sign coming from the legislature was taken from Table 14, and is based on the fact the law itself was enacted by the legislature. What is really interesting is to look at Table 14 shows which factors were identified by participants as aiding versus

TABLE 14

Breakdown of Implementation Activities
Cited by Respondents

	Police	Sheriff	Judges	Prosecutor
Externally Oriented				
Meet with Criminal Justice Agencies:	13	8	12	20
Meet with Non-criminal Justice Agencies:	4	2	9	9
Meet with Public and Media:	9	5	5	7
Internally Oriented				
Changed or Developed Policies/Procedures:	13	2	23	28
Purchased PBTs:	17	16	2	2
Reviewed Related Material:	10	11	4	7
Both				
Acquired and/or Attended Training:	41	27	21	30

hindering implementation. Competition for resources was the number one hindering factor, followed by public attitudes, interagency communication, and standard operating procedures. These findings would support a generally negative reciprocal interdepence model. This might be interpreted to mean that when agencies do interact, they do so out of necessity and not comraderie. Additional data from other actors in the system, such as defense attorneys, corrections officials, and the public, would help complete the model. Eventually it might be possible to evaluate implementation from the strength and direction of such an interagency model.

The final question on the survey was open ended and asked respondents to list each of the steps they had taken to implement the law. They were requested to place the steps in chronological order. Because no standardized format was provided to respondents, the answers took many forms. Some were easy to categorize (e.g., "attended training seminar") while others were too vague (e.g., "policies"). After reviewing the variety of responses, several standard categories of responses were developed. Table 14 displays the response types in the left margin and the overall frequency of each response.

The completion rate for this question was similar for all groups: Police, 71%; Sheriff, 72%; Judges, 70%; and Prosecutors, 76%. The detail provided by many respondents helped explain how implementation was approached at the local level. For example, some respondents indicated each specific agency with which they dealt, others made only vague references to the "system". Some

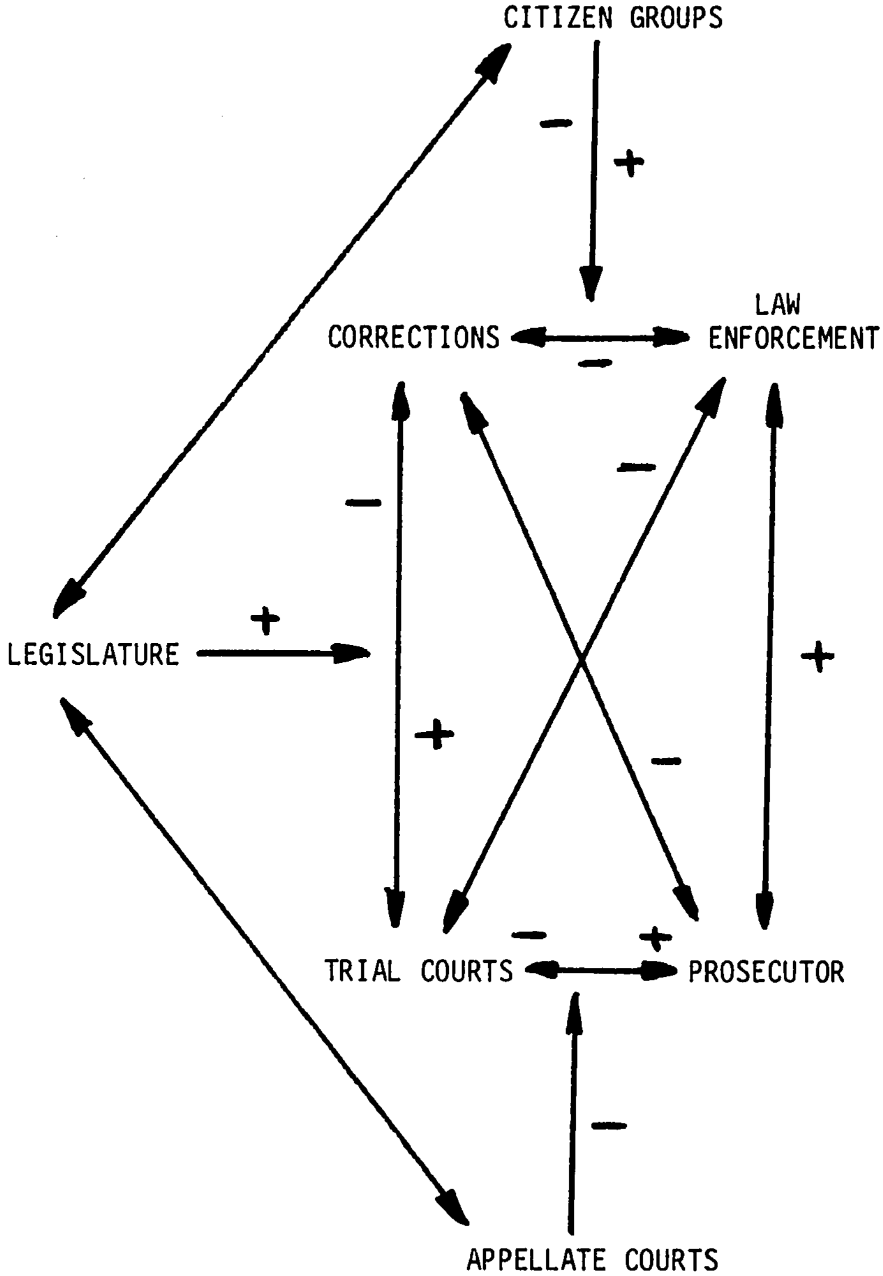


Figure 7 Reciprocal Interdependence Model for the Criminal Justice System

responses could not be categorized. One prosecutor indicated that the first step to successful implementation was the "replacement of the District Judge." The majority of responses zeroed in on training. Prosecutors indicated the highest frequency of meetings with other criminal justice agencies as well as the public. Non-criminal justice agencies generally consisted of public schools, hospitals, and the local defense bar.

As far as changing or developing policies and procedures, sheriffs either did not consider this an important step or had nothing that required attention. Consistent with the significant post-intervention change in additional processing, judges indicated such changes were an important step in the implementation process for courts. Inasmuch as PBTs (Preliminary Breath Testers) are only used by law enforcement as part of a roadside stop, it is not surprising that such purchases ranked high on their list of implementation activities.

Reaggregation

The twelfth question on the survey measures the impact of the new law from the perspective of the respondents. This is based on the idea that they are closest to the actual application. Table 15 shows that, as a group, over half (60%) indicated that the impact was below average, 16% believed the impact to be average, and 46% indicated the law had an above average impact on alcohol-involved fatalities in their jurisdictions.

The survey data suggest that there are some counties in which

TABLE 15

Perceptions of the Michigan Criminal Justice System Actors on the Impact of the 1983 Drunk Driving Law in Their Jurisdiction

No Impact .... Tremendous Impact

	below average	average	above average
Police	34	7	15
Sheriff	22	9	16
Judge	27	7	6
Prosecutor	34	8	9
TOTAL	117 (60%)	31 (16%)	46 (24%)

The survey data suggest that there are some counties in which the law had a real impact. In fact, 31 agency respondents indicated an above average impact in their jurisdictions. In order to test whether this is true, the county level monthly data were re-aggregated on the basis of respondents' estimation of success. Responses were grouped into three categories after grouping the scale scores into three equal dimension: (1) AREA1 = below average (0 - 2); (2) AREA2 = average (3 - 4); and (3) AREA3 = above average (5 - 8). There were no respondents scoring at the extreme high end of the scale on this question. The largest grouping is in AREA2 (N = 40),

followed by AREA1 (N = 27) and finally AREA3 (N = 13). This total is lower than Michigan's 83 counties because there were three counties from which no surveys were returned.

Appendix G shows the plotted raw time series for each re-aggregation area with the vertical line marking the April 1983 intervention. AREA2 (average impact) is composed of the largest number of counties and the highest average number of fatalities. Visually there does not appear to have been any obvious impact exerted by the law (see Appendix G). AREA1 respondents indicated that the law had not reduced fatalities at all, and they certainly appear to be correct (see Appendix G). The law appears to have flattened the 1983 series so that it resembled 1981, but that is all. Finally, the series for the small group of AREA3 jurisdictions where there was agreement that there had been a significant impact, does not appear to reflect their optimistic appraisal (see Appendix G). The next question is whether intervention analysis can uncover a significant post-intervention impact.

The undifferenced ACFs, alomg with parameter estimates for white noise models and both hypothesized intervention strategies are presented in Appendix G for each of the re-aggregation areas. AREA1 respondents, citing no effect for the new law, are supported by the intervention parameter estimates -- none were statistically significant. Like AREA1, AREA2 officials indicated that, at best, there may have been some reduction in fatalities. Statistically, there was no significant impact in AREA2. Finally, there is the assertion made by the AREA3 respondents that there has been a significant

decline in alcohol-involved fatalities since the new law went into effect. The intervention parameter estimates are indeed statistically significant for the gradual implementation and gradual impact model (ω_0 = 3.3830; df=42; t=1.52; p= .20 and δ_1 = -.9781; df=42; t=6.13; p= .001).

The results suggest that there was an identifiable reduction in alcohol-invovled fatalities in 13 of Michigan's 83 counties. What is not known is how many other groups of counties might collectively have shown a similar decrease if reaggregated properly. But the important point is that the criminal justice officials in these counties were very certain that there had been a decrease in their area and they were correct. It would be interesting to know upon what basis they made the estimate: personal knowledge, guess, or did they simply want to look good? Most (N=8) of the thirteen counties are in the northern lower peninsula, which is the RURAL/LP group in the earlier analysis based on population aggregation. Collectively these re-aggregated counties accounted for only 10% of all alcohol-involved fatalities in any of the five years. Furthermore, at their highest point they added only 97 such fatalities annually to the state total of almost 1,000. The statistical influence that they generate at the overall state level is obviously minimal. Conversely, in a statewide analysis, any significant impact in these counties would probably be overwhelmed by the rest of the state.

Because an actual reduction in alcohol-involved fatalities can be statistically linked to agencies that score high on question 12, the next step is to determine whether other questions correlate

with question 12. Those that do may shed some light on the characteristics of the agencies in those jurisdictions experiencing a decrease in alcohol-involved fatalities. Table 16 presents a correlation matrix for question 12 and the first 11 questions from the implementation survey. Only the correlations that appear to be statistically related to question 12 will be discussed.

Table 16

Correlation Matrix for Question 12 with 11 Other Implementation Survey Questions

	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6
Q-12	.1852	.0765	.2190	.1168	.2571	.1671
p =	.005	.145	.001	.052	.000	.010
	Q-7	Q-8	Q-9	Q-10	Q-11	
Q-12	-.0246	.1361	.1757	.0399	.3517	
p =	.367	.029	.007	.290	.000	

Even though only 29% of the respondents indicated that they received information with above average frequency, the correlation between volume of information and above average impact is significant (r = .1852, p <.005). This suggests that those agencies indicating a significant reduction in fatalities also received an above average amount of material prior to implementation. Interestingly enough, there is no significant correlation with the clarity

The perception that above average authority was conferred by the law (question 3) also correlates significantly with a perceived reduction in alcohol-involved fatalities ($r = .2190$, $p < .001$). Those agencies experiencing such a reduction in fatalities, may have made constructive use of whatever additional authority they perceived the new law, regardless of whether additional authority was actually conveyed. Perhaps those agencies believing that they now possessed more authority to deal effectively with drunk drivers, intentionally altered departmental enforcement policies and pursued drunk drivers more vigorously.

The two questions pertaining to training also appear to distinguish agencies that believed the law was more effective. First, it is important to note that there is very little change in the proportion of agency responses to questions 4 and 5 (see Tables 8 and 10): 48% of respondents believed there the law required little additional training and 49% indicated that they did not provide very much additional training. While the correlation between questions 12 and 4 is significant ($r = .1168$, $p < .05$), it is weak by comparison with the correlation between questions 12 and 5 ($r = .2571$, $p < .0001$). The higher correlation, especially in light of the latter question, suggests that those respondents who perceived the law as effective were also more likely to have actually provided additional trianing to the personnel. This strengthens the argument that a favorable disposition toward implementation of a law may be valuable in terms of that law's success.

Those respondents indicating a significant impact were also

likely to have believed their operating budget should have been increased to implement the new law (r = 1757, p <.007). The reality of pre-intervention budget increases showed no difference between respondents. The problem with this question is one of not knowing whether agency officials believed that additional resources were necessary to implement the new law. The post-intervention budget question showed that many agency respondents had received no substantial increases in their budgets for implementation.

Questions 8 and 11 address the areas of interagency coordination and cooperation. In the first case, most respondents indicated an above average level of coordination in the handling of drunk driving cases (68%) and a statistically significant but basically weak correlation exists between impact and coordination (r = 1361, p < .029). There was a stronger relationship between pre-implementation meetings and perceived impact (r = .3517, p < .0001). Respondents who believed that the law had a significant impact on alcohol-involved fatalities were also much more likely to be invovled or know about such meetings. In fact, this was the strongest of the correlations of implementation activities with perceived impact.

Question 15, mentioned earlier, was open ended and asked respondents to list each of the implementation activities they engaged in. The issue here is whether a distinction can be made between agencies that supplied little or no information and those providing detailed data. Respondents were further divided into three groups (below average, average, and above average) based on their perceived impact of the law (question 12). Next, the number

of question 15 entries for each agency was tabulated, a maximum of seven entries was possible. Table 17 shows the distribution of responses.

Overall, the average number of entries made by respondents increases when moving from below average to above average impact.

Table 17

Distribution of Responses to Implementation Survey Question 15,as a Function of Respondents' Perception of the Law's Impact.

	Respondents' Perception of Impact		
	Below Average	Average	Above Average
Respondent			
Sheriff			
Entries	2.7	2.3	3.2
Blank	5	5	4
Police			
Entries	2.8	4.0	5.1
Blank	10	2	4
Judge			
Entries	3.2	3.8	3.8
Blank	7	1	0
Prosecutor			
Entries	3.2	3.2	2.7
Blank	9	2	0
Overall			
Entries	2.9	3.3	3.7
Blank	31	8	8

The proportion of surveys with no entries at all is concentrated in the below average impact area (63%). Chiefs of Police appear to be responsible for the sharpest group increase. The average number of steps they reported almost doubled between below average impact (2.8) and above average impact (5.1). There was an increase for Sheriffs as well, but not quite as dramatic (2.7 to 3.2, respectively). Moving from below average to above average impact, it can be seen that judges and prosecutors were less likely to leave question 15 completely blank. In fact, there were no judges or prosecutors who left question 15 blank who, at the same time, indicated that the law had an above average impact.

Generally it would appear that respondents who perceived that the law had had an impact in their jurisdiction, were also more likely to have completed question 15. Thos respondents who did not perceive any impact in their jurisdiction were more likely to leave the question blank.

Summary

Based on aggregation by census area, Michigan's drunk driving law registered a statistically significant reduction in alcohol-involved fatalities in the most populated area of the state, the Wayne county SMSA. Using a survey to determine if agencies had implemented the new law differently from each other provided another basis upon which to test for localized impact, as well as impact related to implemenation factors. Counties were aggregated into three groups based on criminal justice system officials'

perception of whether the law had reduced alcohol-involved fatalities in their jurisdiction. There were thirteen counties in this group. Intervention analysis supported respondent's belief that there had been a significant reduction. The criminal justice agencies in these counties differed from less successful jurisdictions with respect to some of the things they did prior to the implementation of the law. First, they were more likely to provide training to their employees. Second, there did not appear to be a significant additional level of post-implementation case processing. Last, they perceived a high level of inter-agency coordination in the handling of drunk driver.

The implementation survey also provided material for the evaluation of two implementation models. One is a traditional model based on standard operational needs (e.g., communication, resources, dispostion, and bureacracy). The other is non-traditional and involves the interactions between criminal justice agencies that are necessary to accomplish a joint goal.

CHAPTER VI

CONCLUSION

Introduction

This concluding chapter first summarizes the findings presented in previous chapters. Following this, it provides some interpretation of the results in relation to the theories outlined in Chapter II. Directions for future research are presented and, finally, a series of policy alternatives are delineated.

The overall question studied here is whether anti-drunk driving legislation has any impact on alcohol-involved fatalities. This question is analyzed across 14 states and is studied in detail at the county level in Michigan. There is also a detailed component of the study which seeks to determine whether certain implementation models can be applied to understanding the implementation of anti-drunk driving legislation and whether implementation activities and successful impact are related.

In order to test whether anti-drunk driving legislation does reduce alcohol-involved fatalities, monthly alcohol-involved fatality statistics for the period covering January 1979 through December 1983 were requested from the 50 states and the District of Columbia. Sixteen states provided usable and complete data. In 14 of these states there had been changes to that state's anti-drunk driving laws between January 1979 and December 1983.

The month in which each state's law took effect is identified as the intervention point for purposes of using interrupted time-series analysis to evaluate the impact. The post-intervention

trend is evaluated from two perspectives. First, implementation of the law was hypothesized as immediate and the impact gradual. Second, the implementation and impact were both hypothesized as gradual. These two approaches are considered the most logical with respect to legal intervention. Under the first approach, it is reasoned that criminal justice agencies, particularly law enforcement, were prepared to act immediately after the law took effect. While such preparation meets the criteria for immediate implementation, the impact is hypothesized as gradual on the theory that some time will have passed before local law enforcement efforts could be translated into a reduction in fatalities, especially under the traditional deterrence model. Under the second intervention scenario, the implementation is gradual on the theory that law enforcement agencies were either unable or unwilling to launch an immediate enforcement effort aimed at drunk drivers. If implementation is gradual, it naturally follows that impact will also be gradual.

Time-series analysis, under both hypothesized intervention strategies, was accomplished for each of the 14 states experiencing a change in their law during the time period under study. California was the only state registering a significant statewide post-intervention impact. The significant intervention was that of gradual implementation and gradual impact. A standard computational formula indicates that approximately 232 alcohol-involved fatalities appear to have been avoided in the first five months after the intervention.

It may be possible that when data are aggregated on a large

scale (i,e., statewide), significant intrastate impacts may be overwhelmed and thus go undetected. Although Michigan did not evidence a statistically significant statewide impact, the existence of complete data from individual counties statewide permitted regional analysis. To do this, counties were first aggregated into four groups on the basis of population. A significant intervention effect was registered only in a seven-county area which makes up the Detroit Standard Metropolitan Statistical Area (SMSA-1). The significant intervention was a combination of immediate implementation and gradual impact. This suggests that law enforcement agencies may have begun enhanced enforcement efforts as soon as possible after the law took effect, and those efforts translated into a significant reduction in alcohol-involved fatalities within five months thereafter. By using the appropriate formula, 35 alcohol-involved fatalities appear to have been avoided. This area of the state also evidenced the largest percentage increase (35.6%) of alcohol-involved arrests following the intervention (see Table 5). However, two other areas (SMSA-2 and the U.P.) showed increases in alcohol-involved arrests of similar magnitude (30.8% and 30.5%, respectively), but with no apparent decrease in fatalities. This would suggest that the increase in arrests alone was not responsible for the significant decline in fatalities.

A third approach was used to determine if there were Michigan counties experiencing significant reductions in fatalities based on the results from a statewide implementation survey. The counties

were reaggregated into three areas arranged according to the perception of local criminal justice officials as to whether the new law had significantly reduced alcohol-involved fatalities in their jurisdiction. There were three levels of impact: (1) below average; (2) average; and (3) above average. Each area was subjected to interrupted time-series analysis and both hypothesized intervention strategies were tested. Statistically significant results were obtained for a group of thirteen counties in which the responding criminal justice officials indicated that there had been, in their opinion, an above average impact. That above average impact translated into a reduction of 19 alcohol-involved fatalities.

The results of the implementation survey were also used to test the applicability of two implementation models. One involved the more traditional evaluation of resource allocation, communication, disposition, and bureaucracy. There was an indication that perceived effectiveness and these categories of implementation activities may be related. The other model is of more recent vintage and deals with the reciprocal interdependence between agencies required to accomplish successful implementation. The reciprocal interdependence model was found to have additional power for exploring how criminal justice agencies interact to accomplish implementation.

Interpretation of Results

There are two ways to evaluate the impact of these enforcement efforts. First, if highly effective, then drunk driving fatali-

ties should be sharply declining. Visual analysis of the raw time series data offers no such support. Even statistically significant effects of small magnitude were unusual. Second, there is always the possibility that the significant impact of some intervention was masked by the opposite effects of other variables, including competing interventions. Because of the bewildering array of intervention programs, it may be impossible to separate the wheat from the chaff. A better research question might explore whether all of these efforts are compatible. Are they additive or multiplicative in their impact? Are some more sensitive to seasonal or trend variations? Do some simply not work at all?

Part of the answer to why there have been so few widespread significant effects may lie in the statistical rarity of alcohol-involved fatalities. Although the social costs of these accidents may be high, the probability of an alcohol-involved fatality occurring is not high. And that probability may not be impacted by the activities of the justice system. In Michigan, in 1982, there were 75,000 deaths from all causes. Approximately 3,000 involved motor vehicles. Most official reports, including material presented earlier in this study, indicates that about 50%, or 1,500, are alcohol-involved. This means that alcohol-involved traffic fatalities accounted for 2% of all deaths. If the entire population-at-risk (i.e., licensed drivers) is used in the calculation, the probabilty of being one of the 1,500 fatalities drops to 2 in 10,000. This rate does fluctuate widely between states, but rarely

reaches a point where it could be considered commonplace. According to the 1982 FARS report, the lowest rate is in the District of Columbia (.9 in 10,000), followed immediately by Rhode Island at 2 in 10,000. At the high end of the scale is New Mexico with 6 in 10,000. Even at its worst, considering only licensed drivers, such fatalities are rare. The point here is that, given the limited resources of law enforcement, it is difficult to control or impact such a rare event.

Furthermore, to be effective, the law must deter or enforcement efforts must prevent drunk driving that might lead to a death. The problem is that drunk driving is a relatively frequent occurrance, but arrests are not very frequent relative to the number of incidents. There are two studies which have developed estimates of the probability of a drunk driver being apprehended. Beitel et al. (1975) estimate the figure at 1:200, while Borkenstein et al. (1975) place the ratio at 1:2,000. Using the annual arrest statistics for Michigan (75,000), the first computation would place the total potential number of drunk drivers on the highway at 1,250,000 a year. Using 1:2,000,the estimate is 12,500,000 a year. At this rate, it can be estimated that a project to arrest all of these drivers would take 166 years to execute. The smaller estimate, even though it is ten times lower, would require almost 17 years to accomplish the same end.

What makes the entire project even more unrealistic is the fact that there would be no place to incarcerate these drivers after they

have been arrested; therefore, they would have to be released. Once released, a proportion would rejoin the population of drunk drivers. This would extend the life of the project and probably keep the number of at-large drunk drivers from ever reaching zero.

The point here is to try and provide a realistic frame of reference as to the magnitude of the problem and the impossibility of managing it from the current perspective. The criminal justice system response is, therefore, trivial by comparison to the size of the problem. The long-term solution is to educate the public to the fact that drinking and driving is dangerous and wrong. With the continued presence of alcohol, it is doubtful that such a program will ever be more than mildly successful. The admonition that drinking and driving is wrong must be effectively reinforced through detection, apprehension, and punishment.

The present study has tested empirically that which has generally been taken for granted, namely that the enforcement of penal statutes, which are based on the classical deterrence model, will effectively reduce crime. The contribution made by this study to the literature on deterrence is straightforward. Classical deterrence theory would predict that if alcohol-involved arrests were increased significantly, there would be a decrease in alcohol-involved fatalities. This prediction turns on the idea that potential drunk drivers will perceive the increased threat of being apprehended and avoid drinking and driving. As the results indicate, there was no significant statewide reduction in alcohol-involved

fatalities despite a significant increase in alcohol-involved arrests after the intervention. The findings do not appear to support the predictions of classical deterrence.

The findings also speak to the power of the two implementation models. The findings tend to indicate that agencies actively engaged in certain implementation activities are more likely to experience a significant decline in alcohol-involved fatalities. The findings also permitted the application of a relatively new implementation model, referred to as reciprocal interdependence. This model shows great promise for use in the evaluation of multi-agency implementation projects.

Limitations of the Study

It has been uncritically accepted in most research, including this study, that alcohol-involved is identical to alcohol-caused. The technological state of the art in alcohol measurement and detection has made considerable progress in reducing the error in such determinations. But there is still room for intervening factors. The most accurate measurement is that done at an autopsy. However, if the driver is still alive, the next most reliable device is a blood test, usually administered at a local hospital. The arresting officer generally has to transport the driver some distance to the closest facility. This takes time and with the passage of time, a reduction in the blood alcohol level takes place. Only slightly less accurate, but much more convenient, is

the preliminary breath tester (PBT), which is handheld and can be used by a trained officer at the arrest site. The problem is that the blood alcohol level, however accurate, may also be entirely independent of the cause of the accident. While it is easy to establish an accurate BAC in the driver, more energy should be invested in determining causation. At a minimum the following factors are perhaps as good, or better, at explaining accident causation:

1. Driver ability;
2. Road conditions;
3. Other drivers;
4. Distractions;
5. Mechanical failure; and
6. Driver's general physical and mental health.

The list is not exhaustive. Part of the problem stems from the fact that once alcohol is discovered in the driver, other factors become secondary (e.g., poor driving record) or are brushed aside entirely. The problem increases in general complexity because each of the above in combination with other factors <u>and</u> alcohol creates a confusing picture, thus reducing the chances of ever precisely determining the cause. Research must continue into the relationship between alcohol and accidents generally, as well as alcohol and automobile accidents specifically.

Consider also the simple probability of actually encountering

a drunk driver. If 75,000 alcohol-involved arrests represent the apprehension of 1 in every 2,000 drunk drivers, there are 150,000,000 opportunities annually for law enforcement or the average driver to encounter another person driving a vehicle while legally intoxicated. Given the enormity of this statistic, alternative explanations are necessary to explain why there are not more drunk driving accidents. One possiblity is that drunk drivers are not a threat to life simply because they are intoxicated, but rather because they are also poor drivers. It just does not seem reasonable that if alcohol consumption and driving are such a deadly combination, that the actual number of alcohol-involved fatalities is not substantially higher. In fact, attention should really be directed at determining why so many people are able successfully to avoid detection. There may be a difference between being an intoxicated driver, a safe driver or one who becomes dangerous after drinking. The research on this distinction appears to be limited.

If, however, the estimates of unapprehended drunk drivers is exaggerated and a majority are being caught, then the results of this study suggest that few are being deterred. This is particularly well-illustrated by the fact that the proportion of alcohol-involved fatalities, as a function of total traffic fatalities, does not decline over time or across jurisdictions. If drunk drivers cause fatal accidents and if increased apprehension deterred them, then the total number of fatalities would eventually decline and so would the proportion of alcohol-involved fatalities.

Because of all the initiatives created through pressure from various sources -- citizens, legislators, and criminal justice officials -- separating the impact of various programs has become extremely difficult. One of the major sources of confusion revolves around punishment.

Punishment includes jail sentences, increased fines, restricted licenses, and community service programs. Virtually all states use these programs in varying combinations. As more pressure is brought to bear on policy makers to reduce the threat created by drunk drivers, fines will increase; jail will be used more liberally; and many more drivers will have their driving privileges restricted or revoked. As an example of how complex penalties have become, Appendix H shows the penalty structure for each state represented in this study. Some are multi-level and detailed (e.g., California and Michigan), while others are considerably simpler (e.g., Alaska). What is striking is the array of options. Determining scientifically which provision is effective and which is not will require considerable effort by the researcher. It may be virtually impossible to design an experiment, with all of the appropriate controls, to determine which penalty actually works the best. An additional problem is created by the almost infinite variety of judges, police officers, defendants, and prosecutors. Evaluating penalties in general terms (e.g., jail vs. fines vs. license revocation) will be easiest but the interactive influences operating within and between the independent variables may obscure the effects.

Another problem is created by the use of media campaigns and educational programs. There is a growing body of research which suggests that widespread publicity can have an impact on the incidence of alcohol-involved fatalities (Ross, 1975). The effect is generally shortlived and the level of fatalities eventually returns to normal. A different type of campaign involves increasing law enforcement visibility and sometimes increasing arrest activity too. This is calculated to demonstrate that the probability of being detected is now higher and, therefore, increase the fear of apprehension. While research dealing specifically with drunk drivers is lacking, studies have been conducted evaluating the impact of increased police presence on other types of crimes (Dahmann, 1975; Kelling, Pate, Diekman, and Brown, 1974; and Press, 1971). The results have been favorable and suggest that crime in the experimental area does decline. There is also research to suggest that the crime may simply be displaced to another area (Kelling et al., 1974). If media campaigns and increased enforcement force drunk drivers to drive more carefully or take lightly traveled roads instead of abstaining but the result is still fewer accidents, this should be considered a success. There is no research currently available which points to significant numbers of drunk drivers who are consciously evasive.

Prevention programs are also rapidly becoming important tools in the attempt to reduce drunk driving. Some of the major forms taken by these efforts include:

1. Modification of "happy hour" which restricts selling drinks at half price instead of being served two-at-a-time for the price of one;

2. Incorporation of anti-alcohol abuse material into grade school curricula beginning at the elementry level;

3. Adoption and enforcement of mandatory seat belt laws;

4. Increasing the minimum drinking age to 21;

5. Required emergency medical training for all law enforcement officers to increase the likelihood of survivability at the crash site until an ambulance arrives; and

6. Expanding use of alcohol abuse programs, frequently as part of a court-ordered sentence. Even though a "sentence" is punishment, it becomes prevention on the theory that once someone is exposed to the positive effects of treatment, he/she is less likely to drink and drive again because they do not want to, not because they are fearful of being punished again.

In one form or another, almost all of the above policy changes have been put into effect in Michigan, some of them during the time period under study. Separating the interactive effects of each from the other may prove to be impossible. The impact of the "happy hour" provision will be difficult to evaluate, but the theory is that people will simply consume less alcohol. This can be defeated by drinking faster. Mandatory seat belt legislation is being adopted in many states, including Michigan, and is being justly credited with saving lives. In the case of drunk drivers, it

is unlikely that many will remember to fasten their seat belts. Occupants of other vehicles will benefit if they have their seat belts fastened in the event of an alcohol-involved accident. The recent passage of Public Law 98-363 by Congress, which allows the federal government to withhold highway construction funds from any state that does not raise the minimum drinking age to 21, places considerable pressure on states to modify their laws. This is one of the few instances where the research is clear. A minimum drinking age below 21 results in increased alcohol-involved traffic fatalities in the affected age group (Douglass et al., 1974). These are but a few of the policy changes that interact with changes in drunk driving laws, making the separation of effects difficult.

Directions for Future Research

There are several areas of inquiry that evolve out of this study. The problem is that either the existing data are inadequate or there are simply not data available. To remedy this paucity of data, four productive research questions are posed here.

1. What is the actual proportion of legally impaired drivers on the highway at any point in time?

The answer to this question is crucial both to implementation of further efforts directed at stopping drunk driving and evaluating the success of such programs. If the earlier estimate is accurate that 1 in 2,000 drunk drivers is detected by law enforcement, then it would be virtually impossible with current resources ever to

detect and apprehend a majority of these drivers. The current study demostrates that, at least in Michigan, a significant increase in drunk driving arrests did not cause a statewide decline in alcohol-involved fatalities. While there is no guarantee that a greater commitment of resources necessary to triple or quadruple the number of arrests will significantly reduce alcohol-involved fatalities, the current level is apparently ineffective.

The reverse side of this argument would suggest that if current arrest statistics accurately reflect the apprehension of impaired drivers, then few are being deterred by either the threat of, or actual, apprehension.

The most effective means of determining how many drunk drivers are on the highway is through the use of roadblocks, referred to as sobriety checklanes. The procedure is relatively simple. At a pre-determined time and place, usually between 10:00 pm and 3:00 am on weekend evenings, law enforcement officials set up a roadblock and use PBTs to determine the BAC of every driver stopped. The general reaction of the public is usually unfavorable. Many of the arguments turn on constitutional issues such as invasion of privacy. In order to make the estimate as accurate as possible, sampling should be equally distributed across days of the week, time periods in each day, time of month, and seasons of the year. Such a project would be expensive and would probably generate public resentment over the inconvenience. Furthermore, some provisions will have to be made for all of the drunk drivers who might potentially be apprehen-

ded in the process.

2. What proportion of alcohol-involved traffic fatalities are actually caused by alcohol?

While the current technology permits extremely accurate assessment of the BAC in any deceased driver, as well as those still alive, the same developments have not been as well refined with respect to determining the role played by alcohol in the accident. On the one hand, if, in the absence of alcohol, a majority of accidents would be prevented or be less serious, then efforts at preventing intoxicated persons from operating motor vehicles would be beneficial. On the other hand, if alcohol is present but not responsible for the accident, then research should concentrate on individuals who are involved in accidents, regardless of the presence of alcohol. The suggestion here is that drunk drivers involved in fatal accidents may be identical to non-drinking drivers who are also involved in fatal accidents. In other words, it is entirely possible that the major cause of alcohol-involved accidents is bad driving, but with alcohol present in at least one-half of the cases. An additional possibility is that alcohol amplifies the already poor driving habits of some people. Under these circumstances a policy decision to reduce alcohol consumption would be appropriate; a program to improve driving skills would be even more appropriate. If an arrested drunk driver has an extensive traffic violation record, alcohol-involvement notwithstanding, then a more appropriate alternative might be to make drivers' education mandatory.

3. To what extent do the imposed penalties correspond to statutory provisions?

If the classical deterrence model is correct, the application of severe punishment, along with the likelihood of apprehension, is very important in achieving effectiveness. It is well established that maximum penalties are rarely imposed, especially for misdemeanor and other minor offenses. Furthermore, in states where there are mandatory minimum penalties, if those are not routinely imposed, individuals soon learn that, even if apprehended, the chance of suffering a severe sentence is remote. To the extent that judges consistently impose less severe sentences than the statutory minimum, then the deterrent impact of the law is lessened. This is also true with respect to the prosecutor's traditional power to dismiss charges even when the evidence is compelling.

4. To what extent are chronic drunk drivers overrepresented in the alcohol-involved fatality statistics?

Research must be done to distinguish the "harmless" drunk driver, meaning one who is able to drive home without incident, from those who cause fatalities. If there were adequate information on types of drivers who are more likely to cause accidents, then the use of existing penalties and license restrictions could be more liberally applied to deter them. Of equal importance would be the use of various alcohol abuse treatment programs which might be recommended to these people. Being able to identify such individuals would permit authorities to simply refuse issuance of a driver's license or motor vehicle registration.

Policy Alternatives

One of the important underlying moral arguments fueling alcohol control efforts is the belief that people should generally live longer. Drunk driving laws are one attempt by the government to reduce injury and death on the theory that the "quality of life" enjoyed by a majority of its citizens is worth the risk of alienating a minority who prefer to take chances. The problem with simply permitting drunk drivers freely to forfeit their lives is that there is a good chance that an innocent bystander will be killed or injured in the process.

The govermental attempt to control alcohol does inspire hope. The manufacture, sale, possession, and consumption of alcohol are all regulated with varying degrees of success, through the enforcement of statutes and regulations, by a collection of independent government agencies. Such enforcement is predicated on the belief that the adverse effects of alcohol would probably grow exponentially in the absence of such controls. The most serious adverse effects are of three varieties: (1) long-term, chronic use; (2) commission of violent criminal offenses; and (3) impaired judgment. It is the third category upon which anti-drunk driving laws are brought to bear. The premise is deceptively simple: people who consume alcohol and drive automobiles are less alert and, therefore, less in control of that automobile. Safe operation of an automobile requires mental alertness, unencumbered dexterity, and an ability to recognize excessive or unreasonable risk. In the final

analysis, drinking and driving are wrong because they expose the general population to an unnecessary and unacceptable level of risk.

Many states in recent years have chosen the task force approach to developing and implementing drunk driving countermeasures. This approach encourages community involvement on a statewide basis and attracts professionals from virtually all sectors. Michigan is no exception and the Michigan Drunk Driving Task Force (hereafter Task Force) released its final report in September, 1985. In the Executive Summary, the Task Force proposed 39 separate recommendations for impacting the drunk driving problem.

There may be a way of increasing the impact of drunk driving legislation by copying the task force model at the local level. Results from the present research suggest that those jurisdictions that perceived a greater level of interaction between criminal justice agencies were more likely to have experienced a significant reduction in alcohol-involved fatalities. One proposal this author advocates is putting the fine revenue generated by drunk drivers back into local agencies to help offset the expense of increased enforcement. The only "catch" to the proposal is that a local task force, composed of representatives from each criminal justice agency, must be created. The Task Force would serve two valuable purposes. First, it would provide a forum for citizens concerned about drunk drivers, and, second, it would create an opportunity for criminal justice officials to clarify and coordinate their own local

actions with respect to drunk drivers.

The reduction of alcohol-involved fatalities will require a firm commitment to short- and long-term policy changes. The following penalty structure is recommended as a means to reduce the likelihood of repeat offenders. One of the underlying premises is that the discomfort of one individual should not have equal standing with the potential death or injury of another. This certainly applies to drunk drivers and the fact that their continued ability to drive vehicles turns on the notion that driving is a privilege and not a right. First and second offenders would face mandatory minimum jail terms. These would be brief and are designed to indicate that their offenses are considered serious. Second offenders would also face various types of license restrictions and mandatory counseling programs. More important penalties are reserved for the third-time offender. It is reasonably certain that anyone convicted for drunk driving three times, within some set period of time, is not simply the victim of circumstance. Such an individual has demonstrated a continued disregard for the safety of the community and an apparent disbelief that the criminal justice system will do anything serious in response. The use of fines will not necessarily deter such an individual, especially if they can afford to pay them.

What is recommended instead is that the people with three convictions surrender their motor vehicle and their privilege to drive. Reducing legitimate access to a motor vehicle may be more

effective than attempting to reduce the consumption of alcohol or to restrict consumption to certain specified times and places. Another point in favor of this proposal is that restricting alcohol availability also impacts those individuals who drink responsibly. In Michigan existing computer technology would permit all state offices responsible for issuing vehicle registrations or licenses to know whether the individual at the counter can be permitted to obtain the necessary documents. Disposition of the vehicle in their possession at the time of arrest, assuming subsequent conviction of the alcohol-related charge, will be at the discretion of the appropriate governmental agency. The state of Maryland currently has a law that permits the auction of vehicles seized in this manner. While there is no available research on whether the law is effective, such firm action provides a straightforward basis for coming to grips with a severe problem. Historically this problem has already proven resistant to a wide range of less draconian measures.

In sum, this research indicates that recent statutory changes intended to decrease drunk driving fatalities are having little impact. This study did discover that there is some relationship between implementation measures and impact. What is called for is, first, more research to pinpoint the sources of effectiveness and ineffectiveness. Second, more resources must be linked directly to substantive and tough implementation measures if further progress is to be achieved.

APPENDIX A

Initial and Follow-up Letters to States Requesting Alcohol-Involved Fatality Data

STATE OF MICHIGAN
61ST DISTRICT COURT
HALL OF JUSTICE
GRAND RAPIDS, MICHIGAN 49503
PHONE (616) 456-3278

February 24, 1984

....
....
....
....
....

................;

I am currently a doctoral candidate in public administration at Western Michigan University and am in the process of finalizing my dissertation proposal. Briefly, I am interested in conducting a time series analysis of the impact of Michigan's two most recent changes in its drunk driving laws. The time period under consideration will be April 1979 through April 1984, thus providing sixty continuous months of data.

The purpose of this letter is to secure similar data from .... However, there does not appear to be a "clearing house" available where this can be easily acquired. If available, would you please forward the following statistical information for the years 1979, through 1983, broken down by month:

1. TOTAL monthly traffic fatalities;
2. TOTAL monthly traffic fatalities which included alcohol;
3. TOTAL monthly arrests for drinking and driving;
4. TOTAL monthly court dispositions of drinking drivers.

I realize that states vary as to the degree of completeness with which the above data are collected, so please forward whatever may be available. My mailing address is:

Josef R. Soper, Administrator
61st District Court
Hall of Justice, Room 261-J
333 Monroe Avenue, N.W.
Grand Rapids, Michigan 49503

Again, thank you very much for your cooperation.

Sincerely,

Josef R. Soper

STATE OF MICHIGAN
61ST DISTRICT COURT
HALL OF JUSTICE
GRAND RAPIDS, MICHIGAN 49503
PHONE (616) 456-3278

DISTRICT JUDGES
GORDON A. DOHERTY
CAROL S. IRONS
DONALD A. JOHNSTON
LOUIS E. SIMHAUSER
J. ROBERT SMOLENSKI

COURT ADMINISTRATOR
JOSEF R. SOPER

June 26, 1984

Dear

On February 24, 1984, I mailed the attached letter to your office. A response has not yet been received.

If you never received the letter, I would appreciate it if you could respond to the request. On the other hand if the data are unavailable, it would be worthwhile knowing that as well.

Sincerely,

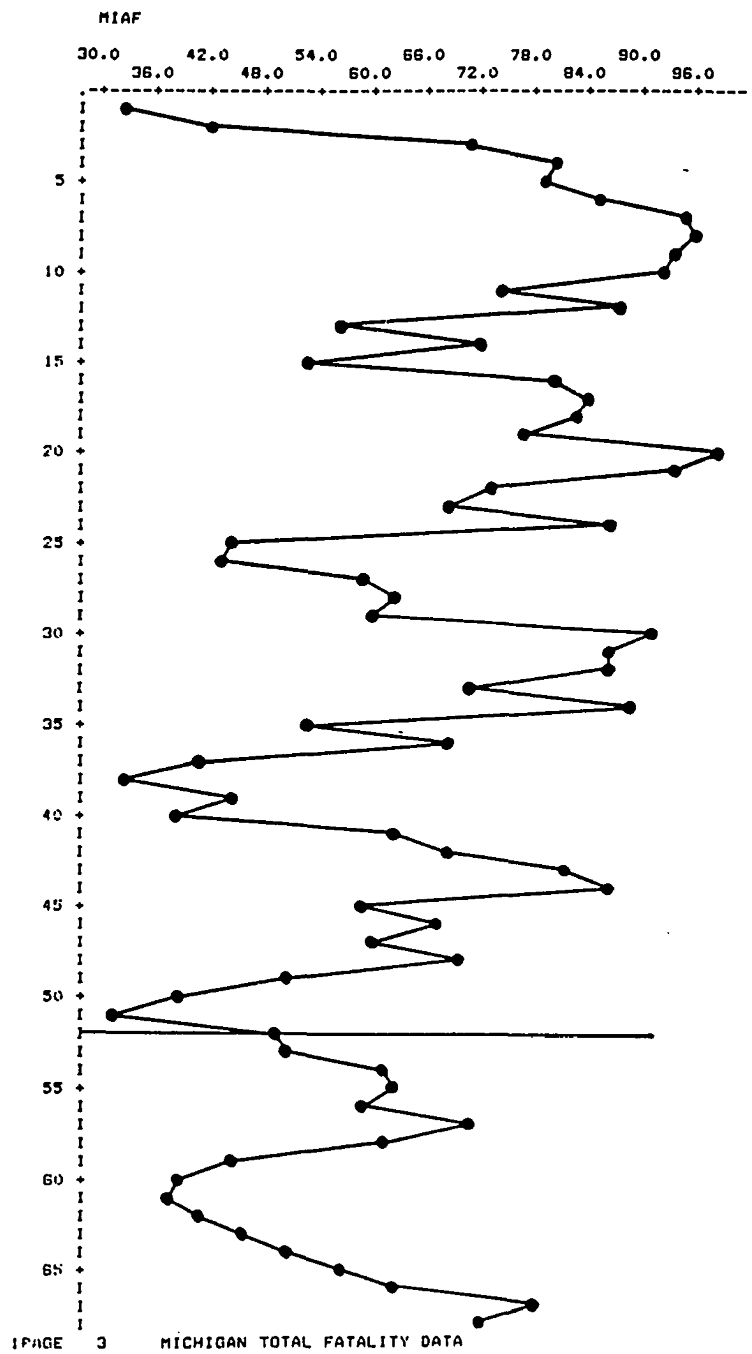
Josef R. Soper

attach/

APPENDIX B

Computer Generated Output from BIOMED Statistical Package for the Box-Jenkins Interrupted Time-Series Analysis

Michigan Alcohol-Involved Fatality Raw Time-Series Data.



Michigan Alcohol-Involved Fatality Data Undifferenced ACFs

AUTOCORRELATIONS

1- 12	.65	.48	.26	.10	-.13	-.18	-.16	-.08	.10	.35	.39	.52
ST.E.	.12	.16	.18	.18	.18	.19	.18	.20	.20	.20	.21	.22
13- 24	.43	.32	.05	-.09	-.26	-.27	-.31	-.14	-.05	.11	.21	.34
ST.E.	.23	.25	.25	.25	.25	.28	.28	.27	.27	.27	.27	.27
25- 36	.25	.12	0.0	-.19	-.35	-.36	-.33	-.25	-.17	-.03	.02	.12
ST.E.	.28	.28	.28	.28	.28	.28	.30	.30	.30	.31	.31	.31
37- 48	.10	.03	-.07	-.16	-.25	-.31	-.28	-.20	-.18	-.11	-.07	-.02
ST.E.	.31	.31	.31	.31	.31	.31	.32	.32	.32	.32	.32	.32
49- 60	0.0	-.02	-.07	-.12	-.14	-.14	-.12	-.11	-.04	.02	.05	.07
ST.E.	.32	.32	.32	.32	.32	.32	.33	.33	.33	.33	.33	.33
61- 62	.06	.05										
ST.E.	.33	.33										

1PAGE 3 MICHIGAN TOTAL FATALITY DATA

PLOT OF SERIAL CORRELATION

```
           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.647                    +     IXXXXX+XXXXXXXXXX
  2   0.488                  +       IXXXXXXX+XXXX
  3   0.256                 +        IXXXXXX  +
  4   0.097                 +        IXX      +
  5  -0.135                 +     XXXI        +
  6  -0.181                 +   XXXXXI        +
  7  -0.157                +     XXXXI         +
  8  -0.055                +        XI         +
  9   0.102                +         IXXX      +
 10   0.345                +         IXXXXXXXXX+
 11   0.391                +         IXXXXXXXXXX
 12   0.520               +          IXXXXXXXXXX+XX
 13   0.431               +          IXXXXXXXXXXX
 14   0.325              +           IXXXXXXXX   +
 15   0.048              +           IX          +
 16  -0.093              +         XXI           +
 17  -0.262              +    XXXXXXXI           +
 18  -0.273             +     XXXXXXXI            +
 19  -0.312             +    XXXXXXXXI            +
 20  -0.136             +         XXXI            +
 21  -0.048             +           XI            +
 22   0.113             +            IXXX         +
 23   0.207             +            IXXXXX       +
 24   0.341             +            IXXXXXXXXX   +
 25   0.249            +             IXXXXXX       +
 26   0.120            +             IXXX          +
 27  -0.004            +             I             +
 28  -0.188            +        XXXXXI             +
 29  -0.348            +    XXXXXXXXXI             +
 30  -0.384            +    XXXXXXXXXI             +
 31  -0.335            +     XXXXXXXXI             +
 32  -0.252           +        XXXXXXI              +
 33  -0.172           +          XXXXI              +
 34  -0.028           +             XI              +
 35   0.018           +              I              +
 36   0.123           +              IXXX           +
 37   0.100           +              IXXX           +
 38   0.030           +              IX             +
 39  -0.073           +            XXI              +
 40  -0.161           +          XXXXI              +
 41  -0.252           +        XXXXXXI              +
 42  -0.311           +      XXXXXXXXI              +
 43  -0.283           +       XXXXXXXI              +
 44  -0.203          +          XXXXXI               +
 45  -0.157          +           XXXXI               +
 46  -0.107          +            XXXI               +
 47  -0.088          +             XXI               +
 48  -0.018          +               I               +
 49   0.002          +               I               +
 50  -0.018          +               I               +
 51  -0.072          +             XXI               +
 52  -0.124          +            XXXI               +
```

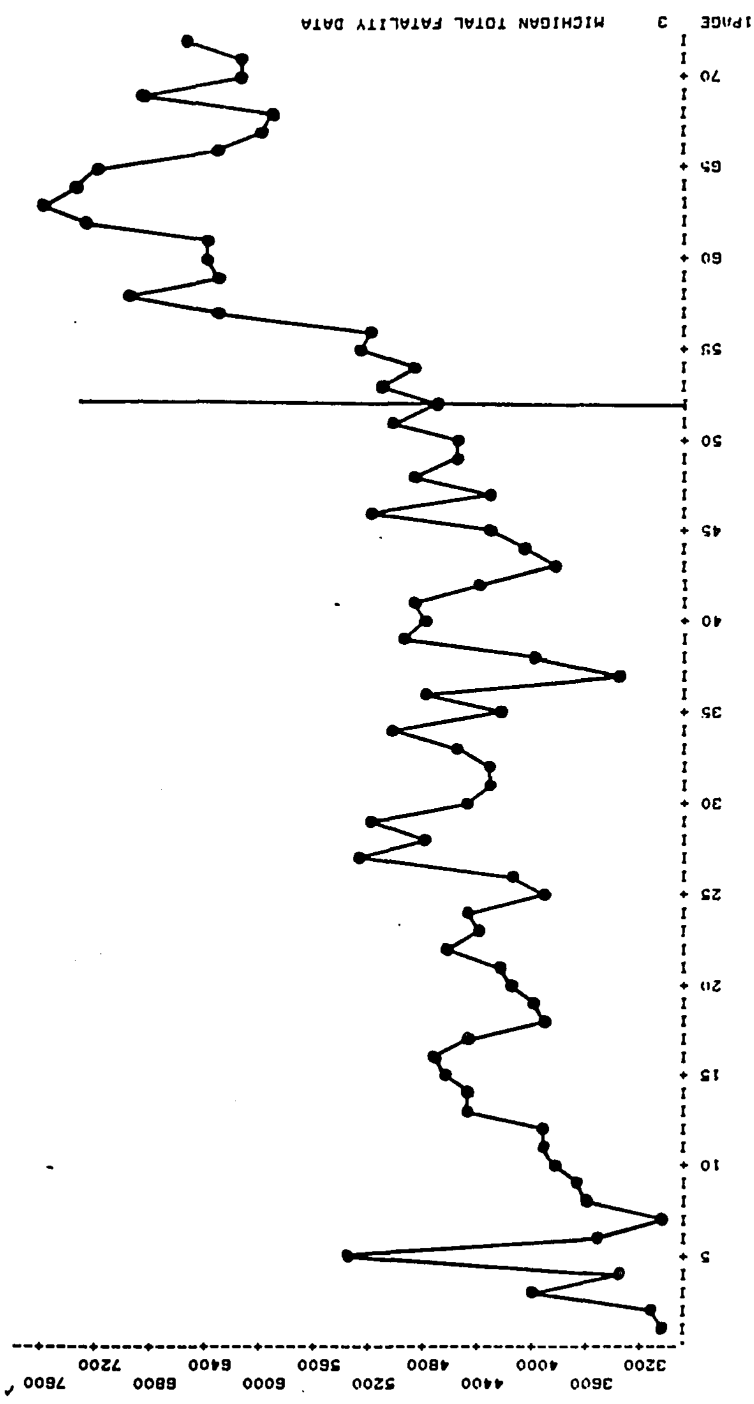
Michigan Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MIAF
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                               1
MIAF         RANDOM             1-  68  (1-8  )


PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1  MIAF            AR      1       1    -0.3241    0.1163     -2.79
     2  MIAF            AR      2      12     0.3474    0.1138      3.05

RESIDUAL SUM OF SQUARES  =       9899.847530 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                52
RESIDUAL MEAN SQUARE     =        190.381683
1PAGE    5      MICHIGAN TOTAL FATALITY DATA


ACF VARIABLE IS RMIAF. MAXLAG=45./

NUMBER OF OBSERVATIONS              =           68
MEAN OF THE (DIFFERENCED) SERIES =          0.5797
STANDARD ERROR OF THE MEAN        =          1.6602
T-VALUE OF MEAN (AGAINST ZERO)    =          0.3492

AUTOCORRELATIONS

  1- 12     -.02 -.06  .06  .11 -.22 -.14  0.0 -.24 -.10  .22  .02 -.08
  ST.E.      .12  .12  .12  .12  .12  .13  .13  .13  .14  .14  .14  .14

 13- 24      .21  .22 -.13 -.07 -.11 -.04 -.26  .09 -.06 -.02  .09  .18
  ST.E.      .14  .15  .15  .16  .16  .16  .16  .16  .16  .16  .16  .17

 25- 36      .07  0.0  .18 -.07 -.17 -.11 -.04 -.09 -.02  .01 -.01  .09
  ST.E.      .17  .17  .17  .17  .17  .17  .17  .17  .18  .18  .18  .18

 37- 45      .08  .07 -.03  .08 -.02 -.14 -.04 -.04  .06
  ST.E.      .18  .18  .18  .18  .18  .18  .18  .18  .18
1PAGE    6      MICHIGAN TOTAL FATALITY DATA


PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.024                    +    XI     +
  2  -0.061                    +   XXI     +
  3   0.065                    +     IXX   +
  4   0.108                    +     IXXX  +
  5  -0.217                    +XXXXXI     +
  6  -0.138                    +  XXXI     +
  7  -0.001                    +     I     +
  8  -0.239                    XXXXXXI     +
  9  -0.100                   +    XXI      +
 10   0.220                   +      IXXXXX +
 11   0.025                   +      IX     +
 12  -0.082                   +    XXI      +
 13   0.214                   +      IXXXXX +
 14   0.219                   +      IXXXXX +
 15  -0.134                  +    XXXI       +
 16  -0.073                  +     XXI       +
 17  -0.108                  +    XXXI       +
 18  -0.043                  +      XI       +
 19  -0.258                  + XXXXXXI       +
 20   0.094                  +       IXX     +
 21  -0.059                  +      XI       +
 22  -0.019                  +       I       +
 23   0.087                  +       IXX     +
 24   0.179                  +       IXXXX   +
 25   0.068                  +       IXX     +
```

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MIAF
INPUT VARIABLES -- NOISE      XI

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES
                                            1
MIAF       RANDOM             1-  68  (1-B   )
                                            1
XI         BINARY             1-  68  (1-B   )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.   T-RATIO
      1  MIAF          AR      1       1   -0.3026      0.1202     -2.52
      2  MIAF          AR      2      12    0.3512      0.1158      3.03
      3  XI            UP      1       0   14.7912     13.1915      1.12
      4  XI            SP      1       1   -0.4659      0.6421     -0.73

RESIDUAL SUM OF SQUARES   =       9675.840820 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =                50
RESIDUAL MEAN SQUARE      =        193.516817
1PAGE   7     MICHIGAN ALCOHOL FATALITY DATA



ACF VARIABLE IS RMIAF. MAXLAG=45./

NUMBER OF OBSERVATIONS                 =            68
MEAN OF THE (DIFFERENCED) SERIES =              0.4408
STANDARD ERROR OF THE MEAN             =        1.6445
T-VALUE OF MEAN (AGAINST ZERO)         =        0.2680

AUTOCORRELATIONS

  1- 12     -.02 -.05  .08  .11 -.26 -.13  .06 -.24 -.11  .21 -.02 -.08
 ST.E.       .12  .12  .12  .12  .12  .13  .13  .13  .14  .14  .15  .15

 13- 24      .19  .23 -.15 -.06 -.08 -.07 -.25  .11 -.06 -.05  .11  .17
 ST.E.       .15  .15  .16  .16  .16  .16  .16  .16  .17  .17  .17  .17

 25- 36      .05  .01  .21 -.09 -.17 -.07 -.05 -.12  0.0  .03 -.02  .07
 ST.E.       .17  .17  .17  .17  .17  .18  .18  .18  .18  .18  .18  .18

 37- 45      .12  .06 -.01  .08  .01 -.15 -.03 -.04  .05
 ST.E.       .18  .18  .18  .18  .18  .18  .18  .18  .18
1PAGE   8     MICHIGAN ALCOHOL FATALITY DATA



PLOT OF SERIAL CORRELATION

          -1.0  -0.8  -0.6  -0.4  -0.2   0.0   0.2   0.4   0.6   0.8   1.0
LAG   CORR. +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
                                          I
   1  -0.019                       +      I      +
   2  -0.047                       +     XI      +
   3   0.076                       +      IXX    +
   4   0.109                       +      IXXX   +
   5  -0.255                        XXXXXXI      +
   6  -0.126                       +   XXXI      +
   7   0.057                      +       IX      +
   8  -0.244                      +XXXXXXI        +
   9  -0.113                      +    XXXI       +
  10   0.213                      +       IXXXXX  +
  11  -0.018                      +       I       +
  12  -0.078                      +     XXI       +
  13   0.194                      +       IXXXXX  +
  14   0.231                      +       IXXXXXX+
  15  -0.152                     +    XXXXI        +
  16  -0.062                     +      XXI        +
  17  -0.077                     +      XXI        +
  18  -0.066                     +      XXI        +
  19  -0.248                     +  XXXXXXI        +
  20   0.111                     +        IXXX     +
  21  -0.065                     +      XXI        +
  22  -0.053                     +       XI        +
```

Michigan Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MIAF
INPUT VARIABLES -- NOISE        X1

VARIABLE  VAR. TYPE  MEAN        TIME      DIFFERENCES
                                                1
MIAF         RANDOM              1-   68  (1-B   )
                                                1
X1           BINARY              1-   68  (1-B   )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE      ST. ERR.   T-RATIO
    1  MIAF             AR       1       1    -0.3714      0.1156     -3.21
    2  MIAF             AR       2      12     0.3480      0.1191      2.92
    3  X1               UP       1       1     0.1712      1.0793      0.16
    4  X1               SP       1       1     1.2713      0.5815      2.19

RESIDUAL SUM OF SQUARES  =         9099.252810 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                  49
RESIDUAL MEAN SQUARE     =          185.699038
1PAGE   7      MICHIGAN ALCOHOL FATALITY DATA


ACF VARIABLE IS RMIAF. MAXLAG=45./

NUMBER OF OBSERVATIONS                =          68
MEAN OF THE (DIFFERENCED) SERIES      =     -0.0298
STANDARD ERROR OF THE MEAN            =      1.6333
T-VALUE OF MEAN (AGAINST ZERO)        =     -0.0183

AUTOCORRELATIONS

  1- 12    -.04 -.10  .07  .09 -.25 -.15  0.0 -.24 -.09  .23  .04 -.07
  ST.E.     .12  .12  .12  .12  .12  .13  .13  .13  .14  .14  .15  .15

 13- 24     .25  .21 -.14 -.07 -.09 -.08 -.26  .10 -.06 -.03  .13  .19
  ST.E.     .15  .15  .16  .16  .16  .16  .16  .17  .17  .17  .17  .17

 25- 36     .04  .01  .18 -.08 -.18 -.09 -.03 -.10  .01  .01  .01  .09
  ST.E.     .17  .17  .17  .18  .18  .18  .18  .18  .18  .18  .18  .18

 37- 45     .08  .06 -.04  .09 -.02 -.12 -.02 -.04  .06
  ST.E.     .18  .18  .18  .18  .18  .18  .18  .18  .18
1PAGE   8      MICHIGAN ALCOHOL FATALITY DATA


PLOT OF SERIAL CORRELATION

              -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                         I
  1  -0.037                       +     XI     +
  2  -0.097                       +    XXI     +
  3   0.067                       +      IXX   +
  4   0.091                       +      IXX   +
  5  -0.247                       XXXXXXI      +
  6  -0.151                       + XXXXI      +
  7  -0.004                      +       I      +
  8  -0.244                      +XXXXXXI       +
  9  -0.088                      +     XXI      +
 10   0.232                      +       IXXXXXX+
 11   0.039                      +       IX     +
 12  -0.075                      +     XXI      +
 13   0.253                      +       IXXXXXX+
 14   0.215                     +        IXXXXX  +
 15  -0.142                     +    XXXXI       +
 16  -0.074                     +      XXI       +
 17  -0.089                     +      XXI       +
 18  -0.079                     +      XXI       +
 19  -0.264                     +XXXXXXXI        +
 20   0.102                     +        IXXX    +
 21  -0.062                     +      XXI       +
```


MICHIGAN TOTAL FATALITY DATA

Michigan Alcohol-Involved Arrest Data Undifferenced ACFs

AUTOCORRELATIONS

1- 12	.81	.74	.67	.61	.67	.62	.56	.43	.35	.31	.28	.27
ST.E.	.12	.18	.22	.24	.27	.29	.31	.32	.33	.33	.34	.34
13- 24	.17	.12	.05	.05	.08	.04	.02	-.08	-.07	-.05	-.03	0.0
ST.E.	.34	.34	.34	.34	.34	.34	.34	.34	.35	.35	.35	.35
25- 36	-.07	-.09	-.11	-.07	-.02	-.01	0.0	-.09	-.06	-.05	-.02	.01
ST.E.	.35	.35	.35	.35	.35	.35	.35	.35	.35	.35	.35	.35
37- 48	-.07	-.10	-.13	-.11	-.08	-.09	-.10	-.17	-.18	-.18	-.20	-.18
ST.E.	.35	.35	.35	.35	.35	.35	.35	.35	.35	.35	.35	.36
49- 60	-.22	-.24	-.28	-.27	-.28	-.30	-.31	-.33	-.31	-.29	-.28	-.28
ST.E.	.36	.36	.36	.36	.37	.37	.37	.38	.38	.38	.39	.39
61- 65	-.28	-.27	-.23	-.17	-.15							
ST.E.	.39	.40	.40	.40	.40							

1PAGE 3 MICHIGAN TOTAL FATALITY DATA

PLOT OF SERIAL CORRELATION

```
           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                      I
  1   0.815                     +     IXXXXX+XXXXXXXXXXXXXX
  2   0.741                  +        IXXXXXXXX+XXXXXXXXXX
  3   0.668                +          IXXXXXXXXXX+XXXXXX
  4   0.609               +           IXXXXXXXXXXX+XXX
  5   0.667              +            IXXXXXXXXXXXX+XXXX
  6   0.620             +             IXXXXXXXXXXXXX+XX
  7   0.560            +              IXXXXXXXXXXXXXX+
  8   0.430           +               IXXXXXXXXXXX    +
  9   0.355           +               IXXXXXXXXX      +
 10   0.309           +               IXXXXXXXX       +
 11   0.275           +               IXXXXXXX        +
 12   0.268          +                IXXXXXXX         +
 13   0.170          +                IXXXX            +
 14   0.123          +                IXXX             +
 15   0.053          +                IX               +
 16   0.045          +                IX               +
 17   0.076          +                IXX              +
 18   0.039          +                IX               +
 19   0.020          +                IX               +
 20  -0.078          +              XXI                +
 21  -0.075          +              XXI                +
 22  -0.051          +               XI                +
 23  -0.028          +               XI                +
 24   0.002          +                I                +
 25  -0.072          +              XXI                +
 26  -0.089          +              XXI                +
 27  -0.109          +             XXXI                +
 28  -0.073          +              XXI                +
 29  -0.016          +                I                +
 30  -0.007          +                I                +
 31  -0.003          +                I                +
 32  -0.087          +              XXI                +
 33  -0.056          +               XI                +
 34  -0.049          +               XI                +
 35  -0.024          +               XI                +
 36   0.008          +                I                +
 37  -0.068          +              XXI                +
 38  -0.104          +             XXXI                +
 39  -0.130          +             XXXI                +
 40  -0.111          +             XXXI                +
 41  -0.080          +              XXI                +
 42  -0.089          +              XXI                +
 43  -0.104          +             XXXI                +
 44  -0.165          +            XXXXI                +
 45  -0.176          +            XXXXI                +
 46  -0.184          +           XXXXXI                +
 47  -0.195          +           XXXXXI                +
 48  -0.185          +           XXXXXI                +
 49  -0.217          +           XXXXXI                +
 50  -0.244         +           XXXXXXI                +
 51  -0.281         +          XXXXXXXI                +
```

Michigan Alcohol-Involved Arrest Data Parameter Estimates and ACFs for White Noise Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MITAA
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES
                                            1      12
MITAA       RANDOM             1-  72  (1-B  ) (1-B  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
    1  MITAA           AR      1       1    -0.3558     0.1239     -2.87

RESIDUAL SUM OF SQUARES  =  18462009.800000 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               57
RESIDUAL MEAN SQUARE     =     323894.906000
1PAGE    5      MICHIGAN TOTAL FATALITY DATA


ACF VARIABLE IS RMITAA. MAXLAG=45./

NUMBER OF OBSERVATIONS               =          67
MEAN OF THE (DIFFERENCED) SERIES     =    -27.8918
STANDARD ERROR OF THE MEAN           =     64.5717
T-VALUE OF MEAN (AGAINST ZERO)       =     -0.4320

AUTOCORRELATIONS

  1- 12     -.02 -.01  .06 -.09 -.08 -.01  0.0  .10  .04 -.06 -.05 -.22
  ST.E.      .12  .12  .12  .12  .12  .12  .12  .12  .13  .13  .13  .13

 13- 24     0.0  -.01  .02  0.0  .03 -.02 -.01  .06 -.19  .03 -.02 -.11
  ST.E.      .13  .13  .13  .13  .13  .13  .13  .13  .13  .14  .14  .14

 25- 36     -.06  .10  .04  .08 -.05  .03 -.03 -.17  .09 -.02  .15  .05
  ST.E.      .14  .14  .14  .14  .14  .14  .14  .14  .14  .14  .14  .15

 37- 45     -.07 -.10 -.01 -.12 -.03  .02  .05  .03  .02
  ST.E.      .15  .15  .15  .15  .15  .15  .15  .15  .15
1PAGE    6      MICHIGAN TOTAL FATALITY DATA


PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.016                     +    I     +
  2  -0.009                     +    I     +
  3   0.061                     +    IXX   +
  4  -0.092                     +  XXI     +
  5  -0.076                     +  XXI     +
  6  -0.011                     +    I     +
  7  -0.003                     +    I     +
  8   0.102                     +    IXXX  +
  9   0.042                     +    IX    +
 10  -0.060                     +  XXI     +
 11  -0.054                     +   XI     +
 12  -0.224                     XXXXXXI    +
 13  -0.001                     +    I     +
 14  -0.011                     +    I     +
 15   0.016                     +    I     +
 16  -0.000                     +    I     +
 17   0.032                     +    IX    +
 18  -0.017                     +    I     +
 19  -0.009                     +    I     +
 20   0.056                     +    IX    +
 21  -0.190                    + XXXXXI     +
 22   0.032                    +     IX     +
 23  -0.021                    +    XI      +
 24  -0.110                    +  XXXI      +
 25  -0.063                    +   XXI      +
 26   0.098                    +     IXX    +
```

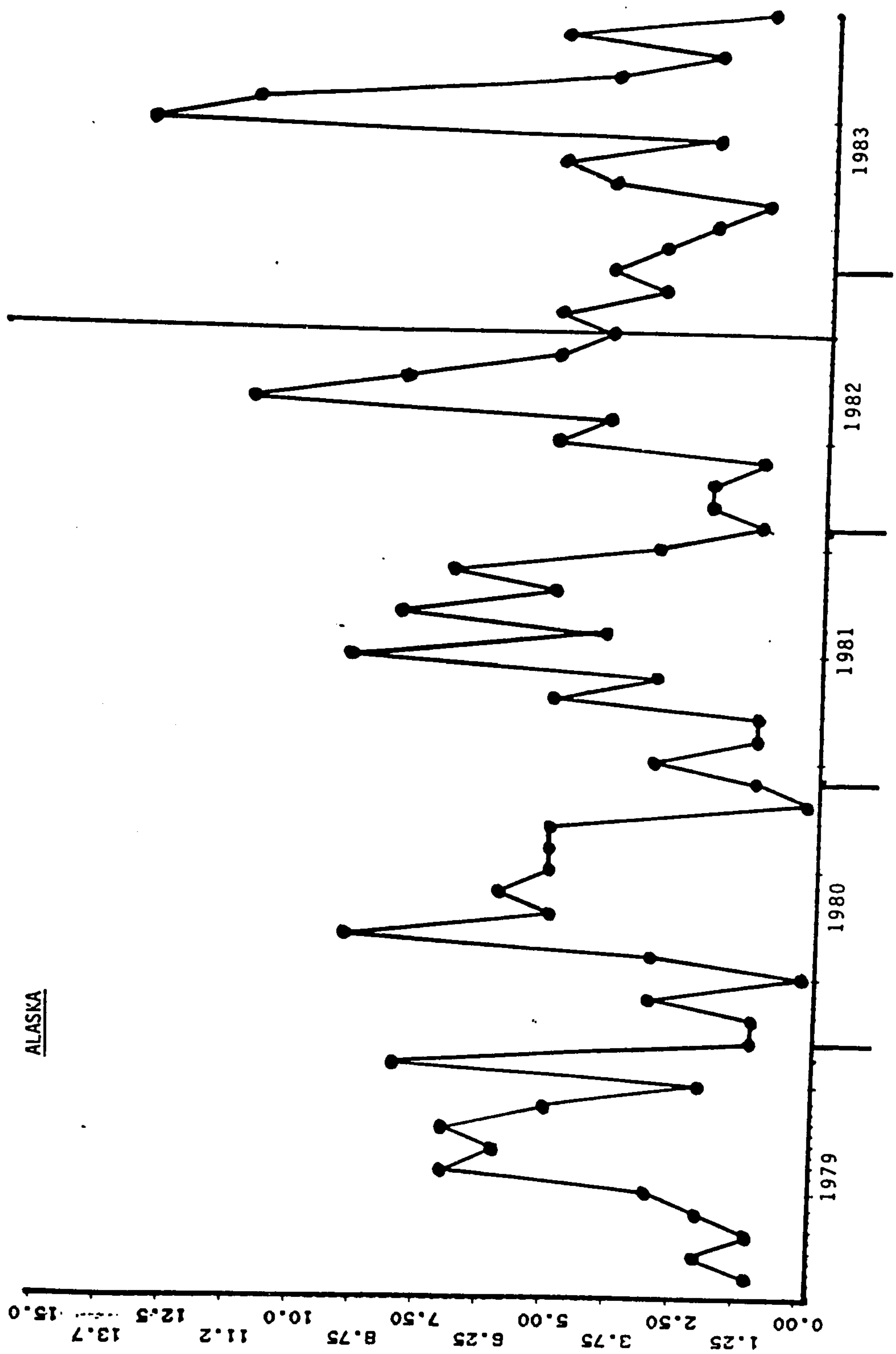
Michigan Alcohol-Involved Arrest Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MITAA
INPUT VARIABLES -- NOISE     X1

VARIABLE   VAR. TYPE   MEAN      TIME      DIFFERENCES
                                              1        12
MITAA        RANDOM             1-  72  (1-B   ) (1-B   )
                                              1        12
X1           BINARY             1-  72  (1-B   ) (1-B   )

PARAMETER VARIABLE     TYPE   FACTOR   ORDER ESTIMATE     ST. ERR.   T-RATIO
      1  MITAA          AR       1        1    -0.3431     0.1268     -2.71
      2  X1             UP       1        0  -207.2891   258.0249     -0.80
      3  X1             SP       1        1    -1.0013     0.0970    -10.32

RESIDUAL SUM OF SQUARES  =  18209863.500000 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               55
RESIDUAL MEAN SQUARE     =     331088.426000
1PAGE    7      MICHIGAN ALCOHOL FATALITY DATA


ACF VARIABLE IS RMITAA. MAXLAG=45./

NUMBER OF OBSERVATIONS                  =            67
MEAN OF THE (DIFFERENCED) SERIES        =      -27.5984
STANDARD ERROR OF THE MEAN              =       64.1311
T-VALUE OF MEAN (AGAINST ZERO)          =       -0.4303

AUTOCORRELATIONS

  1- 12    -.02 -.02  .10 -.10 -.06 -.01  .01  .09  .04 -.06 -.05 -.23
  ST.E.     .12  .12  .12  .12  .12  .13  .13  .13  .13  .13  .13  .13

 13- 24     .01 -.02 -.01  .01  .02 -.01 -.03  .08 -.21  .05 -.03 -.10
  ST.E.     .13  .13  .13  .13  .13  .13  .13  .13  .13  .14  .14  .14

 25- 36    -.06  .10  .04  .08 -.05  .03 -.03 -.17  .11 -.03  .14  .06
  ST.E.     .14  .14  .14  .14  .14  .14  .14  .14  .15  .15  .15  .15

 37- 45    -.10 -.08 -.02 -.10 -.05  .04  .04  .05 -.01
  ST.E.     .15  .15  .15  .15  .15  .15  .15  .15  .15
1PAGE    8      MICHIGAN ALCOHOL FATALITY DATA


PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+----+
                                        I
  1  -0.023                       +    XI    +
  2  -0.016                       +     I    +
  3   0.098                       +     IXX  +
  4  -0.100                       +  XXXI    +
  5  -0.060                       +    XI    +
  6  -0.008                       +     I    +
  7   0.006                       +     I    +
  8   0.086                       +     IXX  +
  9   0.036                       +     IX   +
 10  -0.059                       +    XI    +
 11  -0.047                       +    XI    +
 12  -0.226                       XXXXXXI    +
 13   0.008                       +     I    +
 14  -0.020                      +     XI     +
 15  -0.006                      +      I     +
 16   0.007                      +      I     +
 17   0.016                      +      I     +
 18  -0.012                      +      I     +
 19  -0.032                      +     XI     +
 20   0.082                      +      IXX   +
 21  -0.212                      + XXXXXI     +
 22   0.054                      +      IX    +
 23  -0.031                      +     XI     +
```

Michigan Alcohol-Involved Arrest Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MITAA
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1      12
MITAA       RANDOM             1-  72  (1-B   ) (1-B   )
                                              1      12
X1          BINARY             1-  72  (1-B   ) (1-B   )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1  MITAA          AR      1       1    -0.4854      0.1165    -4.16
     2  X1             UP      1       1   592.1175    190.4585     3.11
     3  X1             SP      1       1     0.8083      0.1015     7.96

RESIDUAL SUM OF SQUARES  =  14584666.100000 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                54
RESIDUAL MEAN SQUARE     =     270086.410000
1PAGE   7      MICHIGAN ALCOHOL FATALITY DATA


ACF VARIABLE IS RMITAA. MAXLAG=45./

NUMBER OF OBSERVATIONS                 =            67
MEAN OF THE (DIFFERENCED) SERIES =      -35.5970
STANDARD ERROR OF THE MEAN             =       57.9342
T-VALUE OF MEAN (AGAINST ZERO)         =       -0.6144

AUTOCORRELATIONS

   1- 12     -.12 -.21  .02 -.12 -.13 -.01  .01  .10  .03 -.01 -.05 -.16
   ST.E.      .12  .12  .13  .13  .13  .13  .13  .13  .13  .13  .13  .13

  13- 24      .06  0.0  .01  .05  .08 -.03  .03  .09 -.17  .08  .01 -.15
   ST.E.      .14  .14  .14  .14  .14  .14  .14  .14  .14  .14  .14  .14

  25- 36     -.07  .10  .04  .08 -.05  .05 -.05 -.18  .07 -.03  .14  .09
   ST.E.      .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15

  37- 45     -.08 -.04  .06 -.11 -.03  .03  .09  .03  .01
   ST.E.      .16  .16  .16  .16  .16  .16  .16  .16  .16
1PAGE   8      MICHIGAN ALCOHOL FATALITY DATA


PLOT OF SERIAL CORRELATION

            -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
 LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
   1  -0.118                   +  XXXI     +
   2  -0.211                   +XXXXXI     +
   3   0.022                   +     IX    +
   4  -0.117                   +  XXXI     +
   5  -0.128                   +  XXXI     +
   6  -0.012                   +     I     +
   7   0.009                   +     I     +
   8   0.102                   +     IXXX  +
   9   0.032                  +      IX     +
  10  -0.012                  +      I      +
  11  -0.050                  +     XI      +
  12  -0.157                  +  XXXXI      +
  13   0.064                  +      IXX    +
  14   0.004                  +      I      +
  15   0.012                  +      I      +
  16   0.050                  +      IX     +
  17   0.076                  +      IXX    +
  18  -0.033                  +     XI      +
  19   0.033                  +      IX     +
  20   0.091                  +      IXX    +
✓ 21  -0.172                  +  XXXXI      +
  22   0.083                  +      IXX    +
  23   0.009                  +      I      +
```

Alaska Alcohol-Involved Fatality Raw Time-Series Data



```
ACF VARIABLE IS AL3.
MAXLAG=30./

NUMBER OF OBSERVATIONS               =          60
MEAN OF THE (DIFFERENCED) SERIES =          4.0833
STANDARD ERROR OF THE MEAN           =          0.3738
T-VALUE OF MEAN (AGAINST ZERO)       =         10.9244

AUTOCORRELATIONS

  1- 12      .30  .14 -.01 -.27 -.42 -.32 -.35 -.10  0.0  .19  .30  .33
  ST.E.      .13  .14  .14  .14  .15  .17  .18  .19  .19  .19  .19  .20

 13- 24      .41  .20 -.04 -.22 -.29 -.34 -.26 -.19  .10  .16  .31  .24
  ST.E.      .21  .22  .23  .23  .23  .24  .24  .25  .25  .25  .25  .26

 25- 30      .26  .13 -.04 -.17 -.23 -.27
  ST.E.      .26  .27  .27  .27  .27  .27

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.295                    +     IXXXXX+X
  2   0.142                   +      IXXXX  +
  3  -0.007                   +      I      +
  4  -0.268                   XXXXXXXI      +
  5  -0.423              XXXX+XXXXXXXI      +
  6  -0.320                 XXXXXXXXXI       +
  7  -0.352                XXXXXXXXXXI        +
  8  -0.099                 +      XXI        +
  9  -0.003                 +        I        +
 10   0.188                 +        IXXXXX   +
 11   0.299                +         IXXXXXXX  +
 12   0.327                +         IXXXXXXXX +
 13   0.413                +         IXXXXXXXXXX
 14   0.199               +          IXXXXX     +
 15  -0.040               +         XI          +
 16  -0.225               +    XXXXXXI          +
 17  -0.294               +   XXXXXXXI          +
 18  -0.338              +  XXXXXXXXXI           +
 19  -0.262              +    XXXXXXXI           +
 20  -0.191              +      XXXXXI           +
 21   0.103              +           IXXX        +
 22   0.165              +           IXXXX       +
 23   0.310              +           IXXXXXXXX   +
 24   0.240             +            IXXXXXX      +
 25   0.264             +            IXXXXXXX     +
 26   0.131             +            IXXX         +
 27  -0.040             +           XI            +
 28  -0.172             +        XXXXI            +
 29  -0.228             +      XXXXXXI            +
 30  -0.269             +     XXXXXXXI            +
1PAGE   3     ALASKA DATA ANALYSIS
```

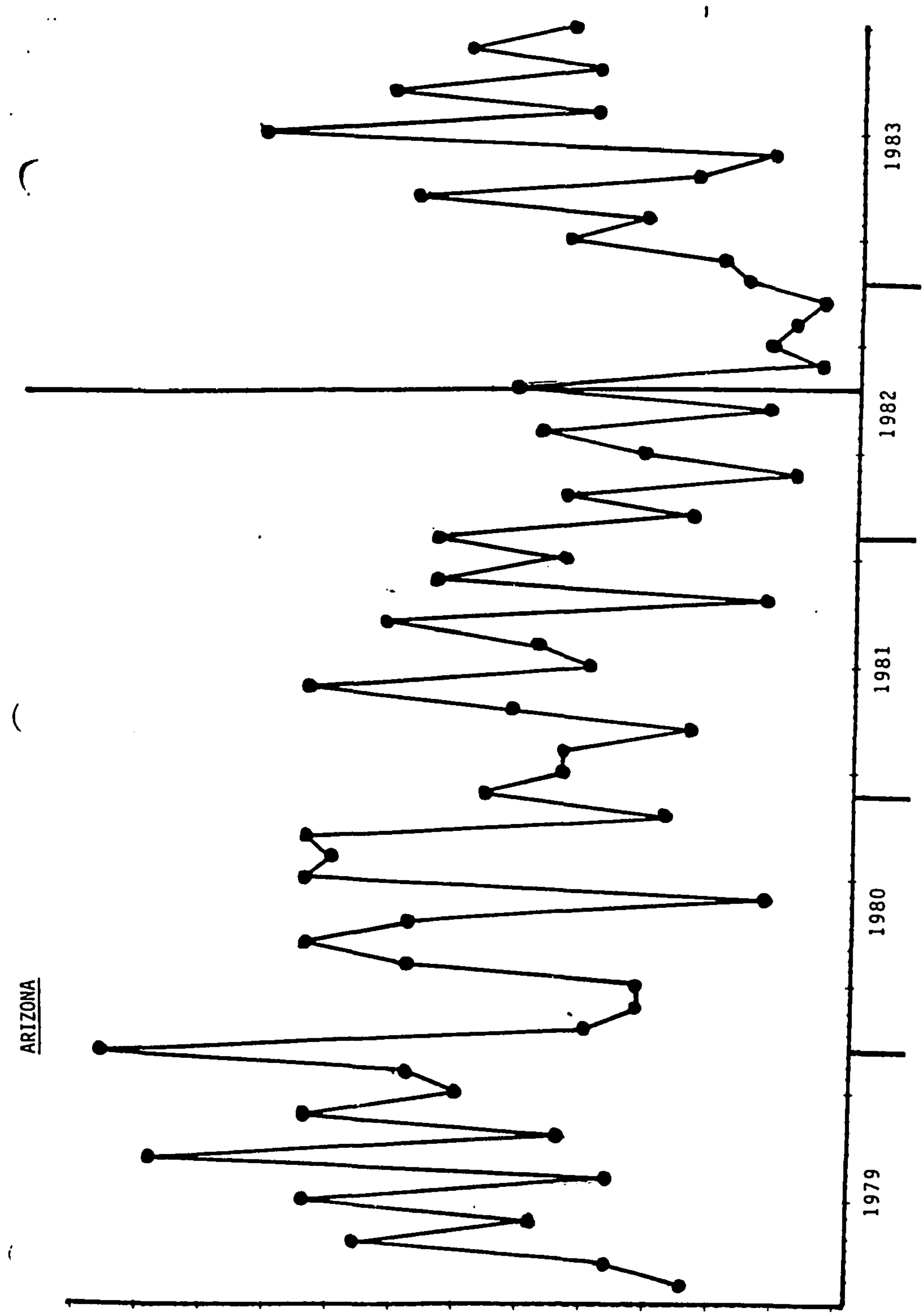
Alaska Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AL3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

AL3        RANDOM             1-  60

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1   AL3           MA      1       1    -0.4566     0.1296     -3.52
     2   AL3           MA      2       2    -0.4587     0.1308     -3.51
     3   AL3           MA      3       3    -0.3459     0.1387     -2.49

RESIDUAL SUM OF SQUARES  =        605.614665 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                57
RESIDUAL MEAN SQUARE     =         10.624815
1PAGE   5     ALASKA DATA ANALYSIS


ACF VARIABLE IS RAL3.
MAXLAG=30./


NUMBER OF OBSERVATIONS                 =            60
MEAN OF THE (DIFFERENCED) SERIES       =        1.4389
STANDARD ERROR OF THE MEAN             =        0.3688
T-VALUE OF MEAN (AGAINST ZERO)         =        3.9020

AUTOCORRELATIONS

  1- 12     -.16 -.09 -.20  .14 -.21  0.0 -.19  .09 -.03  .07 -.03  .05
  ST.E.      .13  .13  .13  .14  .14  .15  .15  .15  .15  .15  .15  .15

 13- 24      .25  .08 -.07 -.14  .01 -.10 -.06 -.18  .15  .01  .14 -.07
  ST.E.      .15  .16  .16  .16  .16  .16  .16  .16  .17  .17  .17  .17

 25- 30      .16  .03  .03 -.15 -.06 -.07
  ST.E.      .17  .17  .17  .17  .18  .18

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.155                    + XXXXI     +
  2  -0.087                    -   XXI     -
  3  -0.200                   + XXXXXI      -
  4   0.136                   +      IXXX   +
  5  -0.213                   + XXXXXI      +
  6   0.004                   +      I      +
  7  -0.189                   + XXXXXI      +
  8   0.086                   +      IXX    +
  9  -0.029                   +     XI      +
 10   0.072                   +      IXX    +
 11  -0.026                   +     XI      +
 12   0.048                   +      IX     -
 13   0.250                   +      IXXXXXX+
 14   0.079                  +       IXX     -
 15  -0.067                  -     XXI       -
 16  -0.145                  -   XXXXI       +
 17   0.009                  +       I       +
 18  -0.100                  +    XXXI       +
 19  -0.056                  -      XI       +
 20  -0.176                  +   XXXXI       +
 21   0.151                  -       IXXXX   -
 22   0.008                  +       I       -
 23   0.144                  +       IXXXX   +
 24  -0.068                  +     XXI       +
 25   0.157                  +       IXXXX   +
 26   0.033                  +       IX      +
 27   0.033                  +       IX      +
 28  -0.155                  +   XXXXI       +
 29  -0.060                 +       XI        +
```

```
OUTPUT VARIABLE -- AL3
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

AL3        RANDOM             1-  60

X1         BINARY             1-  60

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  AL3            MA      1       1    -0.4422      0.1335    -3.31
      2  AL3            MA      2       2    -0.4536      0.1350    -3.36
      3  AL3            MA      3       3    -0.3272      0.1425    -2.30
      4  X1             UP      1       1     3.0719      2.9842     1.03
      5  X1             SP      1       1     0.2509      0.7742     0.32

RESIDUAL SUM OF SQUARES  =        563.641197 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                54
RESIDUAL MEAN SQUARE     =          10.437800
1PAGE    7      ALASKA DATA ANALYSIS


ACF VARIABLE IS RAL3. MAXLAG=45./

NUMBER OF OBSERVATIONS                =              60
MEAN OF THE (DIFFERENCED) SERIES      =          1.0777
STANDARD ERROR OF THE MEAN            =          0.3736
T-VALUE OF MEAN (AGAINST ZERO)        =          2.8846

AUTOCORRELATIONS

  1- 12     -.08 -.03 -.11  .11 -.21  0.0 -.16  .07 -.05  .11  .07  .08
  ST.E.      .13  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14

 13- 24      .24  .07 -.05 -.17 -.03 -.14 -.06 -.17  .13  .01  .16 -.04
  ST.E.      .14  .15  .15  .15  .16  .16  .16  .16  .16  .16  .16  .17

 25- 36      .14  .03  .03 -.14 -.09 -.11  .10 -.10 -.08  .11  .08  .03
  ST.E.      .17  .17  .17  .17  .17  .17  .17  .17  .17  .17  .18  .18

 37- 45     -.02  .10  0.0 -.11 -.11  .01 -.13  .07  .03
  ST.E.      .18  .18  .18  .18  .18  .18  .18  .18  .18
1PAGE    8      ALASKA DATA ANALYSIS


PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1  -0.075                      +   XXI     +
  2  -0.032                      +    XI     +
  3  -0.115                      +  XXXI     +
  4   0.105                      +     IXXX  +
  5  -0.210                     + XXXXXI      +
  6  -0.005                     +      I      +
  7  -0.157                     +  XXXXI      +
  8   0.067                     +      IXX    +
  9  -0.051                     +     XI      +
 10   0.111                     +      IXXX   +
 11   0.070                     +      IXX    +
 12   0.076                     +      IXX    +
 13   0.243                     +      IXXXXXX+
 14   0.068                     +      IXX    +
 15  -0.052                     +     XI      +
 16  -0.171                     +  XXXXI      +
 17  -0.028                    +      XI       +
 18  -0.142                    +   XXXXI       +
 19  -0.063                    +     XXI       +
 20  -0.171                    +   XXXXI       +
 21   0.132                    +       IXXX    +
 22   0.006                    +       I       +
```

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AL3
INPUT VARIABLES -- NOISE      X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES

AL3        RANDOM              1-  60

X1         BINARY              1-  60

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.   T-RATIO
     1  AL3            MA       1       1    -0.3432     0.1195     -2.87
     2  AL3            MA       2       2    -0.3442     0.1201     -2.87
     3  AL3            MA       3      13    -0.8338     0.0500    -16.68
     4  X1             UP       1       0     0.2916     0.3690      0.79
     5  X1             SP       1       1     0.9781     0.1980      4.94

RESIDUAL SUM OF SQUARES  =       347.299439 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =              55
RESIDUAL MEAN SQUARE     =         6.314535
1PAGE   7     ALASKA DATA ANALYSIS


ACF VARIABLE IS RAL3. MAXLAG=30./

NUMBER OF OBSERVATIONS                  =           60
MEAN OF THE (DIFFERENCED) SERIES        =       0.9869
STANDARD ERROR OF THE MEAN              =       0.2857
T-VALUE OF MEAN (AGAINST ZERO)          =       3.4550

AUTOCORRELATIONS

  1- 12     -.13 -.06  .11  .08 -.17  .12 -.16  .10  .03  .03 -.04  .20
 ST.E.       .13  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14

 13- 24     -.07  .05 -.04 -.02 -.10 -.15 -.11 -.03  .02 -.08  .11 -.01
 ST.E.       .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .16

 25- 30      .05  .02  .09 -.09 -.04 -.09
 ST.E.       .16  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1  -0.135                      +  XXXI    +
  2  -0.062                      +   XXI    +
  3   0.112                      +     IXXX +
  4   0.084                     +      IXX   +
  5  -0.166                     + XXXXI      +
  6   0.120                     +      IXXX  +
  7  -0.159                     + XXXXI      +
  8   0.103                     +      IXXX  +
  9   0.026                     +      IX    +
 10   0.027                     +      IX    +
 11  -0.038                     +     XI     +
 12   0.185                     +      IXXXXX +
 13  -0.073                     +    XXI     +
 14   0.052                     +      IX    +
 15  -0.044                     +     XI     +
 16  -0.024                     +     XI     +
 17  -0.085                     +    XXI     +
 18  -0.146                     +  XXXXI     +
 19  -0.111                     +   XXXI     +
 20  -0.028                    +      XI      +
 21   0.021                    +       IX     +
 22  -0.078                    +     XXI      +
 23   0.107                    +       IXXX   +
 24  -0.008                    +       I      +
 25   0.052                    +       IX     +
 26   0.021                    +       IX     +
 27   0.086                    +       IXX    +
```

Arizona Alcohol-Involved Fatality Raw Time-Series Data



```
ACF VARIABLE IS AZ3.
MAXLAG=30./

NUMBER OF OBSERVATIONS                  =          60
MEAN OF THE (DIFFERENCED) SERIES        =     26.9000
STANDARD ERROR OF THE MEAN              =      0.8726
T-VALUE OF MEAN (AGAINST ZERO)          =     30.8278

AUTOCORRELATIONS

  1- 12      .10  .31  .13  .27  .29  .08  .15  .07  .21 -.02  0.0  .12
  ST.E.      .13  .13  .14  .14  .15  .16  .16  .16  .16  .17  .17  .17

 13- 24     -.01  .14 -.05 -.10  .02 -.07 -.02 -.05 -.02 -.11  .02 -.10
  ST.E.      .17  .17  .17  .17  .17  .17  .17  .17  .17  .17  .18  .18

 25- 30     -.06 -.08 -.09 -.18 -.04 -.18
  ST.E.      .18  .18  .18  .18  .18  .18

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.096                    +     IXX   +
  2   0.310                    +     IXXXXX+XX
  3   0.126                   +      IXXX   +
  4   0.275                   +      IXXXXXXX
  5   0.289                   +      IXXXXXXX
  6   0.077                  +       IXX     +
  7   0.149                  +       IXXXX   +
  8   0.071                  +       IXX     +
  9   0.210                  +       IXXXXX  +
 10  -0.023                  +      XI       +
 11  -0.002                  +       I       +
 12   0.115                  +       IXXX    +
 13  -0.011                  +       I       +
 14   0.136                  +       IXXX    +
 15  -0.051                  +      XI       +
 16  -0.096                  +     XXI       +
 17   0.017                  +       I       +
 18  -0.069                  +     XXI       +
 19  -0.018                 +        I        +
 20  -0.049                 +       XI        +
 21  -0.021                 +       XI        +
 22  -0.109                 +     XXXI        +
 23   0.019                 +        I        +
 24  -0.103                 +     XXXI        +
 25  -0.058                 +       XI        +
 26  -0.078                 +      XXI        +
 27  -0.086                 +      XXI        +
 28  -0.184                 +   XXXXXI        +
 29  -0.042                 +       XI        +
 30  -0.184                 +   XXXXXI        +
1PAGE   3     ARIZONA DATA ANALYSIS
```

Arizona Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models

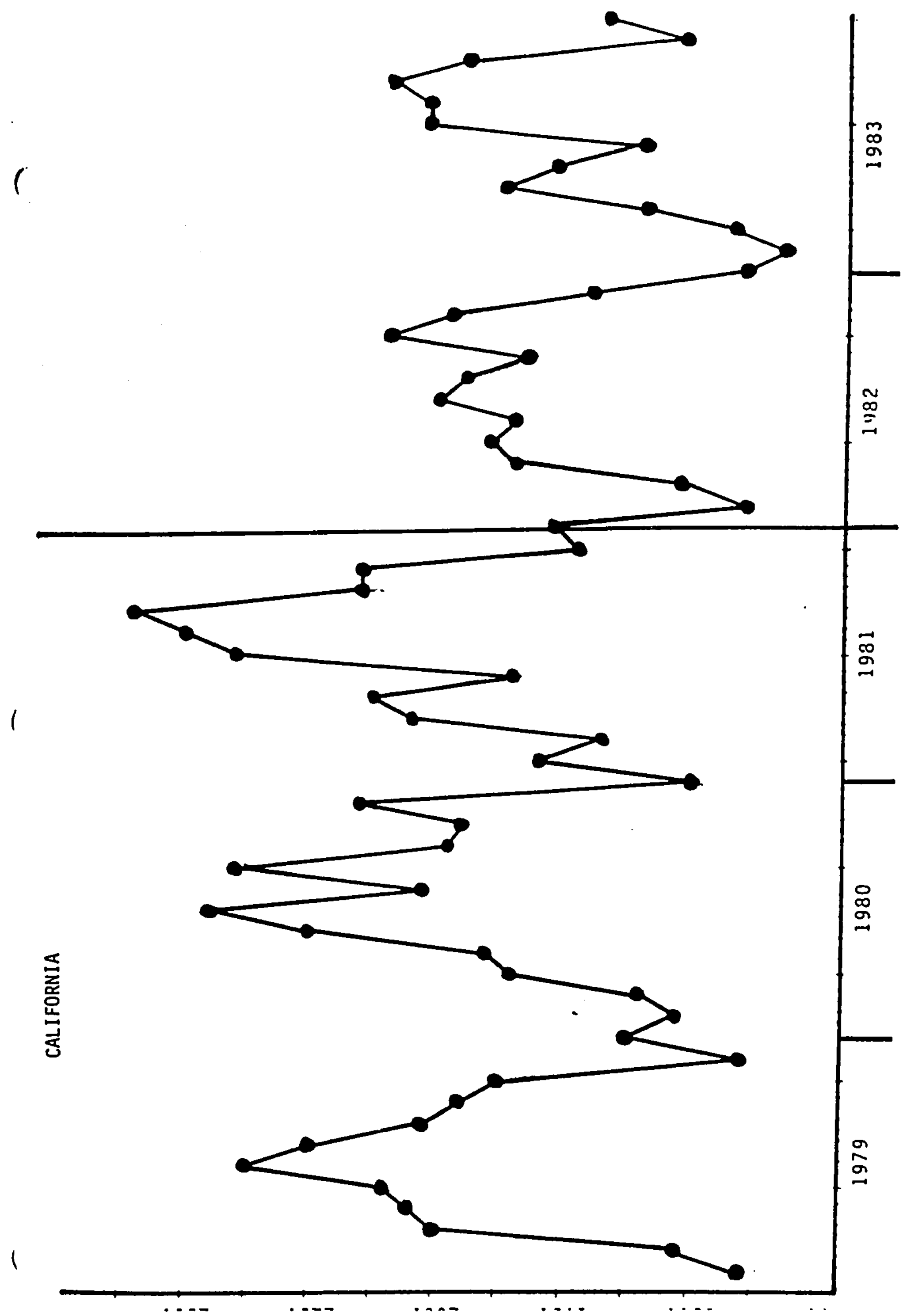

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AZ3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME       DIFFERENCES
                                               1
AZ3         RANDOM              1-  60  (1-8  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
      1  AZ3           MA      1       1    0.8578     0.0662     12.96

RESIDUAL SUM OF SQUARES  =      2427.380710 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =              58
RESIDUAL MEAN SQUARE     =        41.851391
1PAGE   5      ARIZONA DATA ANALYSIS


ACF VARIABLE IS RAZ3. MAXLAG=30./

NUMBER OF OBSERVATIONS               =             60
MEAN OF THE (DIFFERENCED) SERIES =        -0.3274
STANDARD ERROR OF THE MEAN           =         0.8378
T-VALUE OF MEAN (AGAINST ZERO)       =        -0.3907

AUTOCORRELATIONS

  1- 12     -.14  .14 -.08  .12  .15 -.11  .02 -.07  .12 -.15 -.11  .07
  ST.E.      .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .15  .15

 13- 24     -.08  .12 -.10 -.14  .02 -.07 -.01 -.03  .02 -.07  .09 -.05
  ST.E.      .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .16

 25- 30      .01 -.01 -.02 -.13  .06 -.12
  ST.E.      .16  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

                -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                         I
  1   -0.137                     +   XXXI      +
  2    0.137                     +       IXXX  +
  3   -0.078                     +     XXI       +
  4    0.116                     +       IXXX    +
  5    0.154                     +       IXXXX   +
  6   -0.107                     +    XXXI       +
  7    0.015                     +       I       +
  8   -0.068                     +     XXI       +
  9    0.124                     +       IXXX    +
 10   -0.150                     +   XXXXI       +
 11   -0.107                     +    XXXI       +
 12    0.068                     +       IXX     +
 13   -0.078                     +     XXI       +
 14    0.120                     +       IXXX    +
 15   -0.103                     +    XXXI       +
 16   -0.141                     +   XXXXI       +
 17    0.023                     +       IX      +
 18   -0.073                     +     XXI       +
 19   -0.005                    +        I        +
 20   -0.030                    +       XI        +
 21    0.021                    +        IX       +
 22   -0.071                    +      XXI        +
 23    0.092                    +        IXX      +
 24   -0.050                    +       XI        +
 25    0.011                    +        I        +
 26   -0.007                    +        I        +
 27   -0.018                    +        I        +
 28   -0.130                    +     XXXI        +
 29    0.059                    +        IX       +
 30   -0.118                    +     XXXI        +
```

Arizona Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AZ3
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES
                                              1
AZ3         RANDOM             1-  60  (1-B  )
                                              1
X1          BINARY             1-  60  (1-B  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
      1  AZ3           MA      1       1    0.8457     0.0710     11.92
      2  X1            UP      1       0    0.3709     1.5516      0.24
      3  X1            SP      1       1   -1.1888     0.3353     -3.55

RESIDUAL SUM OF SQUARES  =       2372.786130 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                56
RESIDUAL MEAN SQUARE     =         42.371181
1PAGE   7     ARIZONA DATA ANALYSIS



ACF VARIABLE IS RAZ3. MAXLAG=30./

NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES    =     -0.2512
STANDARD ERROR OF THE MEAN          =      0.8287
T-VALUE OF MEAN (AGAINST ZERO)      =     -0.3031

AUTOCORRELATIONS

  1- 12    -.12  .11 -.06  .10  .18 -.10 -.01 -.05  .13 -.15 -.10  .07
  ST.E.     .13  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .15

 13- 24    -.08  .11 -.10 -.16  .03 -.07 -.02  0.0 -.02 -.04  .06 -.02
  ST.E.     .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15

 25- 30    -.01  .02 -.04 -.12  .06 -.12
  ST.E.     .15  .15  .15  .15  .16  .16

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.123                   +   XXXI      +
  2   0.109                   +      IXXX   +
  3  -0.059                   +     XI      +
  4   0.100                  +       IXX     +
  5   0.176                  +       IXXXX   +
  6  -0.103                  +    XXXI       +
  7  -0.005                  +       I       +
  8  -0.052                  +      XI       +
  9   0.128                  +       IXXX    +
 10  -0.147                  +   XXXXI       +
 11  -0.104                  +    XXXI       +
 12   0.069                  +       IXX     +
 13  -0.076                  +     XXI       +
 14   0.113                  +       IXXX    +
 15  -0.098                  +     XXI       +
 16  -0.158                  +   XXXXI       +
 17   0.029                  +       IX      +
 18  -0.067                  +     XXI       +
 19  -0.023                  +      XI       +
 20   0.002                  +       I       +
 21  -0.016                  +       I       +
 22  -0.045                  +      XI       +
 23   0.062                  +       IXX     +
 24  -0.021                 +       XI        +
 25  -0.013                 +        I        +
 26   0.024                 +        IX       +
 27  -0.042                 +       XI        +
 28  -0.122                 +     XXXI        +
```

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AZ3
INPUT VARIABLES -- NOISE      X1

VARIABLE   VAR. TYPE  MEAN      TIME     DIFFERENCES
                                              1
AZ3        RANDOM               1-  60  (1-B  )
                                              1
X1         BINARY               1-  60  (1-B  )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE      ST. ERR.  T-RATIO
    1  AZ3             MA       1       1    0.8531      0.0751     11.36
    2  X1              UP       1       1   -1.1830      2.9929     -0.40
    3  X1              SP       1       1   -1.1096      0.2045     -5.43

RESIDUAL SUM OF SQUARES  =        2298.775970 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                 55
RESIDUAL MEAN SQUARE     =          41.795927
1PAGE    7     ARIZONA DATA ANALYSIS


ACF VARIABLE IS RAZ3. MAXLAG=30./

NUMBER OF OBSERVATIONS              =          59
MEAN OF THE (DIFFERENCED) SERIES =        -0.3753
STANDARD ERROR OF THE MEAN          =        0.8252
T-VALUE OF MEAN (AGAINST ZERO)      =       -0.4548

AUTOCORRELATIONS

  1- 12     -.16  .13 -.08  .12  .15 -.06 -.02 -.04  .13 -.15 -.05  .06
  ST.E.      .13  .13  .14  .14  .14  .14  .14  .14  .14  .14  .15  .15

 13- 24     -.11  .09 -.10 -.13  .03 -.11 -.01  .03  .01 -.06  .07 -.02
  ST.E.      .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .16

 25- 30     -.02  0.0 -.04 -.08  .05 -.11
  ST.E.      .16  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR. +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -0.162                      + XXXXI     +
  2    0.126                     +      IXXX   +
  3   -0.083                     +    XXI      +
  4    0.124                     +      IXXX   +
  5    0.146                     +      IXXXX  +
  6   -0.064                     +    XXI      +
  7   -0.023                     +     XI      +
  8   -0.036                     +     XI      +
  9    0.132                     +      IXXX   +
 10   -0.152                     +  XXXXI      +
 11   -0.048                     +     XI      +
 12    0.061                     +      IXX    +
 13   -0.111                     +   XXXI      +
 14    0.094                     +      IXX    +
 15   -0.102                     +   XXXI      +
 16   -0.131                     +   XXXI      +
 17    0.031                     +      IX     +
 18   -0.113                     +   XXXI      +
 19   -0.007                    +       I       +
 20    0.027                    +       IX      +
 21    0.013                    +       I       +
 22   -0.063                    +     XXI       +
 23    0.071                    +       IXX     +
 24   -0.021                    +      XI       +
 25   -0.024                    +      XI       +
 26    0.002                    +       I       +
 27   -0.044                    +      XI       +
 28   -0.082                    +     XXI       +
```

California Alcohol-Involved Fatality Raw Time-Series Data



California Alcohol-Involved Fatality Data Undifferenced
ACFs


```
ACF VARIABLE IS CA3.
MAXLAG=30./


NUMBER OF OBSERVATIONS               =           60
MEAN OF THE (DIFFERENCED) SERIES     =     188.8167
STANDARD ERROR OF THE MEAN           =       3.9268
T-VALUE OF MEAN (AGAINST ZERO)       =      48.0845

AUTOCORRELATIONS
  1- 12       .60  .36  .10 -.20 -.29 -.43 -.40 -.25 -.02  .25  .43  .47
  ST.E.       .13  .17  .18  .18  .19  .19  .21  .22  .23  .23  .23  .24

 13- 24       .45  .27  .06 -.17 -.36 -.44 -.46 -.36 -.21  .02  .17  .29
  ST.E.       .26  .27  .28  .28  .28  .29  .30  .31  .32  .32  .32  .32

 25- 30       .31  .17  .07 -.08 -.22 -.28
  ST.E.       .32  .33  .33  .33  .33  .33

PLOT OF SERIAL CORRELATION
           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                      I
  1   0.605                     +     IXXXXX+XXXXXXXXX
  2   0.363                   +       IXXXXXXX+X
  3   0.098                  +        IXX      +
  4  -0.196                  +   XXXXXI        +
  5  -0.292                  + XXXXXXXI        +
  6  -0.433                X+XXXXXXXXXI         +
  7  -0.404                 XXXXXXXXXXI         +
  8  -0.250                +    XXXXXXI          +
  9  -0.024                +         XI          +
 10   0.251                +          IXXXXXX    +
 11   0.426                +          IXXXXXXXXXXX
 12   0.471               +           IXXXXXXXXXXXX
 13   0.446              +            IXXXXXXXXXXX +
 14   0.269              +            IXXXXXXX     +
 15   0.056             +             IX            +
 16  -0.169             +         XXXXI             +
 17  -0.362             +    XXXXXXXXXI             +
 18  -0.442             +  XXXXXXXXXXXI             +
 19  -0.461            +  XXXXXXXXXXXXI              +
 20  -0.362            +     XXXXXXXXXI              +
 21  -0.211            +         XXXXXI              +
 22   0.019           +               I               +
 23   0.166           +               IXXXX           +
 24   0.293           +               IXXXXXXX        +
 25   0.315           +               IXXXXXXXX       +
 26   0.173           +               IXXXX           +
 27   0.068           +               IXX             +
 28  -0.077           +             XXI               +
 29  -0.225           +         XXXXXXI               +
 30  -0.278           +        XXXXXXXI               +
1PAGE   3     CALIFORNIA DATA ANALYSIS
```

California Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models


```
NUMBER OF OBSERVATIONS               =          57
MEAN OF THE (DIFFERENCED) SERIES     =     -1.4912
STANDARD ERROR OF THE MEAN           =      4.6130
T-VALUE OF MEAN (AGAINST ZERO)       =     -0.3233
```

```
AUTOCORRELATIONS

  1- 12     -.17 -.25  .13 -.19  .20 -.12 -.19  .03 -.14  .05  .13 -.03
  ST.E.      .13  .14  .14  .15  .15  .15  .16  .16  .16  .16  .16  .17

 13- 24      .15  .09 -.06  .03 -.06 -.09  .01 -.14  0.0  .05 -.15  .14
  ST.E.      .17  .17  .17  .17  .17  .17  .17  .17  .17  .17  .17  .17

 25- 30      .22 -.06 -.02 -.04  .06  .10
  ST.E.      .18  .18  .18  .18  .18  .18
```

```
PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                             I
  1  -0.169                             + XXXXI     +
  2  -0.248                            +XXXXXXI      +
  3   0.126                            +      IXXX   +
  4  -0.190                            + XXXXXI      +
  5   0.201                            +      IXXXXX +
  6  -0.124                           +    XXXI       +
  7  -0.191                           +  XXXXXI       +
  8   0.028                           +       IX      +
  9  -0.144                           +   XXXXI       +
 10   0.055                           +       IX      +
 11   0.133                           +       IXXX    +
 12  -0.027                           +      XI       +
 13   0.154                           +       IXXXX   +
 14   0.095                           +       IXX     +
 15  -0.063                           +     XXI       +
 16   0.033                           +       IX      +
 17  -0.059                           +      XI       +
 18  -0.087                           +     XXI       +
 19   0.014                           +       I       +
 20  -0.141                           +   XXXXI       +
 21  -0.000                           +       I       +
 22   0.054                           +       IX      +
 23  -0.151                           +   XXXXI       +
 24   0.138                          +        IXXX     +
 25   0.220                          +        IXXXXX   +
 26  -0.061                          +      XXI        +
 27  -0.017                          +        I        +
 28  -0.036                          +       XI        +
 29   0.063                          +        IXX      +
 30   0.100                          +        IXXX     +
```

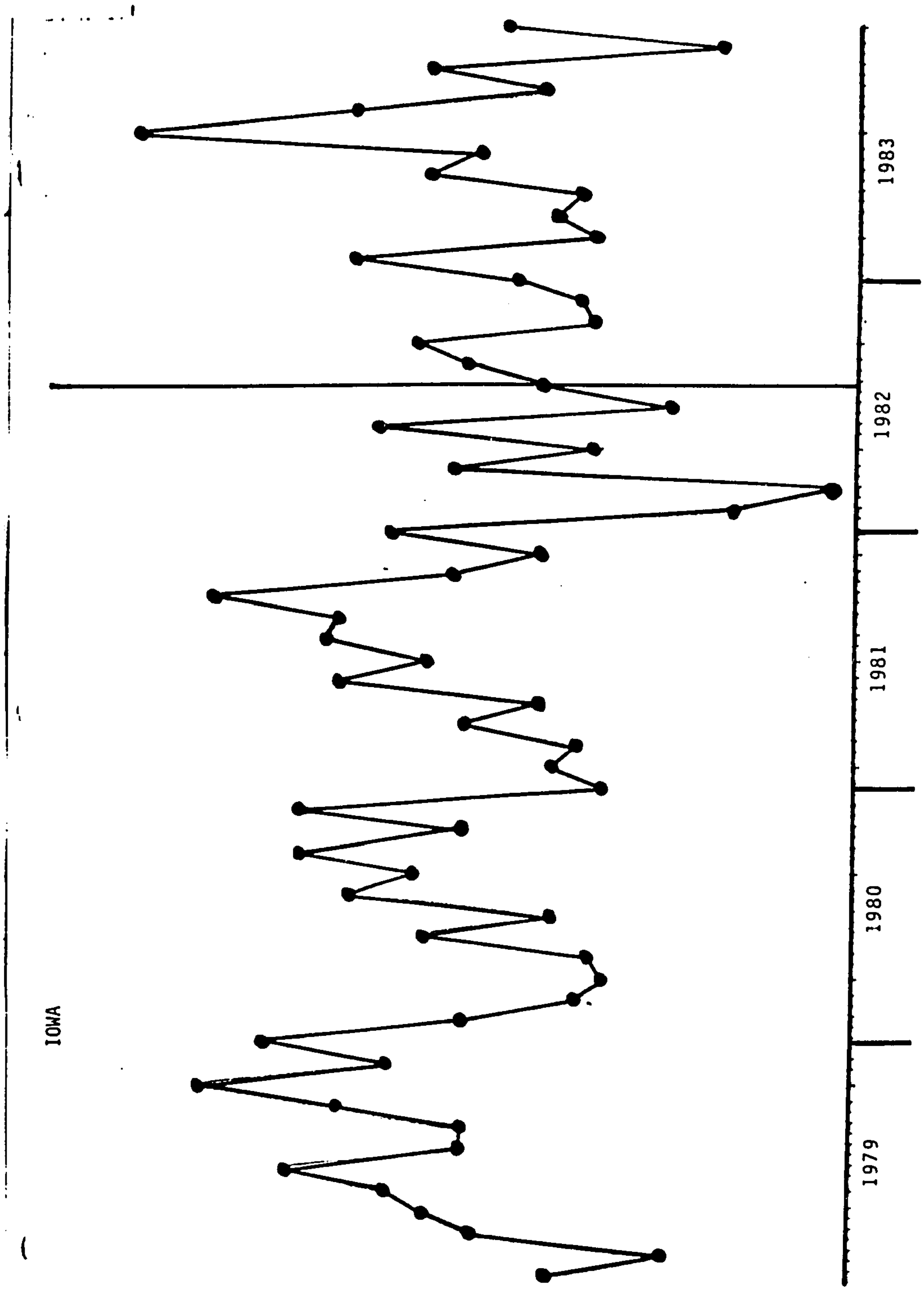
California Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- CA3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN       TIME       DIFFERENCES
                                                1        2
CA3         RANDOM             1-  60   (1-B  ) (1-B  )
                                                1        2
X1          BINARY             1-  60   (1-B  ) (1-B  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  X1            UP      1       1    -0.0246     0.3642    -0.07
      2  X1            SP      1       1    -1.4034     0.6357    -2.21

RESIDUAL SUM OF SQUARES  =      66155.008800 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                54
RESIDUAL MEAN SQUARE     =       1225.092760
1PAGE   7     CALIFORNIA DATA ANALYSIS


ACF VARIABLE IS RCA3. MAXLAG=30./

NUMBER OF OBSERVATIONS                 =          56
MEAN OF THE (DIFFERENCED) SERIES =         -1.7175
STANDARD ERROR OF THE MEAN             =       4.6287
T-VALUE OF MEAN (AGAINST ZERO)         =      -0.3710

AUTOCORRELATIONS

  1- 12     -.16 -.25  .14 -.18  .18 -.12 -.18  .02 -.15  .04  .13 -.03
  ST.E.      .13  .14  .14  .15  .15  .15  .16  .16  .16  .16  .16  .16

 13- 24      .17  .11 -.09  .04 -.06 -.10  .02 -.13 -.03  .05 -.16  .14
  ST.E.      .16  .17  .17  .17  .17  .17  .17  .17  .17  .17  .17  .18

 25- 30      .23 -.07  0.0 -.03  .07  .06
  ST.E.      .18  .18  .18  .18  .18  .18

PLOT OF SERIAL CORRELATION

                -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                          I
  1  -0.156                        +  XXXXI      +
  2  -0.253                        +XXXXXXI      +
  3   0.135                        +      IXXX   +
  4  -0.185                        + XXXXXI      +
  5   0.177                        +      IXXXX  +
  6  -0.119                       +    XXXI       +
  7  -0.181                       +  XXXXXI       +
  8   0.023                       +       IX      +
  9  -0.147                       +   XXXXI       +
 10   0.043                       +       IX      +
 11   0.131                       +       IXXX    +
 12  -0.032                       +      XI       +
 13   0.174                       +       IXXXX   +
 14   0.114                       +       IXXX    +
 15  -0.091                       +     XXI       +
 16   0.045                       +       IX      +
 17  -0.058                       +      XI       +
 18  -0.097                       +     XXI       +
 19   0.019                       +       I       +
 20  -0.127                       +    XXXI       +
 21  -0.028                      +       XI        +
 22   0.055                      +        IX       +
 23  -0.155                      +    XXXXI        +
 24   0.139                      +        IXXX     +
 25   0.226                      +        IXXXXXX  +
 26  -0.070                      +      XXI        +
 27   0.004                      +        I        +
 28  -0.031                      +       XI        +
 29   0.074                      +        IXX      +
```

California Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- CA3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                           1       2
CA3         RANDOM             1-  60  (1-B  ) (1-B  )
                                           1       2
X1          BINARY             1-  60  (1-B  ) (1-B  )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.   T-RATIO
     1  X1             UP       1      0     0.0106      0.1623      0.07
     2  X1             SP       1      1    -1.4331      0.6654     -2.15

RESIDUAL SUM OF SQUARES  =       66133.777300 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                55
RESIDUAL MEAN SQUARE     =         1202.432310
1PAGE    7      CALIFORNIA DATA ANALYSIS



ACF VARIABLE IS RCA3. MAXLAG=30./


NUMBER OF OBSERVATIONS                  =             57
MEAN OF THE (DIFFERENCED) SERIES        =        -1.8088
STANDARD ERROR OF THE MEAN              =         4.5453
T-VALUE OF MEAN (AGAINST ZERO)          =        -0.3980

AUTOCORRELATIONS

  1- 12      -.15 -.25  .14 -.18  .18 -.12 -.18  .02 -.15  .04  .13 -.03
  ST.E.       .13  .14  .14  .15  .15  .15  .15  .16  .16  .16  .16  .16

 13- 24       .17  .11 -.09  .04 -.06 -.10  .02 -.12 -.03  .05 -.16  .14
  ST.E.       .16  .17  .17  .17  .17  .17  .17  .17  .17  .17  .17  .17

 25- 30       .23 -.07  0.0 -.03  .08  .06
  ST.E.       .18  .18  .18  .18  .18  .18

PLOT OF SERIAL CORRELATION

              -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1  -0.153                    + XXXXI     +
  2  -0.254                   +XXXXXXI      +
  3   0.137                   +      IXXX   +
  4  -0.181                   + XXXXXI      +
  5   0.176                   +      IXXXX  +
  6  -0.119                  +    XXXI       +
  7  -0.178                  +   XXXXI       +
  8   0.021                  +       IX      +
  9  -0.150                  +   XXXXI       +
 10   0.043                  +       IX      +
 11   0.128                  +       IXXX    +
 12  -0.032                  +      XI       +
 13   0.174                  +       IXXXX   +
 14   0.112                  +       IXXX    +
 15  -0.087                  +     XXI       +
 16   0.044                  +       IX      +
 17  -0.058                  +      XI       +
 18  -0.085                  +     XXI       +
 19   0.015                  +       I       +
 20  -0.1 2                  +    XXXI       +
 21  -0.030                  +      XI       +
 22   0.051                  +       IX      +
 23  -0.156                  +   XXXXI       +
 24   0.137                 +        IXXX     +
 25   0.230                 +        IXXXXXXX +
 26  -0.073                 +      XXI        +
 27   0.002                 +        I        +
 28  -0.027                 +       XI        +
```

Iowa Alcohol-Involved Fatality Raw Time-Series Data



Iowa Alcohol-Involved Fatality Data Undifferenced ACFs


```
ACF VARIABLE IS IA3.
MAXLAG=30./

NUMBER OF OBSERVATIONS                =          60
MEAN OF THE (DIFFERENCED) SERIES      =     20.7667
STANDARD ERROR OF THE MEAN            =      0.9606
T-VALUE OF MEAN (AGAINST ZERO)        =     21.6178

AUTOCORRELATIONS

  1- 12     .25  .20 -.06 -.12 -.23 -.11 -.18 -.07 -.03  .12  .07  .17
  ST.E.     .13  .14  .14  .14  .14  .15  .15  .15  .16  .16  .16  .16

 13- 24     .13  .04 -.14 -.07 -.18 -.27 -.08  .02  .08  .34  .19  .22
  ST.E.     .16  .16  .16  .16  .16  .17  .18  .18  .18  .18  .19  .19

 25- 30    -.02  0.0 -.09 -.15 -.14 -.16
  ST.E.     .19  .19  .19  .19  .20  .20

PLOT OF SERIAL CORRELATION
              -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG     CORR. +----+----+----+----+----+----+----+----+----+----+
                                         I
  1    0.250                        +    IXXXXXX
  2    0.200                       +     IXXXXX +
  3   -0.062                       +   XXI      +
  4   -0.123                       +  XXXI      +
  5   -0.227                       +XXXXXXI     +
  6   -0.111                       +  XXXI      +
  7   -0.181                       + XXXXXI     +
  8   -0.066                      +    XXI       +
  9   -0.033                      +     XI       +
 10    0.117                      +      IXXX    +
 11    0.073                      +      IXX     +
 12    0.173                      +      IXXXX   +
 13    0.128                      +      IXXX    +
 14    0.038                      +      IX      +
 15   -0.144                      +  XXXXI       +
 16   -0.075                      +    XXI       +
 17   -0.181                      + XXXXXI       +
 18   -0.266                      +XXXXXXXI      +

 20    0.025                     +       IX       +
 21    0.078                     +       IXX      +
 22    0.339                     +       IXXXXXXXXX+
 23    0.186                     +       IXXXXX   +
 24    0.215                     +       IXXXXX   +
 25   -0.015                    +        I         +
 26    0.004                    +        I         +
 27   -0.093                    +      XXI         +
 28   -0.149                    +    XXXXI         +
 29   -0.135                    +     XXXI         +
 30   -0.158                    +    XXXXI         +
1PAGE    3      IOWA DATA ANALYSIS
```

Iowa Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- IA3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES
                                             1
IA3         RANDOM            1-  60  (1-8  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
      1  IA3           AR      1      1    -0.4974     0.1162    -4.28

RESIDUAL SUM OF SQUARES  =       3685.122830 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                57
RESIDUAL MEAN SQUARE     =         64.651278
1PAGE   5      IOWA DATA ANALYSIS


ACF VARIABLE IS RIA3. MAXLAG=30./

NUMBER OF OBSERVATIONS             =             60
MEAN OF THE (DIFFERENCED) SERIES =           0.0376
STANDARD ERROR OF THE MEAN         =         1.0238
T-VALUE OF MEAN (AGAINST ZERO)     =         0.0367

AUTOCORRELATIONS

 1- 12     -.04 -.11 -.09 -.09 -.13 -.03 -.09 -.03  0.0  .10  0.0  .07
 ST.E.      .13  .13  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14

13- 24      .12  .01 -.13  .08 -.08 -.26  .03 -.01 -.04  .24  .09  .12
 ST.E.      .14  .14  .14  .14  .14  .14  .15  .15  .15  .15  .16  .16

25- 30     -.11  .03  .01 -.07  .01 -.04
 ST.E.      .16  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.035                    +    XI     +
  2  -0.115                    +  XXXI     +
  3  -0.090                    +   XXI     +
  4  -0.090                    +   XXI     +
  5  -0.127                   +   XXXI      +
  6  -0.027                   +     XI      +
  7  -0.093                   +    XXI      +
  8  -0.033                   +     XI      +
  9   0.005                   +      I      +
 10   0.097                   +      IXX    +
 11   0.004                   +      I      +
 12   0.070                   +      IXX    +
 13   0.117                   +      IXXX   +
 14   0.009                   +      I      +
 15  -0.131                   +   XXXI      +
 16   0.081                   +      IXX    +
 17  -0.080                   +    XXI      +
 18  -0.255                   +XXXXXXI      +
 19   0.027                   +      IX     +
 20  -0.011                   +      I      +
 21  -0.039                   +     XI      +
 22   0.240                   +      IXXXXXX+
 23   0.092                  +       IXX     +
 24   0.121                  +       IXXX    +
 25  -0.111                  +    XXXI       +
 26   0.032                  +       IX      +
 27   0.005                  +       I       +
 28  -0.072                  +     XXI       +
 29   0.007                  +       I       +
 30  -0.043                  +      XI       +
```

Iowa Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- IA3
INPUT VARIABLES -- NOISE     X1

VARIABLE   VAR. TYPE   MEAN       TIME       DIFFERENCES
                                                 1
IA3         RANDOM               1-  60 1-B  )
                                                 1
X1          BINARY               1-  60  (1-B  )
```

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	IA3	AR	1	1	-0.4952	0.1202	-4.12
2	X1	UP	1	0	3.0466	7.0207	0.43
3	X1	SP	1	1	0.4603	1.5262	0.30

```
RESIDUAL SUM OF SQUARES   =        3665.006810 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =                 55
RESIDUAL MEAN SQUARE      =          66.636487
1PAGE    7       IOWA DATA ANALYSIS


ACF VARIABLE IS RIA3. MAXLAG=30./

NUMBER OF OBSERVATIONS                 =          60
MEAN OF THE (DIFFERENCED) SERIES       =     -0.1030
STANDARD ERROR OF THE MEAN             =      1.0210
T-VALUE OF MEAN (AGAINST ZERO)         =     -0.1009
```

AUTOCORRELATIONS

1- 12	-.03	-.11	-.09	-.11	-.14	-.01	-.08	-.02	.01	.09	-.01	.06
ST.E.	.13	.13	.13	.13	.13	.14	.14	.14	.14	.14	.14	.14
13- 24	.13	.02	-.13	.08	-.09	-.26	.04	0.0	-.03	.24	.09	.11
ST.E.	.14	.14	.14	.14	.14	.14	.15	.15	.15	.15	.16	.16
25- 30	-.12	.02	0.0	-.07	.02	-.03						
ST.E.	.16	.16	.16	.16	.16	.16						

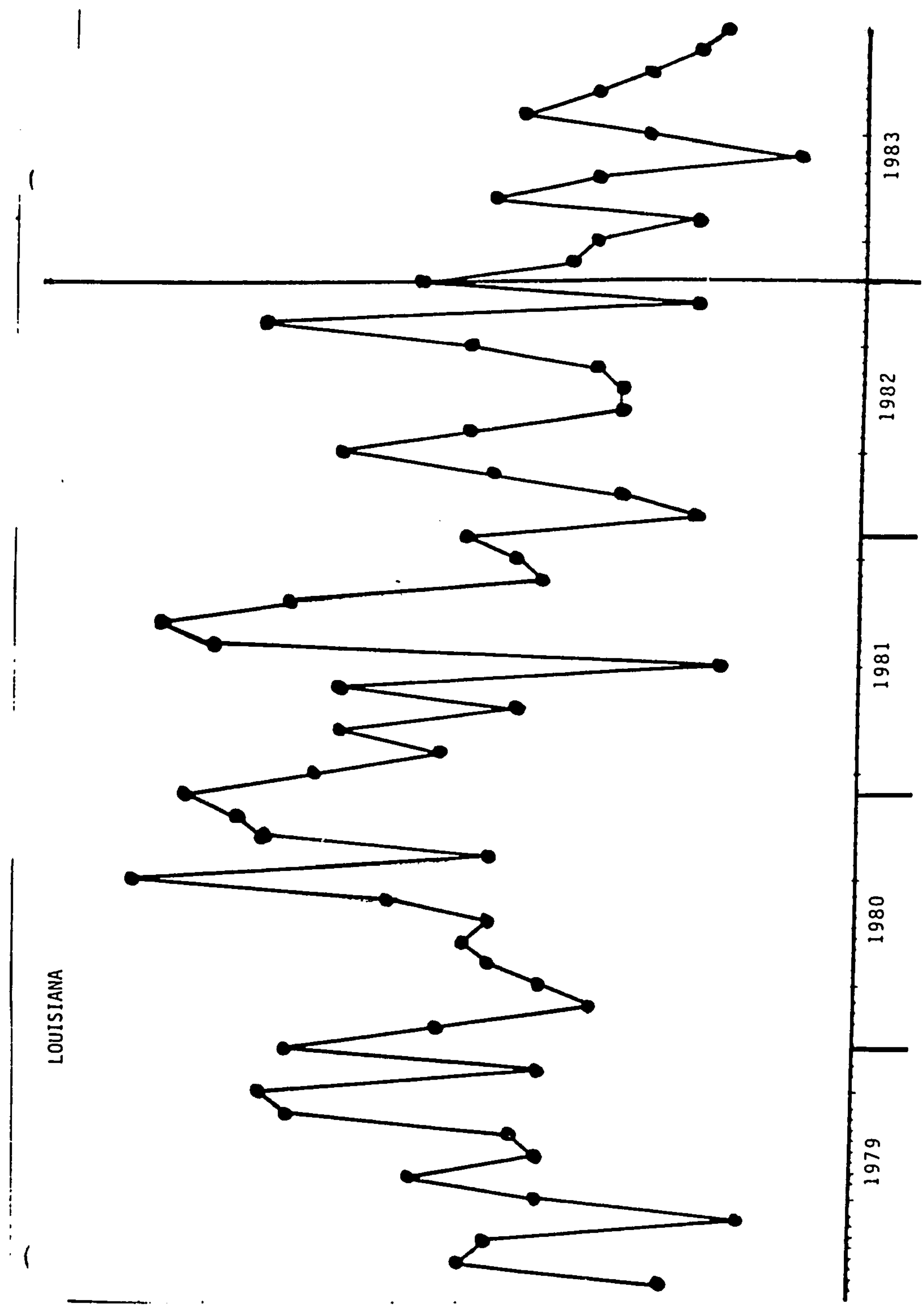
PLOT OF SERIAL CORRELATION

```
          -1.0  -0.8  -0.6  -0.4  -0.2   0.0   0.2   0.4   0.6   0.8   1.0
LAG   CORR. +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
                                          I
  1  -0.035                         +    XI     +
  2  -0.109                         +  XXXI     +
  3  -0.087                         +   XXI     +
  4  -0.109                         +  XXXI     +
  5  -0.139                        +   XXXI      +
  6  -0.012                        +      I      +
  7  -0.077                        +    XXI      +
  8  -0.022                        +     XI      +
  9   0.013                        +      I      +
 10   0.092                        +      IXX    +
 11  -0.009                        +      I      +
 12   0.059                        +      IX     +
 13   0.129                        +      IXXX   +
 14   0.016                        +      I      +
 15  -0.131                        +   XXXI      +
 16   0.082                        +      IXX    +
 17  -0.090                        +    XXI      +
 18  -0.255                        +XXXXXXI      +
 19   0.040                        +      IX     +
 20  -0.004                        +      I      +
 21  -0.033                        +     XI      +
 22   0.242                        +      IXXXXXX+
 23   0.087                       +       IXX     +
 24   0.113                       +       IXXX    +
 25  -0.117                       +    XXXI       +
 26   0.024                       +       IX      +
 27  -0.002                       +       I       +
 28  -0.071                       +     XXI       +
 29   0.019
```

Iowa Alcohol-Involved Fatality Data Parameter
Estimates and ACFs for Gradual Implementation
and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- IA3
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                             1
IA3         RANDOM             1-  60  (1-B  )
                                             1
X1          BINARY             1-  60  (1-B  )

PARAMETER VARIABLE      TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1  IA3              AR      1       1    -0.4817     0.1201     -4.01
     2  X1               UP      1       1    -0.1287     6.7324     -0.02
     3  X1               SP      1       1    -0.9302     7.5720     -0.12

RESIDUAL SUM OF SQUARES  =      3635.007360 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               54
RESIDUAL MEAN SQUARE     =        67.314951
1PAGE    7      IOWA DATA ANALYSIS


ACF VARIABLE IS RIA3. MAXLAG=30./

NUMBER OF OBSERVATIONS            =          60
MEAN OF THE (DIFFERENCED) SERIES  =      0.0571
STANDARD ERROR OF THE MEAN        =      1.0238
T-VALUE OF MEAN (AGAINST ZERO)    =      0.0558

AUTOCORRELATIONS

  1- 12     -.05 -.11 -.09 -.09 -.13 -.02 -.09 -.03  0.0  .10  0.0  .07
  ST.E.      .13  .13  .13  .13  .13  .13  .13  .14  .14  .14  .14  .14

 13- 24      .11  .01 -.13  .08 -.07 -.25  .03 -.01 -.04  .24  .09  .12
  ST.E.      .14  .14  .14  .14  .14  .14  .15  .15  .15  .15  .16  .16

 25- 30     -.11  .03  .01 -.07  .01 -.04
  ST.E.      .16  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.046                    +    XI     +
  2  -0.105                    +  XXXI     +
  3  -0.090                    +   XXI     +
  4  -0.086                    +   XXI     +
  5  -0.129                   +   XXXI      +
  6  -0.024                   +     XI      +
  7  -0.090                   +    XXI      +
  8  -0.029                   +     XI      +
  9  -0.000                   +      I      +
 10   0.097                   +      IXX    +
 11  -0.002                   +      I      +
 12   0.068                   +      IXX    +
 13   0.114                   +      IXXX   +
 14   0.012                   +      I      +
 15  -0.130                   +   XXXI      +
 16   0.081                   +      IXX    +
 17  -0.075                   +    XXI      +
 18  -0.253                   +XXXXXXI      +
 19   0.028                   +      IX     +
 20  -0.012                   +      I      +
 21  -0.041                   +     XI      +
 22   0.237                   +      IXXXXXX+
 23   0.085                  +       IXX     +
 24   0.124                  +       IXXX    +
 25  -0.111                  +    XXXI       +
 26   0.033                  +       IX      +
 27   0.007                  +       I       +
 28  -0.072                  +     XXI       +
 29   0.009                  +       I       +
```

Louisiana Alcohol-Involved Fatality Raw Time-Series Data



Louisiana Alcohol-Involved Fatality Data Undifferenced
ACFs

ACF VARIABLE IS LA3.
MAXLAG=30./

NUMBER OF OBSERVATIONS	=	60
MEAN OF THE (DIFFERENCED) SERIES	=	24.2000
STANDARD ERROR OF THE MEAN	=	0.8126
T-VALUE OF MEAN (AGAINST ZERO)	=	29.7805

AUTOCORRELATIONS

1- 12	.33	.22	.24	.27	.08	.07	.27	.13	.15	.12	.06	.13
ST.E.	.13	.14	.15	.15	.16	.16	.16	.17	.17	.17	.18	.18
13- 24	.16	.06	.01	-.01	.07	-.23	-.12	-.10	-.02	-.07	-.04	-.08
ST.E.	.18	.18	.18	.18	.18	.18	.19	.19	.19	.19	.19	.19
25- 30	-.17	-.08	-.28	-.26	-.14	-.13						
ST.E.	.19	.19	.19	.20	.20	.21						

PLOT OF SERIAL CORRELATION

```
          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.335                    +     IXXXXX+XX
  2   0.221                   +      IXXXXXX+
  3   0.243                   +      IXXXXXX+
  4   0.268                  +       IXXXXXXX+
  5   0.080                  +       IXX     +
  6   0.065                  +       IXX     +
  7   0.269                  +       IXXXXXXX+
  8   0.127                  +       IXXX    +
  9   0.148                  +       IXXXX   +
 10   0.119                 +        IXXX     +
 11   0.064                 +        IXX      +
 12   0.127                 +        IXXX     +
 13   0.158                 +        IXXXX    +
 14   0.057                 +        IX       +
 15   0.007                 +        I        +
 16  -0.006                 +        I        +
 17   0.075                 +        IXX      +
 18  -0.229                 +  XXXXXXI        +
 19  -0.120                 +     XXXI        +
 20  -0.097                 +      XXI        +
 21  -0.016                 +        I        +
 22  -0.068                 +      XXI        +
 23  -0.038                 +       XI        +
 24  -0.082                 +      XXI        +
 25  -0.171                 +    XXXXI        +
 26  -0.084                 +      XXI        +
 27  -0.285                 + XXXXXXXI        +
 28  -0.258                +   XXXXXXI         +
 29  -0.141                +     XXXXI         +
 30  -0.125                +      XXXI         +
1PAGE   3      LOUISIANA DATA ANALYSIS
```

Louisiana Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models


```
OUTPUT VARIABLE -- LA3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              3
LA3         RANDOM             1-  60  (1-B  )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1  LA3             AR      1       3    -0.5449     0.1246     -4.37
     2  LA3             AR      2       6    -0.3741     0.1182     -3.17

RESIDUAL SUM OF SQUARES  =        1973.612200 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               46
RESIDUAL MEAN SQUARE     =          42.904613
1PAGE   5      LOUISIANA DATA ANALYSIS


ACF VARIABLE IS RLA3. MAXLAG=45./

NUMBER OF OBSERVATIONS                 =            60
MEAN OF THE (DIFFERENCED) SERIES =            -0.2769
STANDARD ERROR OF THE MEAN             =         0.8129
T-VALUE OF MEAN (AGAINST ZERO)         =        -0.3406

AUTOCORRELATIONS

  1- 12      .15  .06 -.07  .09 -.12 -.05  .22  .09  .09 -.01 -.02 -.01
  ST.E.      .13  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14

 13- 24      .16  .02  .06  .02  .12 -.23 -.01 -.08  .11  .04  .08  .04
  ST.E.      .14  .15  .15  .15  .15  .15  .15  .15  .16  .16  .16  .16

 25- 36     -.06  .03 -.22 -.09 -.07  .02 -.14 -.05 -.01 -.09 -.13  .05
  ST.E.      .16  .16  .16  .16  .16  .16  .16  .17  .17  .17  .17  .17

 37- 45     -.02 -.03  .02  0.0 -.09 -.08  0.0 -.04 -.05
  ST.E.      .17  .17  .17  .17  .17  .17  .17  .17  .17
1PAGE   6      LOUISIANA DATA ANALYSIS


PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1   0.154                      +     IXXXX +
  2   0.058                      +     IX    +
  3  -0.072                      +   XXI     +
  4   0.091                     +      IXX    +
  5  -0.121                     +   XXXI      +
  6  -0.047                     +     XI      +
  7   0.216                     +      IXXXXX +
  8   0.091                     +      IXX    +
  9   0.093                     +      IXX    +
 10  -0.011                     +      I      +
 11  -0.015                     +      I      +
 12  -0.011                     +      I      +
 13   0.164                     +      IXXXX  +
 14   0.023                     +      IX     +
 15   0.057                     +      IX     +
 16   0.025                     +      IX     +
 17   0.125                     +      IXXX   +
 18  -0.227                     +XXXXXXI      +
 19  -0.009                    +       I       +
 20  -0.078                    +     XXI       +
 21   0.115                    +       IXXX    +
 22   0.040                    +       IX      +
 23   0.081                    +       IXX     +
 24   0.043                    +       IX      +
 25  -0.060                    +      XI       +
 26   0.029                    +       IX      +
```

Louisiana Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- LA3
INPUT VARIABLES -- NOISE      X1

VARIABLE   VAR. TYPE   MEAN        TIME      DIFFERENCES
                                                3
LA3          RANDOM               1-  60   (1-B  )
                                                3
X1           BINARY               1-  60   (1-B  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.   T-RATIO
     1  LA3            AR      1      3    -0.5403     0.1314     -4.11
     2  LA3            AR      2      6    -0.3727     0.1220     -3.06
     3  X1             UP      1      0     0.5139     4.2654      0.12
     4  X1             SP      1      1    -0.9198     1.5337     -0.60

RESIDUAL SUM OF SQUARES  =       1974.706630 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =             44
RESIDUAL MEAN SQUARE     =         44.879696
1PAGE    7      LOUISIANA DATA ANALYSIS


ACF VARIABLE IS RLA3. MAXLAG=45./

NUMBER OF OBSERVATIONS                =           60
MEAN OF THE (DIFFERENCED) SERIES      =      -0.3067
STANDARD ERROR OF THE MEAN            =       0.8126
T-VALUE OF MEAN (AGAINST ZERO)        =      -0.3775

AUTOCORRELATIONS

  1- 12     .16  .06 -.07  .09 -.12 -.04  .22  .09  .10 -.01 -.01 -.01
  ST.E.     .13  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14

 13- 24     .17  .03  .06  .02  .12 -.22 -.01 -.07  .11  .04  .08  .05
  ST.E.     .14  .15  .15  .15  .15  .15  .16  .16  .16  .16  .16  .16

 25- 36    -.06  .03 -.22 -.09 -.07  .02 -.14 -.06  0.0 -.09 -.13  .05
  ST.E.     .16  .16  .16  .16  .16  .17  .17  .17  .17  .17  .17  .17

 37- 45    -.02 -.04  .02  0.0 -.09 -.09  0.0 -.04 -.05
  ST.E.     .17  .17  .17  .17  .17  .17  .17  .17  .17
1PAGE    8      LOUISIANA DATA ANALYSIS


PLOT OF SERIAL CORRELATION

            -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                      I
  1   0.160                     +     IXXXX +
  2   0.055                     +     IX    +
  3  -0.071                    +    XXI      +
  4   0.088                    +      IXX    +
  5  -0.115                    +   XXXI      +
  6  -0.045                    +     XI      +
  7   0.221                    +      IXXXXXX+
  8   0.089                    +      IXX    +
  9   0.095                    +      IXX    +
 10  -0.011                    +      I      +
 11  -0.009                    +      I      +
 12  -0.009                    +      I      +
 13   0.170                    +      IXXXX  +
 14   0.026                    +      IX     +
 15   0.060                    +      IX     +
 16   0.024                    +      IX     +
 17   0.123                    +      IXXX   +
 18  -0.224                    +XXXXXXI      +
 19  -0.011                   +       I       +
 20  -0.074                   +     XXI       +
```

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- LA3
INPUT VARIABLES -- NOISE X1

VARIABLE	VAR. TYPE	MEAN	TIME	DIFFERENCES
LA3	RANDOM		1- 60	$(1-B^3)$
X1	BINARY		1- 60	$(1-B^3)$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	LA3	AR	1	3	-0.5804	0.1238	-4.69
2	LA3	AR	2	6	-0.4411	0.1280	-3.45
3	X1	UP	1	1	-1.6671	2.3523	-0.71
4	X1	SP	1	1	0.7146	0.4906	1.46

RESIDUAL SUM OF SQUARES = 1834.390720 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM = 43
RESIDUAL MEAN SQUARE = 42.660249
1PAGE 7 LOUISIANA DATA ANALYSIS

ACF VARIABLE IS RLA3. MAXLAG=30./

NUMBER OF OBSERVATIONS = 60
MEAN OF THE (DIFFERENCED) SERIES = 0.2242
STANDARD ERROR OF THE MEAN = 0.7952
T-VALUE OF MEAN (AGAINST ZERO) = 0.2820

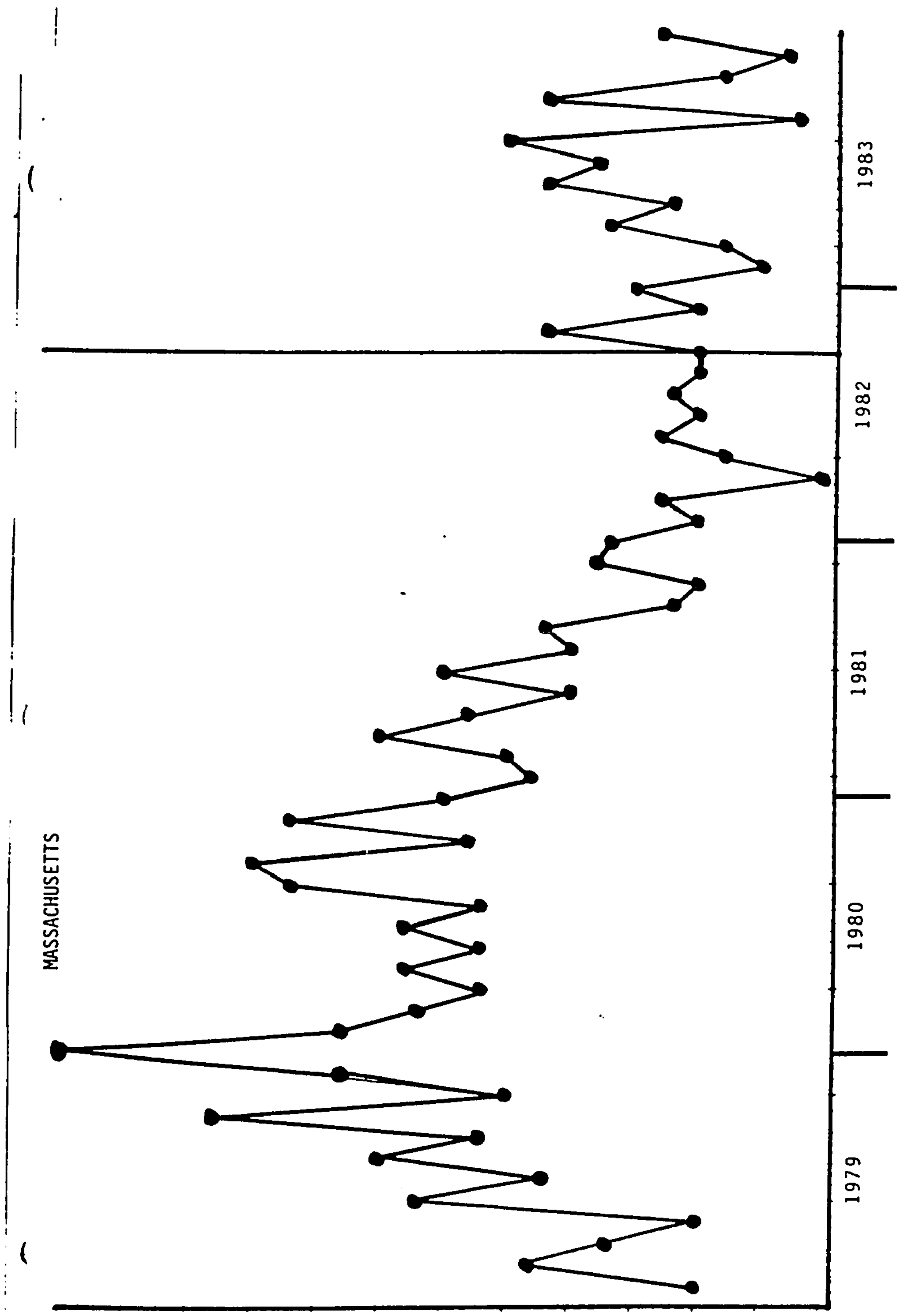
AUTOCORRELATIONS

1- 12	.12	.03	-.06	.08	-.15	-.01	.21	.05	.06	0.0	-.05	-.07
ST.E.	.13	.13	.13	.13	.13	.14	.14	.14	.14	.14	.14	.14
13- 24	.15	-.02	0.0	-.03	.06	-.26	-.06	-.10	.05	-.01	.04	0.0
ST.E.	.14	.14	.14	.14	.15	.15	.15	.15	.15	.16	.16	.16
25- 30	-.08	.02	-.19	-.09	-.02	.04						
ST.E.	.16	.16	.16	.16	.16	.16						

PLOT OF SERIAL CORRELATION

```
               -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.   +----+----+----+----+----+----+----+----+----+----+
                                         I
  1    0.123                        +    IXXX  +
  2    0.030                        +    IX    +
  3   -0.057                        +   XI     +
  4    0.077                        +    IXX   +
  5   -0.150                        + XXXXI    +
  6   -0.013                       +     I      +
  7    0.214                       +     IXXXXX +
  8    0.047                       +     IX     +
  9    0.057                       +     IX     +
 10   -0.004                       +     I      +
 11   -0.050                       +    XI      +
 12   -0.067                       +   XXI      +
 13    0.154                       +     IXXXX  +
 14   -0.024                       +    XI      +
 15    0.004                       +     I      +
 16   -0.030                       +    XI      +
 17    0.084                       +     IXX    +
 18   -0.263                      XXXXXXXI      +
 19   -0.059                      +     XI       +
 20   -0.102                      +   XXXI       +
 21    0.046                      +      IX      +
 22   -0.008                      +      I       +
 23    0.044                      +      IX      +
 24   -0.004                      +      I       +
 25   -0.081                      +    XXI       +
 26    0.020                      +      I       +
 27   -0.190                      +  XXXXXI
```

Massachusetts Alcohol-Involved Fatality Raw Time-Series Data



```
ACF VARIABLE IS MA3.
MAXLAG=30./

NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES =        21.9833
STANDARD ERROR OF THE MEAN          =        0.9586
T-VALUE OF MEAN (AGAINST ZERO)      =       22.9327

AUTOCORRELATIONS

  1- 12      .59  .62  .58  .51  .45  .40  .45  .32  .40  .28  .28  .20
  ST.E.      .13  .17  .20  .23  .25  .26  .27  .28  .29  .30  .30  .31

 13- 24      .11  .15  .11  .05 -.05 -.02 -.09 -.14 -.16 -.22 -.18 -.25
  ST.E.      .31  .31  .31  .31  .31  .31  .31  .31  .31  .31  .32  .32

 25- 30     -.21 -.30 -.31 -.32 -.33 -.27
  ST.E.      .32  .32  .33  .33  .34  .34

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.592                    +     IXXXXX+XXXXXXXXX
  2   0.620                  +       IXXXXXXX+XXXXXXX
  3   0.581                +         IXXXXXXXXX+XXXXX
  4   0.508               +          IXXXXXXXXXXX+XX
  5   0.447              +           IXXXXXXXXXXX+
  6   0.400             +            IXXXXXXXXXX  +
  7   0.452             +            IXXXXXXXXXXX +
  8   0.322            +             IXXXXXXXX     +
  9   0.399            +             IXXXXXXXXXX   +
 10   0.276           +              IXXXXXXX       +
 11   0.284           +              IXXXXXXX       +
 12   0.199           +              IXXXXX         +
 13   0.109           +              IXXX           +
 14   0.147           +              IXXXX          +
 15   0.112           +              IXXX           +
 16   0.052           +              IX             +
 17  -0.050           +             XI              +
 18  -0.018           +              I              +
 19  -0.094           +            XXI              +
 20  -0.142           +          XXXXI              +
 21  -0.159           +          XXXXI              +
 22  -0.221           +        XXXXXXI              +
 23  -0.181          +          XXXXXI               +
 24  -0.254          +         XXXXXXI               +
 25  -0.212          +          XXXXXI               +
 26  -0.298          +        XXXXXXXI               +
 27  -0.310          +       XXXXXXXXI               +
 28  -0.318          +       XXXXXXXXI               +
 29  -0.329         +        XXXXXXXXI                +
 30  -0.272         +         XXXXXXXI                +
1PAGE    3     MASSACHUSETTS DATA ANALYSIS
```

Massachusetts Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MA3
INPUT VARIABLES -- NOISE

VARIABLE   VAR. TYPE   MEAN       TIME      DIFFERENCES
                                                 2
MA3          RANDOM              1-  60   (1-B  )


PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1  MA3            MA      1       2     0.4393     0.1153      3.81

RESIDUAL SUM OF SQUARES  =         1954.784650 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                  57
RESIDUAL MEAN SQUARE     =           34.294467
1PAGE    5     MASSACHUSETTS DATA ANALYSIS
```

```
ACF VARIABLE IS RMA3. MAXLAG=30./

NUMBER OF OBSERVATIONS              =               60
MEAN OF THE (DIFFERENCED) SERIES    =          -0.2577
STANDARD ERROR OF THE MEAN          =           0.7457
T-VALUE OF MEAN (AGAINST ZERO)      =          -0.3456

AUTOCORRELATIONS

  1- 12      .09  .02  .20 -.01 -.04 -.05  .11 -.08  .14 -.02  .08 -.02
  ST.E.      .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .14  .14

 13- 24     -.20  .05  .08 -.02 -.15  .03 -.06 -.10 -.11 -.10  .01 -.06
  ST.E.      .14  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15

 25- 30      .05 -.11 -.13 -.10 -.12  .02
  ST.E.      .15  .15  .15  .16  .16  .16
```

```
PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.088                    +     IXX   +
  2   0.018                    +     I     +
  3   0.200                    +     IXXXXX+
  4  -0.008                   +      I      +
  5  -0.038                   +     XI      +
  6  -0.049                   +     XI      +
  7   0.107                   +      IXXX   +
  8  -0.077                   +    XXI      +
  9   0.136                   +      IXXX   +
 10  -0.018                   +      I      +
 11   0.077                   +      IXX    +
 12  -0.016                   +      I      +
 13  -0.196                   + XXXXXI      +
 14   0.046                   +      IX     +
 15   0.079                   +      IXX    +
 16  -0.025                   +     XI      +
 17  -0.154                   +  XXXXI      +
 18   0.029                   +      IX     +
 19  -0.057                   +     XI      +
 20  -0.103                   +   XXXI      +
 21  -0.106                   +   XXXI      +
 22  -0.104                   +   XXXI      +
 23   0.008                   +      I      +
 24  -0.062                   +    XXI      +
 25   0.048                  +       IX      +
 26  -0.108                  +    XXXI       +
 27  -0.130                  +    XXXI       +
 28  -0.104                  +    XXXI       +
 29  -0.123                  +    XXXI       +
 30   0.018                  +       I       +
```

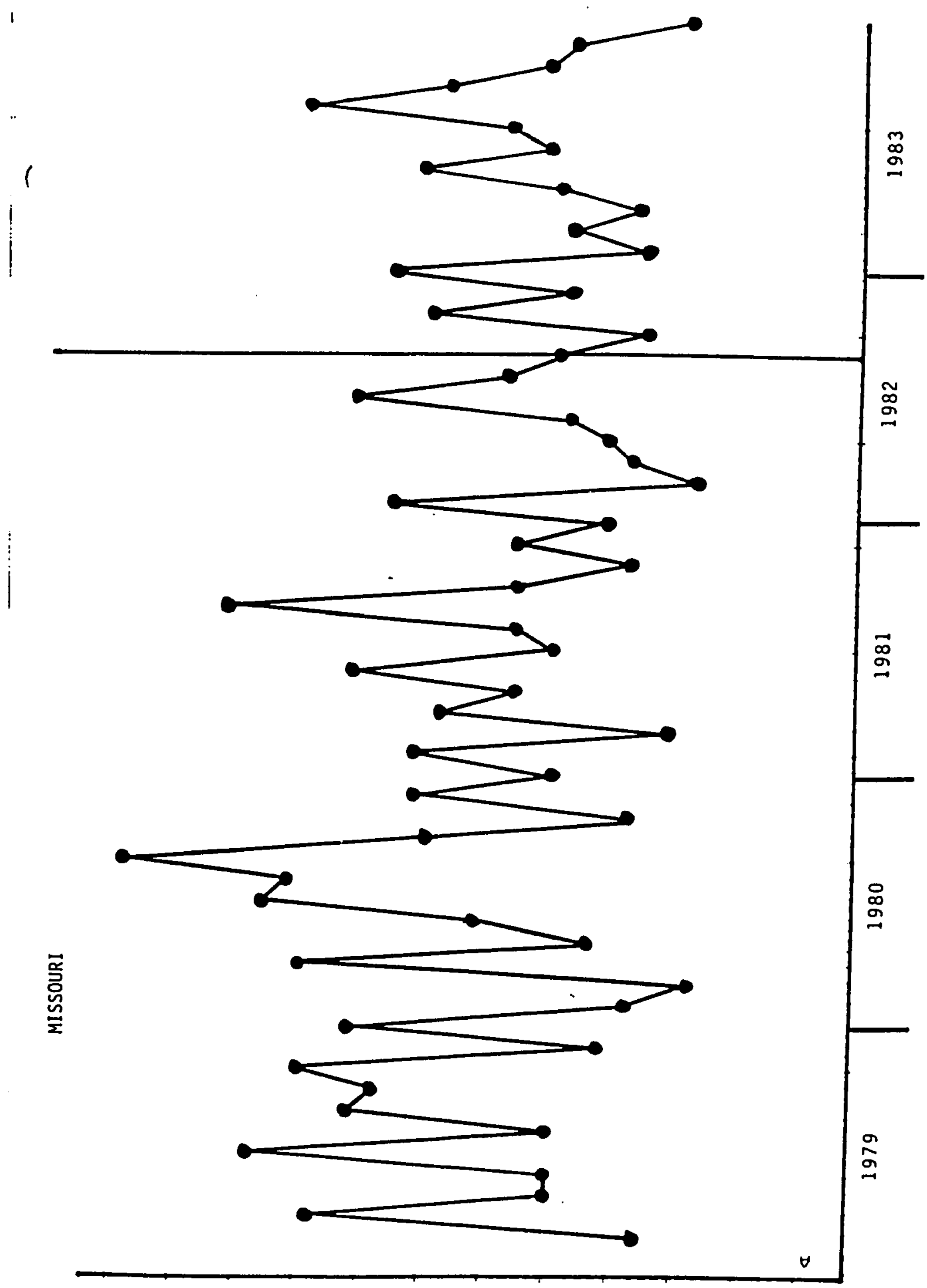
Massachusetts Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MA3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES
                                               2
MA3        RANDOM              1-  60   (1-B   )
                                               2
X1         BINARY              1-  60   (1-B   )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1  MA3            MA      1       2     0.4120      0.1220      3.38
     2  X1             UP      1       0    -0.0308      0.8643     -0.04
     3  X1             SP      1       1    -1.4462      0.9017     -1.60

RESIDUAL SUM OF SQUARES  =        1924.858630 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                 55
RESIDUAL MEAN SQUARE     =          34.997429
1PAGE   7     MASSACHUSETTS DATA ANALYSIS



ACF VARIABLE IS RMA3. MAXLAG=30./

NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES =         -0.2686
STANDARD ERROR OF THE MEAN          =          0.7394
T-VALUE OF MEAN (AGAINST ZERO)      =         -0.3633

AUTOCORRELATIONS

  1- 12       .09  0.0  .19  0.0 -.06 -.05  .09 -.07  .13 -.02  .09 -.02
  ST.E.       .13  .13  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14

 13- 24      -.20  .04  .09 -.02 -.16  .04 -.06 -.10 -.09 -.10  .02 -.05
  ST.E.       .14  .14  .14  .15  .15  .15  .15  .15  .15  .15  .15  .15

 25- 30       .05 -.10 -.12 -.10 -.11  .01
  ST.E.       .15  .15  .15  .16  .16  .16

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  0.093                     +     IXX   +
  2  0.001                     +     I     +
  3  0.186                     +     IXXXXX+
  4  0.004                    +      I      +
  5 -0.056                    +     XI      +
  6 -0.048                    +     XI      +
  7  0.092                    +      IXX    +
  8 -0.071                    +    XXI      +
  9  0.126                    +      IXXX   +
 10 -0.017                    +      I      +
 11  0.089                    +      IXX    +
 12 -0.021                    +     XI      +
 13 -0.199                    + XXXXXI      +
 14  0.036                    +      IX     +
 15  0.086                    +      IXX    +
 16 -0.022                    +     XI      +
 17 -0.160                    +  XXXXI      +
 18  0.040                    +      IX     +
 19 -0.057                    +     XI      +
 20 -0.104                    +   XXXI      +
 21 -0.094                    +    XXI      +
 22 -0.101                    +   XXXI      +
 23  0.016                    +      I      +
 24 -0.053                    +     XI      +
 25  0.048                    +      IX     +
 26 -0.098                    +    XXI      +
 27 -0.119                   +    XXXI       +
 28 -0.105                   +    XXXI       +
```

Massachusetts Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MA3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES
                                               2
MA3         RANDOM            1-  60  (1-B   )
                                               2
X1          BINARY            1-  60  (1-B   )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  MA3            MA      1       2    0.4789      0.1183      4.05
      2  X1             UP      1       1    0.0031      0.0508      0.06
      3  X1             SP      1       1   -1.7883      1.6749     -1.07

RESIDUAL SUM OF SQUARES  =        1814.448180 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                 54
RESIDUAL MEAN SQUARE     =          33.600892
1PAGE    7     MASSACHUSETTS DATA ANALYSIS



ACF VARIABLE IS RMA3. MAXLAG=30./


NUMBER OF OBSERVATIONS              =          59
MEAN OF THE (DIFFERENCED) SERIES =         -0.5119
STANDARD ERROR OF THE MEAN          =       0.7311
T-VALUE OF MEAN (AGAINST ZERO)      =      -0.7002

AUTOCORRELATIONS

  1- 12      .15  .01  .16  .01 -.07 -.08  .07 -.04  .06 -.01  .16  0.0
  ST.E.      .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .14  .14

 13- 24     -.20  .01  .06 -.05 -.19 -.02 -.05 -.10 -.10 -.08  .02 -.09
  ST.E.      .14  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15

 25- 30      .02 -.06 -.12 -.10 -.08  .02
  ST.E.      .16  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.151                    +     IXXXX +
  2   0.006                   +      I      +
  3   0.157                   +      IXXXX  +
  4   0.011                   +      I      +
  5  -0.071                   +    XXI      +
  6  -0.075                   +    XXI      +
  7   0.067                   +      IXX    +
  8  -0.043                   +     XI      +
  9   0.056                   +      IX     +
 10  -0.006                   +      I      +
 11   0.159                   +      IXXXX  +
 12   0.001                   +      I      +
 13  -0.205                   + XXXXXI      +
 14   0.013                   +      I      +
 15   0.061                   +      IXX    +
 16  -0.048                   +     XI      +
 17  -0.191                   + XXXXXI      +
 18  -0.015                   +      I      +
 19  -0.052                   +     XI      +
 20  -0.098                   +    XXI      +
 21  -0.102                   +   XXXI      +
 22  -0.080                  +     XXI       +
 23   0.016                  +       I       +
 24  -0.086                  +     XXI       +
 25   0.021                  +       IX      +
 26  -0.064                  +     XXI       +
 27  -0.119                  +    XXXI       +
 28  -0.105                  +    XXXI       +
```

Missouri Alcohol-Involved Fatality Raw Time-Series Data



Missouri Alcohol-Involved Fatality Data Undifferenced
ACFs


```
ACF VARIABLE IS MO3.
MAXLAG=30./

NUMBER OF OBSERVATIONS                  =          60
MEAN OF THE (DIFFERENCED) SERIES        =     24.2167
STANDARD ERROR OF THE MEAN              =      1.0076
T-VALUE OF MEAN (AGAINST ZERO)          =     24.0334

AUTOCORRELATIONS

  1- 12     .04  .05  .08 -.10 -.01 -.09 -.16 -.07  .13  .15  .06  .24
  ST.E.     .13  .13  .13  .13  .13  .13  .13  .14  .14  .14  .14  .14

 13- 24     .10  .07  .03 -.16  .03 -.33 -.13 -.11  .01  .02  .04  .05
  ST.E.     .15  .15  .15  .15  .15  .15  .16  .17  .17  .17  .17  .17

 25- 30     .05 -.02  0.0 -.12 -.01 -.15
  ST.E.     .17  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

            -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.035                    +     IX    +
  2   0.051                    +     IX    +
  3   0.080                    +     IXX   +
  4  -0.098                    +   XXI     +
  5  -0.006                    +     I     +
  6  -0.090                    +   XXI     +
  7  -0.160                   +  XXXXI      +
  8  -0.068                   +    XXI      +
  9   0.129                   +      IXXX   +
 10   0.147                   +      IXXXX  +
 11   0.060                   +      IXX    +
 12   0.238                   +      IXXXXXX+
 13   0.099                   +      IXX    +
 14   0.069                   +      IXX    +
 15   0.028                   +      IX     +
 16  -0.164                   +  XXXXI      +
 17   0.032                   +      IX     +
 18  -0.333                  X+XXXXXXI      +
 19  -0.133                  +    XXXI       +
 20  -0.107                  +    XXXI       +
 21   0.006                  +       I       +
 22   0.024                  +       IX      +
 23   0.043                  +       IX      +
 24   0.050                  +       IX      +
 25   0.046                  +       IX      +
 26  -0.024                  +      XI       +
 27  -0.004                  +       I       +
 28  -0.123                  +    XXXI       +
 29  -0.007                  +       I       +
 30  -0.154                  +   XXXXI       +
1PAGE    3      MISSOURI DATA ANALYSIS
```

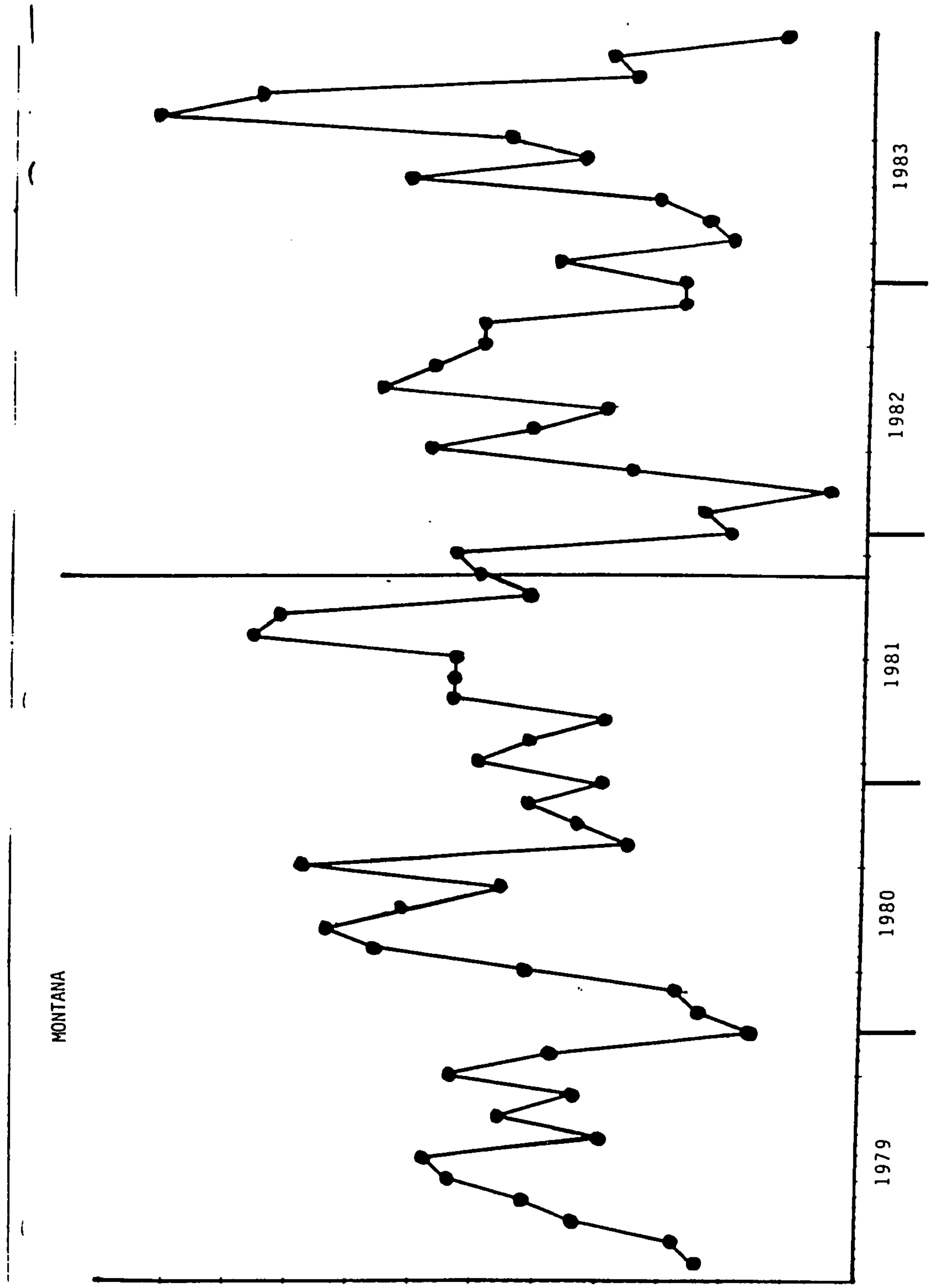
Missouri Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MO3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES

MO3        RANDOM              1-  60

X1         BINARY              1-  60

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
      1  X1            UP      1      0    19.4898    21.8993     0.89
      2  X1            SP      1      1     0.1408     1.0031     0.14

RESIDUAL SUM OF SQUARES  =      30192.289300 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                58
RESIDUAL MEAN SQUARE     =        520.556709
1PAGE   7     MISSOURI DATA ANALYSIS



ACF VARIABLE IS RMO3. MAXLAG=30./

NUMBER OF OBSERVATIONS              =           60
MEAN OF THE (DIFFERENCED) SERIES    =      17.8517
STANDARD ERROR OF THE MEAN          =       1.7685
T-VALUE OF MEAN (AGAINST ZERO)      =      10.0944

AUTOCORRELATIONS

  1- 12     .64  .58  .56  .48  .51  .44  .36  .36  .37  .35  .28  .26
  ST.E.     .13  .17  .20  .23  .24  .26  .27  .28  .29  .30  .30  .31

 13- 24     .21  .17  .10 -.01 -.01 -.13 -.07 -.07 -.06 -.05 -.08 -.10
  ST.E.     .31  .31  .32  .32  .32  .32  .32  .32  .32  .32  .32  .32

 25- 30    -.15 -.20 -.21 -.24 -.21 -.25
  ST.E.     .32  .32  .32  .32  .33  .33

PLOT OF SERIAL CORRELATION

            -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
 LAG    CORR. +----+----+----+----+----+----+----+----+----+----+
                                       I
   1    0.645                    +     IXXXXX+XXXXXXXXXX
   2    0.585                 +        IXXXXXXXX+XXXXXX
   3    0.560                +         IXXXXXXXXX+XXXX
   4    0.476               +          IXXXXXXXXXX+X
   5    0.509              +           IXXXXXXXXXXX+X
   6    0.442             +            IXXXXXXXXXXX +
   7    0.365             +            IXXXXXXXXX   +
   8    0.357            +             IXXXXXXXXX    +
   9    0.374            +             IXXXXXXXXX    +
  10    0.347           +              IXXXXXXXXX     +
  11    0.279           +              IXXXXXXX       +
  12    0.260           +              IXXXXXXX       +
  13    0.209           +              IXXXXX         +
  14    0.172           +              IXXXX          +
  15    0.103           +              IXXX           +
  16   -0.014          +               I               +
  17   -0.011          +               I               +
  18   -0.126          +            XXXI               +
  19   -0.066          +             XXI               +
  20   -0.074          +             XXI               +
  21   -0.061          +             XXI               +
  22   -0.053          +              XI               +
  23   -0.075          +             XXI               +
  24   -0.103          +            XXXI               +
  25   -0.146          +           XXXXI               +
  26   -0.195          +          XXXXXI               +
  27   -0.210          +          XXXXXI               +
  28   -0.245          +         XXXXXXI               +
  29   -0.211          +          XXXXXI               +
```

Missouri Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MO3
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES

MO3         RANDOM           1-  60

X1          BINARY           1-  60


PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  X1            UP      1       1    18.2813     21.0881     0.87
      2  X1            SP      1       1     0.2030      0.9606     0.21

RESIDUAL SUM OF SQUARES  =       30569.064000 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                 57
RESIDUAL MEAN SQUARE     =         536.299370
1PAGE    7      MISSOURI DATA ANALYSIS



ACF VARIABLE IS RMO3. MAXLAG=30./


NUMBER OF OBSERVATIONS               =           59
MEAN OF THE (DIFFERENCED) SERIES     =      18.4037
STANDARD ERROR OF THE MEAN           =       1.7588
T-VALUE OF MEAN (AGAINST ZERO)       =      10.4636

AUTOCORRELATIONS

  1- 12      .64  .63  .56  .48  .50  .41  .37  .35  .39  .32  .28  .29
  ST.E.      .13  .18  .21  .23  .25  .27  .28  .29  .29  .30  .31  .31

 13- 24      .19  .16  .08 -.05  .02 -.12 -.03 -.06 -.05 -.05 -.06 -.05
  ST.E.      .32  .32  .32  .32  .32  .32  .32  .32  .32  .32  .32  .32

 25- 30     -.12 -.16 -.20 -.24 -.19 -.26
  ST.E.      .32  .32  .32  .33  .33  .33

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
   1   0.641                   +     IXXXXX+XXXXXXXXXX
   2   0.634                +        IXXXXXXXX+XXXXXXX
   3   0.561               +         IXXXXXXXXX+XXXX
   4   0.477             +           IXXXXXXXXXXXX
   5   0.503             +           IXXXXXXXXXXX+X
   6   0.411            +            IXXXXXXXXXX  +
   7   0.367           +             IXXXXXXXXX    +
   8   0.351           +             IXXXXXXXXX    +
   9   0.391           +             IXXXXXXXXXX   +
  10   0.320          +              IXXXXXXXX      +
  11   0.280          +              IXXXXXXX       +
  12   0.289          +              IXXXXXXX       +
  13   0.189          +              IXXXXX         +
  14   0.155         +               IXXXX           +
  15   0.078         +               IXX             +
  16  -0.053         +              XI               +
  17   0.018         +               I               +
  18  -0.123         +            XXXI               +
  19  -0.026         +              XI               +
  20  -0.064         +             XXI               +
  21  -0.049         +              XI               +
  22  -0.047         +              XI               +
  23  -0.063         +             XXI               +
  24  -0.048         +              XI               +
  25  -0.118         +            XXXI               +
  26  -0.156         +           XXXXI               +
  27  -0.198         +          XXXXXI               +
  28  -0.239         +         XXXXXXI               +
```

Montana Alcohol-Involved Fatality Raw Time-Series Data



```
ACF VARIABLE IS MT3.
MAXLAG=30./

NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES    =     12.7667
STANDARD ERROR OF THE MEAN          =      0.7289
T-VALUE OF MEAN (AGAINST ZERO)      =     17.5152

AUTOCORRELATIONS

  1- 12     .43  .10 -.01 -.25 -.31 -.32 -.36 -.16  .02  .13  .24  .40
  ST.E.     .13  .15  .15  .15  .16  .17  .18  .19  .19  .19  .19  .20

 13- 24     .27  .20  .05 -.13 -.21 -.34 -.43 -.28 -.08  .04  .12  .26
  ST.E.     .21  .22  .22  .22  .22  .23  .23  .25  .25  .25  .25  .25

 25- 30     .27  .20  .04 -.07 -.11 -.19
  ST.E.     .26  .26  .27  .27  .27  .27

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.434                    +     IXXXXX+XXXXX
  2   0.095                   +      IXX    +
  3  -0.012                   +      I      +
  4  -0.247                   +XXXXXXI      +
  5  -0.313                  XXXXXXXXI       +
  6  -0.324                  XXXXXXXXI       +
  7  -0.365                XXXXXXXXXXI        +
  8  -0.161                 +     XXXXI       +
  9   0.021                 +        IX       +
 10   0.132                 +        IXXX     +
 11   0.240                +         IXXXXXX   +
 12   0.397                +         IXXXXXXXXXX
 13   0.275                +         IXXXXXXX  +
 14   0.199               +          IXXXXX     +
 15   0.053               +          IX         +
 16  -0.133               +       XXXI          +
 17  -0.210               +     XXXXXI          +
 18  -0.338               +  XXXXXXXXI          +
 19  -0.427               XXXXXXXXXXXXI         +
 20  -0.276              +    XXXXXXXI           +
 21  -0.076              +         XXI           +
 22   0.043              +           IX          +
 23   0.119              +           IXXX        +
 24   0.258              +           IXXXXXX     +
 25   0.271             +            IXXXXXXX     +
 26   0.197             +            IXXXXX       +
 27   0.042             +            IX           +
 28  -0.072             +          XXI            +
 29  -0.112             +         XXXI            +
 30  -0.185             +       XXXXXI            +
1PAGE    3        MONTANA DATA ANALYSIS
```

Montana Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models

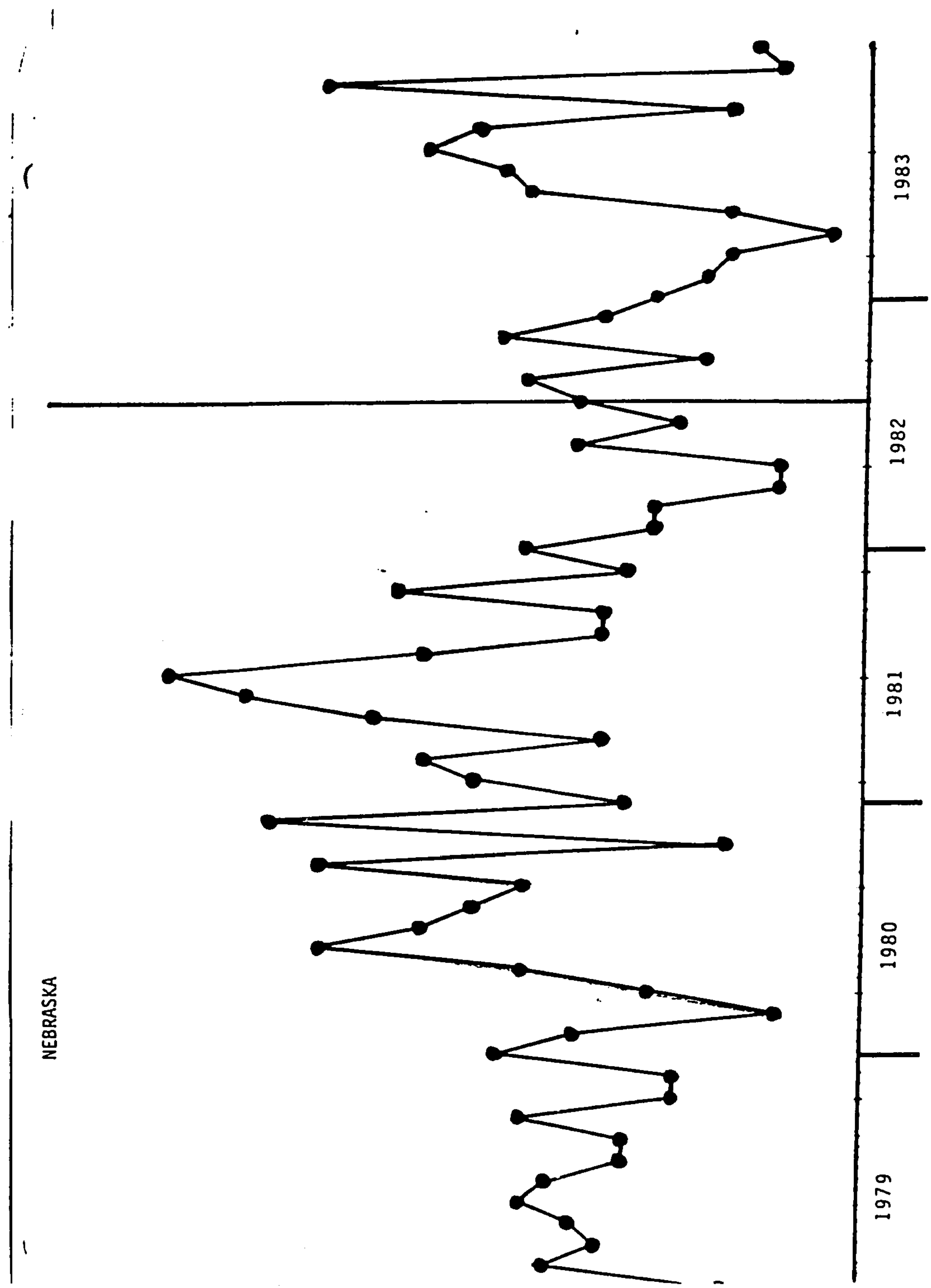

```
NUMBER OF OBSERVATIONS                 =             59
MEAN OF THE (DIFFERENCED) SERIES       =        -0.0508
STANDARD ERROR OF THE MEAN             =         0.7620
T-VALUE OF MEAN (AGAINST ZERO)         =        -0.0667

AUTOCORRELATIONS

  1- 12     -.18 -.21  .20 -.13 -.12 -.01 -.18 -.04   .07 -.02 -.04  .25
  ST.E.      .13  .13  .14  .14  .15  .15  .15  .15   .15  .15  .15  .15

 13- 24     -.04  .13  .06 -.09  .05 -.10 -.18 -.07   .04  .01 -.05  .13
  ST.E.      .16  .16  .16  .16  .16  .16  .16  .17   .17  .17  .17  .17

 25- 30      .13  .06 -.03 -.02  .04 -.08
  ST.E.      .17  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR. +----+----+----+----+----+----+----+----+----+----+
                                      I
  1  -0.177                     + XXXXI     +
  2  -0.211                    + XXXXXI      +
  3   0.202                    +      IXXXXX +
  4  -0.130                    +    XXXI     +
  5  -0.117                    +    XXXI     +
  6  -0.011                    +      I      +
  7  -0.183                    + XXXXXI      +
  8  -0.038                    +     XI      +
  9   0.073                    +      IXX    +
 10  -0.015                    +      I      +
 11  -0.039                    +     XI      +
 12   0.246                    +      IXXXXXX+
 13  -0.041                  +       XI        +
 14   0.127                  +        IXXX     +
 15   0.058                  +        IX       +
 16  -0.086                  +      XXI        +
 17   0.047                  +        IX       +
 18  -0.095                  +      XXI        +
 19  -0.184                  +   XXXXXI        +
 20  -0.072                  +      XXI        +
 21   0.045                  +        IX       +
 22   0.008                  +        I        +
 23  -0.045                  +       XI        +
 24   0.131                  +        IXXX     +
 25   0.130                  +        IXXX     +
 26   0.061                  +        IXX      +
 27  -0.028                  +       XI        +
 28  -0.021                  +       XI        +
 29   0.037                  +        IX       +
 30  -0.082                  +      XXI        +
1PAGE    3       MONTANA DATA ANALYSIS
```

Montana Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MT3
INPUT VARIABLES -- NOISE      X1

VARIABLE   VAR. TYPE   MEAN        TIME      DIFFERENCES

MT3          RANDOM                1-  60   (1-B   )

X1           BINARY                1-  60   (1-B   )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.   T-RATIO
      1  X1            UP       1      0   -13.0357     5.6426     -2.31
      2  X1            SP       1      1    -0.1044     0.4247     -0.25

RESIDUAL SUM OF SQUARES  =       1815.103490 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                57
RESIDUAL MEAN SQUARE     =         31.843921
1PAGE    7      MONTANA DATA ANALYSIS


ACF VARIABLE IS RMT3. MAXLAG=45./

NUMBER OF OBSERVATIONS                 =            58
MEAN OF THE (DIFFERENCED) SERIES       =        0.1493
STANDARD ERROR OF THE MEAN             =        0.7280
T-VALUE OF MEAN (AGAINST ZERO)         =        0.2050

AUTOCORRELATIONS

  1- 12     -.12 -.25  .18 -.09 -.10  0.0 -.16 -.03  .02  .02 -.01  .17
  ST.E.      .13  .13  .14  .14  .14  .15  .15  .15  .15  .15  .15  .15

 13- 24      0.0  .10  0.0 -.06  .02 -.03 -.14 -.11  .02  .08 -.06  .13
  ST.E.      .15  .15  .15  .15  .15  .15  .15  .16  .16  .16  .16  .16

 25- 36      .15  .01 -.04  .02 -.01 -.08  .01 -.08  .01 -.03  .03  .09
  ST.E.      .16  .16  .16  .16  .16  .16  .16  .16  .16  .16  .16  .16

 37- 45     -.06 -.02  .06  .06  0.0 -.08  .01 -.15 -.03
  ST.E.      .16  .17  .17  .17  .17  .17  .17  .17  .17
1PAGE    8      MONTANA DATA ANALYSIS


PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1  -0.125                      +  XXXI    +
  2  -0.250                     XXXXXXI     +
  3   0.175                     +      IXXXX +
  4  -0.091                     +    XXI     +
  5  -0.099                     +    XXI     +
  6  -0.001                     +      I     +
  7  -0.156                     +  XXXXI     +
  8  -0.028                     +     XI     +
  9   0.015                     +      I     +
 10   0.018                     +      I     +
 11  -0.005                     +      I     +
 12   0.170                     +      IXXXX +
 13  -0.002                     +      I     +
 14   0.100                     +      IXX   +
 15  -0.004                     +      I     +
 16  -0.063                     +    XXI     +
```

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- MT3
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1
MT3         RANDOM             1-  60  (1-9   )
                                              1
X1          BINARY             1-  60  (1-2   )

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  X1           UP      1       1     1.7033      5.0868      0.34
      2  X1           SP      1       1     0.7217      1.1359      0.63

RESIDUAL SUM OF SQUARES  =       1979.944930 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                56
RESIDUAL MEAN SQUARE     =         35.356160
1PAGE    7      MONTANA DATA ANALYSIS


ACF VARIABLE IS RMT3. MAXLAG=45./

NUMBER OF OBSERVATIONS                 =              56
MEAN OF THE (DIFFERENCED) SERIES       =         -0.1745
STANDARD ERROR OF THE MEAN             =          0.7725
T-VALUE OF MEAN (AGAINST ZERO)         =         -0.2258

AUTOCORRELATIONS

   1- 12    -.17 -.21  .20 -.12 -.11 -.02 -.18 -.05  .07  0.0 -.02  .25
  ST.E.      .13  .14  .14  .15  .15  .15  .15  .15  .15  .15  .15  .15

  13- 24    -.04  .13  .06 -.09  .04 -.11 -.18 -.06  .04  .01 -.05  .13
  ST.E.      .16  .16  .16  .16  .16  .16  .17  .17  .17  .17  .17  .17

  25- 36     .14  .06 -.03 -.02  .03 -.09  0.0 -.14  .09 -.04 -.05  .12
  ST.E.      .17  .17  .17  .17  .17  .17  .17  .17  .18  .18  .18  .18

  37- 45     .04 -.03  .10  .05 -.01 -.07  .01 -.14 -.02
  ST.E.      .18  .18  .19  .19  .18  .18  .16  .16  .18
1PAGE    8      MONTANA DATA ANALYSIS


PLOT OF SERIAL CORRELATION

               -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.    +----+----+----+----+----+----+----+----+----+----+
                                         I
  1  -0.171                        + XXXXI    +
  2  -0.213                       - XXXXXI     +
  3   0.201                       -      IXXXXX +
  4  -0.124                       -    XXXI     +
  5  -0.114                       +    XXXI     +
  6  -0.023                       +      XI     +
  7  -0.181                       + XXXXXI      +
  8  -0.050                      +       XI      +
  9   0.067                      +        IXX    +
 10  -0.002                      -        I      +
 11  -0.025                      +       XI      +
 12   0.247                      +        IXXXXXX +
 13  -0.039                      +       XI      +
 14   0.129                      +        IXXX   +
 15   0.058                      +        IX     +
```

Nebraska Alcohol-Involved Fatality Raw Time-Series Data



```
ACF VARIABLE IS NB3.
MAXLAG=30./

NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES =        11.3500
STANDARD ERROR OF THE MEAN          =      0.7448
T-VALUE OF MEAN (AGAINST ZERO)      =     15.2393

AUTOCORRELATIONS

  1- 12     .26  .27  .15  .05  .09  .03  .03  .10  .04  .03  .09  .12
 ST.E.      .13  .14  .15  .15  .15  .15  .15  .15  .15  .15  .15  .15

 13- 24     .08 -.08 -.16 -.25 -.09 -.11 -.22 -.20 -.17 -.27 -.13  0.0
 ST.E.      .15  .15  .16  .16  .16  .17  .17  .17  .18  .18  .18  .19

 25- 30     .04 -.01 -.03 -.05 -.08 -.11
 ST.E.      .19  .19  .19  .19  .19  .19

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.260                    +     IXXXXXX
  2   0.271                   +      IXXXXXXX
  3   0.152                   +      IXXXX  +
  4   0.052                   +      IX     +
  5   0.087                   +      IXX    +
  6   0.034                   +      IX     +
  7   0.034                   +      IX     +
  8   0.097                   +      IXX    +
  9   0.039                   +      IX     +
 10   0.026                   +      IX     +
 11   0.090                   +      IXX    +
 12   0.119                   +      IXXX   +
 13   0.082                  +       IXX     +
 14  -0.077                  +     XXI       +
 15  -0.159                  +   XXXXI       +
 16  -0.253                  + XXXXXXI       +
 17  -0.090                  +     XXI       +
 18  -0.113                  +    XXXI       +
 19  -0.225                  + XXXXXXI       +
 20  -0.205                  +  XXXXXI       +
 21  -0.174                 +    XXXXI        +
 22  -0.266                 + XXXXXXXI        +
 23  -0.132                 +     XXXI        +
 24   0.002                 +        I        +
 25   0.045                 +        IX       +
 26  -0.007                 +        I        +
 27  -0.027                 +       XI        +
 28  -0.051                 +       XI        +
 29  -0.083                 +      XXI        +
 30  -0.106                 +     XXXI        +
1PAGE   3     NEBRASKA DATA ANALYSIS
```

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- NB3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1
NB3        RANDOM              1-  60   (1-B   )

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  NB3          AR      1       1    -0.5209     0.1108     -4.70

RESIDUAL SUM OF SQUARES  =       2027.849610 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                57
RESIDUAL MEAN SQUARE     =         35.576309
1PAGE    5      NEBRASKA DATA ANALYSIS


ACF VARIABLE IS RNB3. MAXLAG=30./

NUMBER OF OBSERVATIONS                 =            60
MEAN OF THE (DIFFERENCED) SERIES =     -0.1100
STANDARD ERROR OF THE MEAN             =        0.7629
T-VALUE OF MEAN (AGAINST ZERO)         =       -0.1442

AUTOCORRELATIONS

  1- 12     -.09 -.17 -.05 -.10  .03 -.07 -.07  .05 -.07 -.09  .07  .17
  ST.E.      .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .14

 13- 24      .15 -.01 -.15 -.18  .13  .11 -.13 -.04  .01 -.18 -.06  .17
  ST.E.      .14  .14  .14  .15  .15  .15  .15  .16  .16  .16  .16  .16

 25- 30      .16  .02 -.01  .03  .06 -.04
  ST.E.      .16  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR. +----+----+----+----+----+----+----+----+----+----+
                                           I
  1  -0.087                           +  XXI    +
  2  -0.168                           + XXXXI   +
  3  -0.047                          +     XI    +
  4  -0.103                          +   XXXI    +
  5   0.033                          +      IX   +
  6  -0.071                          +    XXI    +
  7  -0.069                          +    XXI    +
  8   0.049                          +      IX   +
  9  -0.069                          +    XXI    +
 10  -0.087                          +    XXI    +
 11   0.066                          +      IXX  +
 12   0.168                          +      IXXXX +
 13   0.147                          +      IXXXX +
 14  -0.013                          +      I    +
 15  -0.147                          +  XXXXI    +
 16  -0.179                          +  XXXXI    +
 17   0.134                          +      IXXX +
 18   0.110                          +      IXXX +
 19  -0.127                         +   XXXI      +
 20  -0.045                         +     XI      +
 21   0.011                         +      I      +
 22  -0.176                         +  XXXXI      +
 23  -0.058                         +     XI      +
 24   0.175                         +      IXXXX  +
 25   0.157                         +      IXXXX  +
 26   0.023                         +      IX     +
 27  -0.013                         +      I      +
 28   0.028                         +      IX     +
 29   0.059                         +      IX     +
 30  -0.035                         +     XI      +
```

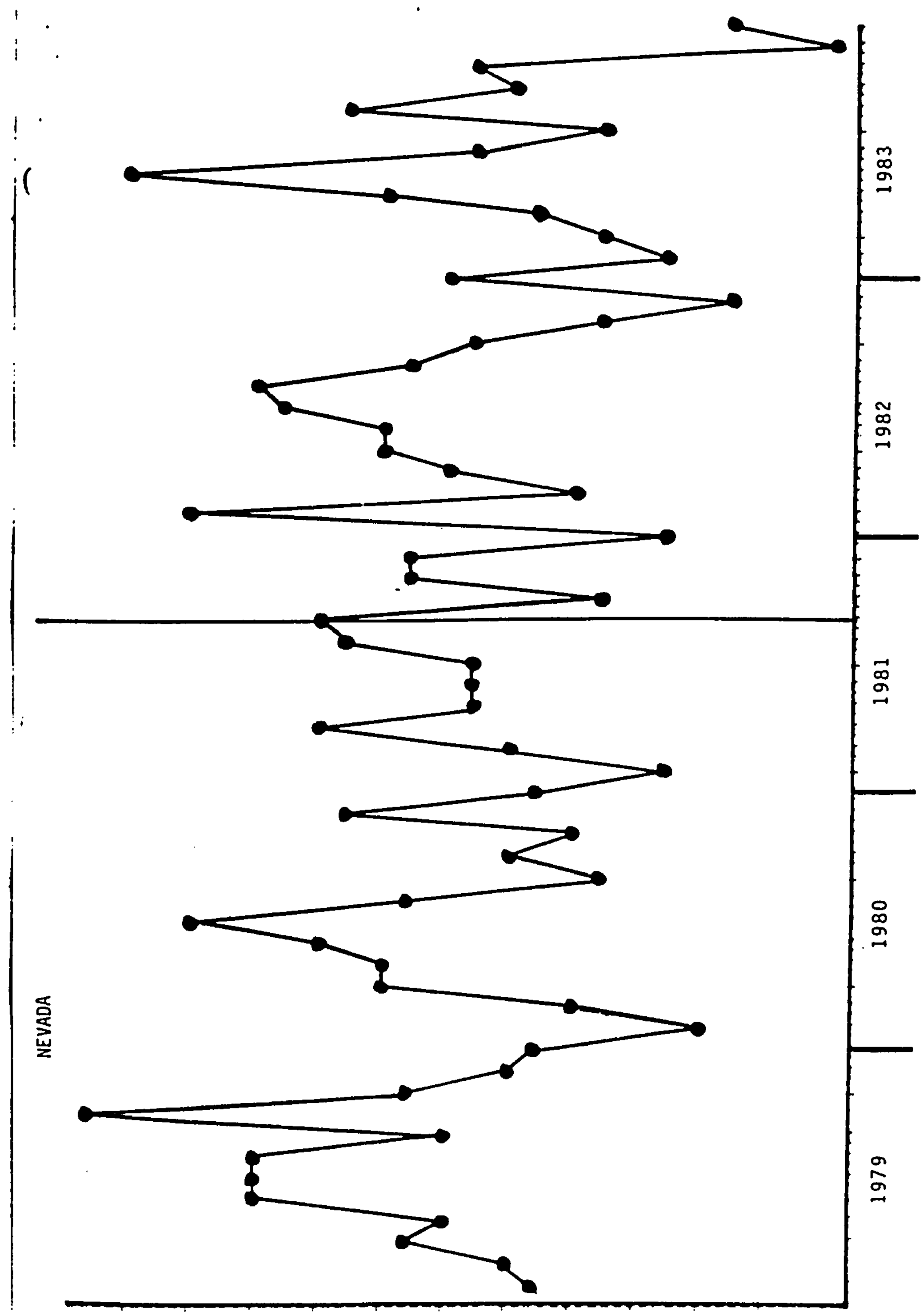
Nebraska Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- NB3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES
                                               1
NB3         RANDOM             1-  60  (1-B   )
                                               1
X1          BINARY             1-  60  (1-B   )

PARAMETER VARIABLE       TYPE  FACTOR  ORDER ESTIMATE      ST. ERR.  T-RATIO
      1  NB3             AR       1       1     -0.5213      0.1132     -4.61
      2  X1              UP       1       0      3.2087      5.9795      0.54
      3  X1              SP       1       1     -0.0300      1.8877     -0.02

RESIDUAL SUM OF SQUARES  =      2014.911450 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               55
RESIDUAL MEAN SQUARE     =        36.634754
1PAGE   7      NEBRASKA DATA ANALYSIS


ACF VARIABLE IS RNB3. MAXLAG=30./

NUMBER OF OBSERVATIONS                 =             60
MEAN OF THE (DIFFERENCED) SERIES       =        -0.1890
STANDARD ERROR OF THE MEAN             =         0.7602
T-VALUE OF MEAN (AGAINST ZERO)         =        -0.2487

AUTOCORRELATIONS

 1- 12     -.09 -.18 -.06 -.09  .05 -.06 -.06  .06 -.09 -.11  .08  .19
 ST.E.      .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .14

13- 24      .15 -.02 -.17 -.15  .14  .11 -.12 -.06  .02 -.18 -.06  .18
 ST.E.      .14  .15  .15  .15  .15  .16  .16  .16  .16  .16  .16  .16

25- 30      .16  .01 -.03  .02  .07 -.03
 ST.E.      .17  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.089                    +   XXI     +
  2  -0.177                    + XXXXI     +
  3  -0.057                   +     XI      +
  4  -0.091                   +    XXI      +
  5   0.050                   +      IX     +
  6  -0.059                   +     XI      +
  7  -0.060                   +     XI      +
  8   0.062                   +      IXX    +
  9  -0.080                   +    XXI      +
 10  -0.108                   +   XXXI      +
 11   0.078                   +      IXX    +
 12   0.186                   +      IXXXXX +
 13   0.154                   +      IXXXX  +
 14  -0.025                   +     XI      +
 15  -0.174                   +  XXXXI      +
 16  -0.154                   +  XXXXI      +
 17   0.143                  +       IXXXX   +
 18   0.108                  +       IXXX    +
 19  -0.120                  +    XXXI       +
 20  -0.058                  +      XI       +
 21   0.021                  +       IX      +
 22  -0.179                  +   XXXXI       +
 23  -0.060                  +     XXI       +
 24   0.185                  +       IXXXXX  +
 25   0.161                  +       IXXXX   +
 26   0.006                  +       I       +
 27  -0.034                  +      XI       +
 28   0.020                  +       IX      +
```

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- NB3
INPUT VARIABLES -- NOISE      X1

VARIABLE  VAR. TYPE  MEAN        TIME       DIFFERENCES
                                                1
NB3         RANDOM             1-  60   (1-B  )
                                                1
X1          BINARY             1-  60   (1-B  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE      ST. ERR.  T-RATIO
     1  NB3            AR      1       1    -0.4678      0.1231     -3.80
     2  X1             UP      1       1     2.1000      3.4730      0.60
     3  X1             SP      1       1    -1.0643      0.1377     -7.73

RESIDUAL SUM OF SQUARES  =        1952.152340 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                 54
RESIDUAL MEAN SQUARE     =          36.150970
1PAGE   7      NEBRASKA DATA ANALYSIS
```

```
ACF VARIABLE IS RNB3. MAXLAG=30./

NUMBER OF OBSERVATIONS                =            60
MEAN OF THE (DIFFERENCED) SERIES      =       -0.2420
STANDARD ERROR OF THE MEAN            =        0.7425
T-VALUE OF MEAN (AGAINST ZERO)        =       -0.3259

AUTOCORRELATIONS

  1- 12     -.09 -.18 -.05 -.08  .05 -.08 -.07  .06 -.07 -.13  .11  .17
  ST.E.      .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .14

 13- 24      .16 -.08 -.14 -.17  .16  .08 -.12 -.05  0.0 -.16 -.06  .17
  ST.E.      .15  .15  .15  .15  .15  .16  .16  .16  .16  .16  .16  .16

 25- 30      .18 -.01 -.06  .06  .09  .02
  ST.E.      .17  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                      I
  1  -0.086                     +   XXI     +
  2  -0.181                     +XXXXXI     +
  3  -0.051                    +     XI      +
  4  -0.085                    +    XXI      +
  5   0.051                    +      IX     +
  6  -0.080                    +    XXI      +
  7  -0.074                    +    XXI      +
  8   0.057                    +      IX     +
  9  -0.069                    +    XXI      +
 10  -0.133                    +   XXXI      +
 11   0.111                    +      IXXX   +
 12   0.175                    +      IXXXX  +
 13   0.161                    +      IXXXX  +
 14  -0.083                    +    XXI      +
 15  -0.144                    +  XXXXI      +
 16  -0.168                    +  XXXXI      +
 17   0.160                   +       IXXXX   +
 18   0.085                   +       IXX     +
 19  -0.118                   +    XXXI       +
 20  -0.047                   +      XI       +
 21   0.005                   +       I       +
 22  -0.159                   +   XXXXI       +
 23  -0.063                   +     XXI       +
 24   0.168                   +       IXXXX   +
 25   0.176                   +       IXXXX   +
 26  -0.013                   +       I       +
 27  -0.063                   +     XXI       +
 28   0.058                   +       IX      +
```

Nevada Alcohol-Involved Fatality Raw Time-Series Data



```
ACF VARIABLE IS NV3.
MAXLAG=30./

NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES    =     13.6500
STANDARD ERROR OF THE MEAN          =      0.6207
T-VALUE OF MEAN (AGAINST ZERO)      =     21.9929
```

AUTOCORRELATIONS

1- 12	.26	.08	.02	-.17	-.08	-.29	-.34	.03	.12	.14	.24	.13
ST.E.	.13	.14	.14	.14	.14	.14	.15	.16	.16	.17	.17	.17
13- 24	.16	.10	-.19	-.07	-.23	-.18	-.06	-.12	.08	.07	.01	.06
ST.E.	.18	.18	.18	.18	.18	.19	.19	.19	.19	.19	.19	.19
25- 30	.18	.13	-.03	-.11	-.14	-.03						
ST.E.	.19	.20	.20	.20	.20	.20						

PLOT OF SERIAL CORRELATION

```
                -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.    +----+----+----+----+----+----+----+----+----+----+
                                          I
  1    0.259                       +      IXXXXXX
  2    0.077                      +       IXX    +
  3    0.022                      +       IX     +
  4   -0.174                      +   XXXXI      +
  5   -0.079                      +     XXI      +
  6   -0.286                      XXXXXXXI       +
  7   -0.344                    XX+XXXXXXI       +
  8    0.027                     +        IX      +
  9    0.125                     +        IXXX    +
 10    0.143                     +        IXXXX   +
 11    0.239                     +        IXXXXXX +
 12    0.133                    +         IXXX     +
 13    0.162                    +         IXXXX    +
 14    0.096                    +         IXX      +
 15   -0.185                    +    XXXXXI        +
 16   -0.068                    +       XXI        +
 17   -0.228                    +   XXXXXXI        +
 18   -0.181                    +    XXXXXI        +
 19   -0.063                    +       XXI        +
 20   -0.117                    +      XXXI        +
 21    0.081                    +         IXX      +
 22    0.072                    +         IXX      +
 23    0.013                    +         I        +
 24    0.063                    +         IXX      +
 25    0.179                    +         IXXXX    +
 26    0.128                   +          IXXX      +
 27   -0.033                   +         XI         +
 28   -0.110                   +       XXXI         +
 29   -0.141                   +      XXXXI         +
 30   -0.028                   +         XI         +
1PAGE    3      NEVADA DATA ANALYSIS
```

Nevada Alcohol-Involved Fatality Data Parameter
Estiamtes and ACFs for White Noise Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- NV3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES
                                                 1
NV3         RANDOM              1-  60  (1-B  )


PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  NV3           AR      1       1    -0.4581     0.1242    -3.69
      2  NV3           AR      2       7    -0.3991     0.1380    -2.89

RESIDUAL SUM OF SQUARES  =        1252.580400 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                 49
RESIDUAL MEAN SQUARE     =          25.562865
1PAGE   5      NEVADA DATA ANALYSIS



ACF VARIABLE IS RNV3. MAXLAG=30./


NUMBER OF OBSERVATIONS                =             60
MEAN OF THE (DIFFERENCED) SERIES =             -0.0585
STANDARD ERROR OF THE MEAN            =          0.6309
T-VALUE OF MEAN (AGAINST ZERO)        =         -0.0927

AUTOCORRELATIONS

  1- 12      -.10 -.21 -.05 -.07  .03 -.20  .02  .05  .09 -.05  .03  0.0
  ST.E.       .13  .13  .14  .14  .14  .14  .14  .14  .14  .14  .14  .14

 13- 24       .03  .12 -.15  .11 -.19  .04  .07 -.16  .15  .01 -.06 -.20
  ST.E.       .14  .14  .15  .15  .15  .15  .15  .15  .16  .16  .16  .16

 25- 30       .21  .17 -.08 -.03 -.06  .05
  ST.E.       .16  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1 -0.102                     +  XXXI     +
  2 -0.210                     +XXXXXI     +
  3 -0.049                    +     XI      +
  4 -0.068                    +    XXI      +
  5  0.035                    +      IX     +
  6 -0.196                    + XXXXXI      +
  7  0.024                    +      IX     +
  8  0.051                    +      IX     +
  9  0.091                    +      IXX    +
 10 -0.053                    +     XI      +
 11  0.032                    +      IX     +
 12 -0.002                    +      I      +
 13  0.034                    +      IX     +
 14  0.119                    +      IXXX   +
 15 -0.151                    +  XXXXI      +
 16  0.108                    +      IXXX   +
 17 -0.186                    + XXXXXI      +
 18  0.035                    +      IX     +
 19  0.068                    +      IXX    +
 20 -0.165                   +   XXXXI       +
 21  0.148                   +       IXXXX   +
 22  0.015                   +       I       +
 23 -0.059                   +      XI       +
 24 -0.199                   +  XXXXXI       +
 25  0.210                   +       IXXXXX  +
 26  0.169                   +       IXXXX   +
 27 -0.076                   +     XXI       +
 28 -0.027                   +      XI       +
 29 -0.058                   +      XI       +
 30  0.055                   +       IX      +
```

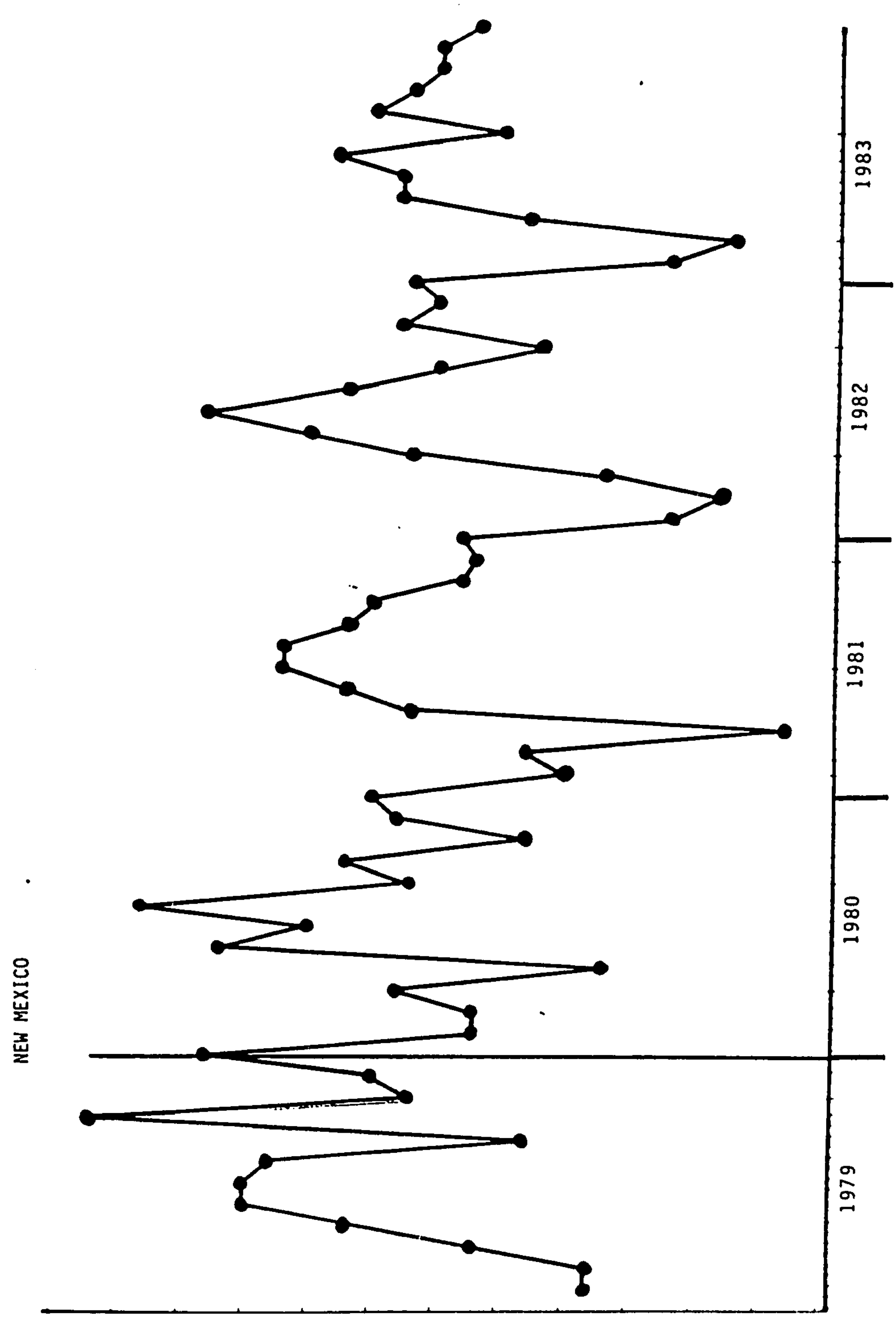
Nevada Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- NV3
INPUT VARIABLES -- NOISE      X1

VARIABLE   VAR. TYPE   MEAN       TIME       DIFFERENCES
                                                 1
NV3         RANDOM                1-  60   (1-B   )
                                                 1
X1          BINARY                1-  60   (1-B   )

PARAMETER VARIABLE      TYPE   FACTOR   ORDER ESTIMATE      ST. ERR.   T-RATIO
     1  NV3              AR       1       1     -0.4689      0.1272     -3.69
     2  NV3              AR       2       7     -0.4166      0.1442     -2.89
     3  X1               UP       1       0     -2.7788      4.3033     -0.65
     4  X1               SP       1       1     -0.1709      1.3513     -0.13

RESIDUAL SUM OF SQUARES   =        1249.575070 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =               47
RESIDUAL MEAN SQUARE      =          26.586704
1PAGE   7     NEVADA DATA ANALYSIS


ACF VARIABLE IS RNV3. MAXLAG=30./

NUMBER OF OBSERVATIONS                =             60
MEAN OF THE (DIFFERENCED) SERIES      =         0.0281
STANDARD ERROR OF THE MEAN            =         0.6301
T-VALUE OF MEAN (AGAINST ZERO)        =         0.0447

AUTOCORRELATIONS

  1- 12     -.10 -.19 -.06 -.08  .06 -.21  .02  .05  .12 -.04  .03 -.02
  ST.E.      .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .14  .14

 13- 24      .01  .11 -.16  .13 -.17  .05  .05 -.17  .15 -.02 -.05 -.19
  ST.E.      .14  .14  .15  .15  .15  .15  .15  .15  .16  .16  .16  .16

 25- 30      .21  .17 -.08 -.02 -.06  .06
  ST.E.      .16  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

                -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                           I
  1  -0.101                          +  XXXI     +
  2  -0.186                          +XXXXXI     +
  3  -0.061                         +    XXI      +
  4  -0.085                         +    XXI      +
  5   0.061                         +      IXX    +
  6  -0.208                         + XXXXXI      +
  7   0.021                         +      IX     +
  8   0.047                         +      IX     +
  9   0.119                         +      IXXX   +
 10  -0.039                         +     XI      +
 11   0.027                         +      IX     +
 12  -0.023                         +     XI      +
 13   0.007                         +      I      +
 14   0.105                         +      IXXX   +
 15  -0.162                         +  XXXXI      +
 16   0.133                         +      IXXX   +
 17  -0.170                         +  XXXXI      +
 18   0.046                        +       IX      +
 19   0.053                        +       IX      +
 20  -0.169                        +   XXXXI       +
 21   0.147                        +       IXXXX   +
 22  -0.019                        +       I       +
 23  -0.050                        +      XI       +
 24  -0.193                        + XXXXXI        +
 25   0.206                        +       IXXXXX  +
 26   0.169                        +       IXXXX   +
 27  -0.079                        +     XXI       +
 28  -0.025                        +      XI       +
```

Nevada Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- NV3
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN       TIME     DIFFERENCES
                                               1
NV3         RANDOM              1-  60   (1-B  )
                                               1
X1          BINARY              1-  60   (1-B  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE      ST. ERR.  T-RATIO
      1  NV3           AR      1       1    -0.4552      0.1285     -3.54
      2  NV3           AR      2       7    -0.4221      0.1401     -3.01
      3  X1            UP      1       1    -6.0577      4.7135     -1.29
      4  X1            SP      1       1    -0.4830      0.6904     -0.70

RESIDUAL SUM OF SQUARES  =        1197.324070 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                 46
RESIDUAL MEAN SQUARE     =          26.028784
1PAGE    7      NEVADA DATA ANALYSIS



ACF VARIABLE IS RNV3. MAXLAG=30./


NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES =       -0.0420
STANDARD ERROR OF THE MEAN          =      0.6125
T-VALUE OF MEAN (AGAINST ZERO)      =     -0.0686

AUTOCORRELATIONS

  1- 12      -.08 -.19 -.08 -.06  0.0 -.20  .01  .08  .13 -.01  .06 -.05
  ST.E.       .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .14  .14

 13- 24      -.05  .05 -.12  .12 -.14  .10  .08 -.19  .08 -.04 -.04 -.19
  ST.E.       .14  .14  .14  .15  .15  .15  .15  .15  .16  .16  .16  .16

 25- 30       .19  .16 -.06 -.03 -.08  .07
  ST.E.       .16  .16  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                        I
  1  -0.082                       +   XXI     +
  2  -0.190                       +XXXXXI     +
  3  -0.083                      +    XXI      +
  4  -0.062                      +    XXI      +
  5   0.004                      +      I      +
  6  -0.198                      + XXXXXI      +
  7   0.014                      +      I      +
  8   0.081                      +      IXX    +
  9   0.126                      +      IXXX   +
 10  -0.012                      +      I      +
 11   0.060                      +      IX     +
 12  -0.046                      +     XI      +
 13  -0.052                      +     XI      +
 14   0.049                      +      IX     +
 15  -0.120                      +   XXXI      +
 16   0.120                      +      IXXX   +
 17  -0.139                      +   XXXI      +
 18   0.098                      +      IXX    +
 19   0.083                      +      IXX    +
 20  -0.191                      + XXXXXI      +
 21   0.080                     +       IXX     +
 22  -0.036                     +      XI       +
 23  -0.036                     +      XI       +
 24  -0.187                     +  XXXXXI       +
 25   0.185                     +       IXXXXX  +
 26   0.164                     +       IXXXX   +
 27  -0.059                     +      XI       +
 28  -0.070                     +      XI       +
```

New Mexico Alcohol-Involved Fatality Raw Time-Series Data



New Mexico Alcohol-Involved Fatality Data
Undifferenced ACFs

ACF VARIABLE IS NM3.
MAXLAG=30./

NUMBER OF OBSERVATIONS	=	60
MEAN OF THE (DIFFERENCED) SERIES	=	27.5000
STANDARD ERROR OF THE MEAN	=	0.8549
T-VALUE OF MEAN (AGAINST ZERO)	=	32.1689

AUTOCORRELATIONS

1- 12	.36	.20	-.13	-.25	-.09	-.09	-.19	-.22	-.10	.16	.36	.48
ST.E.	.13	.14	.15	.15	.16	.16	.16	.16	.17	.17	.17	.18
13- 24	.24	.10	-.14	-.21	-.17	-.23	-.16	-.20	-.06	.11	.27	.26
ST.E.	.20	.21	.21	.21	.21	.22	.22	.22	.23	.23	.23	.23
25- 30	.14	-.05	-.09	-.13	-.12	-.14						
ST.E.	.24	.24	.24	.24	.24	.24						

PLOT OF SERIAL CORRELATION

```
             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.   +----+----+----+----+----+----+----+----+----+----+
                                        I
   1    0.356                     +     IXXXXX+XXX
   2    0.200                    +      IXXXXX +
   3   -0.129                    +   XXXI      +
   4   -0.248                    +XXXXXXI      +
   5   -0.089                   +     XXI       +
   6   -0.092                   +     XXI       +
   7   -0.192                   +  XXXXXI       +
   8   -0.217                   +  XXXXXI       +
   9   -0.099                   +     XXI       +
  10    0.155                   +       IXXXX   +
  11    0.362                   +       IXXXXXXX+X
  12    0.484                  +        IXXXXXXXX+XXX
  13    0.239                 +         IXXXXXX   +
  14    0.096                 +         IXX       +
  15   -0.142                 +     XXXXI         +
  16   -0.211                 +    XXXXXI         +
  17   -0.169                 +     XXXXI         +
  18   -0.234                +    XXXXXXI          +
  19   -0.155                +      XXXXI          +
  20   -0.204                +     XXXXXI          +
  21   -0.060                +         XI          +
  22    0.106                +          IXXX       +
  23    0.272                +          IXXXXXXX   +
  24    0.262                +          IXXXXXXX   +
  25    0.135               +           IXXX        +
  26   -0.046               +          XI           +
  27   -0.093               +         XXI           +
  28   -0.126               +        XXXI           +
  29   -0.125               +        XXXI           +
  30   -0.143               +       XXXXI           +
1PAGE    3     NEW MEXICO DATA ANALYSIS
```

New Mexico Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models


```
OUTPUT VARIABLE -- NM3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1
NM3         RANDOM            1-  60  (1-8   )


PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
     1  NM3             AR      1       1    -0.4952    0.1094    -4.53
     2  NM3             AR      2      12     0.4601    0.1196     3.85

RESIDUAL SUM OF SQUARES  =        1532.032720 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                 44
RESIDUAL MEAN SQUARE     =          34.818925
1PAGE   5      NEW MEXICO DATA ANALYSIS



ACF VARIABLE IS RNM3. MAXLAG=45./


NUMBER OF OBSERVATIONS             =              60
MEAN OF THE (DIFFERENCED) SERIES   =          0.0519
STANDARD ERROR OF THE MEAN         =          0.8081
T-VALUE OF MEAN (AGAINST ZERO)     =          0.0642

AUTOCORRELATIONS

  1- 12     -.07 -.12 -.11 -.27  .17  .14 -.18 -.04 -.13  0.0  .24 -.05
  ST.E.      .13  .13  .13  .13  .14  .15  .15  .15  .15  .15  .15  .16

 13- 24      .07  .09 -.18  0.0 -.03 -.11  .03 -.12 -.10  .07  .18  .11
  ST.E.      .16  .16  .16  .16  .16  .16  .17  .17  .17  .17  .17  .17

 25- 36     -.03 -.18  .04  .10  .04 -.02 -.11 -.11  .02  .06  .02  .02
  ST.E.      .17  .17  .18  .18  .18  .18  .18  .18  .18  .18  .18  .18

 37- 45      .11 -.04  .03 -.09 -.07  .10 -.03 -.03 -.01
  ST.E.      .18  .18  .18  .18  .18  .18  .18  .18  .18
1PAGE   6      NEW MEXICO DATA ANALYSIS



PLOT OF SERIAL CORRELATION

            -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR. +----+----+----+----+----+----+----+----+----+----+
                                      I
  1  -0.070                    +   XXI     +
  2  -0.121                    +  XXXI     +
  3  -0.106                    +  XXXI     +
  4  -0.272                   XXXXXXXI      +
  5   0.171                   +      IXXXX  +
  6   0.143                   +      IXXXX  +
  7  -0.185                   + XXXXXI      +
  8  -0.043                   +     XI      +
  9  -0.127                   +   XXXI      +
 10   0.004                  +       I       +
 11   0.237                  +       IXXXXXX +
 12  -0.052                  +      XI       +
 13   0.069                  +       IXX     +
 14   0.091                  +       IXX     +
 15  -0.184                  +  XXXXXI       +
 16  -0.001                  +       I       +
 17   0.030                  +       IX      +
 18  -0.114                  +    XXXI       +
 19   0.035                  +       IX      +
 20  -0.118                  +    XXXI       +
 21  -0.102                  +    XXXI       +
 22   0.074                  +       IXX     +
 23   0.179                  +       IXXXX   +
 24   0.111                  +       IXXX    +
 25  -0.033                  +      XI       +
 26  -0.180                  +   XXXXI       +
 27   0.037                 +        IX       +
 28   0.100                 +        IXXX     +
```

New Mexico Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- NM3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES
                                                 1
NM3        RANDOM              1-  60  (1-B   )
                                                 1
X1         BINARY              1-  60  (1-B   )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  NM3           AR      1       1    -0.4630     0.1112    -4.16
      2  NM3           AR      2      12     0.4497     0.1129     3.98
      3  X1            UP      1       0     3.1016     4.4740     0.69
      4  X1            SP      1       1    -0.8996     0.2669    -3.37

RESIDUAL SUM OF SQUARES  =       1461.981190 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =             42
RESIDUAL MEAN SQUARE     =         34.809076
1PAGE   7      NEW MEXICO DATA ANALYSIS


ACF VARIABLE IS RNM3. MAXLAG=30./

NUMBER OF OBSERVATIONS                 =              60
MEAN OF THE (DIFFERENCED) SERIES =              0.0262
STANDARD ERROR OF THE MEAN             =              0.8052
T-VALUE OF MEAN (AGAINST ZERO)         =              0.0326

AUTOCORRELATIONS

  1- 12      -.08 -.12 -.08 -.30  .19  .13 -.18 -.04 -.14  0.0  .23 -.04
  ST.E.       .13  .13  .13  .13  .14  .15  .15  .15  .15  .16  .16  .16

 13- 24       .06  .11 -.19  0.0  .02 -.12  .03 -.12 -.09  .08  .17  .11
  ST.E.       .16  .16  .16  .17  .17  .17  .17  .17  .17  .17  .17  .17

 25- 30      -.03 -.18  .03  .10  .02 -.02
  ST.E.       .18  .18  .18  .18  .18  .18

PLOT OF SERIAL CORRELATION

              -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                         I
  1  -0.077                       +   XXI     +
  2  -0.118                       +  XXXI     +
  3  -0.075                       +   XXI     +
  4  -0.304                     XX+XXXXXI     +
  5   0.192                      +       IXXXXX +
  6   0.126                      +       IXXX   +
  7  -0.182                      + XXXXXI      +
  8  -0.036                     +       XI       +
  9  -0.140                     +     XXXI       +
 10  -0.002                     +        I       +
 11   0.229                     +        IXXXXXX +
 12  -0.042                     +       XI       +
 13   0.062                     +        IXX     +
 14   0.107                     +        IXXX    +
 15  -0.185                     +  XXXXXI        +
 16   0.000                     +        I       +
 17   0.025                     +        IX      +
 18  -0.115                     +     XXXI       +
 19   0.034                     +        IX      +
 20  -0.118                     +     XXXI       +
 21  -0.084                     +      XXI       +
 22   0.083                     +        IXX     +
 23   0.174                     +        IXXXX   +
 24   0.114                   +          IXXX      +
 25  -0.025                   +         XI         +
 26  -0.180                   +     XXXXI          +
 27   0.079
```

New Mexico Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- NM3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN       TIME       DIFFERENCES
                                                1
NM3         RANDOM             1-   60  (1-B     )
                                                1
X1          BINARY             1-   60  (1-B     )
```

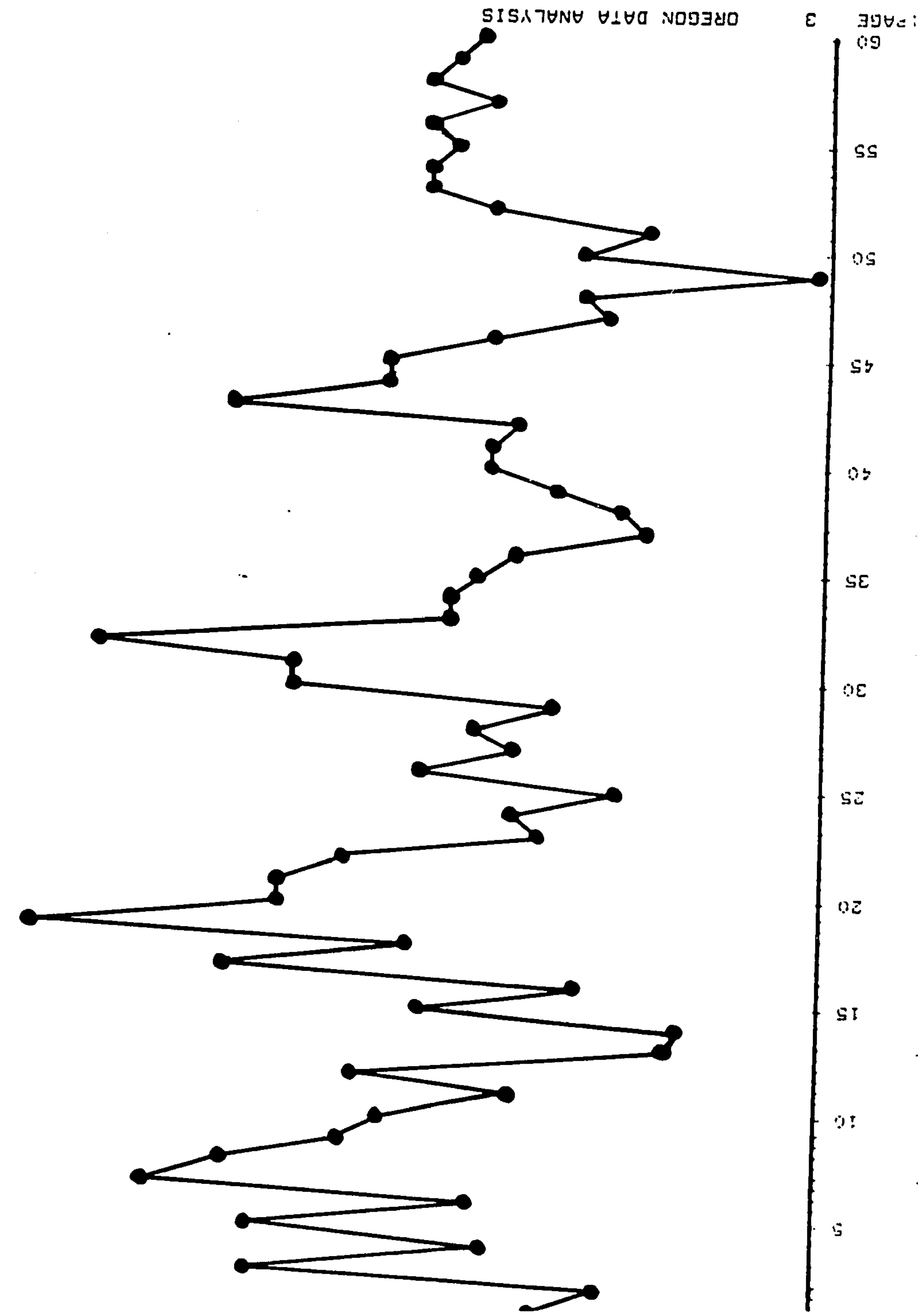
PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	NM3	AR	1	1	-0.5035	0.1134	-4.44
2	NM3	AR	2	12	0.4709	0.1224	3.85
3	X1	UP	1	1	-1.5934	3.0989	-0.51
4	X1	SP	1	1	0.7687	0.6081	1.26

```
RESIDUAL SUM OF SQUARES  =      1522.341370 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               41
RESIDUAL MEAN SQUARE     =        37.130277
1PAGE    7     NEW MEXICO DATA ANALYSIS


ACF VARIABLE IS RNM3. MAXLAG=30./

NUMBER OF OBSERVATIONS              =            60
MEAN OF THE (DIFFERENCED) SERIES    =        0.1415
STANDARD ERROR OF THE MEAN          =        0.8052
T-VALUE OF MEAN (AGAINST ZERO)      =        0.1757

AUTOCORRELATIONS
```

1- 12	-.08	-.13	-.10	-.28	.18	.14	-.20	-.04	-.12	.01	.25	-.05
ST.E.	.13	.13	.13	.13	.14	.15	.15	.15	.15	.15	.15	.16
13- 24	.08	.12	-.17	.01	.03	-.11	.03	-.12	-.11	.07	.18	.11
ST.E.	.16	.16	.16	.17	.17	.17	.17	.17	.17	.17	.17	.17
25- 30	-.03	-.18	.04	.10	.02	-.03						
ST.E.	.18	.18	.18	.18	.18	.18						

```
PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.081                    +   XXI     +
  2  -0.134                    +  XXXI     +
  3  -0.102                    +  XXXI     +
  4  -0.279                   XXXXXXXI      +
  5   0.175                   +      IXXXX  +
  6   0.136                   +      IXXX   +
  7  -0.187                   + XXXXXI      +
  8  -0.044                   +     XI      +
  9  -0.123                   +   XXXI      +
 10   0.013                  +       I       +
 11   0.248                  +       IXXXXXX +
 12  -0.050                  +      XI       +
 13   0.084                  +       IXX     +
 14   0.116                  +       IXXX    +
 15  -0.174                  +   XXXXI       +
 16   0.009                  +       I       +
 17   0.033                  +       IX      +
 18  -0.114                  +    XXXI       +
 19   0.035                  +       IX      +
 20  -0.121                  +    XXXI       +
 21  -0.106                  +    XXXI       +
 22   0.071                  +       IXX     +
 23   0.177                  +       IXXXX   +
 24   0.112                 +        IXXX     +
 25  -0.031                 +       XI        +
 26  -0.180                 +   XXXXXI        +
 27   0.036                 +        IX       +
```

Oregon Alcohol-Involved Fatality Raw Time-Series Data



```
ACF VARIABLE IS OR3.
MAXLAG=30./

NUMBER OF OBSERVATIONS               =           60
MEAN OF THE (DIFFERENCED) SERIES     =      21.0833
STANDARD ERROR OF THE MEAN           =       0.8837
T-VALUE OF MEAN (AGAINST ZERO)       =      23.8576

AUTOCORRELATIONS

  1- 12      .37  .44 -.01 -.12 -.29 -.53 -.27 -.21  .07  .21  .38  .50
  ST.E.      .13  .15  .17  .17  .17  .18  .20  .21  .21  .21  .21  .23

 13- 24      .38  .25  .03 -.14 -.32 -.37 -.29 -.18 -.04  .09  .23  .29
  ST.E.      .24  .25  .26  .26  .26  .26  .27  .28  .28  .28  .28  .28

 25- 30      .19  .11  .01 -.13 -.22 -.38
  ST.E.      .29  .29  .29  .29  .29  .30
```

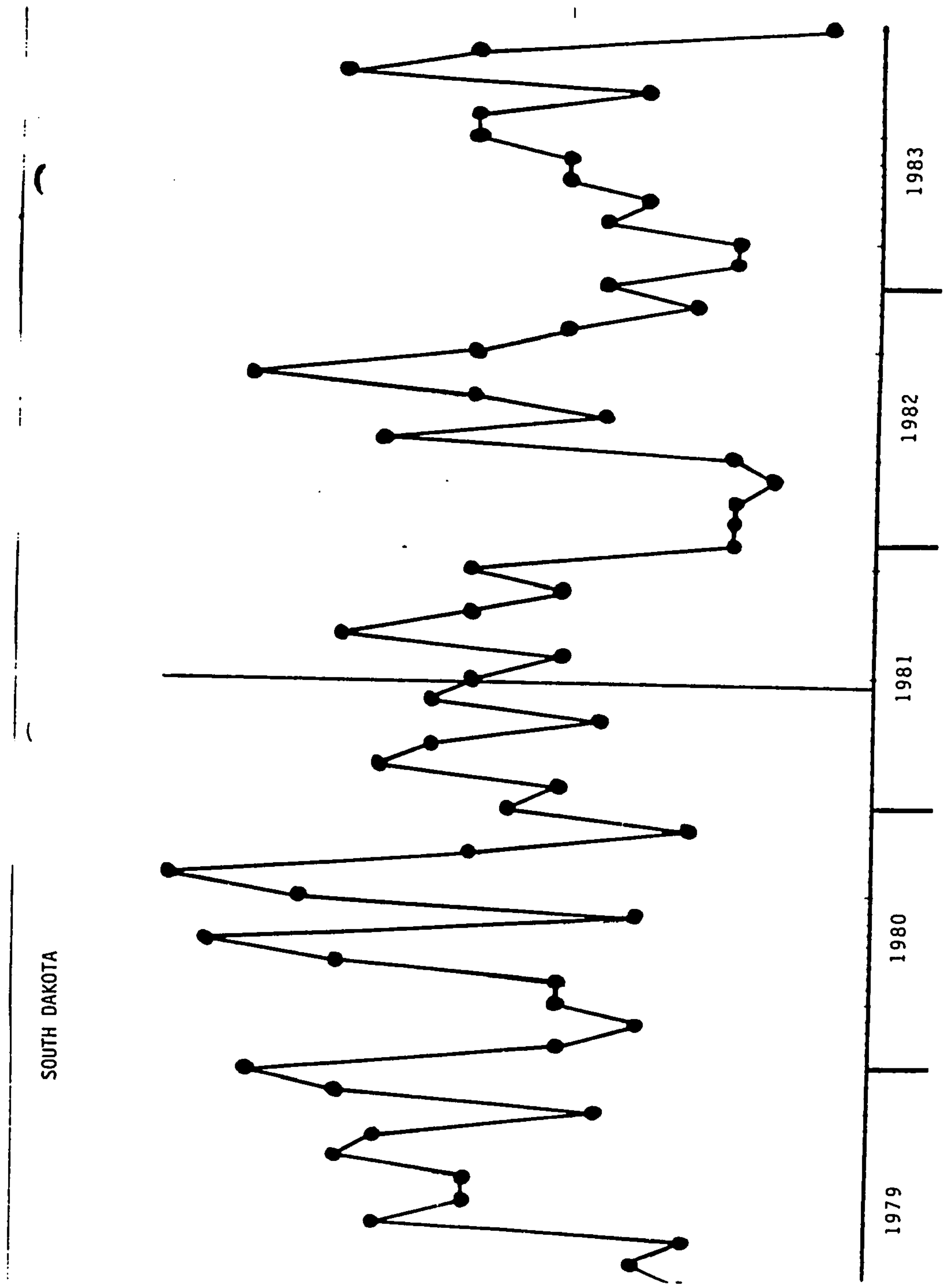
Oregon Alcohol-Involved Fatal

```
PLOT OF SERIAL CORRELATION

            -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1    0.372                     +     IXXXXX+XXX
  2    0.436                    +      IXXXXXX+XXXX
  3   -0.009                   +       I       +
  4   -0.118                   +    XXXI       +
  5   -0.287                   +XXXXXXXI       +
  6   -0.531              XXXX+XXXXXXXXI        +
  7   -0.275                 +  XXXXXXXI         +
  8   -0.212                 +    XXXXXI         +
  9    0.070                 +         IXX       +
 10    0.210                 +         IXXXXX    +
 11    0.378                 +         IXXXXXXXXX+
 12    0.505                +          IXXXXXXXXXX+XX
 13    0.376               +           IXXXXXXXXX  +
 14    0.250               +           IXXXXXX     +
 15    0.026              +            IX           +
 16   -0.144              +        XXXXI            +
 17   -0.316              +    XXXXXXXXI            +
 18   -0.368              +   XXXXXXXXXI            +
 19   -0.290              +     XXXXXXXI            +
 20   -0.182             +        XXXXXI             +
 21   -0.039             +            XI             +
 22    0.088             +             IXX           +
 23    0.228             +             IXXXXXX       +
 24    0.293             +             IXXXXXXX      +
 25    0.188             +             IXXXXX        +
 26    0.107             +             IXXXX         +
 27    0.008             +             I             +
 28   -0.126             +          XXXI             +
 29   -0.221             +       XXXXXXI             +
 30   -0.380             +    XXXXXXXXXI             +
```

Oregon Alcohol-Involved Fatality Data Parameter Estiamtes and ACFs for White Noise Models

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- OR3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              2
OR3        RANDOM            1-  60  (1-8  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  OR3           AR      1      3    -0.3269     0.1248     -2.62
      2  OR3           AR      2      6    -0.6937     0.0897     -7.74

RESIDUAL SUM OF SQUARES  =      1244.662960 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               47
RESIDUAL MEAN SQUARE     =        26.482191
1PAGE   5      OREGON DATA ANALYSIS


ACF VARIABLE IS ROR3. MAXLAG=45./

NUMBER OF OBSERVATIONS               =            60
MEAN OF THE (DIFFERENCED) SERIES =            0.3556
STANDARD ERROR OF THE MEAN          =            0.6820
T-VALUE OF MEAN (AGAINST ZERO)      =            0.5214

AUTOCORRELATIONS

  1- 12      .17 -.16  .01 -.08  .01  .01  .01 -.08 -.04  .07  .02 -.03
  ST.E.      .13  .13  .14  .14  .14  .14  .14  .14  .14  .14  .14  .14

 13- 24      .18  .12  .04 -.13 -.12  .08 -.09 -.02 -.02 -.07  .07  .07
  ST.E.      .14  .14  .14  .14  .15  .15  .15  .15  .15  .15  .15  .15

 25- 36     -.04 -.05  .02  .12 -.05 -.27 -.09  0.0  0.0  0.0  .09 -.03
  ST.E.      .15  .15  .15  .15  .15  .15  .16  .16  .16  .16  .16  .16

 37- 45     -.09  .03 -.09 -.05  .05 -.03 -.05 -.03 -.06
  ST.E.      .16  .16  .16  .16  .16  .16  .16  .17  .17
1PAGE   6      OREGON DATA ANALYSIS


PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
                                          I
  1   0.171                        +      IXXXX +
  2  -0.160                       +   XXXXI       +
  3   0.008                       +       I       +
  4  -0.082                       +     XXI       +
  5   0.012                       +       I       +
  6   0.010                       +       I       +
  7   0.006                       +       I       +
  8  -0.084                       +     XXI       +
  9  -0.044                       +      XI       +
 10   0.069                       +       IXX     +
 11   0.022                       +       IX      +
 12  -0.034                       +      XI       +
 13   0.179                       +       IXXXX   +
 14   0.116                       +       IXXX    +
 15   0.038                       +       IX      +
 16  -0.127                       +    XXXI       +
 17  -0.115                       +    XXXI       +
 18   0.075                       +       IXX     +
 19  -0.092                       +     XXI       +
 20  -0.018                       +       I       +
 21  -0.024                       +      XI       +
 22  -0.066                       +     XXI       +
 23   0.066                       +       IXX     +
 24   0.067                       +       IXX     +
```

South Dakota Alcohol-Involved Fatality Raw Time-Series Data



South Dakota Alcohol-Involved Fatality Data
Undifferenced ACFs


```
ACF VARIABLE IS SD3.
MAXLAG=30./

NUMBER OF OBSERVATIONS                 =           60
MEAN OF THE (DIFFERENCED) SERIES =         7.6333
STANDARD ERROR OF THE MEAN          =         0.4676
T-VALUE OF MEAN (AGAINST ZERO)      =        16.3254

AUTOCORRELATIONS

  1- 12     .31  .06  .26 -.07 -.16 -.06 -.22 -.08  .21  .08  .11  .27
  ST.E.     .13  .14  .14  .15  .15  .15  .15  .16  .16  .16  .16  .16

 13- 24     .16  .14  .09 -.25 -.16 -.15 -.29 -.12  0.0 -.05  .13  .13
  ST.E.     .17  .17  .18  .18  .18  .19  .19  .19  .20  .20  .20  .20

 25- 30    -.12  .01 -.05 -.24 -.15 -.18
  ST.E.     .20  .20  .20  .20  .21  .21

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR. +----+----+----+----+----+----+----+----+----+----+
                                      I
  1    0.310                    +     IXXXXX+XX
  2    0.065                   +      IXX    +
  3    0.258                   +      IXXXXXX+
  4   -0.075                   +    XXI      +
  5   -0.156                   +  XXXXI      +
  6   -0.064                   +    XXI      +
  7   -0.216                   + XXXXXI      +
  8   -0.082                  +     XXI       +
  9    0.208                  +       IXXXXX  +
 10    0.077                  +       IXX     +
 11    0.108                  +       IXXX    +
 12    0.269                  +       IXXXXXXX+
 13    0.163                  +       IXXXX   +
 14    0.143                 +        IXXXX    +
 15    0.087                 +        IXX      +
 16   -0.245                 +  XXXXXXI        +
 17   -0.160                 +    XXXXI        +
 18   -0.152                 +    XXXXI        +
 19   -0.295                 + XXXXXXXI        +
 20   -0.124                +      XXXI         +
 21   -0.003                +         I         +
 22   -0.046                +        XI         +
 23    0.131                +         IXXX      +
 24    0.126                +         IXXX      +
 25   -0.122                +      XXXI         +
 26    0.011                +         I         +
 27   -0.051                +        XI         +
 28   -0.240                +   XXXXXXI         +
 29   -0.151                +     XXXXI         +
 30   -0.177                +     XXXXI         +
1PAGE    3     SOUTH DAKOTA DATA ANALYSIS
```

South Dakota Alcohol-Involved Fatality Data Parameter Estiamtes and ACFs for White Noise Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- SD3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

SD3        RANDOM              1-  60


PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
     1  SD3            AR     1       1    0.6869     0.1069     6.43
     2  SD3            AR     2       3    0.5974     0.1253     4.77

RESIDUAL SUM OF SQUARES  =        693.697754 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =              54
RESIDUAL MEAN SQUARE     =          12.846255
1PAGE   5      SOUTH DAKOTA DATA ANALYSIS



ACF VARIABLE IS RSD3. MAXLAG=30./


NUMBER OF OBSERVATIONS               =           60
MEAN OF THE (DIFFERENCED) SERIES     =       1.0181
STANDARD ERROR OF THE MEAN           =       0.4301
T-VALUE OF MEAN (AGAINST ZERO)       =       2.3670

AUTOCORRELATIONS

  1- 12     -.09 -.17 -.16  .10  .03 -.15 -.19 -.06  .24  .06 -.05 -.08
  ST.E.      .13  .13  .13  .14  .14  .14  .14  .15  .15  .15  .15  .15

 13- 24      .14  .11  .18 -.21  .04 -.16  .02 -.11 -.01 -.07  .18  .19
  ST.E.      .15  .16  .16  .16  .16  .17  .17  .17  .17  .17  .17  .17

 25- 30     -.10  .06  0.0  0.0 -.07 -.05
  ST.E.      .18  .18  .18  .18  .18  .18

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.089                    +   XXI     +
  2  -0.170                    + XXXXI     +
  3  -0.164                   +  XXXXI      +
  4   0.102                   +      IXXX   +
  5   0.026                   +      IX     +
  6  -0.149                   +  XXXXI      +
  7  -0.194                   + XXXXXI      +
  8  -0.060                   +    XXI      +
  9   0.236                   +      IXXXXXX+
 10   0.061                   +      IXX    +
 11  -0.052                   +     XI      +
 12  -0.081                   +    XXI      +
 13   0.142                  +       IXXXX   +
 14   0.111                  +       IXXX    +
 15   0.185                  +       IXXXXX  +
 16  -0.208                  +  XXXXXI       +
 17   0.038                  +       IX      +
 18  -0.160                  +   XXXXI       +
 19   0.022                  +       IX      +
 20  -0.114                  +    XXXI       +
 21  -0.013                  +       I       +
 22  -0.071                  +     XXI       +
 23   0.178                  +       IXXXX   +
 24   0.180                  +       IXXXXX  +
 25  -0.098                 +      XXI        +
 26   0.058                 +        IX       +
 27  -0.005                 +        I        +
 28   0.000                 +        I        +
 29  -0.067                 +      XXI        +
 30  -0.050                 +       XI        +
```

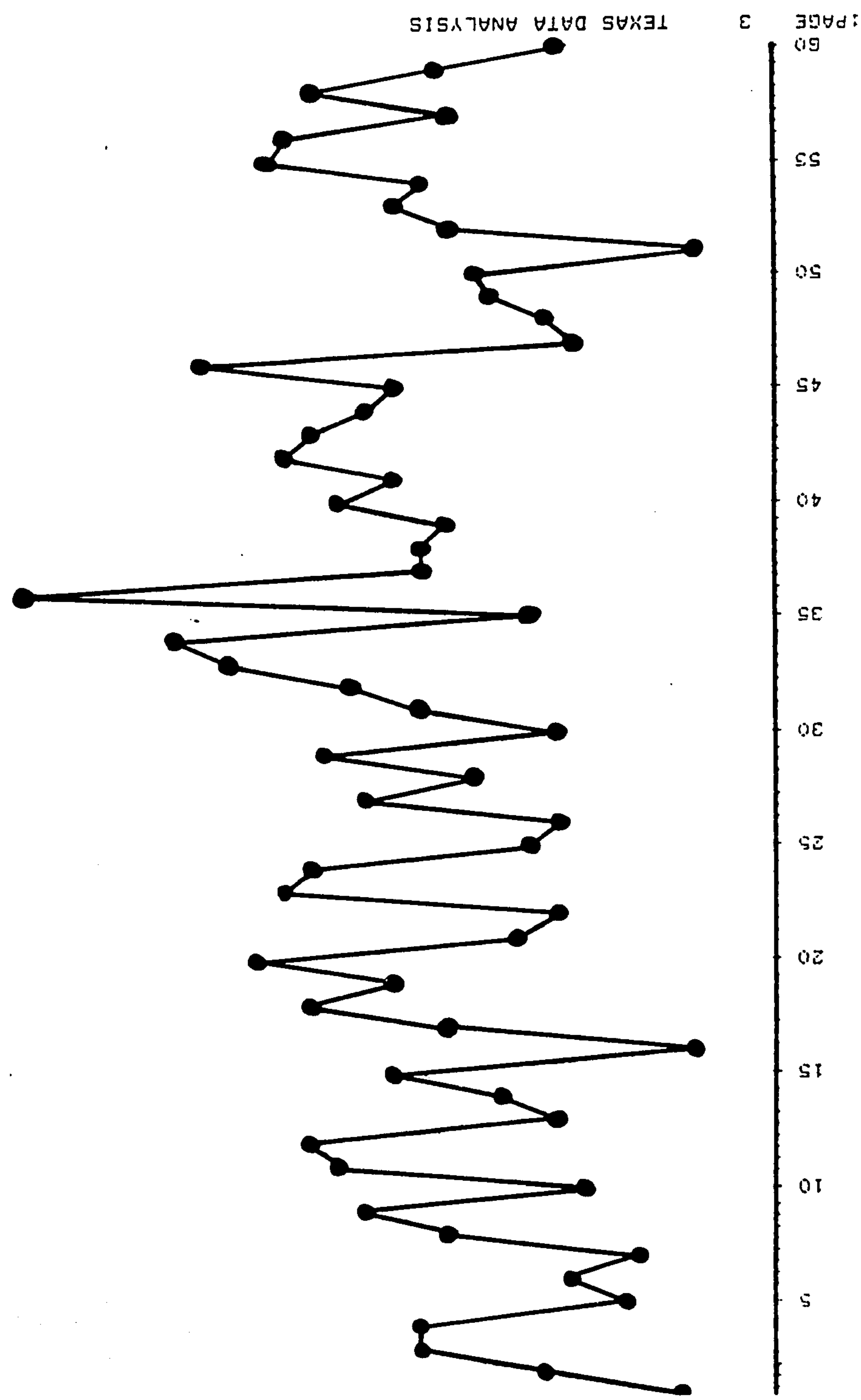
South Dakota Alcohol-Involved Fatality Data
Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- SD3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

SD3         RANDOM             1-  60

X1          BINARY             1-  60

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1  SD3            AR      1       1     0.6276     0.1164      5.39
     2  SD3            AR      2       3     0.6115     0.1258      4.86
     3  X1             UP      1       0     2.0379     2.7854      0.73
     4  X1             SP      1       1     0.5971     0.6078      0.98

RESIDUAL SUM OF SQUARES  =       669.496933 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               52
RESIDUAL MEAN SQUARE     =        12.874941
1PAGE   7      SOUTH DAKOTA DATA ANALYSIS


ACF VARIABLE IS RSD3. MAXLAG=30./

NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES    =      0.7065
STANDARD ERROR OF THE MEAN          =      0.4300
T-VALUE OF MEAN (AGAINST ZERO)      =      1.6432

AUTOCORRELATIONS

  1- 12     -.03 -.12 -.12  .12  .03 -.15 -.14 -.01  .23  .04 -.03 -.04
  ST.E.      .13  .13  .13  .13  .13  .13  .14  .14  .14  .15  .15  .15

 13- 24      .16  .10  .17 -.16  .07 -.16 -.01 -.11 -.01 -.04  .15  .17
  ST.E.      .15  .15  .15  .15  .16  .16  .16  .16  .16  .16  .16  .16

 25- 30     -.10  .04 -.03 -.02 -.08 -.06
  ST.E.      .17  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

              -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                        I
  1  -0.025                       +    XI    +
  2  -0.123                       +  XXXI    +
  3  -0.124                       +  XXXI    +
  4   0.116                      +      IXXX  +
  5   0.035                      +      IX    +
  6  -0.147                      + XXXXI      +
  7  -0.143                      + XXXXI      +
  8  -0.012                      +     I      +
  9   0.229                      +     IXXXXXX+
 10   0.043                      +     IX     +
 11  -0.032                      +    XI      +
 12  -0.044                      +    XI      +
 13   0.158                      +     IXXXX  +
 14   0.097                      +     IXX    +
 15   0.165                      +     IXXXX  +
 16  -0.158                     +  XXXXI       +
 17   0.072                     +      IXX     +
 18  -0.156                     +  XXXXI       +
 19  -0.014                     +      I       +
 20  -0.112                     +   XXXI       +
 21  -0.008                     +      I       +
 22  -0.038                     +     XI       +
 23   0.151                     +      IXXXX   +
 24   0.174                     +      IXXXX   +
 25  -0.103                     +   XXXI       +
```

South Dakota Alcohol-Involved Fatality Data
Parameter Estimates and ACFs for Gradual
Implementation and Gradual Impact Models

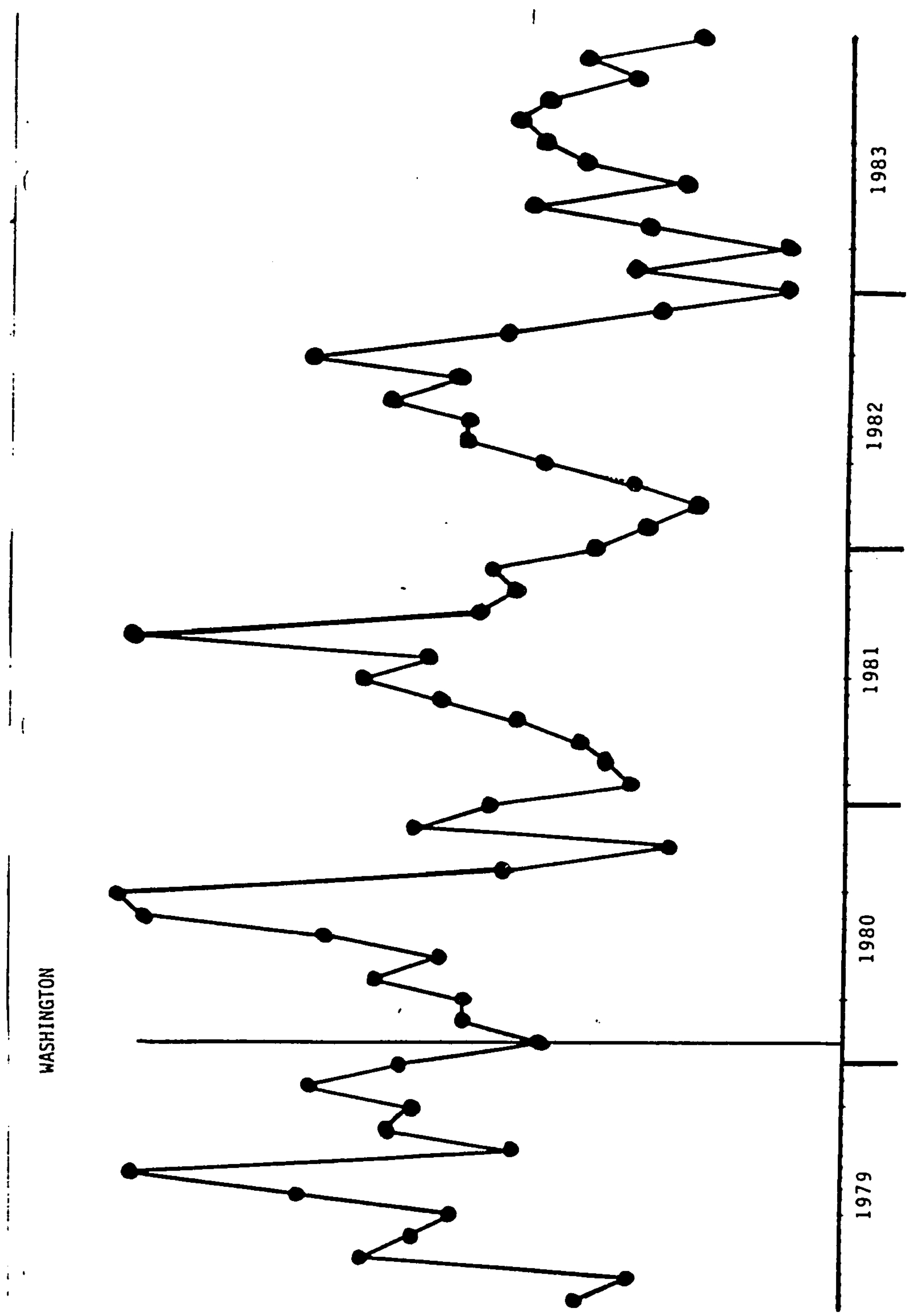
```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- SD3
INPUT VARIABLES -- NOISE      XI

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES

SD3         RANDOM            1-  60

XI          BINARY            1-  60

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1  SD3            AR      1      1     0.6438      0.1136     5.67
     2  SD3            AR      2      3     0.6519      0.1214     5.37
     3  XI             UP      1      1     1.0560      1.7377     0.61
     4  XI             SP      1      1    -0.8953      0.2229    -4.02

RESIDUAL SUM OF SQUARES  =        649.756615 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                51
RESIDUAL MEAN SQUARE     =         12.740326
1PAGE   7      SOUTH DAKOTA DATA ANALYSIS



ACF VARIABLE IS RSD3. MAXLAG=30./

NUMBER OF OBSERVATIONS               =               60
MEAN OF THE (DIFFERENCED) SERIES     =           0.9384
STANDARD ERROR OF THE MEAN           =           0.4271
T-VALUE OF MEAN (AGAINST ZERO)       =           2.1973

AUTOCORRELATIONS

  1- 12    -.05 -.17 -.18  .09  .04 -.20 -.18 -.04  .22  .07 -.08 -.03
  ST.E.     .13  .13  .13  .14  .14  .14  .14  .15  .15  .15  .15  .15

 13- 24     .13  .15  .11 -.16  .01 -.15 -.02 -.11 -.02 -.02  .16  .18
  ST.E.     .15  .16  .16  .16  .16  .16  .16  .16  .17  .17  .17  .17

 25- 30    -.09  .05  0.0  0.0 -.07 -.07
  ST.E.     .17  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                      I
  1  -0.051                    +    XI     +
  2  -0.172                    + XXXXI     +
  3  -0.184                   + XXXXXI      +
  4   0.086                   +      IXX    +
  5   0.042                   +      IX     +
  6  -0.200                   + XXXXXI      +
  7  -0.180                   + XXXXXI      +
  8  -0.038                   +     XI      +
  9   0.218                   +      IXXXXX +
 10   0.068                   +      IXX    +
 11  -0.076                   +    XXI      +
 12  -0.028                  +      XI       +
 13   0.133                  +       IXXX    +
 14   0.152                  +       IXXXX   +
 15   0.107                  +       IXXX    +
 16  -0.155                  +   XXXXI       +
 17   0.009                  +       I       +
 18  -0.147                  +   XXXXI       +
 19  -0.020                  +      XI       +
 20  -0.109                  +    XXXI       +
 21  -0.015                  +       I       +
 22  -0.021                  +      XI       +
 23   0.158                  +       IXXXX   +
 24   0.182                  +       IXXXXX  +
 25  -0.089                  +     XXI       +
 26   0.049                  +       IX      +
```

Texas Alcohol-Involved Fatality Raw Time-Series Data



```
.... ......... .. TX.
MAXLAG=30./

NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES    =     84.7667
STANDARD ERROR OF THE MEAN          =      1.9131
T-VALUE OF MEAN (AGAINST ZERO)      =     44.3077

AUTOCORRELATIONS

  1- 12     .10  .06  .19  .05 -.05  .06 -.10 -.07  .29  .08 -.08  .15
  ST.E.     .13  .13  .13  .14  .14  .14  .14  .14  .14  .15  .15  .15

 13- 24     .05 -.04 -.06  .04 -.15 -.14  .02 -.04  .08  .11  .01 -.03
  ST.E.     .15  .15  .15  .15  .15  .16  .16  .16  .16  .16  .16  .16

 25- 30     .13 -.12 -.15 -.14 -.10 -.13
  ST.E.     .16  .16  .16  .17  .17  .17

PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1   0.103                       +    IXXX +
  2   0.058                       +    IX   +
  3   0.195                       +    IXXXXX+
  4   0.051                      +     IX     +
  5  -0.050                      +    XI      +
  6   0.060                      +     IXX    +
  7  -0.099                      +   XXI      +
  8  -0.067                      +   XXI      +
  9   0.289                      +     IXXXXXXX
 10   0.076                      +     IXX    +
 11  -0.078                      +   XXI      +
 12   0.154                      +     IXXXX  +
 13   0.051                      +     IX     +
 14  -0.037                      +    XI      +
 15  -0.060                      +   XXI      +
 16   0.039                      +     IX     +
 17  -0.145                     +  XXXXI       +
 18  -0.135                     +   XXXI       +
 19   0.021                     +      IX      +
 20  -0.037                     +     XI       +
 21   0.077                     +      IXX     +
 22   0.107                     +      IXXX    +
 23   0.012                     +      I       +
 24  -0.028                     +     XI       +
 25   0.131                     +      IXXX    +
 26  -0.116                     +   XXXI       +
 27  -0.152                     +  XXXXI       +
 28  -0.135                     +   XXXI       +
 29  -0.102                     +   XXXI       +
 30  -0.131                     +   XXXI       +
```

Washington Alcohol-Involved Fatality Raw Time-Series Data



```
ACF VARIABLE IS WA3.
MAXLAG=30./


NUMBER OF OBSERVATIONS                  =            60
MEAN OF THE (DIFFERENCED) SERIES        =       41.7833
STANDARD ERROR OF THE MEAN              =        1.8220
T-VALUE OF MEAN (AGAINST ZERO)          =       22.9322


AUTOCORRELATIONS

  1- 12      .54  .30  .22  .13 -.07 -.17 -.10  .02  .18  .19  .31  .47
  ST.E.      .13  .16  .17  .18  .18  .18  .18  .18  .18  .18  .19  .20

 13- 24      .45  .19 -.03 -.04 -.13 -.32 -.26 -.07 -.01  .05  .11  .11
  ST.E.      .21  .23  .23  .23  .23  .23  .24  .24  .25  .25  .25  .25

 25- 30      .22  .13 -.06 -.16 -.14 -.28
  S1.E.      .25  .25  .25  .25  .25  .25


PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.535                    +     IXXXXX+XXXXXXX
  2   0.295                  +       IXXXXXXX+
  3   0.222                  +       IXXXXXX +
  4   0.127                 +        IXXX     +
  5  -0.073                 +      XXI        +
  6  -0.167                 +    XXXXI        +
  7  -0.104                 +     XXXI        +
  8   0.018                 +        I        +
  9   0.184                 +        IXXXXX   +
 10   0.191                 +        IXXXXX   +
 11   0.309                 +        IXXXXXXXX+
 12   0.468                +         IXXXXXXXXX+XX
 13   0.446                +         IXXXXXXXXX+X
 14   0.194               +          IXXXXX     +
 15  -0.031               +         XI          +
 16  -0.039               +         XI          +
 17  -0.130               +       XXXI          +
 18  -0.323               +  XXXXXXXXI          +
 19  -0.264              +    XXXXXXXI           +
 20  -0.073              +         XXI           +
 21  -0.009              +           I           +
 22   0.051              +           IX          +
 23   0.113              +           IXXX        +
 24   0.105              +           IXXX        +
 25   0.218              +           IXXXXX      +
 26   0.126              +           IXXX        +
 27  -0.058              +          XI           +
 28  -0.162              +       XXXXI           +
 29  -0.141              +       XXXXI           +
 30  -0.280              +    XXXXXXXI           +
1PAGE    3     WASHINGTON DATA ANALYSIS
```

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- WA3
INPUT VARIABLES -- NOISE

VARIABLE   VAR. TYPE  MEAN       TIME       DIFFERENCES
                                                 1
WA3          RANDOM              1-  60  (1-8  )

PARAMETER VARIABLE      TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  WA3             AR      1       1    -0.5136     0.1317    -3.90
      2  WA3             AR      2       2    -0.3482     0.1441    -2.42
      3  WA3             AR      3      13     0.5067     0.1310     3.87

RESIDUAL SUM OF SQUARES  =       5291.259640 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =              40
RESIDUAL MEAN SQUARE     =         132.281490
1PAGE   5      WASHINGTON DATA ANALYSIS


ACF VARIABLE IS RWA3. MAXLAG=30./

NUMBER OF OBSERVATIONS                  =           60
MEAN OF THE (DIFFERENCED) SERIES =        -0.2500
STANDARD ERROR OF THE MEAN            =         1.4535
T-VALUE OF MEAN (AGAINST ZERO)        =        -0.1720

AUTOCORRELATIONS

 1- 12    -.04 -.02  .06 -.13 -.08 -.17 -.23 -.01  .09 -.12  .22  .24
 ST.E.     .13  .13  .13  .13  .13  .13  .14  .14  .14  .14  .15  .15

13- 24    -.02  .16 -.10 -.06  .03 -.37 -.22  .08 -.03  .01  .19  0.0
 ST.E.     .16  .16  .16  .16  .16  .16  .17  .18  .18  .18  .18  .18

25- 30     .25  .06 -.10  .03 -.05 -.25
 ST.E.     .18  .19  .19  .19  .1■  .19

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                      I
 1  -0.043                       +   XI     +
 2  -0.023                       +   XI     +
 3   0.062                       +    IXX   +
 4  -0.132                       +  XXXI    +
 5  -0.083                       +   XXI    +
 6  -0.174                      +  XXXXI     +
 7  -0.232                      +XXXXXXI     +
 8  -0.011                      +     I      +
 9   0.093                      +     IXX    +
10  -0.120                      +   XXXI     +
11   0.218                      +     IXXXXX +
12   0.240                      +     IXXXXXX+
13  -0.020                     +      I       +
14   0.157                     +      IXXXX   +
15  -0.101                     +    XXXI      +
16  -0.057                     +     XI       +
17   0.026                     +      IX      +
18  -0.368                    X+XXXXXXXI      +
19  -0.222                    +  XXXXXXI       +
20   0.078                    +       IXX      +
21  -0.029                    +      XI        +
22   0.015                    +       I        +
23   0.194                    +       IXXXXX   +
24  -0.004                    +       I        +
25   0.249                    +       IXXXXXX  +
26   0.060                    +       IX       +
27  -0.098                    +     XXI        +
28   0.027                    +       IX       +
29  -0.048                    +      XI        +
```

Washington Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- WA3
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES
                                                 1
WA3         RANDOM              1-  60  (1-B  )
                                                 1
X1          BINARY              1-  60  (1-B  )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE      ST. ERR.   T-RATIO
     1  WA3             AR      1       1    -0.5292      0.1361     -3.89
     2  WA3             AR      2       2    -0.3499      0.1502     -2.33
     3  WA3             AR      3      13     0.5220      0.1352      3.86
     4  X1              UP      1       0   -13.0917      9.9477     -1.32
     5  X1              SP      1       1    -0.4339      0.6978     -0.62

RESIDUAL SUM OF SQUARES  =       5253.139950 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =              38
RESIDUAL MEAN SQUARE     =         138.240524
1PAGE   7     WASHINGTON DATA ANALYSIS


ACF VARIABLE IS RWA3. MAXLAG=30./

NUMBER OF OBSERVATIONS                 =           60
MEAN OF THE (DIFFERENCED) SERIES =              -0.1045
STANDARD ERROR OF THE MEAN             =            1.4303
T-VALUE OF MEAN (AGAINST ZERO)         =           -0.0731

AUTOCORRELATIONS

  1- 12     -.04 -.02  .05 -.11 -.08 -.13 -.22 -.03  .05 -.06  .22  .24
  ST.E.      .13  .13  .13  .13  .13  .13  .13  .14  .14  .14  .14  .15

 13- 24     -.02  .16 -.10 -.04  .05 -.38 -.21  .04 -.03  .04  .13 -.01
  ST.E.      .15  .15  .16  .16  .16  .16  .17  .18  .18  .18  .18  .18

 25- 30      .24  .06 -.08  .05 -.05 -.25
  ST.E.      .18  .18  .18  .18  .18  .18

PLOT OF SERIAL CORRELATION

            -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                      I
  1  -0.038                      +   XI    +
  2  -0.023                      +   XI    +
  3   0.049                      +    IX   +
  4  -0.115                      + XXXI    +
  5  -0.082                      +  XXI    +
  6  -0.133                      + XXXI    +
  7  -0.221                     +XXXXXXI    +
  8  -0.027                     +    XI     +
  9   0.052                     +     IX    +
 10  -0.059                     +    XI     +
 11   0.216                     +     IXXXXX +
 12   0.244                     +     IXXXXXX+
 13  -0.023                    +     XI      +
 14   0.156                    +      IXXXX  +
 15  -0.098                    +    XXI      +
 16  -0.040                    +     XI      +
 17   0.053                    +      IX     +
 18  -0.376                  X+XXXXXXXI      +
 19  -0.212                    + XXXXXI      +
 20   0.041                   +       IX      +
 21  -0.027                   +      XI       +
 22   0.037                   +       IX      +
 23   0.131                   +       IXXX    +
 24  -0.009                   +       I       +
 25   0.235                   +       IXXXXXX +
 26   0.056                   +       IX      +
```

Washington Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- WA3
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1
WA3         RANDOM            1-  60  (1-B  )
                                              1
X1          BINARY            1-  60  (1-B  )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE      ST. ERR.   T-RATIO
      1  WA3            AR      1       1    -0.4988       0.1349     -3.70
      2  WA3            AR      2       2    -0.3416       0.1462     -2.34
      3  WA3            AR      3      13     0.4815       0.1286      3.75
      4  X1             UP      1       1    -1.3438       2.2221     -0.60
      5  X1             SP      1       1     0.9770       0.0781     12.51

RESIDUAL SUM OF SQUARES  =       5104.673040 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                37
RESIDUAL MEAN SQUARE     =        137.964136
1PAGE   7      WASHINGTON DATA ANALYSIS


ACF VARIABLE IS RWA3. MAXLAG=30./

NUMBER OF OBSERVATIONS              =            60
MEAN OF THE (DIFFERENCED) SERIES =          0.6081
STANDARD ERROR OF THE MEAN          =        1.4574
T-VALUE OF MEAN (AGAINST ZERO)      =        0.4172

AUTOCORRELATIONS

  1- 12    -.04 -.02  .05 -.13 -.09 -.20 -.22 -.03  .09 -.12  .21  .25
  ST.E.     .13  .13  .13  .13  .13  .13  .14  .14  .14  .14  .15  .15

 13- 24     0.0  .17 -.09 -.04  .03 -.36 -.23  .07 -.02  .01  .19  0.0
  ST.E.     .16  .16  .16  .16  .16  .16  .17  .18  .18  .18  .18  .18

 25- 30     .25  .07 -.09  .02 -.05 -.25
  ST.E.     .18  .19  .19  .19  .19  .19

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR. +----+----+----+----+----+----+----+----+----+----+
                                      I
  1  -0.039                       +  XI     +
  2  -0.021                       +  XI     +
  3   0.052                       +   IX    +
  4  -0.129                       + XXXI    +
  5  -0.093                       +  XXI    +
  6  -0.198                      + XXXXXI    +
  7  -0.223                      +XXXXXXI    +
  8  -0.025                      +   XI      +
  9   0.093                      +    IXX    +
 10  -0.120                      +  XXXI     +
 11   0.210                      +    IXXXXX +
 12   0.248                      +    IXXXXXX+
 13   0.004                     +     I       +
 14   0.166                     +     IXXXX   +
 15  -0.089                     +   XXI       +
 16  -0.036                     +    XI       +
 17   0.032                     +     IX      +
 18  -0.359                    X+XXXXXXXI     +
 19  -0.227                     +  XXXXXXI     +
 20   0.070                     +      IXX     +
 21  -0.016                     +      I       +
 22   0.011                     +      I       +
 23   0.194                     +      IXXXXX  +
 24  -0.000                     +      I       +
 25   0.252                     +      IXXXXXX +
 26   0.070                     +      IXX     +
```

APPENDIX C

Listing of Michigan Counties Aggregated by Census Data

Geographical Aggregation of Counties in Michigan

SMSA I

Lapeer
Livingston
Macomb
Oakland
St. Claire
Wayne
Washtenaw

SMSA II

Calhoun
Barry
Bay
Genesee
Shiawasee
Kent
Ottawa
Jackson
Kalamazoo
VanBuren
Ingham
Ionia
Clinton
Eaton
Muskegon
Saginaw

Upper Penn.

Gogebic
Ontonagon
Keweenaw
Houghton
Baraga
Iron
Marquette
Dickinson
Menominee
Alger
Delta
Schoolcraft
Luce
Chippewa
Macinac

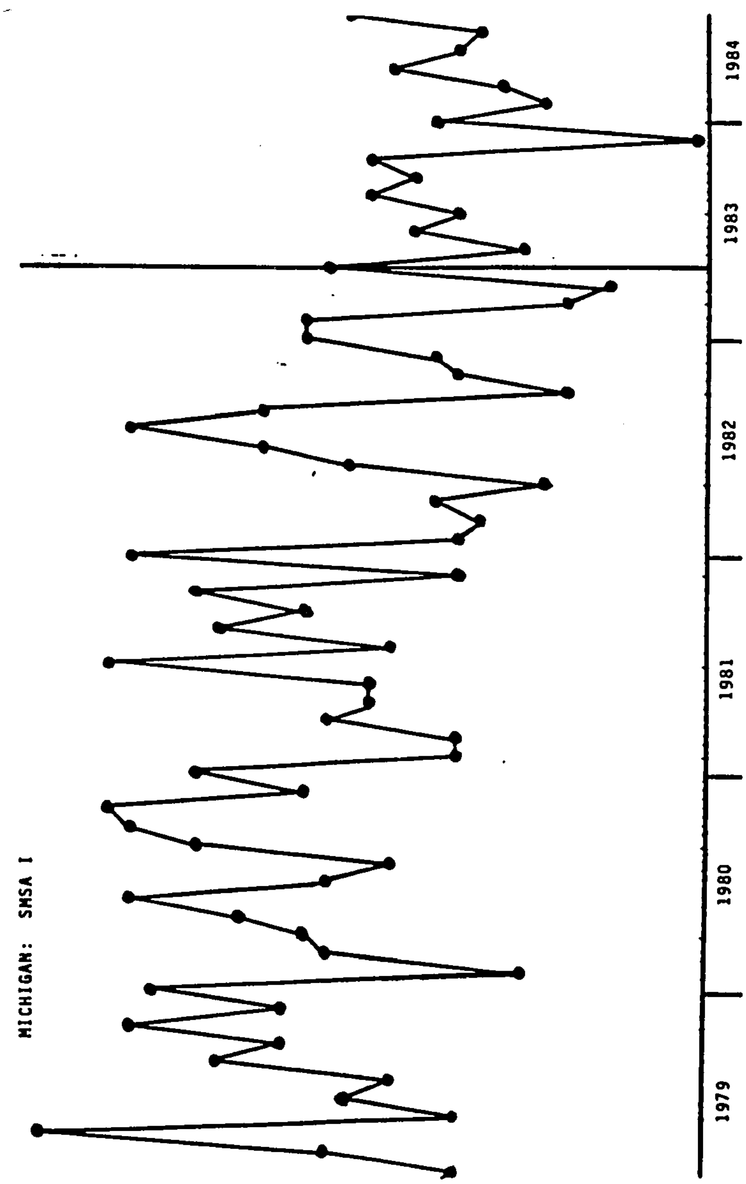
Else

Emmet
Cheboygan
Presque Isle
Charlevoix
Antrim
Otsego
Montmorency
Alpena
Leelanau
Benzie
Grand Traverse
Kalkaska
Crawford
Oscoda
Alcona
Manistee
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
Tuscola
Allegan
Mason
Lake
Osceola
Clare
Gladwin
Oceana
Newago
Mecosta
Isabella
Midland
Montcalm
Gratiot
Arenac
Berrien
Cass
St. Joseph
Branch
Hillsdale
Lenawee
Monroe
Huron
Sanilac

APPENDIX D

Computer Generated Output from BIOMED Statistical Package for the Box-Jenkins Interrupted Time-Series Analysis for Aggregated Michigan Counties

SMSA-1 Alcohol-Involved Fatality Raw Time-Series Data



SMSA-1 Alcohol-Involved Fatality Data Undifferenced ACFs

13- 24	.26	.20	-.04	-.03	-.14	-.02	0.0	.10	-.05	.11	-.18	.09
ST.E.	.17	.18	.18	.18	.18	.18	.18	.18	.18	.18	.18	.19
25- 36	-.07	.11	-.06	-.09	-.30	-.15	-.16	.03	-.06	-.09	-.15	-.11
ST.E.	.19	.19	.19	.19	.19	.20	.20	.20	.20	.20	.20	.20
37- 45	-.12	-.10	-.10	-.06	-.23	-.19	-.18	-.07	-.07			
ST.E.	.20	.21	.21	.21	.21	.21	.21	.22	.22			

1PAGE 3 AGGREGATED COUNTY DATA

PLOT OF SERIAL CORRELATION

```
            -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG     CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1    0.236                     +     IXXXXXX
  2    0.240                     +     IXXXXXX
  3    0.034                    +      IX     +
  4    0.144                    +      IXXXX  +
  5    0.150                    +      IXXXX  +
  6    0.339                    +      IXXXXXX+X
  7    0.083                    +      IXX    +
  8    0.186                   +       IXXXXX  +
  9    0.071                   +       IXX     +
 10    0.170                   +       IXXXX   +
 11    0.126                   +       IXXX    +
 12    0.325                   +       IXXXXXXXX
 13    0.261                   +       IXXXXXXX+
 14    0.198                  +        IXXXXX   +
 15   -0.038                  +       XI        +
 16   -0.029                  +       XI        +
 17   -0.145                  +    XXXXI        +
 18   -0.020                  +        I        +
 19    0.002                  +        I        +
 20    0.102                  +        IXXX     +
 21   -0.054                  +       XI        +
 22    0.114                  +        IXXX     +
 23   -0.177                  +    XXXXI        +
 24    0.091                  +        IXX      +
 25   -0.072                  +      XXI        +
 26    0.108                  +        IXXX     +
 27   -0.059                  +       XI        +
 28   -0.092                  +      XXI        +
 29   -0.300                  +XXXXXXXXI        +
 30   -0.149                 +     XXXXI         +
 31   -0.160                 +     XXXXI         +
 32    0.025                 +         IX        +
 33   -0.061                 +       XXI         +
 34   -0.089                 +       XXI         +
 35   -0.151                 +     XXXXI         +
 36   -0.110                 +      XXXI         +
 37   -0.123                 +      XXXI         +
 38   -0.095                 +       XXI         +
 39   -0.095                 +       XXI         +
 40   -0.062                 +       XXI         +
 41   -0.230                 +   XXXXXXI         +
 42   -0.194                 +    XXXXXI         +
 43   -0.176                 +     XXXXI         +
 44   -0.073               +         XXI           +
```

SMSA-1 Alcohol-Involved Fatality Data Parameter
Estiamtes and ACFs for White Noise Models


```
VARIABLE     VAR. TYPE   MEAN        TIME       DIFFERENCES
                                                    1         3
SMSA1        RANDOM                  1-   66   (1-B   ) (1-B   )


PARAMETER VARIABLE      TYPE  FACTOR  ORDER ESTIMATE      ST. ERR.   T-RATIO
      1   SMSA1          AR      1       1    -0.4765     0.1040      -4.58
      2   SMSA1          AR      2       3    -0.6543     0.0775      -8.44

RESIDUAL SUM OF SQUARES   =        3106.162200 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =                 56
RESIDUAL MEAN SQUARE      =          55.467182
1PAGE   5      AGGREGATED COUNTY DATA




ACF VARIABLE IS RSMSA1. MAXLAG=20./


NUMBER OF OBSERVATIONS                =             66
MEAN OF THE (DIFFERENCED) SERIES =           -0.2336
STANDARD ERROR OF THE MEAN            =          0.9565
T-VALUE OF MEAN (AGAINST ZERO)        =         -0.2443


AUTOCORRELATIONS


  1- 12     -.06 -.14 -.16 -.11  .16 -.14 -.21  .03  .14  0.0 -.09  .07
  ST.E.      .12  .12  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14

 13- 20      .21  .12 -.11 -.14 -.08 -.08  .09 -.03
  ST.E.      .14  .15  .15  .15  .15  .15  .15  .16


PLOT OF SERIAL CORRELATION

              -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                        I
  1  -0.059                        +   XI     +
  2  -0.143                        + XXXXI    +
  3  -0.160                        + XXXXI    +
  4  -0.107                        +  XXXI    +
  5   0.160                        +      IXXXX +
  6  -0.145                       + XXXXI      +
  7  -0.208                       + XXXXXI     +
  8   0.033                       +     IX     +
  9   0.144                       +     IXXXX  +
 10  -0.002                       +     I      +
 11  -0.086                       +   XXI      +
 12   0.074                       +     IXX    +
 13   0.215                       +     IXXXXX +
 14   0.123                       +     IXXX   +
 15  -0.114                       +  XXXI      +
 16  -0.138                       +  XXXI      +
 17  -0.081                      +    XXI       +
 18  -0.080                      +    XXI       +
 19   0.094                      +     IXX      +
 20  -0.025                      +     XI       +
```

SMSA-1 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- SMSA1
INPUT VARIABLES -- NOISE   X1

```
VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1         3
SMSA1       RANDOM             1-  66   (1-B   ) (1-B   )
                                              1         3
X1          BINARY             1-  66   (1-B   ) (1-B   )
```

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	SMSA1	AR	1	1	-0.4803	0.1052	-4.57
2	SMSA1	AR	2	3	-0.6573	0.0777	-8.45
3	X1	UP	1	0	10.3530	5.4210	1.91
4	X1	SP	1	1	-0.8661	0.1502	-5.77

RESIDUAL SUM OF SQUARES = 2886.245420 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM = 54
RESIDUAL MEAN SQUARE = 53.448989
1PAGE 7 AGGREGATED COUNTY DATA

ACF VARIABLE IS RSMSA1. MAXLAG=30./

NUMBER OF OBSERVATIONS = 66
MEAN OF THE (DIFFERENCED) SERIES = -0.2340
STANDARD ERROR OF THE MEAN = 0.9293
T-VALUE OF MEAN (AGAINST ZERO) = -0.2518

AUTOCORRELATIONS

1- 12	-.05	-.11	-.15	-.17	.17	-.14	-.12	0.0	.12	-.01	-.15	.12
ST.E.	.12	.12	.12	.13	.13	.13	.14	.14	.14	.14	.14	.14
13- 24	.16	.19	-.12	-.13	-.05	-.12	.14	-.09	.02	.15	-.15	.07
ST.E.	.14	.15	.15	.15	.15	.15	.15	.16	.16	.16	.16	.16
25- 30	-.13	.15	.10	-.02	-.09	-.15						
ST.E.	.16	.16	.17	.17	.17	.17						

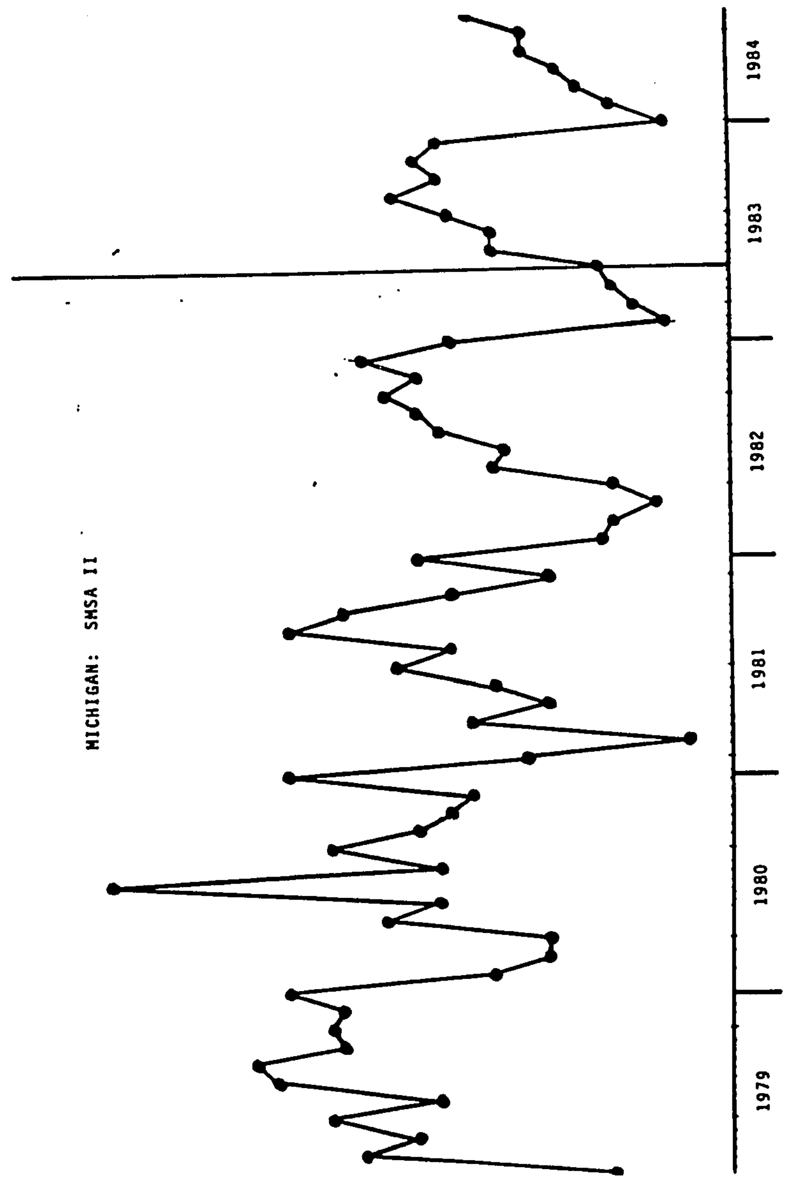
PLOT OF SERIAL CORRELATION

```
           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
   1  -0.054                   +    XI     +
   2  -0.111                   +  XXXI     +
   3  -0.148                   + XXXXI     +
   4  -0.173                   + XXXXI     +
   5   0.168                   +     IXXXX +
   6  -0.144                  +  XXXXI      +
   7  -0.115                  +   XXXI      +
   8  -0.004                  +      I      +
   9   0.124                  +      IXXX   +
  10  -0.007                  +      I      +
  11  -0.146                  +  XXXXI      +
  12   0.118                  +      IXXX   +
  13   0.161                  +      IXXXX  +
  14   0.186                  +      IXXXXX +
  15  -0.121                  +   XXXI      +
  16  -0.132                  +   XXXI      +
  17  -0.050                  +     XI      +
  18  -0.117                 +    XXXI       +
  19   0.137                 +       IXXX    +
  20  -0.087                 +     XXI       +
  21   0.019                 +       I       +
  22   0.146                 +       IXXXX   +
  23  -0.154                 +   XXXXI       +
  24   0.072                 +       IXX     +
  25  -0.127                 +    XXXI       +
  26   0.153                 +       IXXXX   +
```

SMSA-1 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- SMSA1
INPUT VARIABLES -- NOISE     X1

VARIABLE   VAR. TYPE  MEAN       TIME      DIFFERENCES
                                                1        3
SMSA1         RANDOM             1-  66  (1-B   ) (1-B   )
                                                1        3
X1            BINARY             1-  66  (1-B   ) (1-B   )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1  SMSA1          AR      1       1     -0.4623     0.1138     -4.06
     2  SMSA1          AR      2       3     -0.6692     0.0833     -8.04
     3  X1             UP      1       1     -1.2282     5.1286     -0.24
     4  X1             SP      1       1     -0.9661     0.5467     -1.77

RESIDUAL SUM OF SQUARES  =       3098.547390 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                53
RESIDUAL MEAN SQUARE     =         58.463159
1PAGE    7      AGGREGATED COUNTY DATA


ACF VARIABLE IS RSMSA1. MAXLAG=30./

NUMBER OF OBSERVATIONS               =            66
MEAN OF THE (DIFFERENCED) SERIES     =        0.3955
STANDARD ERROR OF THE MEAN           =        0.9197
T-VALUE OF MEAN (AGAINST ZERO)       =        0.4300

AUTOCORRELATIONS

  1- 12     -.07 -.17 -.14 -.03  .11 -.21 -.16 -.01  .11  .04 -.06  .16
  ST.E.      .12  .12  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14

 13- 24      .22  .08 -.12 -.12 -.08 -.23  .05  .01 -.04  .25 -.10  .15
  ST.E.      .14  .15  .15  .15  .15  .15  .16  .16  .16  .16  .16  .17

 25- 30     -.09  .11  .06 -.07 -.16 -.18
  ST.E.      .17  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.069                    +   XXI     +
  2  -0.167                    + XXXXI     +
  3  -0.139                    +  XXXI     +
  4  -0.034                    +    XI     +
  5   0.111                    +     IXXX  +
  6  -0.206                    +XXXXXI     +
  7  -0.162                   +  XXXXI      +
  8  -0.014                   +      I      +
  9   0.111                   +      IXXX   +
 10   0.044                   +      IX     +
 11  -0.056                   +     XI      +
 12   0.160                   +      IXXXX  +
 13   0.217                   +      IXXXXX +
 14   0.079                   +      IXX    +
 15  -0.120                   +   XXXI      +
 16  -0.125                   +   XXXI      +
 17  -0.081                   +    XXI      +
 18  -0.228                   +XXXXXXI      +
 19   0.054                  +       IX      +
 20   0.013                  +       I       +
 21  -0.035                  +      XI       +
 22   0.254                  +       IXXXXXX +
 23  -0.103                  +    XXXI       +
 24   0.146                  +       IXXXX   +
 25  -0.092                  +     XXI       +
```

SMSA-2 Alcohol-Involved Fatality Raw Time-Series Data



ST.E.	.21	.21	.22	.22	.22	.23	.23	.24	.24	.24	.24	.24
25- 36	.23	.13	.02	-.12	-.13	-.27	-.32	-.25	-.15	-.03	.08	.10
ST.E.	.24	.25	.25	.25	.25	.25	.25	.26	.26	.26	.26	.27
37- 45	.10	.10	.01	-.06	-.13	-.23	-.21	-.20	-.14			
ST.E.	.27	.27	.27	.27	.27	.27	.27	.27	.28			

1PAGE 3 AGGREGATED COUNTY DATA

PLOT OF SERIAL CORRELATION

```
          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.496                    +     IXXXXX+XXXXXX
  2   0.339                   +      IXXXXXX+X
  3   0.135                  +       IXXX    +
  4  -0.023                  +      XI       +
  5  -0.161                  +   XXXXI       +
  6  -0.166                  +   XXXXI       +
  7  -0.222                  + XXXXXXI       +
  8  -0.084                  +     XXI       +
  9   0.120                  +       IXXX    +
 10   0.147                 +        IXXXX    +
 11   0.374                 +        IXXXXXXXXX
 12   0.471                 +        IXXXXXXXX+XXX
 13   0.369                +         IXXXXXXXXX+
 14   0.239               +          IXXXXXX    +
 15   0.091               +          IXX        +
 16  -0.126               +       XXXI          +
 17  -0.261               +   XXXXXXXI          +
 18  -0.268               +   XXXXXXXI          +
 19  -0.302               +  XXXXXXXXI          +
 20  -0.117              +        XXXI           +
 21  -0.041              +          XI           +
 22   0.022              +           IX          +
 23   0.176              +           IXXXX       +
 24   0.264              +           IXXXXXXX    +
 25   0.232              +           IXXXXXX     +
 26   0.128              +           IXXX        +
 27   0.023              +           IX          +
 28  -0.124              +        XXXI           +
 29  -0.134              +        XXXI           +
 30  -0.268              +    XXXXXXXI           +
 31  -0.319              +   XXXXXXXXI           +
 32  -0.252             +      XXXXXXI            +
 33  -0.149             +        XXXXI            +
 34  -0.030             +           XI            +
 35   0.078             +            IXX          +
 36   0.097             +            IXX          +
 37   0.100             +            IXX          +
 38   0.096             +            IXX          +
 39   0.009             +            I            +
 40  -0.060             +          XXI            +
 41  -0.128             +         XXXI            +
 42  -0.231             +      XXXXXXI            +
 43  -0.206             +       XXXXXI            +
 44  -0.197             +       XXXXXI            +
```

SMSA-2 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models


```
VARIABLE   VAR. TYPE   MEAN       TIME      DIFFERENCES
                                                 1       3
SMSA2        RANDOM                1-   66  (1-B   ) (1-B   )


PARAMETER VARIABLE    TYPE   FACTOR   ORDER ESTIMATE     ST. ERR.   T-RATIO
     1  SMSA2          AR       1        1    -0.4362     0.1082      -4.03
     2  SMSA2          AR       2        3    -0.7326     0.0868      -8.44
     3  SMSA2          AR       3        6    -0.5898     0.1040      -5.67

RESIDUAL SUM OF SQUARES   =       1856.187380 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =                49
RESIDUAL MEAN SQUARE      =         37.881375
1PAGE    5      AGGREGATED COUNTY DATA



ACF VARIABLE IS RSMSA2. MAXLAG=20./


NUMBER OF OBSERVATIONS               =                66
MEAN OF THE (DIFFERENCED) SERIES =               -0.6853
STANDARD ERROR OF THE MEAN           =            0.7897
T-VALUE OF MEAN (AGAINST ZERO)       =           -0.8678


AUTOCORRELATIONS

  1- 12     -.01 -.05 -.10 -.01 -.04  0.0 -.04 -.09  .04  .02  .18 -.13
  ST.E.      .12  .12  .12  .12  .12  .12  .12  .13  .13  .13  .13  .13

 13- 20      .16  .09  .01  .05 -.14 -.20 -.10  .10
  ST.E.      .13  .13  .14  .14  .14  .14  .14  .14


PLOT OF SERIAL CORRELATION

                -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                           I
  1  -0.011                        +       I     +
  2  -0.049                        +      XI     +
  3  -0.099                        +     XXI     +
  4  -0.011                        +       I     +
  5  -0.043                        +      XI     +
  6  -0.000                        +       I     +
  7  -0.038                        +      XI     +
  8  -0.087                        +     XXI     +
  9   0.037                        +       IX    +
 10   0.023                        +       IX    +
 11   0.179                        +       IXXXX +
 12  -0.126                        +    XXXI     +
 13   0.155                        +       IXXXX +
 14   0.086                       +        IXX     +
 15   0.010                       +        I       +
 16   0.053                       +        IX      +
 17  -0.136                       +    XXXI        +
 18  -0.196                       + XXXXXI         +
 19  -0.100                       +     XXI        +
 20   0.100                       +        IXX     +
```

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- SMSA2
INPUT VARIABLES -- NOISE X1

```
VARIABLE  VAR. TYPE  MEAN     TIME      DIFFERENCES
                                          1        3
SMSA2       RANDOM            1-  66  (1-B  ) (1-B  )
                                          1        3
X1          BINARY            1-  66  (1-B  ) (1-B  )
```

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	SMSA2	AR	1	1	-0.4383	0.1108	-3.95
2	SMSA2	AR	2	3	-0.7338	0.0894	-8.20
3	SMSA2	AR	3	6	-0.5914	0.1073	-5.51
4	X1	UP	1	0	-0.0966	4.1071	-0.02
5	X1	SP	1	1	-0.8808	6.8923	-0.13

RESIDUAL SUM OF SQUARES = 1854.721730 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM = 47
RESIDUAL MEAN SQUARE = 39.462164
1PAGE 7 AGGREGATED COUNTY DATA

ACF VARIABLE IS RSMSA2. MAXLAG=30./

NUMBER OF OBSERVATIONS = 66
MEAN OF THE (DIFFERENCED) SERIES = -0.6888
STANDARD ERROR OF THE MEAN = 0.7897
T-VALUE OF MEAN (AGAINST ZERO) = -0.8723

AUTOCORRELATIONS

1- 12	-.01	-.05	-.10	-.01	-.04	0.0	-.04	-.09	.04	.02	.18	-.13
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12	.13	.13	.13	.13
13- 24	.15	.09	.01	.05	-.14	-.20	-.10	.10	-.05	-.02	.07	.11
ST.E.	.13	.13	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14
25- 30	.08	-.05	-.01	-.09	.07	.05						
ST.E.	.15	.15	.15	.15	.15	.15						

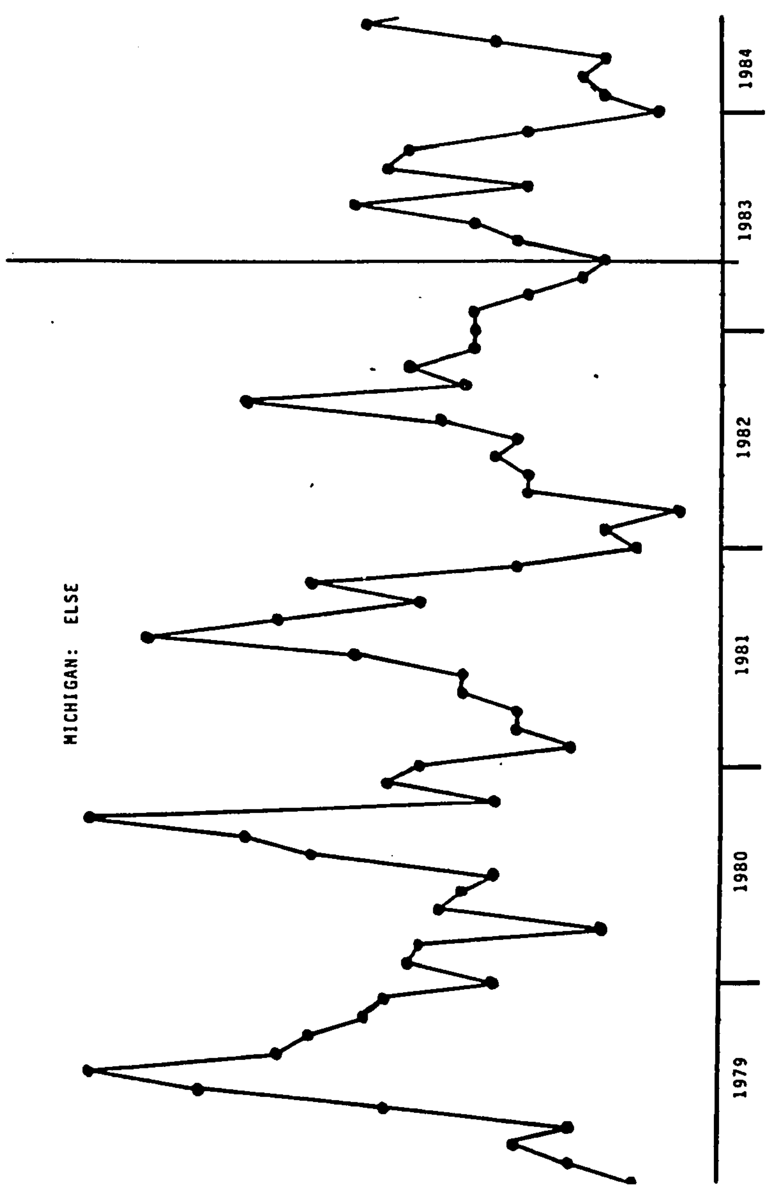
PLOT OF SERIAL CORRELATION

```
             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1  -0.010                      +     I    +
  2  -0.050                      +    XI    +
  3  -0.098                      +   XXI    +
  4  -0.011                      +     I    +
  5  -0.042                      +    XI    +
  6   0.001                      +     I    +
  7  -0.037                      +    XI    +
  8  -0.087                      +   XXI    +
  9   0.038                      +     IX   +
 10   0.023                      +     IX   +
 11   0.178                      +     IXXXX +
 12  -0.127                      +  XXXI    +
 13   0.154                      +     IXXXX +
 14   0.086                     +      IXX   +
 15   0.011                     +      I     +
 16   0.053                     +      IX    +
 17  -0.136                     +   XXXI     +
 18  -0.196                     + XXXXXI     +
 19  -0.100                     +    XXI     +
 20   0.101                     +      IXXX  +
 21  -0.048                     +     XI     +
 22  -0.020                     +     XI     +
 23   0.087                     +      IXX   +
 24   0.105                     +      IXXX  +
 25   0.076                     +      IXX   +
```

SMSA-2 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- SMSA2
INPUT VARIABLES -- NOISE      X1

VARIABLE   VAR. TYPE   MEAN        TIME      DIFFERENCES
                                                1       3
SMSA2        RANDOM              1-  66  (1-B   ) (1-B   )
                                                1       3
X1           BINARY              1-  66  (1-B   ) (1-B   )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.   T-RATIO
      1  SMSA2          AR      1       1    -0.3887     0.1113     -3.49
      2  SMSA2          AR      2       3    -0.7154     0.0918     -7.79
      3  SMSA2          AR      3       6    -0.5367     0.1156     -4.64
      4  X1             UP      1       1     3.0264     4.8974      0.62
      5  X1             SP      1       1     0.4253     1.2483      0.34

RESIDUAL SUM OF SQUARES  =       1835.418820 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =              46
RESIDUAL MEAN SQUARE     =         39.900409
1PAGE   7     AGGREGATED COUNTY DATA


ACF VARIABLE IS RSMSA2. MAXLAG=30./

NUMBER OF OBSERVATIONS                 =            66
MEAN OF THE (DIFFERENCED) SERIES =              -0.8569
STANDARD ERROR OF THE MEAN             =        0.8039
T-VALUE OF MEAN (AGAINST ZERO)         =       -1.0660

AUTOCORRELATIONS

  1- 12     0.0  .01 -.10  .03  0.0 -.01 -.04 -.07  .03 -.02  .19 -.11
  ST.E.     .12  .12  .12  .12  .12  .12  .12  .12  .13  .13  .13  .13

 13- 24     .13  .10  .02  .05 -.14 -.18 -.10  .10 -.05 -.03  .05  .09
  ST.E.     .13  .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14

 25- 30     .10 -.07  0.0 -.06  .06  .02
  ST.E.     .14  .15  .15  .15  .15  .15

PLOT OF SERIAL CORRELATION

               -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG     CORR. +----+----+----+----+----+----+----+----+----+----+
                                          I
  1   0.004                          +    I    +
  2   0.005                          +    I    +
  3  -0.096                          +  XXI    +
  4   0.032                          +    IX   +
  5   0.001                          +    I    +
  6  -0.008                          +    I    +
  7  -0.044                          +   XI    +
  8  -0.071                          +  XXI    +
  9   0.034                          +    IX   +
 10  -0.020                          +   XI    +
 11   0.187                          +    IXXXXX+
 12  -0.112                          + XXXI    +
 13   0.128                          +    IXXX +
 14   0.098                         +     IXX   +
 15   0.017                         +     I     +
 16   0.050                         +     IX    +
 17  -0.145                         + XXXXI     +
 18  -0.181                         +XXXXXI     +
 19  -0.104                         +   XXXI    +
 20   0.102                         +     IXXX  +
 21  -0.054                         +    XI     +
 22  -0.028                         +    XI     +
 23   0.054                         +     IX    +
 24   0.092                         +     IXX   +
 25   0.096                         +     IXX   +
 26  [illegible]
```

Rural/LP Alcohol-Involved Fatality Raw Time-Series Data



13- 24	.38	.31	.05	-.16	-.28	-.25	-.32	-.16	.05	.08	.33	.37
ST.E.	.22	.23	.24	.24	.24	.24	.25	.25	.26	.26	.26	.26
25- 36	.30	.13	-.02	-.19	-.38	-.39	-.32	-.23	-.08	.12	.11	.14
ST.E.	.27	.27	.28	.28	.28	.29	.29	.30	.30	.30	.30	.30
37- 45	.16	.08	-.05	-.16	-.12	-.17	-.19	-.07	-.06			
ST.E.	.30	.31	.31	.31	.31	.31	.31	.31	.31			

1PAGE 3 AGGREGATED COUNTY DATA

PLOT OF SERIAL CORRELATION

```
             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG     CORR.  +----+----+----+----+----+----+----+----+----+----+
                                        I
   1    0.568                     +     IXXXXX+XXXXXXXX
   2    0.319                   +       IXXXXXXXX
   3    0.122                   +       IXXX    +
   4   -0.155                   +   XXXXI       +
   5   -0.342                  X+XXXXXXXI       +
   6   -0.408                 X+XXXXXXXXI        +
   7   -0.208                 +    XXXXXI         +
   8   -0.157                 +     XXXXI         +
   9   -0.012                 +         I         +
  10    0.270                 +         IXXXXXXX  +
  11    0.351                 +         IXXXXXXXXX+
  12    0.321                 +         IXXXXXXXX +
  13    0.383                +          IXXXXXXXXXX+
  14    0.307                +          IXXXXXXXX  +
  15    0.045               +           IX          +
  16   -0.157               +       XXXXI           +
  17   -0.276               +    XXXXXXXI           +
  18   -0.249               +     XXXXXXI           +
  19   -0.323               +   XXXXXXXXI           +
  20   -0.157               +       XXXXI           +
  21    0.048              +            IX           +
  22    0.083              +            IXX          +
  23    0.326              +            IXXXXXXXX    +
  24    0.369              +            IXXXXXXXXX   +
  25    0.298              +            IXXXXXXX     +
  26    0.128              +            IXXX         +
  27   -0.015             +             I             +
  28   -0.193             +        XXXXXI             +
  29   -0.383             +   XXXXXXXXXXI             +
  30   -0.391             +   XXXXXXXXXXI             +
  31   -0.323             +     XXXXXXXXI             +
  32   -0.229            +        XXXXXXI              +
  33   -0.085            +            XXI              +
  34    0.116            +              IXXX           +
  35    0.112            +              IXXX           +
  36    0.139            +              IXXX           +
  37    0.165            +              IXXXX          +
  38    0.083            +              IXX            +
  39   -0.050            +             XI              +
  40   -0.155            +          XXXXI              +
  41   -0.120            +           XXXI              +
  42   -0.174            +          XXXXI
```

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ELSE	AR	1	1	-0.2456	0.1247	-1.97
2	ELSE	AR	2	3	-0.5321	0.1168	-4.55
3	ELSE	AR	3	6	-0.4867	0.1116	-4.36

```
RESIDUAL SUM OF SQUARES  =     2696.712460 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =              49
RESIDUAL MEAN SQUARE     =       55.034948
1PAGE    5      AGGREGATED COUNTY DATA
```

ACF VARIABLE IS RELSE. MAXLAG=20./

```
NUMBER OF OBSERVATIONS              =          66
MEAN OF THE (DIFFERENCED) SERIES    =     -0.1118
STANDARD ERROR OF THE MEAN          =      0.8936
T-VALUE OF MEAN (AGAINST ZERO)      =     -0.1252
```

AUTOCORRELATIONS

1- 12	-.04	-.15	-.06	-.05	-.13	-.17	.12	-.09	-.17	.25	.06	-.22
ST.E.	.12	.12	.13	.13	.13	.13	.13	.13	.13	.14	.14	.14
13- 20	.20	.26	-.08	-.15	-.13	.10	-.15	.03				
ST.E.	.15	.15	.16	.16	.16	.16	.17	.17				

PLOT OF SERIAL CORRELATION

```
             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR. +----+----+----+----+----+----+----+----+----+----+
                                        I
  1  -0.035                       +    XI     +
  2  -0.150                       + XXXXI     +
  3  -0.063                       +   XXI     +
  4  -0.054                       +    XI     +
  5  -0.128                       +  XXXI     +
  6  -0.165                       + XXXXI     +
  7   0.123                       +     IXXX  +
  8  -0.091                      +     XXI     +
  9  -0.167                      +  XXXXI      +
 10   0.249                      +       IXXXXXX+
 11   0.055                      +       IX     +
 12  -0.224                      +XXXXXXI       +
 13   0.200                      +       IXXXXX +
 14   0.259                     +        IXXXXXX +
 15  -0.077                     +      XXI       +
 16  -0.148                     +    XXXXI       +
 17  -0.134                     +     XXXI       +
 18   0.101                     +        IXXX    +
 19  -0.147                     +    XXXXI       +
 20   0.033                     +        IX      +
```

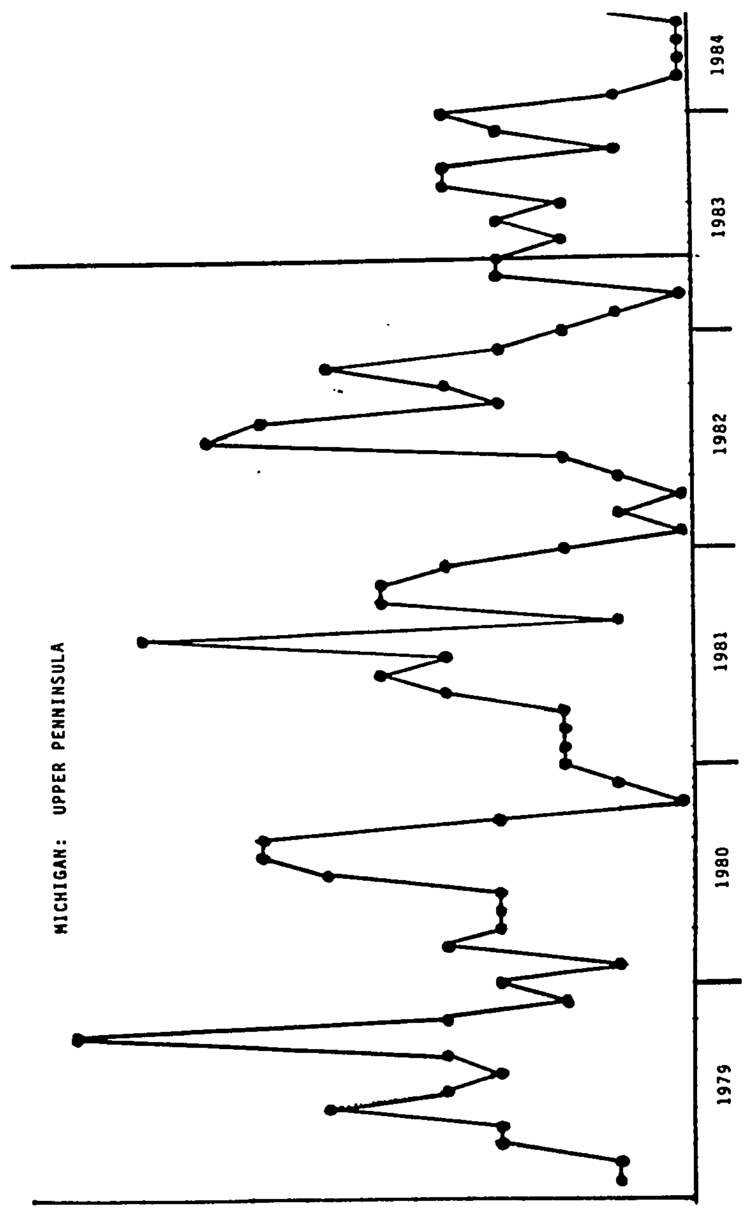
Rural/LP Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
ESTIMATION BY BACKCASTING METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ELSE
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                             1       3
ELSE        RANDOM             1-  66  (1-B   ) (1-B   )
                                             1       3
X1          BINARY             1-  66  (1-B   ) (1-B   )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  ELSE          AR      1       1    -0.2012     0.1275     -1.58
      2  ELSE          AR      2       3    -0.4987     0.1197     -4.17
      3  ELSE          AR      3       6    -0.4878     0.1117     -4.37
      4  X1            UP      1       0    -4.0268     3.7602     -1.07
      5  X1            SP      1       1    -0.9463     0.1339     -7.07

RESIDUAL SUM OF SQUARES   =       2530.368010 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =                47
RESIDUAL MEAN SQUARE      =         53.837617
1PAGE   7      AGGREGATED COUNTY DATA



ACF VARIABLE IS RELSE. MAXLAG=30./


NUMBER OF OBSERVATIONS              =            66
MEAN OF THE (DIFFERENCED) SERIES    =       -0.0943
STANDARD ERROR OF THE MEAN          =        0.8717
T-VALUE OF MEAN (AGAINST ZERO)      =       -0.1082


AUTOCORRELATIONS

  1- 12     -.03 -.17 -.05 -.09 -.09 -.17  .13 -.07 -.20  .27  .03 -.20
  ST.E.      .12  .12  .13  .13  .13  .13  .13  .13  .13  .14  .15  .15

 13- 24      .21  .27 -.10 -.15 -.16  .14 -.17  .05  .05 -.27  .22  .19
  ST.E.      .15  .16  .16  .16  .17  .17  .17  .17  .17  .17  .18  .18

 25- 30      .11 -.05  .05  .03 -.18 -.12
  ST.E.      .19  .19  .19  .19  .19  .19


PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.035                     +   XI     +
  2  -0.170                     + XXXXI    +
  3  -0.047                     +   XI     +
  4  -0.085                     +  XXI     +
  5  -0.093                     +  XXI     +
  6  -0.167                     + XXXXI    +
  7   0.130                     +     IXXX +
  8  -0.074                    +   XXI      +
  9  -0.202                    + XXXXXI     +
 10   0.267                    +      IXXXXXXX
 11   0.028                    +      IX    +
 12  -0.204                    + XXXXXI     +
 13   0.211                    +      IXXXXX +
 14   0.272                   +       IXXXXXXX+
 15  -0.097                   +    XXI       +
 16  -0.151                   +  XXXXI       +
 17  -0.158                   +  XXXXI       +
 18   0.137                   +      IXXX    +
 19  -0.167                   +  XXXXI       +
 20   0.047                   +      IX      +
 21   0.052                   +      IX      +
 22  -0.274                   +XXXXXXXI      +
 23   0.223                  +       IXXXXXX  +
 24   0.187                  +       IXXXXX   +
 25   0.109                  +       IXXX     +
 26  -0.054                  +      XI        +
 27   0.049                  +       IX       +
 28   [illegible]
```

Rural/LP Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
ESTIMATION BY BACKCASTING METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ELSE
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                            1         3
ELSE        RANDOM             1-  66  (1-B   ) (1-B   )
                                            1         3
X1          BINARY             1-  66  (1-B   ) (1-B   )

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
      1  ELSE         AR      1       1    -0.1899    0.1259     -1.51
      2  ELSE         AR      2       3    -0.4667    0.1186     -3.94
      3  ELSE         AR      3       6    -0.5109    0.1167     -4.38
      4  X1           UP      1       1     3.3327    3.5361      0.94
      5  X1           SP      1       1    -0.9658 .  0.1568     -6.16

RESIDUAL SUM OF SQUARES  =      2415.393710 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               46
RESIDUAL MEAN SQUARE     =        52.508559
1PAGE   7     AGGREGATED COUNTY DATA


ACF VARIABLE IS RELSE. MAXLAG=30./

NUMBER OF OBSERVATIONS              =             66
MEAN OF THE (DIFFERENCED) SERIES =           -0.3003
STANDARD ERROR OF THE MEAN          =          0.8823
T-VALUE OF MEAN (AGAINST ZERO)      =         -0.3403

AUTOCORRELATIONS

  1- 12     -.04 -.19 -.03 -.05 -.09 -.12  .16 -.09 -.20  .25  .02 -.21
  ST.E.      .12  .12  .13  .13  .13  .13  .13  .13  .13  .14  .15  .15

 13- 24      .17  .27 -.12 -.16 -.11  .15 -.13  .05  .04 -.29  .19  .19
  ST.E.      .15  .15  .16  .16  .16  .17  .17  .17  .17  .17  .18  .18

 25- 30      .11 -.09  .07  .05 -.18 -.08
  ST.E.      .18  .18  .18  .18  .18  .19

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.036                    +    XI     +
  2  -0.187                    +XXXXXI     +
  3  -0.027                    +    XI     +
  4  -0.054                    +    XI     +
  5  -0.089                    +   XXI     +
  6  -0.124                    +  XXXI     +
  7   0.165                    +     IXXXX +
  8  -0.094                   +    XXI      +
  9  -0.198                   + XXXXXI      +
 10   0.249                   +      IXXXXXX+
 11   0.024                   +      IX     +
 12  -0.212                   + XXXXXI      +
 13   0.188                   +      IXXXX  +
 14   0.274                  +       IXXXXXXX+
 15  -0.122                  +    XXXI       +
 16  -0.155                  +   XXXXI       +
 17  -0.106                  +    XXXI       +
 18   0.151                  +       IXXXX   +
 19  -0.131                  +    XXXI       +
 20   0.048                  +       IX      +
 21   0.040                  +       IX      +
 22  -0.289                  +XXXXXXXI       +
 23   0.189                 +        IXXXXX   +
 24   0.192                 +        IXXXXX   +
 25   0.106                 +        IXXX     +
 26  -0.087                 +      XXI        +
 27   0.067                 +        IXX      +
```

U.P. Alcohol-Involved Fatality Raw Time-Series Data



13- 24	.18	.23	.19	-.05	-.13	-.27	-.30	-.26	-.13	.08	.10	.21
ST.E.	.19	.19	.19	.20	.20	.20	.20	.21	.22	.22	.22	.22
25- 36	.26	.29	.06	.01	-.13	-.25	-.20	-.18	-.03	-.04	-.05	.08
ST.E.	.22	.23	.23	.23	.23	.23	.24	.24	.24	.24	.24	.24
37- 45	.20	.11	.05	.01	-.05	-.03	-.08	-.17	-.14			
ST.E.	.24	.24	.24	.25	.25	.25	.25	.25	.25			

1PAGE 3 AGGREGATED COUNTY DATA

PLOT OF SERIAL CORRELATION

```
            -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.   +----+----+----+----+----+----+----+----+----+----+
                                       I
  1   0.411                      +     IXXXXX+XXXX
  2   0.136                     +      IXXX   +
  3   0.024                     +      IX     +
  4  -0.076                     +    XXI      +
  5  -0.155                     +  XXXXI      +
  6  -0.285                     XXXXXXXI      +
  7  -0.327                    XXXXXXXXI       +
  8  -0.224                    + XXXXXXI       +
  9   0.057                    +       IX      +
 10   0.163                    +       IXXXX   +
 11   0.335                    +       IXXXXXXXXX
 12   0.247                   +        IXXXXXX  +
 13   0.184                   +        IXXXXX   +
 14   0.226                   +        IXXXXXX  +
 15   0.187                  +         IXXXXX    +
 16  -0.052                  +        XI         +
 17  -0.131                  +      XXXI         +
 18  -0.266                  +  XXXXXXXI         +
 19  -0.303                  + XXXXXXXXI         +
 20  -0.263                  +  XXXXXXXI         +
 21  -0.127                 +       XXXI          +
 22   0.084                 +          IXX        +
 23   0.099                 +          IXX        +
 24   0.205                 +          IXXXXX     +
 25   0.263                 +          IXXXXXXX   +
 26   0.290                 +          IXXXXXXX   +
 27   0.060                 +          IXX        +
 28   0.012                 +          I          +
 29  -0.133                 +       XXXI          +
 30  -0.245                 +    XXXXXXI          +
 31  -0.203                +      XXXXXI           +
 32  -0.178                +       XXXXI           +
 33  -0.033                +          XI           +
 34  -0.042                +          XI           +
 35  -0.051                +          XI           +
 36   0.079                +           IXX         +
 37   0.203                +           IXXXXX      +
 38   0.112                +           IXXX        +
 39   0.052                +           IX          +
 40   0.006                +           I           +
 41  -0.054                +          XI           +
 42  -0.027                +          XI           +
 43  -0.084                +         XXI           +
 44  -0.172                +       XXXXI           +
```

U.P. Alcohol-Involved Fatality Data Parameter
Estiamtes and ACFs for White Noise Models


```
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

UP         RANDOM              1-  66


PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  UP             MA      1       1    -0.7008     0.0925     -7.58
      2  UP             MA      2       2    -0.4589     0.1165     -3.94

RESIDUAL SUM OF SQUARES   =        403.811375 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =                64
RESIDUAL MEAN SQUARE      =          6.309553
1PAGE   5     AGGREGATED COUNTY DATA



ACF VARIABLE IS RU?. MAXLAG=20./


NUMBER OF OBSERVATIONS             =              66
MEAN OF THE (DIFFERENCED) SERIES =          1.2225
STANDARD ERROR OF THE MEAN         =          0.2667
T-VALUE OF MEAN (AGAINST ZERO)     =          4.5836


AUTOCORRELATIONS

  1- 12     -.22 -.13 -.08  .17 -.01 -.13 -.10 -.11  .13 -.06  .24 -.06
  ST.E.      .12  .13  .13  .13  .13  .13  .14  .14  .14  .14  .14  .15

 13- 20     -.01  .05  .20 -.17  .03 -.04 -.05 -.12
  ST.E.      .15  .15  .15  .15  .15  .15  .15  .16


PLOT OF SERIAL CORRELATION

               -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                         I
  1   -0.218                         +XXXXXI    +
  2   -0.128                         +  XXXI    +
  3   -0.078                         +   XXI    +
  4    0.172                         +     IXXXX +
  5   -0.005                        +      I     +
  6   -0.132                        +   XXXI     +
  7   -0.099                        +    XXI     +
  8   -0.110                        +   XXXI     +
  9    0.128                        +      IXXX  +
 10   -0.060                        +    XXI     +
 11    0.239                        +      IXXXXXX+
 12   -0.058                        +     XI     +
 13   -0.008                        +      I     +
 14    0.050                        +      IX    +
 15    0.199                        +      IXXXXX +
 16   -0.167                        +  XXXXI     +
 17    0.027                       +       IX      +
 18   -0.040                       +      XI       +
```

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- UP
INPUT VARIABLES -- NOISE   X1

VARIABLE	VAR. TYPE	MEAN	TIME	DIFFERENCES
UP	RANDOM		1- 66	
X1	BINARY		1- 66	

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	UP	MA	1	1	-0.6892	0.0962	-7.17
2	UP	MA	2	2	-0.4458	0.1209	-3.69
3	X1	UP	1	0	1.8446	1.8679	0.99
4	X1	SP	1	1	-0.2052	1.1193	-0.18

RESIDUAL SUM OF SQUARES = 395.451706 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM = 62
RESIDUAL MEAN SQUARE = 6.378253
.1PAGE 7 AGGREGATED COUNTY DATA

ACF VARIABLE IS RUP. MAXLAG=30./

NUMBER OF OBSERVATIONS = 66
MEAN OF THE (DIFFERENCED) SERIES = 1.0886
STANDARD ERROR OF THE MEAN = 0.2719
T-VALUE OF MEAN (AGAINST ZERO) = 4.0032

AUTOCORRELATIONS

1- 12	-.16	-.08	-.03	.19	.04	-.10	-.08	-.07	.15	-.06	.24	-.04
ST.E.	.12	.13	.13	.13	.13	.13	.13	.13	.13	.14	.14	.14
13- 24	.01	.04	.20	-.14	.03	-.04	-.08	-.09	-.11	.19	-.10	.04
ST.E.	.14	.14	.14	.15	.15	.15	.15	.15	.15	.15	.16	.16
25- 30	0.0	.24	-.14	.06	-.02	-.06						
ST.E.	.16	.16	.16	.16	.16	.16						

PLOT OF SERIAL CORRELATION

```
             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
 LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                        I
   1  -0.164                    + XXXXI    +
   2  -0.076                    +   XXI    +
   3  -0.025                    +    XI    +
   4   0.190                    +     IXXXXX+
   5   0.038                    +     IX   +
   6  -0.101                    +  XXXI    +
   7  -0.079                   +    XXI     +
   8  -0.073                   +    XXI     +
   9   0.153                   +      IXXXX +
  10  -0.064                   +    XXI     +
  11   0.243                   +      IXXXXXX+
  12  -0.040                   +     XI     +
  13   0.012                   +      I     +
  14   0.041                   +      IX    +
  15   0.196                   +      IXXXXX +
  16  -0.138                   +   XXXI     +
  17   0.025                   +      IX    +
  18  -0.044                   +     XI     +
  19  -0.078                   +    XXI     +
  20  -0.087                   +    XXI     +
  21  -0.109                   +   XXXI     +
  22   0.186                   +      IXXXXX +
  23  -0.104                  +    XXXI      +
  24   0.041                  +       IX     +
  25   0.004                  +       I      +
  26   0.235                  +       IXXXXXX +
```

U.P. Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- UP
INPUT VARIABLES -- NOISE X1

VARIABLE	VAR. TYPE	MEAN	TIME	DIFFERENCES
UP	RANDOM		1- 66	
X1	BINARY		1- 66	

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	UP	MA	1	1	-0.7011	0.0945	-7.42
2	UP	MA	2	2	-0.4522	0.1212	-3.73
3	X1	UP	1	1	0.6939	2.2438	0.31
4	X1	SP	1	1	0.6059	1.4791	0.41

RESIDUAL SUM OF SQUARES = 395.826759 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM = 61
RESIDUAL MEAN SQUARE = 6.488963
1PAGE 7 AGGREGATED COUNTY DATA

ACF VARIABLE IS RUP. MAXLAG=30./

NUMBER OF OBSERVATIONS = 66
MEAN OF THE (DIFFERENCED) SERIES = 1.0809
STANDARD ERROR OF THE MEAN = 0.2727
T-VALUE OF MEAN (AGAINST ZERO) = 3.9644

AUTOCORRELATIONS

1- 12	-.16	-.08	-.03	.19	.03	-.09	-.05	-.10	.15	-.04	.23	-.05
ST.E.	.12	.13	.13	.13	.13	.13	.13	.13	.13	.14	.14	.14
13- 24	-.01	.05	.18	-.15	.03	-.04	-.07	-.13	-.06	.18	-.10	.04
ST.E.	.14	.14	.14	.15	.15	.15	.15	.15	.15	.15	.15	.16
25- 30	.01	.23	-.14	.06	0.0	-.11						
ST.E.	.16	.16	.16	.16	.16	.16						

PLOT OF SERIAL CORRELATION

```
                 -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.      +----+----+----+----+----+----+----+----+----+----+
                                          I
 1   -0.163                           + XXXXI     +
 2   -0.078                           +   XXI     +
 3   -0.025                           +    XI     +
 4    0.187                           +     IXXXXX+
 5    0.032                           +     IX    +
 6   -0.091                           +   XXI     +
 7   -0.052                           +    XI     +
 8   -0.104                           +  XXXI     +
 9    0.147                          +      IXXXX  +
10   -0.036                          +     XI      +
11    0.228                          +      IXXXXXX+
12   -0.048                          +     XI      +
13   -0.012                          +      I      +
14    0.048                          +      IX     +
15    0.182                          +      IXXXXX +
16   -0.148                          + XXXXI       +
17    0.033                          +      IX     +
18   -0.038                          +     XI      +
19   -0.066                          +    XXI      +
20   -0.129                          +   XXXI      +
21   -0.061                          +    XXI      +
22    0.178                          +      IXXXX  +
23   -0.098                         +    XXI        +
24    0.039                         +      IX       +
25    0.009                         +      I        +
26    0.228                         +      IXXXXXX  +
27   -0.143                         +  XXXXI        +
28    0.061                         +      IXX      +
```

APPENDIX E

Initial and Follow-up Letters to Michigan Criminal Justice Officials Requesting Completion of Implementation Survey

STATE OF MICHIGAN
61ST DISTRICT COURT
HALL OF JUSTICE
GRAND RAPIDS, MICHIGAN 49503
PHONE (616) 456-3278

DONALD A. JOHNSTON
Chief Judge
CAROL S. IRONS
MICHAEL R. SMOLENSKI
PATRICK C. BOWLER
JOEL P. HOEKSTRA
Judges

JOSEF R. SOPER
Court Administrator
JANIS K. HAMMERLUND
Deputy Court Administrator

April 12, 1985

Please find enclosed a questionnaire that is intended to help evaluate some of the factors involved in implementing Michigan's 1983 O.U.I.L. law. Please take the five to ten minutes necessary to complete all of the questions. Your assistance is obviously crucial in collecting this information. The results should also prove useful in the implementation of any future drunk driving countermeasures.

The code number in the upper right corner of the questionnaire is for recontact purposes only, your answers will be kept ABSOLUTELY CONFIDENTIAL. All published results will be presented only in multi-county geographical areas and under no circumstances will agencies or individuals be identified. This questionnaire is independent and not part of any project, task force, or study at the local, state, or national level.

When you have completed the questionnaire, please place it in the stamped, self-addressed envelope provided and drop it in the nearest mailbox.

If you have any questions or concerns about this questionnaire, please feel free to contact me at (616) 456-3278. THANK YOU VERY MUCH.

Sincerely yours,

Josef R. Soper

Attach/

DONALD A. JOHNSTON
Chief Judge

STATE OF MICHIGAN
61ST DISTRICT COURT
HALL OF JUSTICE
GRAND RAPIDS, MICHIGAN 49503
PHONE (616) 456-3278

DONALD A. JOHNSTON
Chief Judge
CAROL S. IRONS
MICHAEL R. SMOLENSKI
PATRICK C. BOWLER
JOEL P. HOEKSTRA
Judges

JOSEF R. SOPER
Court Administrator
JANIS K. HAMMERLUND
Deputy Court Administrator

April 29, 1985

Dear

On or about April 15, 1985, you received a questionnaire dealing with Michigan's O.U.I.L. Law. This questionnaire concerned implementation of that law in your jurisdiction.

As of this date, your questionnaire has not been received. If you have not already done so, it would be greatly appreciated if you would return the questionnaire. If it has been lost or misplaced, please contact me at (616) 456-3278 or in writing and a replacement will be sent to you immediately.

Again, thank you for your cooperation.

Sincerely yours,

Josef R. Soper

APPENDIX F

Implementation Survey

(PLEASE ANSWER THIS FIRST:

Were you in your current office of when the new Operating Under the Influence of Liquor (OUIL) law went into effect April 1, 1983?

_____ YES, Please complete the survey.

_____ NO, Please stop and return the survey in the provided envelope.

INSTRUCTIONS

After reading the question carefully, place an "X" on the line immediately above the point which most closely corresponds with how you feel.

SAMPLE QUESTION

To what extent do you believe that computer technology has made the criminal justice system more efficient?

NO EXTENT --- TO A GREAT EXTENT

0 1 2 3 4 5 6 7 8 9 10

1. Prior to April 1, 1983, approximately how frequently did you receive information about the requirements of the new OUIL law?

NEVER --- MORE THAN TEN TIMES

0 1 2 3 4 5 6 7 8 9 10

2. How clearly were the requirements of the new OUIL law communicated to you?

NOT AT ALL --- VERY CLEARLY

0 1 2 3 4 5 6 7 8 9 10

3. How much additional authority does the new OUIL law provide to you for dealing effectively with drunk drivers?

NO ADDITIONAL AUTHORITY --- MUCH ADDITIONAL AUTHORITY

0 1 2 3 4 5 6 7 8 9 10

Page 2

4. To what extent did you believe the new OUIL law required additional training of your personnel to insure successful implementation?

NO EXTENT -- TO A GREAT EXTENT
0 1 2 3 4 5 6 7 8 9 10

5. To what extent was training actually provided prior to implementation?

NONE -- QUITE A LOT
0 1 2 3 4 5 6 7 8 9 10

6. Some OUIL cases are handled by routine procedures. Others require extra processing. BEFORE implementation of the new OUIL law, what percentage of drunk driving cases would you estimate required additional processing?

0 PERCENT -- 100 PERCENT
0 1 2 3 4 5 6 7 8 9 10

7. AFTER implementation of the new OUIL law, what percentage of drunk driving cases would you estimate required additional processing?

0 PERCENT -- 100 PERCENT
0 1 2 3 4 5 6 7 8 9 10

8. In your geographical area, how well do other agencies in the criminal justice system coordinate the handling of drunk driving cases with your agency under the new OUIL law?

NOT WELL -- VERY WELL
0 1 2 3 4 5 6 7 8 9 10

9. By what percentage should your operating budget have increased to effectively implement the new OUIL law?

0 PERCENT -- 100 PERCENT
0 1 2 3 4 5 6 7 8 9 10

10. In reality, by what percentage did your operating budget increase to implement the new law?

0 PERCENT -- 100 PERCENT
0 1 2 3 4 5 6 7 8 9 10

11. Within your jurisdiction, meetings to discuss implementation of the new OUIL law were held:

NEVER -- VERY OFTEN
0 1 2 3 4 5 6 7 8 9 10

Page 3

12. In terms of actually reducing alcohol-involved fatalities in your jurisdiction, the new OUIL law has had:

NO IMPACT -- TREMENDOUS IMPACT

0 1 2 3 4 5 6 7 8 9 10

13. Below is an alphabetical listing of key PARTICIPANTS in the criminal justice system. Please rank the three who most AIDED your implementation of the new law (on the left side, using "1" for most aided, and so forth). Then please rank three who most HINDERED your implementation of the law (on the right side). Please read the list of actors before answering.

	AIDED		HINDERED
A.	______	Appelate Courts	______
B.	______	Chiefs of Police	______
C.	______	Citizen Groups	______
D.	______	Correctional Agencies	______
E.	______	Defense Attorneys	______
F.	______	District Court Judges	______
G.	______	Patrol Officers	______
H.	______	Prosecutors	______
I.	______	Sheriffs	______
J.	______	Other: ______________	______

14. Below is a listing of key FACTORS in the criminal justice system. Just as you answered question 13 above, please rank order the three factors that most AIDED your implementation of the new law. Then rank the three that most HINDERED your implementation of the law. Please read the list of factors before answering.

	AIDED		HINDERED
A.	______	The Law Itself	______
B.	______	Competition for Resources	______
C.	______	Public Attitudes Toward Drunk Drivers	______
D.	______	Standard Operating Procedures in Other Agencies	______
E.	______	Technology	______
F.	______	Other Existing Laws	______
G.	______	Communication Between Key Actors in the Criminal Justice System	______
H.	______	Public Attitudes Toward Alcohol Abuse Generally	______
I.	______	Other: ______________________	______

16. Please list below any major steps you took to implement the new OUIL law. If there was a clear sequence, please put the steps in order from first to last.

What key actors such as judges, prosecutors, Sheriffs, agency directors, or others were involved at each step.

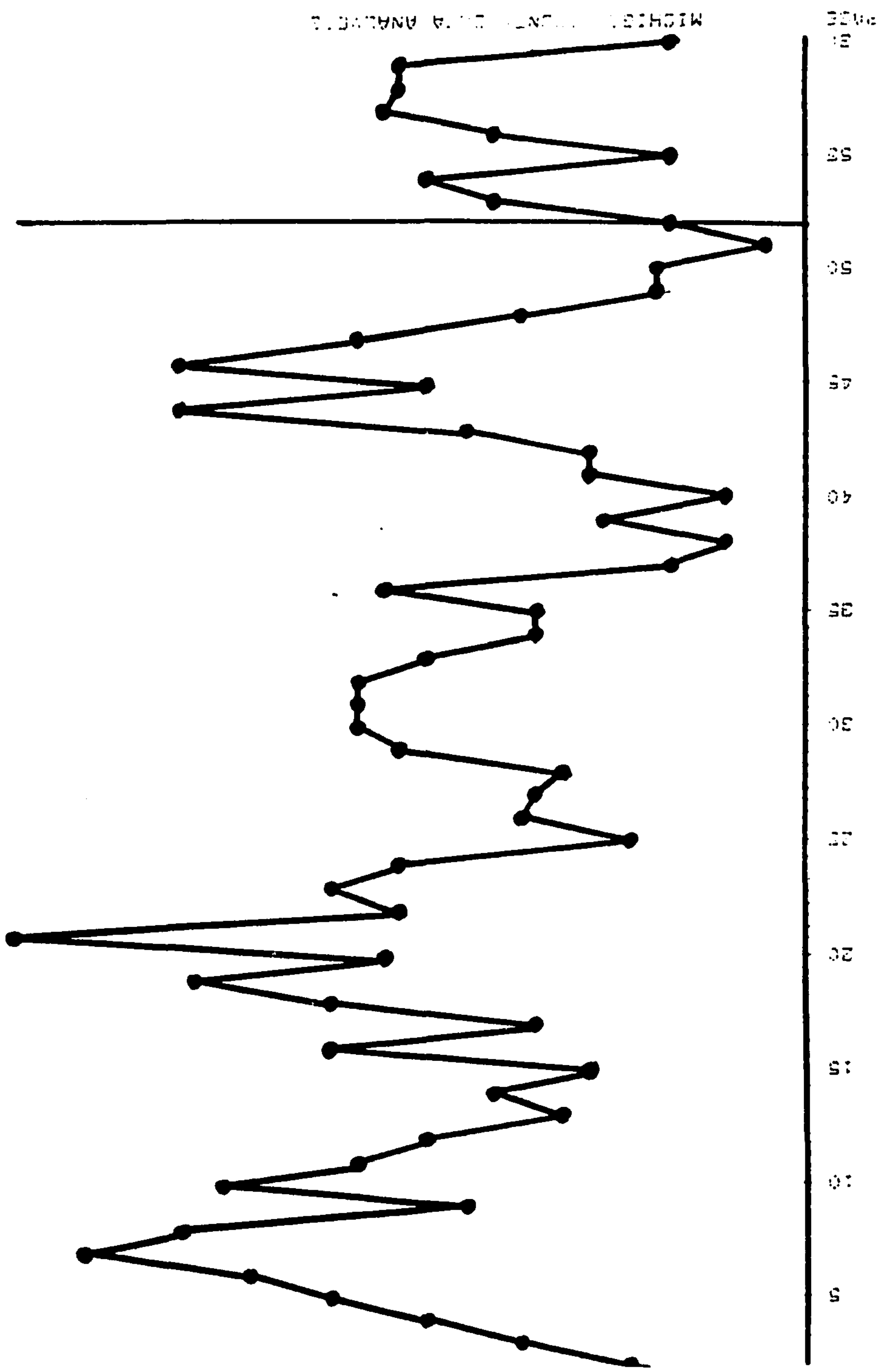
Step	Key actors
1 ________	1 ________
2 ________	2 ________
3 ________	3 ________
4 ________	4 ________
5 ________	5 ________
6 ________	6 ________
7 ________	7 ________

17. Are the steps listed above, in question 16, in sequence? YES ______ NO ______

APPENDIX G

Computer Generated Output from BIOMED Statistical Package for the Box-Jenkins Interrupted Time-Series Analysis for Re-aggregated Michigan Counties

AREA-1 Alcohol-Involved Fatality Raw Time-Series Data



AREA-1 Alcohol-Involved Fatality Data Undifferenced ACFs

```
ACF VARIABLE IS AREA1./

NUMBER OF OBSERVATIONS              =           60
MEAN OF THE (DIFFERENCED) SERIES    =      22.5167
STANDARD ERROR OF THE MEAN          =       0.9583
T-VALUE OF MEAN (AGAINST ZERO)      =      23.4962

AUTOCORRELATIONS

  1- 12      .48  .37  .17 -.14 -.20 -.38 -.31 -.12 -.05  .16  .30  .33
  ST.E.      .13  .16  .17  .17  .17  .18  .19  .20  .20  .20  .20  .21

 13- 24      .36  .26  .17 -.04 -.14 -.24 -.36 -.23 -.15 -.01  .18  .15
  ST.E.      .22  .23  .23  .24  .24  .24  .24  .25  .25  .26  .26  .26

 25- 36      .25  .14  0.0 -.10 -.22 -.29 -.31 -.24 -.16 -.10 -.01  .14
  ST.E.      .26  .26  .26  .26  .26  .27  .27  .28  .28  .28  .28  .28

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.482                    +     IXXXXX+XXXXXX
  2   0.369                  +       IXXXXXXX+X
  3   0.169                  +       IXXXX   +
  4  -0.135                  +    XXXI       +
  5  -0.205                 +   XXXXXI        +
  6  -0.384                X+XXXXXXXXI        +
  7  -0.312                 +XXXXXXXXI        +
  8  -0.117                +      XXXI         +
  9  -0.045                +        XI         +
 10   0.161                +         IXXXX     +
 11   0.305                +         IXXXXXXXX +
 12   0.335                +         IXXXXXXXX +
 13   0.360               +          IXXXXXXXXX +
 14   0.262               +          IXXXXXXX   +
 15   0.170               +          IXXXX      +
 16  -0.042              +          XI           +
 17  -0.136              +        XXXI           +
 18  -0.238              +     XXXXXXI           +
 19  -0.357              +  XXXXXXXXXI           +
 20  -0.233              +     XXXXXXI           +
 21  -0.146              +       XXXXI           +
 22  -0.007             +            I            +
 23   0.180             +            IXXXX        +
 24   0.148             +            IXXXX        +
 25   0.252             +            IXXXXXX      +
 26   0.141             +            IXXXX        +
 27   0.002             +            I            +
 28  -0.096             +          XXI            +
 29  -0.225             +      XXXXXXI            +
 30  -0.286             +     XXXXXXXI            +
 31  -0.313             +    XXXXXXXXI            +
 32  -0.240            +       XXXXXXI             +
 33  -0.159            +         XXXXI             +
 34  -0.096            +           XXI             +
 35  -0.006            +             I             +
 36   0.142            +             IXXXX         +
```

AREA-1 Alcohol-Involved Fatality Data Parameter Estiamtes and ACFs for White Noise Models

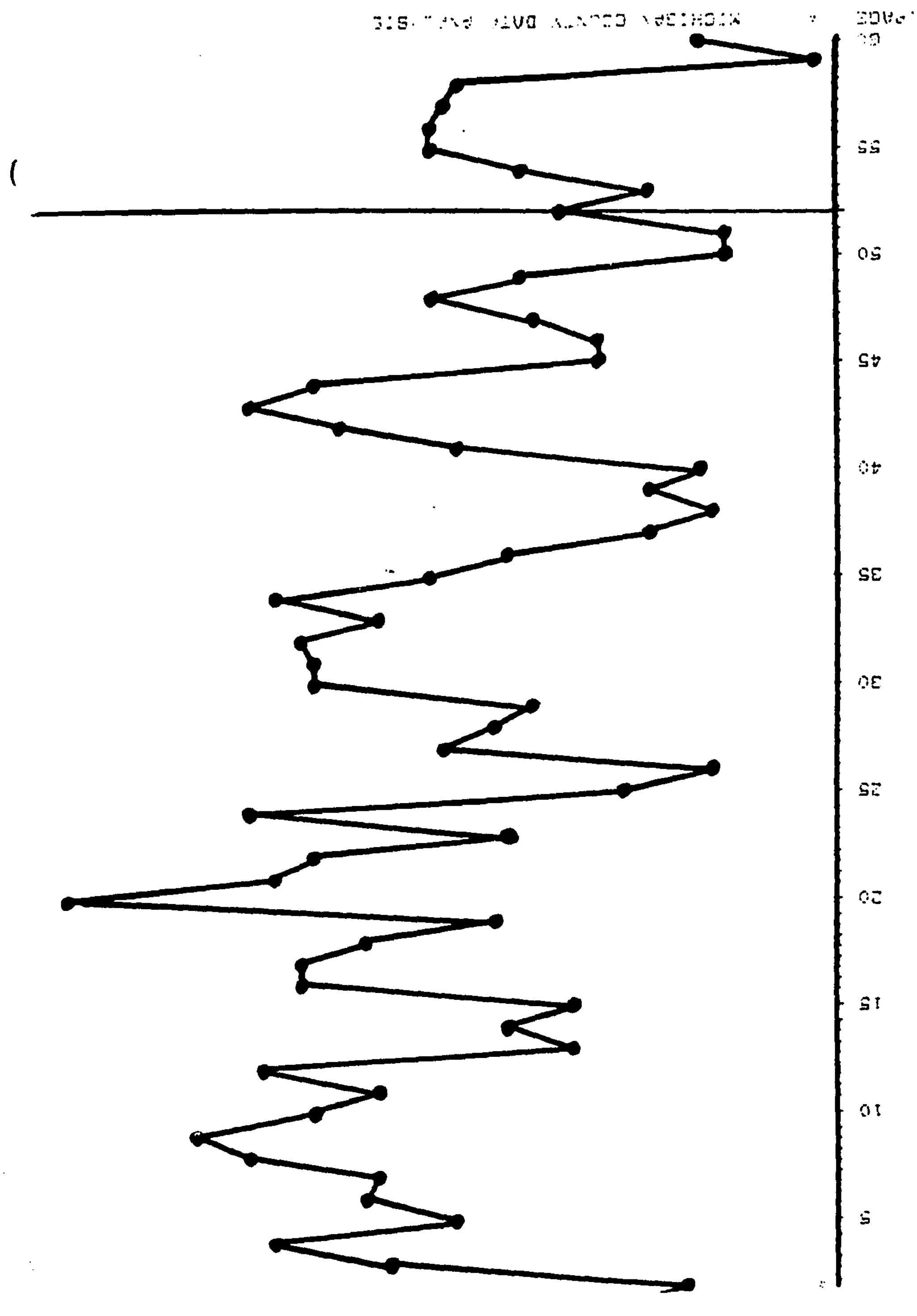

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AREA1
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES
                                          1      2
AREA1      RANDOM            1-  60  (1-B  ) (1-B  )

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
     1  AREA1         AR      1       1    -0.4473    0.1240    -3.61
     2  AREA1         AR      2       3    -0.4641    0.1336    -3.62
     3  AREA1         AR      3       5    -0.5846    0.1165    -5.02

RESIDUAL SUM OF SQUARES   =      2344.313800 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =               43
RESIDUAL MEAN SQUARE      =        54.518895
1PAGE   6     MICHIGAN COUNTY DATA ANALYSIS


ACF VARIABLE IS RAREA1.
MAXLAG=30./

NUMBER OF OBSERVATIONS              =          60
MEAN OF THE (DIFFERENCED) SERIES    =     -0.8255
STANDARD ERROR OF THE MEAN          =      0.8257
T-VALUE OF MEAN (AGAINST ZERO)      =     -0.9958

AUTOCORRELATIONS

  1- 12     0.0  0.0 -.06 -.06  .05 -.12 -.05  .05 -.08  .05  .08 -.17
  ST.E.     .13  .13  .13  .13  .13  .13  .13  .13  .13  .13  .14  .14

 13- 24     .11  .05  .14 -.01  .01  0.0 -.20 -.09 -.09  .04  .15 -.03
  ST.E.     .14  .14  .14  .14  .14  .14  .14  .15  .15  .15  .15  .15

 25- 30     .19 -.01 -.07  .01 -.05 -.05
  ST.E.     .15  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

             -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1  -0.004                      +     I     +
  2  -0.001                      +     I     +
  3  -0.078                      +   XXI     +
  4  -0.065                      +   XXI     +
  5   0.053                      +     IX    +
  6  -0.121                      +  XXXI     +
  7  -0.050                      +   XXI     +
  8   0.046                     +      IX     +
  9  -0.081                     +    XXI      +
 10   0.052                     +      IX     +
 11   0.081                     +      IXX    +
 12  -0.166                     +  XXXXI      +
 13   0.109                     +      IXXX   +
 14   0.054                     +      IX     +
 15   0.141                     +      IXXXX  +
 16  -0.012                     +      I      +
 17   0.012                     +      I      +
 18   0.003                     +      I      +
 19  -0.199                     + XXXXXI      +
 20  -0.087                     +    XXI      +
 21  -0.085                     +    XXI      +
 22   0.040                     +      IX     +
 23   0.146                     +      IXXXX  +
 24  -0.032                     +     XI      +
 25   0.187                     +      IXXXXX +
 26  -0.010                    +       I       +
 27  -0.073                    +     XXI       +
 28   0.013                    +       I       +
```

AREA-1 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AREA1
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN       TIME       DIFFERENCES
                                              1         3
AREA1        RANDOM             1-  60  (1-B   ) (1-B   )
                                              1         3
X1           BINARY             1-  60  (1-B   ) (1-B   )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  AREA1         AR      1       1    -0.4931     0.1239    -3.98
      2  AREA1         AR      2       3    -0.3242     0.1403    -2.31
      3  AREA1         AR      3       6    -0.6239     0.1156    -5.40
      4  X1            UP      1       0    14.5628     5.7994     2.51
      5  X1            SP      1       1    -0.0536     0.4098    -0.13

RESIDUAL SUM OF SQUARES  =        2075.838810 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                 41
RESIDUAL MEAN SQUARE     =          50.630215
1PAGE    8      MICHIGAN COUNTY DATA ANALYSIS



ACF VARIABLE IS RAREA1. MAXLAG=30./

NUMBER OF OBSERVATIONS               =            60
MEAN OF THE (DIFFERENCED) SERIES =           -1.0580
STANDARD ERROR OF THE MEAN           =         0.8773
T-VALUE OF MEAN (AGAINST ZERO)       =        -1.2060

AUTOCORRELATIONS

  1- 12       0.0 -.01 -.07  0.0  .01 -.16 -.09  .02 -.09  .03  .06 -.22
  ST.E.       .13  .13  .13  .13  .13  .13  .13  .13  .13  .14  .14  .14

 13- 24       .09  .12  .22 -.04 -.03 -.04 -.13 -.07 -.08  .01  .10 -.01
  ST.E.       .14  .14  .14  .15  .15  .15  .15  .15  .15  .15  .15  .15

 25- 30       .18 -.03 -.09  .03 -.01  .04
  ST.E.       .15  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.003                    +     I     +
  2  -0.006                    +     I     +
  3  -0.069                    +   XXI     +
  4   0.005                    +     I     +
  5   0.010                    +     I     +
  6  -0.159                    + XXXXI     +
  7  -0.092                   +    XXI      +
  8   0.023                   +      IX     +
  9  -0.092                   +    XXI      +
 10   0.026                   +      IX     +
 11   0.060                   +      IXX    +
 12  -0.215                   + XXXXXI      +
 13   0.093                   +      IXX    +
 14   0.119                   +      IXXX   +
 15   0.225                   +      IXXXXXX+
 16  -0.042                   +     XI      +
 17  -0.027                   +     XI      +
 18  -0.038                   +     XI      +
 19  -0.132                   +   XXXI      +
 20  -0.074                   +    XXI      +
 21  -0.082                   +    XXI      +
 22   0.011                  +       I       +
 23   0.103                  +       IXXX    +
 24  -0.012                  +       I       +
```

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AREA1
INPUT VARIABLES -- NOISE     X1

VARIABLE   VAR. TYPE  MEAN       TIME      DIFFERENCES
                                                1          3
AREA1        RANDOM              1-  60  (1-B  ) (1-B  )
                                                1          3
X1           BINARY              1-  60  (1-B  ) (1-B  )

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE      ST. ERR.  T-RATIO
     1   AREA1         AR      1       1    -0.4593       0.1257    -3.65
     2   AREA1         AR      2       3    -0.4818       0.1422    -3.39
     3   AREA1         AR      3       6    -0.5693       0.1241    -4.59
     4   X1            UP      1       1     0.0137       0.1856     0.07
     5   X1            SP      1       1    -2.6010       4.0304    -0.65

RESIDUAL SUM OF SQUARES  =        2214.914950 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                40
RESIDUAL MEAN SQUARE     =          55.372874
1PAGE   8      MICHIGAN COUNTY DATA ANALYSIS


ACF VARIABLE IS RAREA1. MAXLAG=30./

NUMBER OF OBSERVATIONS                =              60
MEAN OF THE (DIFFERENCED) SERIES =           -0.7011
STANDARD ERROR OF THE MEAN          =             0.9046
T-VALUE OF MEAN (AGAINST ZERO)     =           -0.7750

AUTOCORRELATIONS

  1- 12      0.0  0.0 -.07 -.08 -.01 -.12 -.09  .06 -.10  .08  .07 -.18
  ST.E.      .13  .13  .13  .13  .13  .13  .13  .13  .13  .13  .14  .14

 13- 24      .09  .10  .12  .03  .03  0.0 -.20 -.09 -.08  .02  .13  .01
  ST.E.      .14  .14  .14  .14  .14  .14  .14  .15  .15  .15  .15  .15

 25- 30      .20  0.0 -.10  .01 -.04 -.06
  ST.E.      .15  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

              -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                         I
  1  -0.002                       +      I      +
  2  -0.003                       +      I      +
  3  -0.068                       +    XXI      +
  4  -0.077                       +    XXI      +
  5  -0.010                       +      I      +
  6  -0.117                       +   XXXI      +
  7  -0.086                       +    XXI      +
  8   0.061                      +       IXX     +
  9  -0.095                      +     XXI       +
 10   0.078                      +       IXX     +
 11   0.068                      +       IXX     +
 12  -0.181                      + XXXXXI        +
 13   0.086                      +       IXX     +
 14   0.095                      +       IXX     +
 15   0.118                      +       IXXX    +
 16   0.025                      +       IX      +
 17   0.026                      +       IX      +
 18  -0.001                      +       I       +
 19  -0.202                      + XXXXXI        +
 20  -0.090                      +     XXI       +
 21  -0.078                      +     XXI       +
 22   0.025                      +       IX      +
 23   0.134                      +       IXXX    +
 24   0.010                      +       I       +
 25   0.198                      +       IXXXXX  +
```

AREA-2 Alcohol-Involved Fatality Raw Time-Series Data



```
PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
 LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                      I
  1    0.493                    +     IXXXXX+XXXXXX
  2    0.200                  +       IXXXXX  +
  3    0.064                  +       IXX     +
  4    0.017                  +       I       +
  5   -0.167                  +   XXXXI       +
  6   -0.123                  +    XXXI       +
  7   -0.105                  +    XXXI       +
  8    0.061                  +       IXX     +
  9    0.079                  +       IXX     +
 10    0.216                  +       IXXXXX  +
 11    0.268                  +       IXXXXXXX+
 12    0.424                 +        IXXXXXXXX+XX
 13    0.377                +         IXXXXXXXXX+
 14    0.270                +         IXXXXXXX  +
 15   -0.010                +         I         +
 16   -0.174                +     XXXXI         +
 17   -0.267               +   XXXXXXXI          +
 18   -0.262               +   XXXXXXXI          +
 19   -0.192               +     XXXXXI          +
 20   -0.055               +         XI          +
 21    0.049               +          IX         +
 22    0.096               +          IXX        +
 23    0.130               +          IXXX       +
 24    0.202               +          IXXXXX     +
 25    0.084               +          IXX        +
 26    0.004               +          I          +
 27   -0.026               +         XI          +
 28   -0.160              +       XXXXI           +
 29   -0.328              +   XXXXXXXXI           +
 30   -0.254              +     XXXXXXI           +
 31   -0.152              +       XXXXI           +
 32   -0.100              +        XXXI           +
 33   -0.078              +         XXI           +
 34    0.006              +           I           +
 35   -0.012              +           I           +
 36    0.008              +           I           +
1PAGE    4      MICHIGAN COUNTY DATA ANALYSIS
```

AREA-2 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for White Noise Models

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AREA2
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES
                                             1        3
AREA2       RANDOM             1-  60  (1-B  ) (1-B  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
      1   AREA2        AR      1       1   -0.2129     0.1347     -1.58
      2   AREA2        AR      2       3   -0.7643     0.0924     -8.27
      3   AREA2        AR      3       6   -0.5828     0.1214     -4.80

RESIDUAL SUM OF SQUARES   =      4910.056340 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =               43
RESIDUAL MEAN SQUARE      =       114.187357
1PAGE   6      MICHIGAN COUNTY DATA ANALYSIS



ACF VARIABLE IS RAREA2.
MAXLAG=30./

NUMBER OF OBSERVATIONS                =            60
MEAN OF THE (DIFFERENCED) SERIES      =       -1.4595
STANDARD ERROR OF THE MEAN            =        1.3155
T-VALUE OF MEAN (AGAINST ZERO)        =       -1.1055

AUTOCORRELATIONS

  1- 12     -.06 -.20  0.0  .12 -.20  0.0 -.02  .11 -.12  .09 -.01 -.07
  ST.E.      .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .14

 13- 24      .14  .20 -.06 -.08 -.01 -.14 -.02 -.06  0.0  0.0  .09  .02
  ST.E.      .15  .15  .15  .15  .15  .15  .16  .16  .16  .16  .16  .16

 25- 30     -.04  .05  .14 -.11 -.16  .01
  ST.E.      .16  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

              -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                         I
  1  -0.059                     +       XI      +
  2  -0.198                     +XXXXXI      +
  3   0.003                    +         I       +
  4   0.123                    +         IXXX    +
  5  -0.197                    + XXXXXI          +
  6   0.003                    +         I       +
  7  -0.022                    +        XI       +
  8   0.110                    +         IXXX    +
  9  -0.116                    +     XXXI        +
 10   0.086                    +         IXX     +
 11  -0.014                    +         I       +
 12  -0.069                    +       XXI       +
 13   0.137                    +         IXXX    +
 14   0.197                    +         IXXXXX  +
 15  -0.076                    +       XXI       +
 16  -0.078                    +       XXI       +
 17  -0.009                   +          I        +
 18  -0.139                   +      XXXI         +
 19  -0.018                   +          I        +
 20  -0.058                   +         XI        +
 21   0.002                   +          I        +
 22  -0.002                   +          I        +
 23   0.094                   +          IXX      +
 24   0.022                   +          IX       +
 25  -0.039                   +         XI        +
 26   0.047                   +          IX       +
 27   0.135                   +          IXXX     +
 28  -0.111                   +       XXXI        +
```

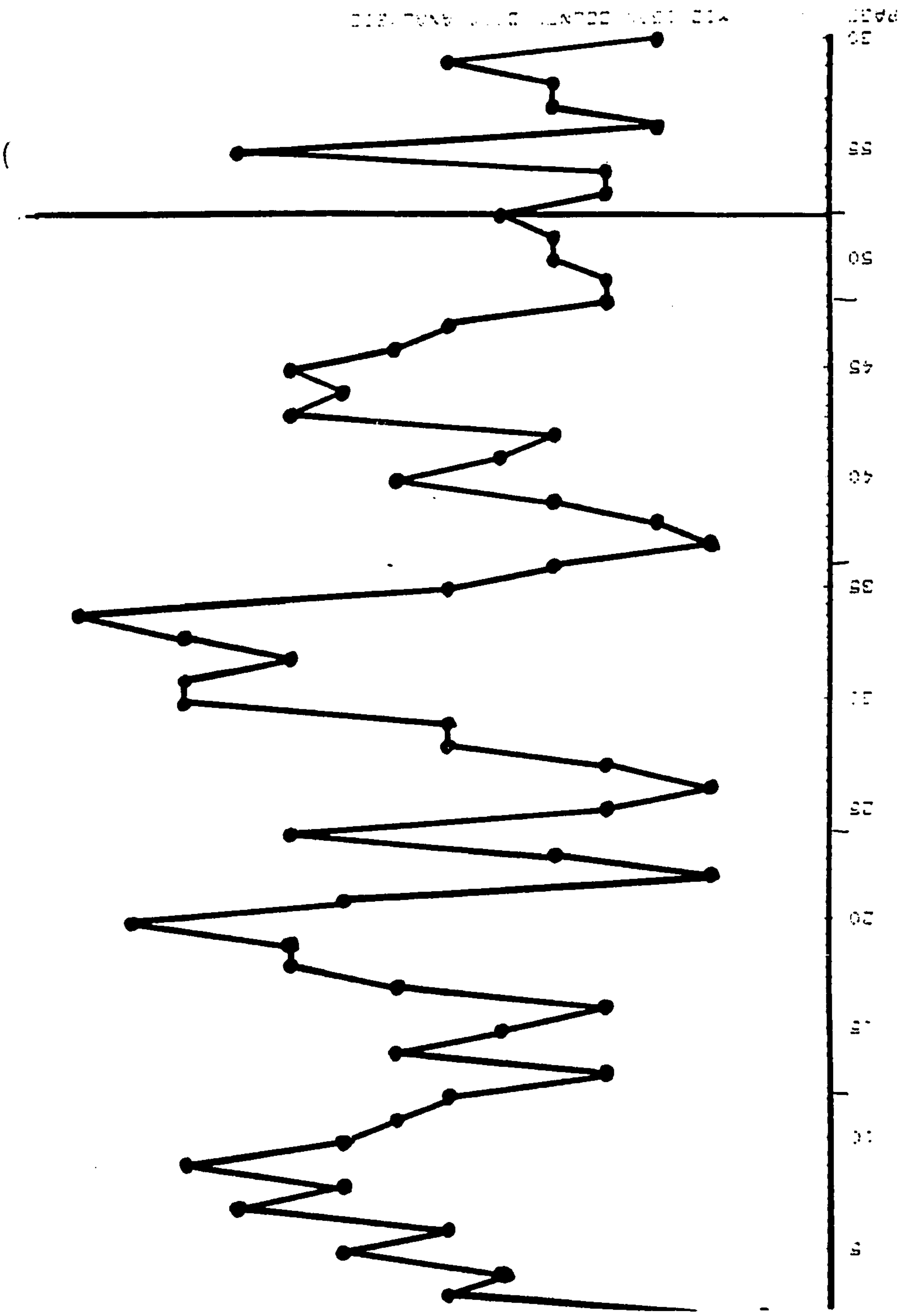
AREA-2 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AREA2
INPUT VARIABLES -- NOISE     X1

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1         3
AREA2       RANDOM           1-  60  (1-B   ) (1-B   )
                                              1         3
X1          BINARY           1-  60  (1-B   ) (1-B   )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
      1  AREA2         AR      1       1   -0.1940     0.1380     -1.41
      2  AREA2         AR      2       3   -0.7679     0.0924     -8.31
      3  AREA2         AR      3       8   -0.5885     0.1232     -4.77
      4  X1            UP      1       0    8.7288     8.9983      0.97
      5  X1            SP      1       1   -0.7865     0.3454     -2.28

RESIDUAL SUM OF SQUARES  =       4746.895200 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                41
RESIDUAL MEAN SQUARE     =        115.777932
1PAGE   8     MICHIGAN COUNTY DATA ANALYSIS



ACF VARIABLE IS RAREA2. MAXLAG=30./


NUMBER OF OBSERVATIONS              =            60
MEAN OF THE (DIFFERENCED) SERIES    =       -1.5055
STANDARD ERROR OF THE MEAN          =        1.2964
T-VALUE OF MEAN (AGAINST ZERO)      =       -1.1613


AUTOCORRELATIONS

  1- 12    -.06 -.19  .01  .09 -.21  .01  .03  .11 -.13  .08 -.04 -.06
  ST.E.     .13  .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .15

 13- 24     .13  .21 -.08 -.05 -.01 -.15 -.01 -.06 -.01 -.02  .11  .02
  ST.E.     .15  .15  .15  .15  .15  .15  .16  .16  .16  .16  .16  .16

 25- 30    -.06  .07  .14 -.12 -.14 -.01
  ST.E.     .16  .16  .16  .16  .16  .16


PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                      I
  1  -0.057                    +    XI     +
  2  -0.185                    +XXXXXI     +
  3   0.006                   +      I      +
  4   0.091                   +      IXX    +
  5  -0.209                   + XXXXXI      +
  6   0.005                   +      I      +
  7   0.028                   +      IX     +
  8   0.107                   +      IXXX   +
  9  -0.129                   +   XXXI      +
 10   0.084                   +      IXX    +
 11  -0.038                   +     XI      +
 12  -0.063                   +    XXI      +
 13   0.127                   +      IXXX   +
 14   0.213                   +      IXXXXX +
 15  -0.084                   +    XXI      +
 16  -0.050                  +      XI       +
 17  -0.015                  +       I       +
 18  -0.147                  +   XXXXI       +
 19  -0.008                  +       I       +
 20  -0.059                  +      XI       +
 21  -0.010                  +       I       +
 22  -0.020                  +      XI       +
 23   0.108                  +       IXXX    +
 24   0.018                  +       I       +
```

AREA-2 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AREA2
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES
                                                1       3
AREA2       RANDOM            1-  60  (1-B  ) (1-B  )
                                                1       3
X1          BINARY            1-  60  (1-B  ) (1-B  )


PARAMETER VARIABLE      TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1   AREA2          AR      1       1    -0.2536     0.1357     -1.87
      2   AREA2          AR      2       3    -0.7495     0.0953     -7.87
      3   AREA2          AR      3       6    -0.5969     0.1229     -4.86
      4   X1             UP      1       1    -1.5690     5.4851     -0.29
      5   X1             SP      1       1    -1.2005     0.7360     -1.63

RESIDUAL SUM OF SQUARES  =       4638.083370 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                40
RESIDUAL MEAN SQUARE     =        115.952085
1PAGE   8      MICHIGAN COUNTY DATA ANALYSIS



ACF VARIABLE IS RAREA2. MAXLAG=30./


NUMBER OF OBSERVATIONS              =             60
MEAN OF THE (DIFFERENCED) SERIES =           -1.1360
STANDARD ERROR OF THE MEAN          =          1.3139
T-VALUE OF MEAN (AGAINST ZERO)      =         -0.8646

AUTOCORRELATIONS

  1- 12      -.07 -.25  .02  .07 -.22  .02 -.03  .08 -.10  .08  0.0 -.06
  ST.E.       .13  .13  .14  .14  .14  .14  .14  .14  .14  .15  .15  .15

 13- 24       .13  .19 -.07 -.05 -.04 -.15 -.01 -.05 -.01  .02  .10  .02
  ST.E.       .15  .15  .15  .15  .15  .15  .16  .16  .16  .16  .16  .16

 25- 30      -.03  .07  .13 -.12 -.15  0.0
  ST.E.       .16  .16  .16  .16  .16  .16

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG    CORR. +----+----+----+----+----+----+----+----+----+----+
                                      I
  1  -0.073                   +     XXI     +
  2  -0.252                     XXXXXXI     +
  3   0.017                    +      I      +
  4   0.069                    +      IXX    +
  5  -0.217                    + XXXXXI      +
  6   0.019                    +      I      +
  7  -0.033                    +     XI      +
  8   0.081                    +      IXX    +
  9  -0.101                    +   XXXI      +
 10   0.077                    +      IXX    +
 11  -0.003                    +      I      +
 12  -0.061                    +    XXI      +
 13   0.134                    +      IXXX   +
 14   0.181                    +      IXXXXX +
 15  -0.070                   +     XXI       +
 16  -0.049                   +      XI       +
 17  -0.040                   +      XI       +
 18  -0.147                   +   XXXXI       +
 19  -0.006                   +       I       +
 20  -0.055                   +      XI       +
 21  -0.013                   +       I       +
 22   0.024                   +       IX      +
 23   0.103                   +       IXXX    +
 24   0.018                   +       I       +
 25  -0.033                   +      XI       +
 26   0.070                   +       IXX     +
```

AREA-3 Alcohol-Involved Fatality Raw Time-Series Data



AREA-3 Alcohol-Involved Fatality Data Undifferenced
ACFs

ACF VARIABLE IS AREA3./

NUMBER OF OBSERVATIONS	=	60
MEAN OF THE (DIFFERENCED) SERIES	=	6.9167
STANDARD ERROR OF THE MEAN	=	0.4001
T-VALUE OF MEAN (AGAINST ZERO)	=	17.2889

AUTOCORRELATIONS

1- 12	.43	.18	.05	-.07	-.33	-.29	-.36	-.36	.01	.30	.31	.31
ST.E.	.13	.15	.16	.16	.16	.17	.17	.19	.20	.20	.21	.21
13- 24	.25	.19	.08	-.08	-.32	-.43	-.21	-.07	.07	.06	.15	.21
ST.E.	.22	.22	.23	.23	.23	.24	.25	.25	.25	.25	.25	.25
25- 36	.25	.08	.01	-.15	-.21	-.22	-.06	-.16	-.08	.08	.16	.08
ST.E.	.26	.26	.26	.26	.26	.27	.27	.27	.27	.27	.27	.27

PLOT OF SERIAL CORRELATION

```
          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1   0.434                    +     IXXXXX+XXXXX
  2   0.179                   +      IXXXX  +
  3   0.051                  +       IX      +
  4  -0.069                  +     XXI       +
  5  -0.328                  XXXXXXXXI       +
  6  -0.286                  +XXXXXXXI       +
  7  -0.364                 XXXXXXXXXI        +
  8  -0.359                 XXXXXXXXXI        +
  9   0.006                +         I         +
 10   0.296                +         IXXXXXXX  +
 11   0.310                +         IXXXXXXXX +
 12   0.308                +         IXXXXXXXX +
 13   0.248               +          IXXXXXX    +
 14   0.194               +          IXXXXX     +
 15   0.080               +          IXX        +
 16  -0.076               +        XXI          +
 17  -0.321               +  XXXXXXXXI          +
 18  -0.428              +XXXXXXXXXXXI           +
 19  -0.215              +      XXXXXI           +
 20  -0.074              +         XXI           +
 21   0.068              +           IXX         +
 22   0.057              +           IX          +
 23   0.148              +           IXXXX       +
 24   0.212              +           IXXXXX      +
 25   0.246             +            IXXXXXX      +
 26   0.082             +            IXX          +
 27   0.006             +            I            +
 28  -0.152             +        XXXXI            +
 29  -0.211             +       XXXXXI            +
 30  -0.217             +       XXXXXI            +
 31  -0.062             +          XXI            +
 32  -0.156             +        XXXXI            +
 33  -0.079             +          XXI            +
```

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AREA3
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1       2
AREA3       RANDOM             1-  60  (1-8   ) (1-8   )


PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
      1  AREA3        AR      1       2    -0.5794    0.1157    -5.01
      2  AREA3        AR      2       8    -0.4622    0.1372    -3.37

RESIDUAL SUM OF SQUARES  =        596.290642 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                45
RESIDUAL MEAN SQUARE     =         13.250903
1PAGE    6      MICHIGAN COUNTY DATA ANALYSIS



ACF VARIABLE IS RAREA3.
MAXLAG=30./

NUMBER OF OBSERVATIONS                  =              60
MEAN OF THE (DIFFERENCED) SERIES =         -0.0804
STANDARD ERROR OF THE MEAN         =          0.4377
T-VALUE OF MEAN (AGAINST ZERO)     =         -0.1837

AUTOCORRELATIONS

  1- 12     -.20 -.16  .20 -.24 -.12  .01 -.16 -.02 -.03  .15  .08  .04
  ST.E.      .13  .13  .14  .14  .15  .15  .15  .15  .15  .15  .16  .16

 13- 24      .05  .13 -.06  .06 -.18 -.27  .08 -.03  .08  .09 -.04  .14
  ST.E.      .16  .16  .16  .16  .16  .16  .17  .17  .17  .17  .17  .17

 25- 30      .02 -.04  .06 -.06 -.09 -.09
  ST.E.      .17  .18  .18  .18  .18  .18

PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -0.204                    +XXXXXI     +
  2  -0.164                    + XXXXI     +
  3   0.202                    +     IXXXXX +
  4  -0.243                   +XXXXXXI     +
  5  -0.116                    +   XXXI     +
  6   0.015                    +     I     +
  7  -0.162                    + XXXXI     +
  8  -0.017                   +      I      +
  9  -0.027                   +     XI      +
 10   0.148                   +      IXXXX  +
 11   0.082                   +      IXX    +
 12   0.038                   +      IX     +
 13   0.054                   +      IX     +
 14   0.129                   +      IXXX   +
 15  -0.064                   +    XXI      +
 16   0.060                   +      IXX    +
 17  -0.179                   +  XXXXI      +
 18  -0.275                  +XXXXXXXI      +
 19   0.084                   +      IXX    +
 20  -0.029                   +     XI      +
 21   0.078                   +      IXX    +
 22   0.090                   +      IXX    +
 23  -0.045                   +     XI      +
 24   0.142                   +      IXXXX  +
 25   0.020                  +       I       +
 26  -0.042                  +      XI       +
 27   0.058                  +       IX      +
 28  -0.061                  +     XXI       +
 29  -0.086                  +     XXI       +
 30  -0.088
```

AREA-3 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Immediate Implementation and Gradual Impact Models


```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AREA3
INPUT VARIABLES -- NOISE    X1

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES
                                              1       2
AREA3       RANDOM           1-  60  (1-B  ) (1-B  )
                                              1       2
X1          BINARY           1-  60  (1-B  ) (1-B  )


PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1   AREA3        AR      1      2    -0.6082     0.1284     -4.72
      2   AREA3        AR      2      8    -0.4701     0.1398     -3.37
      3   X1           UP      1      0     0.0057     0.1016      0.06
      4   X1           SP      1      1    -2.2069     4.2377     -0.52

RESIDUAL SUM OF SQUARES  =       584.277840 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               43
RESIDUAL MEAN SQUARE     =        13.587857
1PAGE   8     MICHIGAN COUNTY DATA ANALYSIS



ACF VARIABLE IS RAREA3. MAXLAG=30./


NUMBER OF OBSERVATIONS             =            60
MEAN OF THE (DIFFERENCED) SERIES =         -0.1141
STANDARD ERROR OF THE MEAN         =          0.4343
T-VALUE OF MEAN (AGAINST ZERO)     =         -0.2628


AUTOCORRELATIONS

  1- 12     -.20 -.15  .18 -.21 -.14  .02 -.16 -.01 -.04  .14  .09  .04
  ST.E.      .13  .13  .14  .14  .15  .15  .15  .15  .15  .15  .15  .15

 13- 24      .06  .14 -.08  .08 -.19 -.27  .08 -.03  .06  .08 -.04  .14
  ST.E.      .15  .15  .16  .16  .16  .16  .17  .17  .17  .17  .17  .17

 25- 30      .05 -.04  .05 -.05 -.08 -.10
  ST.E.      .17  .17  .17  .17  .17  .17


PLOT OF SERIAL CORRELATION

          -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
                                          I
  1  -0.196                         +XXXXXI      +
  2  -0.155                        +  XXXXI       +
  3   0.178                        +      IXXXX   +
  4  -0.214                        + XXXXXI       +
  5  -0.140                        +  XXXXI       +
  6   0.017                        +      I       +
  7  -0.164                        +  XXXXI       +
  8  -0.012                        +      I       +
  9  -0.037                        +     XI       +
 10   0.138                        +      IXXX    +
 11   0.080                       +       IXX      +
 12   0.039                       +       IX       +
 13   0.058                       +       IX       +
 14   0.143                       +       IXXXX    +
 15  -0.078                       +     XXI        +
 16   0.075                       +       IXX      +
 17  -0.193                       +  XXXXXI        +
 18  -0.288                       +XXXXXXXI        +
 19   0.082                       +       IXX      +
 20  -0.031                       +      XI        +
 21   0.081                       +       IXX      +
 22   0.084                       +       IXX      +
 23  -0.042                       +      XI        +
 24   0.139                       +       IXXX     +
✓25   0.048                       +       IX       +
 26  -0.040                      +       XI         +
```

AREA-3 Alcohol-Involved Fatality Data Parameter Estimates and ACFs for Gradual Implementation and Gradual Impact Models

```
SUMMARY OF THE MODEL

OUTPUT VARIABLE -- AREA3
INPUT VARIABLES -- NOISE      X1

VARIABLE   VAR. TYPE   MEAN      TIME      DIFFERENCES
                                               1      2
AREA3        RANDOM             1-  60  (1-B  ) (1-B  )
                                               1      2
X1           BINARY             1-  60  (1-B  ) (1-B  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  AREA3         AR      1       2    -0.6344     0.1108    -5.72
      2  AREA3         AR      2       8    -0.4921     0.1349    -3.65
      3  X1            UP      1       1     3.3830     2.2323     1.52
      4  X1            SP      1       1    -0.9781     0.1596    -6.13

RESIDUAL SUM OF SQUARES  =       519.304291 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               42
RESIDUAL MEAN SQUARE     =        12.364388
1PAGE   8      MICHIGAN COUNTY DATA ANALYSIS



ACF VARIABLE IS RAREA3. MAXLAG=30./

NUMBER OF OBSERVATIONS                 =            60
MEAN OF THE (DIFFERENCED) SERIES       =       -0.2054
STANDARD ERROR OF THE MEAN             =        0.4192
T-VALUE OF MEAN (AGAINST ZERO)         =       -0.4900

AUTOCORRELATIONS

  1- 12     -.13 -.20  .23 -.25 -.16  .04 -.15 -.03  .03  .12  .10  .02
  ST.E.      .13  .13  .14  .14  .15  .15  .15  .15  .16  .16  .16  .16

 13- 24      .05  .10 -.04  .05 -.15 -.24  .04 -.04  .10  .08 -.03  .13
  ST.E.      .16  .16  .16  .16  .16  .16  .17  .17  .17  .17  .17  .17

 25- 30     -.01 -.05  .04 -.05 -.09 -.08
  ST.E.      .17  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

           -1.0 -0.8 -0.6 -0.4 -0.2  0.0  0.2  0.4  0.6  0.8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                      I
  1  -0.131                      +  XXXI     +
  2  -0.200                      +XXXXXI     +
  3   0.228                     +     IXXXXXX+
  4  -0.248                     +XXXXXXI     +
  5  -0.163                     +  XXXXI     +
  6   0.045                     +     IX     +
  7  -0.145                     +  XXXXI     +
  8  -0.025                    +     XI       +
  9   0.028                    +      IX      +
 10   0.117                    +      IXXX    +
 11   0.102                    +      IXXX    +
 12   0.019                    +      I       +
 13   0.047                    +      IX      +
 14   0.101                    +      IXXX    +
 15  -0.042                    +     XI       +
 16   0.046                    +      IX      +
 17  -0.154                    +  XXXXI       +
 18  -0.242                    + XXXXXXI      +
 19   0.038                    +      IX      +
 20  -0.044                    +     XI       +
 21   0.100                    +      IXX     +
 22   0.081                    +      IXX     +
 23  -0.030                    +     XI       +
 24   0.134                    +      IXXX    +
 25  -0.006                    +      I       +
 26  -0.048                    +     XI       +
```

APPENDIX H

Drunk Driving Penalty Structure for all States in Study

ALASKA

1984 Legislation:
Nothing passed.

Per Se: .10
Drinking Age: 21 yrs.
Dram Shop Law: Applies to businesses only (not private hosts) and only if the person served was already intoxicated.
Open Container Prohibition: None.
Section 408 Grant: Received $262,000 Alcohol/Traffic Safety Grant (Basic and Supplemental).
PBTs: Allowed, refusal is admissible in court.

Refusals to Submit, or if .10 BAC:
Same penalties as for criminal offenses (see below). Lic. revoc. are administratively imposed and all hard revocs. (no restricted lic. avail.). Lic. revocs. for DWI and refusal/.10 BAC admin. can run either consecutively or concurrently.

Driving under DWI Revoc. License:
1st Offense: Min. $500, mand. 30 days jail.
2nd Offense: Min. $1000, mand. 90 days jail.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	Min. $250,	Mand. 72 consecutive hrs. jail,	30 days hard. admin. lic. revoc., 60 days restricted admin. lic. revoc., rehab.	
2nd Offense w/in 10 yrs.	Min. $500,	Mand. 20 consecutive days jail,	1 yr. hard admin. lic. revoc., rehab.	Possible vehicle impoundment.
3rd Offense w/in 10 yrs.	Min. $1000,	Mand. 30 days jail,	10 yrs. hard admin. lic. revoc., rehab.	Possible vehicle impoundment.

Miscellaneous:
Cannot refuse BAC if death/physical injury occured.

ARIZONA

1984 Legislation:

HB2307 (ch.257) - Clarifies that if blood is taken from a "refuser" for any reason, police have right to a sample. Info on prior convictions/pending charges are admissible (at court's discretion) any time prior to start of trial. New punishment for DWI and driving without lic. Mand. 6 mos. jail before any parole/probation can be offered.

HB2027 (ch.2) - Deletes provision for 1st offenders allowing probation and only fine instead of other penalties.

HB2149 (Ch.67) - Raised legal drinking age from 19 to 21 yrs. old. Provides 2 yr. lic. revoc. if underage DWI, or if 2nd offense of underago possession.

Per Se: .10
Drinking Age: 21 yrs. (new)
Dram Shop Law: No statute, and case law does not appear to support such 3rd party liability in absence of statute.
Open Container Prohibition: Partial; illegal to drink while driving.
Section 408 Grant: Received $701,413 Alcohol/Traffic Safety Grant (Basic and Supplemental).

Refusals to Submit:
1 yr. admin. lic. revoc., admissible as evidence.

Driving under Revoc. License:
Class 1 misdemeanor, mand. 48 hrs. jail, double original lic. revoc.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	Class 1 misdemeanor, Mand $250	Mand. 24 hrs. jail. 8-24 hrs. comm. svc.	Mand. 90 days lic. revoc., rehab.	OR probation, same penalties except no rehab. or comm. svc.
1st Offense if BAC less than .20 and no injury	Mand. $250.	8-24 hrs. comm. svc.	Rehab. 30 days hard lic. revoc, 60 days restricted.	OR probation, but same penalties (new).
2nd Offense w/in 5 yrs	Class 1 misdemeanor, mand. $500	Mand. 60 days jail	Mand. 1 yr. hard lic. revoc., rehab.	OR probation but same penalties.
3rd Offense w/in 5 yrs	Class 5 felony	Mand. 6 mos. jail	Mand. 3 yrs. lic. revoc., rehab.	

Miscellaneous:
Jurisdictions may establish minimum security facilities for drunk driving jail terms of less than 180 days.

CALIFORNIA

1984 Legislation:

SB1441 (CH.326) - Increases lic. revoc. to 3 yrs. for refusal after 2 prior offenses.

SB1411 (not yet signed by Governor) - Provides for lic. revoc. for minors who commit any DWI offense (even where lic. revoc. is not part of existing penalties such as open container violation).

Bills pending, but expected to pass (session ends August 31, 1984, all have passed origінting House):

SB1522 - Relates to vehicle impoundment for 2nd and 3rd offenders.

AB3834 - DWI misdemeanor does not have to occur in presence of police officer (as other misdemeanors need to be). Example: Intoxicated driver in car on road, but not driving can be charged with DWI.

AB3832 - Technical change relating to prior offenses considered separate offenses.

AB3509 - Statutorily mandates no drinking and driving as one term of probation. DMV records to show driver on probation. Requires probation agreement to inlcude mand. 2 days jail if BAC .04 while on probation. Requires all plea bargained to "wet-reckless charge" to be considered as alcohol-offenses for purposes of DWI sentence enhancement.

Per Se: .10
Drinking Age: 21 yrs.
Dram Shop Law: Liability specifically forbidden by statute although it is illegal to sell to intoxicated person; BP§25602.
Open Container Prohibition: Exists.

Refusals to Submit:
1st refusal: 6 mos. admin. lic. revoc.
2nd refusal: 1 yr. lic. revoc.
3rd refusal: 3 yr. lic. revoc. (new)
If hearing requested, revoc. stayed pending outcome.
Defendent has choice of tests. If choose breath, police can require blood/urine for drug detection.

Driving under DWI Revoc. License:
1st Offense: Max. $500, 10 days-6 mos. jail, or probation, 10 days jail.
2nd Offense: Max. $1000, 30 days-1 yr. jail, or probation, maxx. 30 days jail.

Youth Offender Legislation:
If convicted of DWI, lic. revoked until 18th birthday, 1 yr. or peeriod specified in statute, whichever is longest.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense, no injury	$390-500,	96 hrs.-6 mos. jail,	6 mos. lic. revoc.	
If probation,	$390-5000,	48 hrs.-6 mos. jail,	6 mos. lic. revoc.	
OR	$390-500,		90 days restricted lic.	

California, cont.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
2nd offense w/in 5 yrs., no injury	$375-1000,	90 days-1 yr. jail,	1 yr. lic. revoc.	
If probation	$390-1000,	10 days-1 yr. jail,	1 yr. lic. revoc.	
<u>OR</u>	$390-1000,	48 hrs.-1 yr. jail,	1 yr. hard lic. revoc., 2 yrs. restricted, 1 yr. rehab.	
3rd Offense w/in 5 yrs., no injury	$390-1000,	120 days-1 yr. jail,	3 yrs. lic. revoc.	
If probation	$390-1000,	120 days-1 yr. jail,	3 yrs lic. revoc., 1 yr. rehab.	
4th Offense w/in 5 yrs., no injury	$390-1000,	180 days jail,	4 yrs. lic. revoc.	
If probation	Same.			
1st offense, injury occured	$390-5000,	90 days-1 yr. jail,	1 yr. lic. revoc., rehab.	
If probation	$390-1000,	5 days-1 yr. jail,	1 yr. lic. revoc., rehab.	
2nd Offense w/in 5 yrs., injury occured	$390-5000,	120 days-1 yr. jail,	3 yrs. lic. revoc.	
If probation	$390-1000,	Min. 120 days jail,	3 yrs. lic. revoc.	
<u>OR</u>	$390-1000,	30 days-1 yr. jail,	1 yr. hard lic. revoc., 2 yrs. restricted lic. revoc., 1 yr. rehab.	
3rd Offense w/in 5 yrs., njury occured	$1015-5000,	2-4 yrs. jail,	5 yrs. lic. revoc.	
If probation	$390-5000,	Min. 1 yr. jail,	5 yrs. lic. revoc., 1 yr. rehab.	Restitution
Vehicular Manslaughter while DWI & gross negligence		4-8 yrs. jail		
Vehicular Manslaughter while DWI & not gross negligence		16 mos.-4 yrs. jail.		

* All penalties min. mand. unless noted.

Possible 1-30 day vehicle impoundments added to above penalties. Judge may order pre-sentence evaluation. Limits on plea bargains, info. must be recorded.

Miscellaneous:

Probation Officer to notify victims of all sentencing proceedings and also give info. on victim's right to civil recovery and opportunity for compensation from Restitution Fund.

IOWA

1984 Legislation:

HF2486 - Major revision of penalties.

HF2472 - Open container prohibition, parents to be notified of underage drinking violations.

HF2235 - relating to driving under revoc. lic.

Per Se: .13, .10 for administrative revocation.
Drinking Age: 19 yrs.
Dram Shop Law: Yes, §123.92
Open Container Prohibition: new (see HF2472).

Refusals to Submit (administratively imposed):
1st refusal: 240 days. lic. revoc. (was 180 days).
2nd refusal: 540 days lic. revoc. (was 1 yr.), work-restricted lic. avail. after 365 days.

.10 Admin. Revoc. Penalties (regardless of criminal disposition):
1st Offense: 180 days lic. revoc. (was 120 days), work-restricted lic. avail.
2nd Offense: 1 yr. lic. revoc. (was 240 days), work-restricted lic. avail.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	Serious Misdemeanor, $500-1000, OR 50-200 hrs. comm. svc.	Mand. 48 hrs. jail.	30-90 days. lic. revoc.	
2nd Offense w/in 6 yrs.	Aggravated misdemeanor, min. $750.	Mand. 7 days jail.	Lic. revoc. until rehab., restricted lic. avail. if plead guilty.	Substance abuse evaluation in-patient time can be credited against sentence.
3rd Offense w/in 6 yrs.	Class D felony, min. $750.		Min. 2-6 yr. lic. revoc.	Substance abuse evaluation in-patient time can be credited against sentence.
If serious injury occured	Class D felony, min. $750.		Additional 1 yr. lic. revoc., work-restricted lic. avail.	
If death occured	Class D felony, min. $750.		Addition 6 yrs. lic. revoc.	Restitution.

LOUISIANA

1984 Legislation:

HB1051 (Act 511) - Allows exemplary damages (in addition to general and special damages) to be awarded when DWI caused injuries occur.

SB612 (Act 409) - Non-substantive technical changes relating to admin. lic. revoc. procedures.

Per Se: .10
Drinking Age: 18 yrs.
Dram Shop Law: No statute, except illegal to sell to intoxicated person.
Open Container Prohibition: None.
Sec. 408 Grant: Received $527,956 (Basic only. Has not yet submitted Supplemental Grant information. Will receive additional $351,971 when that is done.)

Refusals to Submit:
1st refusal: 90 days hard admin. lic. revoc., 90 days restricted lic.
2nd refusal: 545 days hard admin. lic. revoc.

Administrative Lic. Revoc. for .10:
1st Offense: 90 days admin. lic. revoc.
2nd Offense: 365 days hard admin. lic. revoc.

DWI and Driving under Revoc. License:
$300-500, mand. 7 days-6 mos. jail.

	Penalties*	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	$125-500,	10 days-6 mos. jail,	60 days lic. revoc., restricted lic. avail.	
OR if probation		2 days jail or 32 hrs. comm. svc.,	Rehab., including assessment.	
2nd Offense	$300-500,	30 days-6 mos. jail,	1 yr. hard lic. revoc.	
OR if probation		15 days jail or 30 days comm. svc.,	Rehab., including assessment.	
3rd Offense	Max. $1000,	6 mos.-5 yrs. jail,	1 yr. hard lic. revoc., rehab. including assessment.	
4th Offense		10-30 yrs. hard labor imprisonment.	1 yr. hard lic. revoc.	
Vehicular Homicide while DWI	$2000-5000,	2-5 yrs. jail.		
Vehicular Injury while DWI	Max. $500,	and/or 6 mos. jail.		

* All penalties are min. mand. unless stated.

Miscellaneous:
Owner of vehicle notified if car involved in DWI offense.

MASSACHUSETTS

1984 Legislation:

Approximately 11 bills pending, including:

HB5952 - to raise legal drinking age to 21 yrs. Has passed House, and in Senate Ways & Means Committee as of 8/15/84.

S2152 - Establishes .10 per se offense.

S2106 - Establishes .10 per se offense and increases/clarifies ceretain other penalties for repeat offenders.

H1357 - Info. on conviction shall also be sent to establishment that allegedly served violator.

H2110 - Deletes ability to serve sentence on weekends, evenings and holidays.

H2488 - Additional $100 penalty for DWI to fund Victim Compensation Fund.

H2688 - Mandates driver ed. courses to include OWI info.

H5589 - Repeals provision requiring DWI violator to give name and location of establishment where alcohol was obtained.

Per Se: None.

Drinking Age: 20 yrs.

Dram Shop Law: Illegal to sell to intoxicated person. Case law supports 3rd party (dram shop) liability (138 §69).

Open Container Prohibition: $100-500 (adopted 1982).

Refusals to Submit:

90 days admin. lic. revoc. If hearing requested, revoc. not stayed.

Driving under DWI Revoc. License:

$200-500, mand. 7 days-2 yrs. jail.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	$100-1000,	Max. 2 days jail, 36 hrs. comm. svc.	Mand. 1 yr. lic. revoc.	
	OR 2 yrs. probation*, $100-1000,	Max. 2 days jail, 36 hrs. comm. svc.,	Mand. 30 days lic. revoc., 14 day residential treatment program,	Additional $200 assessment to support program.
2nd Offense w/in 6 yrs.s	$300-1000,	Mand. 7 days--2 yrs. jail, 36 hrs. comm. svc.	Mand. 1 yr. hard lic. revoc., 1 yr. restricted lic.	
	OR 2 yrs. probation* if never rec'd before, $300-1000,	Mand. 7 days-2 yrs. jail, 36 hrs. comm. svc.	Mand. 1 yr.. hard lic. revoc., 2 yrs. restricted lic., 14 day residential treatment program,	Additional $200 assessment.

Massachusetts, cont.

3rd Offense w/in 6 yrs.	$500-1000,	Mand. 60 days-2 yrs. jail, 36 hrs. comm. svc.,	Mand. 3 yrs. hard lic. revoc., 2 yrs. restricted lic.	
Homicide by M.V. - 1st Offense	Max. $5000,	1-10 yrs. jail,	10 yrs. lic. revoc.	
Homicide by M.V. - 2nd Offense	Max. $5000,	1-10 yrs. jail,	Permanent lic. revoc.	

* No probation available if death/serious injury occured.

Miscellaneous:

In all convictions, court shall obtain name and address of establishment where defendent was served alcohol prior to the violation.

MICHIGAN

1984 Legislation:
All still pending in Committee, on recess until September 11, 1984.
HB4397 - Assesses 1 pt. penalty for open container violation. Current law has 2 pt. penalty.

HB4443 - Assesses 3 pt. penalty for violations of open container law.

HB4472 - Adds mand. 48 hrs. jail or 80 days comm. svc. for 2nd offenders. Changes 1st refusals from *fine or jail to fine and jail.* Additional changes relating to minor drivers.

HB4681 - Technical change, court not required to authorize assessment, but if it does, it can designate person or agency to do assessment.

HB4717 - Allows Court probation department to do assessment.

HB5675 - *Youth Offender Legislation*; cannot drive with any BAC in system.

Per Se: .10
Drinking Age: 21 yrs.
Dram Shop Law: Yes, §18.993
Open Container Prohibition: Yes.

Refusals to Submit:
1st refusal: 6 mos. admin. lic. revoc.
2nd refusal: 1 yr. admin. lic. revoc.

Driving under Revoc. License:
1st Offense: Max. $100, or 3-90 days jail, registration plates confiscated. Double original lic. revoc.
2nd Offense: Max $500, 5 days-1 yr. jail, other provisions same as above.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense DWI .10	Misdemeanor, $100-500,	Max. 90 days jail. Max. 12 days comm. svc.	6 mos.-2 yrs. lic. revoc., restricted lic. avail.	Prosecution costs, pre-sentence assessment/ rehab.
2nd Offense w/in 7 yrs.	Max. $1000	And/or max. 1 yr. jail. Max. 12 days comm. svc.	Mand. lic revoc.	Pre-sentence assessment/ rehab.
3rd Offense w/in 10 yrs.	Felony,	Max. 12 days comm. svc.	Mand. lic. revoc.	Pre-sentencce assessment/ rehab.
1st Offense Operating While Impaired (.07-.09 BAC)	$300,	Max. 90 days jail. Max. 12 days comm. svc.	90 days-1 yr. lic. revoc.	Pre-sentencce assessment/ rehab.
2nd Offense w/in 7 yrs. of either OWI or .10	Max. $1000,	Max. 1 yr. jail. Max. 12 days comm. svc.	Mand. 6-18 mos. lic. revoc., including 60 day hard.	

Miscellaneous:
Statute provides for annual drunk driving audit to be prepared each year showing number of alcohol-related m.v. accidents, injuries, deaths, arrests made, lic. suspensions, convictions and penalties assessed.

MISSOURI

1984 Legislation:

S8608/681 - Prohibits imposition of administrative lic. revoc. if arrest was based upon roadblock/checkpoint stop in which there was no probable cause to stop.

HB1226 - Expands Crime Victims Compensation Fund to include DWI victims.

Per Se: .10 per se, administrative lic. revoc. at .13.
Drinking Age: 21 yrs.
Dram Shop Law: No specific law, although some case law to back up joint negligence of tavern owner and intoxicated person (Carver vs. Schafer (App. 1983) 647 SW.2d 570).
Open Container Prohibition: none

Refusals to Submit (administratively imposed):
1 yr. lic revocation.

Administrative License Revocation for .13 BAC:
Cannot be imposed if arrest occured at roadblock/checkpoint (new, see S860/681). May be credited against later criminal revocation.
1st Offense: 30 day hard lic. revoc., 60 day restricted lic. revoc., rehab.
2nd Offense: 1 yr. hard lic. revoc. and rehab.

Driving under Revoc. License:
Class A misdemeanor, $100, mandatory 48 hrs.-1 yr. jail or 10 days (40 hrs.) comm. svc.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense DWI (not necessarily .10)	Class B misdemeanor, $500,	Max. 6 mos. jail.	30 days lic. revoc.	All mandatory unless min. 2 yr. probation is given.
1st Offense w/.10 BAC	Class C misdemeanor, $300,	Max. 15 days jail.	No lic. revoc. stipulated.	
2nd Offense w/in 5 yrs.	Prior offender, Class A misdemeanor, $1000.	Mand. 48 hrs.-1 yr. jail or 10 days comm. svc. (40 hrs.)	Mand. 1 yr. lic. revoc.	
3rd Offense w/in 5 yrs.	Persistent offender, Class D felony, $5000,	1-5 yrs. jail, min. mand. 1/3 of jail term must be served.	Mand. 1 yr. lic. revoc.	

MONTANA

1984 Legislation:
None; did not meet.

Per Se: .10
Drinking Age: 19 yrs.
Dram Shop Law: No law, except illegal to sell to intoxicated person.
Open Container Prohibition: Yes.
Section 408 Grant: Received $363,265 Alcohol/Traffic Safety Grant (Basic and Supplemental).

Refusals to Submit (administratively imposed, refusal admissible as evidence):
1st refusal: 90 days hard lic. revoc.
2nd refusal: 1 yr. hard lic. revoc.

Driving under Revoc. License:
Misdemeanor, max. $500, 2 days-6 mos. jail. 2x/initial revoc. period.

DWI (below .10)	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	$100-500	Mand. 24 hrs.-60 days jail, unless judge feels imposition poses risk to defendents physical/mental well-being.	Mand. 6 mos. lic. revoc. Rehab.	
2nd Offense w/in 5 yrs	$300-500	Mand. 4 days (at least 48 hrs. consecutive)-6 mos. jail.	Mand. 1 yr. lic. revoc. Rehab.	
3rd Offense w/in 5 yrs	$500-1000	Mand 10 days (at least 48 hrs. consecutive)-1 yr. jail.	Mand. 1 yr. lic. revoc. Rehab.	
.10				
1st Offense	$100-500	Max. 10 days jail.	Mand. 6 mos. lic. revoc. Rehab.	
2nd Offense w/in 5 yrs.	$300-500	48 hrs.-30 days jail	Mand. 1 yr. lic. revoc. Rehab.	
3rd Offense w/in 5 yrs.	$500-1000	48 hrs.-6 mos. jail.	Mand. 1 yr. lic. revoc. Rehab.	

NEVADA

1984 Legislation:
None, did not meet.

Per Se: .10
Drinking Age: 21 yrs.
Dram Shop Law: None.
Open Container Prohibition: Partial; illegal to drink while driving.
Section 408 Grant: Received $273,488 Alcohol/Traffic Safety Grant (Basic and Supplemental).
PBTs: Allowed, not admissible as evidence.

Refusals to Submit:
1st refusal: 1 yr. lic. revoc.
2nd refusal: 3 yrs. lic. revoc.

Driving under Revoc. License:
Mand. $500-1000, mand 30 days-6 mos. jail does not have to be served consecutively. Double original lic. revoc.

Refusal to submit to PBT or if .10 BAC:
90 days admin. lic. revoc.

	Penalties*	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense w/in 7 yrs.	Misdemeanor, $200-1000,	2 days-6 mos. jail or 48 hrs. comm. svc. (dressed in manner to identify as violator of law),	90 days lic. revoc, 45 days hard.,	Education. OR probation, max. $200, 1 day jail or 24 hrs. comm. svc., 45 day lic revoc. Prosecutor has right to request hearing on probation.
2nd Offense w/in 7 yrs.	Misdemeanor, $500-1000,	10 days-6 mos. jail (at least 48 hrs. consecutive),	1 yr. hard lic. revoc.	OR probation, max. $500, 5 days jail (at least 48 hrs. consecutive), rehab., 6 mos. lic revoc. Prosecutor has right to request hearing on probation.
3rd Offense w/in 7 yrs., or if death/injury occured	$2000-5000,	1-6 yrs. jail (segregated from violent offenders),	3 yrs. hard lic. revoc.	

* all penalties minimum mandatory.

Miscellaneous:
Can require more than 1 BAC test. Failure to submit to either or both constitute failure.

NEW MEXICO

1984 Legislation:

HB67 (ch. 72) - Clarifies .10 per se law; adds administrative lic. revoc for .10. Prohibits work-restricted lic. for refusals and 2nd offenders. Administrative revocations and subsequent criminal revocation penalties to total maximum 1 yr. Prohibits refusals if great bodily injury occured. Youth offender legislation stipulates admin. lic. revoc. if less than 18 yrs old and BAC is .05.

HB75 (ch. 73) - Technical amendment appropriates funds for administrative revocation.

Per Se: .10
Drinking Age: 21 yrs.
Dram Shop Law: none
Open Container Prohibition: none
Section 408 Grant: Received $389,777 Alcohol/Traffic Safety Grant (Basic and Supplemental)

Refusals to Submit (administratively imposed):
1 yr. lic. revoc.

Administrative License Revocation (.10 for over 18 yr. olds, .05 for under 18 yr. olds):
1st Offense: 90 days for 18 yr. olds and older. 6 mos. if under 18 yrs.
2nd Offense: 1 yr. if under 18 yrs. old.
All administrative lic. revoc. penalties to run concurrently with any criminal revocation penalties, if so assessed (new, see HB67).

Driving Under Revoc. Lic.:
Misdemeanor, max. $500, 2 days-6 mos. jail, additional revocation.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	$300-500,	30-90 days jail,	Mand. 1 yr. lic. revoc, restricted lic. avail.	OR 90 days-3 yrs. probation.
2nd Offense	$1000.	Mand. 48 hrs.-1 yr. jail,	Mand. 1 yr. hard lic. revoc.	OR 1-5 yrs. probation and mand. 48 hrs. jail instead of fine.
Homicide or great bodily injury by m.v. while DUI	3rd degree felony,		1 yr. lic. revoc.	

SOUTH DAKOTA

1984 Legislation:
HB1026 - Raises drinking age for 3.2 beer from 18 yrs. to 19 yrs.

Per Se: .10
Drinking Age: 19 yrs. for 3.2 beer, 21 yrs. for everything else.
Dram Shop Law: No specific statute, except illegal to sell to intoxicated persons. Some case law to support liability of vendor under this statute.
Open Container Prohibition: Class 2 misdemeanor.

Refusals to Submit:
Administratively imposed but penalty can be canceled if plead guilty to criminal charges before revoc. order is issued. Refusal admissible into evidence. Work restricted lic available.
1 yr. lic. revoc.

Driving under Revoc. License:
Class 2 misdemeanor, $100 and/or 30 days jail.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	Class 1 misdemeanor, max. $1000	&/OR 1 yr. jail.	30 day-1 yr. lic. revoc., work-restricted lic. avail.	
2nd Offense w/in 5 yrs	Class 1 misdemeanor, max. $1000	&/OR 1 yr. jail.	Mand. 1 yr. hard lic. revoc.	
2nd Offense DWI & driving under revoked lic.		Mand. 3 days jail.		
3rd Offense w/in 5 yrs.	Class 6 felony, $2000	&/OR 2 yrs. jail.	Mand. 1 yr.-permanent hard lic. revoc.	
3rd Offense DWI & driving under revoked lic.		Mand. 10 days jail.		
Vehicular homicide (while DWII)	Class 4 felony, $10,000	&/OR 2 yrs. jail.		

Miscellaneous:
Prosecutor must state, or record, reasons for reducing or dismissing .10 BAC chargeable offense.

TEXAS

1984 Legislation:
None; did not meet.

Per Se: .10
Drinking Age: 19 yrs.
Dram Shop Law: No specific statute giving right of action against 3rd party. There is a statute prohibiting sales to intoxicated persons.
Open Container Prohibition: none.

Refusals to Submit:
Admissible as evidence. Administratively imposed although lic. revoc period would be credited against any criminal DWI conviction (would run concurrently, not separately).
90 day lic. revoc.

Driving under Revoc. License:
Misdemeanor, $25-500 and 72 hrs.-6 mos. jail.

If allow m.v. to be used by DWI revoc. lic. holder:
Class B. misdemeanor, max. $1000 adn 180 days jail.

Youth Offender Legislation:
Between 14-17 yrs. old, if caught DWI, misdemeanor, max. $100 fine.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	$100-2000.	72 hrs.-2 yrs. jail.	90-365 days lic. suspension	OR probation assessment (if county has funds) and rehab.
2nd Offense w/in 10 yrs.	$300-2000.	15 days-2 yrs. jail.	180 days lic. revoc.	OR probation and mand. 72 hrs. jail, and assessment (if county has funds) and rehab.
3rd Offense w/in 10 yrs.	$500-2000.	30 days-5 yrs. jail.	180 days-2 yrs. lic revoc.	OR probation, mand. 10 days jail and assessment (if county has funds) and rehab.
If bodily injury	Additional $500	AND additional 60 days jail.		OR probation, mand 30 days jail, assessment (if county has funds) and rehab.

Miscellaneous:
3 yr. insurance premium surcharge per DWI offense.
Mandates videotaping of DWI arrests in certain counties. Refusal to be videotaped is admissible as evidence.

WASHINGTON

1984 Legislation:

HB1582 -- $3 million appropriation to counties to help pay enforcement (primarily adjudication) of DWI. Needed because many cities are refusing to prosecute because of state Supreme Court case requiring speedy jury trials be offered to traffic infraction violators (DWI). The cases are being heard at county level instead.

SB4362 - Exempts vehicles for hire from open container law Illegal to mislabel alcohol container or add alcohol to non-alcoholic container while in m.v.

Per Se: .10
Drinking Age: 21 yrs.
Dram Shop Law: Illegal to sell to intoxicated person, but no clear 3rd party liability established.
Open Container Prohibition: Yes.

Refusals to Submit:
Criminal and admin. lic. revoc. penalties run concurrently; longer period to prevail.
1st refusal: 1 yr. admin. lic. revoc.
2nd refusal: 2 yrs. admin. lic. revoc.

Admin. Lic. Revoc. for .10:
Criminal and admin. lic. revoc. penalties run concurrently; longer period to prevail.
1st Offense: 90 days admin. lic. revoc.
2nd Offense w/in 5 yrs.: 1 yr. admin. lic. revoc.
3rd Offense w/in 5 yrs.: 2 yrs. admin. lic. revoc.

DWI and Driving under DWI/Revoc. License:
Mand. $200, mand. 90 days jail, diagnostic evaluation and rehab., additional 180 days-1 yr. jail if terms of sentence are violated.
Additional assessment of 25% of fine. Monies go to fund driver Alcohol Services Programs.

Youthful Offender Legislation:
If under 19 yrs. old and charges with DWI license suspended until 19th birthday, or for 90 days, whichever is longer.

	Penalties	Jail/CommSvc	LicRevoc/Rehab/Therapy	Other
1st Offense	Max. $750,	Mand. 24 hrs.-1 yr. jail, unless judge finds jail poses physical/mental risk.	60 days hard lic. revoc., 30 days restricted. Diagnostic evaluation and rehab.	
2nd Offense w/in 5 yrs.	Max. $1500,	Mand. 7 days-1 yr. jail, unless judge finds jail poses physical/mental risk.	1 yr. hard lic. revoc. Diagnostic evaluation and rehab.	Additional 180 days-1 yr. jail levied if terms of sentence are violated.
3rd Offense w/in 5 yrs.	Max. $1500,	Mand. 7 days-1 yr. jail, unless judge finds jail poses physical/mental risk.	2 yrs. hard lic. revoc. Diagnostic evaluation and rehab.	Additional 180 days-1 yr. jail levied if terms of sentence are violated.

APPENDIX I

Michigan Drunk Driving Task Force Recommendations

DIGEST OF RECOMMENDATIONS

The goal of the Michigan Drunk Driving Task Force is to save lives, to prevent injuries, and to reduce property damage and economic loss caused by drinking drivers on the highways of this state. In order to accomplish this ultimate goal, it is necessary to design and implement programs and procedures that will convince individuals that driving while intoxicated on the highways of this state is socially and legally unacceptable.

It is the intent of the Task Force to accomplish this goal in a reasonable and fair manner with programs and procedures that are the least intrusive as possible. How effective the Task Force is in achieving its goal will depend upon the level of public support which is given to its proposals.

After a careful study of the drunk driving problem, the Task Force, through the various subcommittees and ad hoc committees, generated a substantial number of recommendations to solve the various problems of drinking and driving. The following is a condensed list of those recommendations. A full discussion appears later in this report in the section entitled, FINDINGS AND RECOMMENDATIONS.

The Michigan Drunk Driving Task Force recommends that:

- Legislation be enacted so that license suspensions and revocations by the Department of State are not appealable to circuit court.
- Legislation be enacted to earmark fines collected from drinking and driving offenses to remedy the problem through highway safety programs.
- The number of forms required of the arresting officer for processing a drunk driver be reduced.
- The testing location and lodging location of drunk drivers be combined.
- The Law Enforcement Information Network (LEIN) printouts be admissible for court use.
- Additional personnel be provided in those prosecutors' offices, courts, and probation departments currently understaffed.
- Special schools in dealing with drunk driving cases be provided for prosecutors and judges.
- The prosecutors' compensation and office hours be increased to deal with the added workload due to increased arrests of drunk drivers. Merit increases should also be made available based on the prosecutor's ability to prosecute drunk driving cases, but the attorney should also be held accountable for cases reduced to a lesser offense.

- The sentence from a guilty plea at arraignment be identical to that imposed upon conviction at trial and that the length of sentence and points against the driving record remain and not bargained to a lesser charge.
- Legislation be enacted to earmark funds realized by a probation department from screening and assessment for use to hire and train additional probation officers.
- Those courts requiring strict adherence to the res gestae witness rule relax the requirement to allow the prosecutor's case to proceed.
- Law enforcement agencies consider the use of the horizontal gaze nystagmus test, walk-and-turn, and the one-leg stand as part of their roadside sobriety testing.
- Local communities utilize the model community service program developed by the Task Force for developing their local programs.
- The contract agreement between Wayne County and the Volunteers of America be utilized as a model for Alternative Detention Facilities by local communities.
- Long-term coordinated public education campaigns regarding enforcement and general deterrent measures be developed.
- The Department of State, District Judges Association, and the District Court Administrators Office establish a uniform policy of reporting jail time.
- The Department of State institute a new series of codes for use on the abstract of conviction which would distinguish convictions under the various penalty levels.
- A long-term strategy for implementation of a comprehensive public information and education plan be developed.
- A reporting system be established to assure that offenders assigned to education and treatment services comply with the assignments.
- The glossary developed by the Task Force be the basis to standardize the language used by various agencies on alcohol and drug abuse.
- The Holmes Youthful Trainee Act be amended to exclude OUIL (Operating a Vehicle While Under the Influence of Liquor) violations.
- Strict enforcement of the mandatory seat belt law.
- Legislation be enacted to allow the admissibility into evidence of the refusal of a breath test.

- The Motor Vehicle Code be amended to redefine "operator" to include a person arrested for intoxication while asleep in a stationary vehicle with the motor running.
- Any reform tending to limit the bar owner's liability should include mandatory liability insurance to all bar owners.
- A study be conducted on the concept of administrative per se driver license sanctions and its deterrent affect on drunk drivers.
- Legislation be enacted to mandate central reporting of drunk driving offenses at each phase from arrest to disposition.
- Legislation be adopted to meet the requirements of the federal Section 408 Alcohol Highway Safety Fund.
- A uniform health education curriculum be developed and implemented for grades kindergarten through twelve including the effects of alcohol and other drugs on driving.
- Funding be provided for drunk and drugged driving programs and for the development and promotion of those type of activities and campaigns.
- Schools be encouraged to promote programs on the abuse of alcohol and other drugs as they relate to traffic safety.
- A greater emphasis be placed on drug abuse as it relates to traffic safety in the Michigan Model for Comprehensive School Health Education.
- Adequate funding be provided for a driver education curriculum and to expand the training on alcohol and other drugs as they relate to traffic safety.
- Curriculum assistance and professional development be provided to driver education teachers, the curriculum to be collaborated by the joint efforts of the Office of Substance Abuse Services, Office of Highway Safety Planning, and the Department of Education.
- The training program for judges as developed by the Michigan Judicial Institute be continually available.
- Temporary sobriety checklanes be implemented on a trial basis.
- Quarterly meetings of the Office of Substance Abuse Services, Michigan District Judges' Association, and Michigan Association of Probationary Services be continued to evaluate screening and assessment processes.
- A full-time staff be employed and maintained to carry out the recommendations of the Task Force.
- Standards for alcohol highway safety education programs be implemented for those involved in alcohol and other drug offenses while operating motor vehicles on public highways.

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