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<p>16. Abstract Traffic crashes and crime both exact an immense toll from their victims and society through injury, loss of life, and property damage and loss. Considerable resources are expended to reduce the economic and social consequences of both crashes and crime. Informed decisions about the allocation of increasingly scarce resources require accurate information about the magnitude of these problems--not only their incidence, but also an estimation of their costs to society. The goal of this study is to identify the economic impact of traffic crashes and selected crimes.</p> <p>Traffic crash and selected index crime incidence data from the calendar year 1988 were obtained from the Michigan State Police and were subset by county. Costs for crashes and index crimes were generated by leading experts in the fields of economics of crime and traffic crashes. These cost estimates were applied to incidence data to create statewide and county specific costs for crashes and index crimes.</p> <p>Cost estimates for traffic crashes and index crimes underscore the magnitude of these problems for the State of Michigan. In 1988, traffic crashes in Michigan resulted in \$2.3 billion in direct costs and \$7.1 billion in total costs (using the willingness-to-pay approach). Index crimes resulted in \$0.8 billion in direct costs and \$2.4 billion in total costs. The distribution of traffic crash and index crime incidents and costs by type of crime and crash outcome varied across counties within the state.</p> <p>Incidence and cost data allow decision makers to study the unique experience of traffic crashes and index crimes in their own communities and to identify crash and crime outcomes which pose particular problems in terms of both incidence and cost. Such data, used in combination with information about the political environment, current resource allocation patterns, and potential benefits of program interventions can facilitate program and policy development in each problem area.</p>					
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## Introduction and Background

At first glance, motor vehicle crashes and crime appear to represent quite different societal problems. They are, however, similar in several important ways. Crashes and crime both exact an immense toll from their victims and society through injury and loss of life, as well as property damage and loss. Thus, both represent major threats to the health and safety of the public. Considerable resources are expended to reduce the economic and social burdens imposed on society by both crashes and crime. Informed decisions about the allocation of increasingly scarce resources to address the problems of traffic crashes and crime require accurate information about the magnitude of these problems--not only their incidence, but also an estimation of their costs to society.

There is considerable debate about how societal costs should be derived and used. Luchter, Faigin, Cohen, and Lombardo (1989) conducted an extensive review of the status of costs-of-injury research in the United States, particularly research associated with motor vehicle crashes. They suggest that the human capital method, which measures the cost of resources used or lost as the result of an injury, is the most accurate method to estimate societal costs resulting from injuries in monetary terms. However, they caution that the human capital method fails to identify the total societal impact of injuries, including pain and suffering, and does not fully capture costs from the individual's perspective.

The willingness-to-pay approach attempts to estimate the *value* of lives lost or injuries sustained rather than the *costs* of injury. The estimation of individuals' willingness to pay (or individuals' willingness to receive compensation) for small changes in their probability of survival encompasses all aspects of individual well-being, including the value of pain and suffering. Several studies reviewed by Luchter et al. suggest there is consensus among economists that the willingness-to-pay approach is conceptually the most appropriate method for establishing the value of life in benefit-cost analyses.

Luchter et al. present the latest cost estimates for a motor vehicle fatality as being \$400,000 using the human capital method and \$2 million using the willingness-to-pay method. While the authors note the shortcomings of both the human capital and willingness-to-pay methods in fully capturing societal impact of injuries, they emphasize the need for a measure that addresses not only the direct economic costs, but also the social and emotional consequences of injury.

The literature on costs of traffic crashes and crime also indicates a need to look beyond direct monetary costs in evaluating fatality reduction countermeasures and making resource allocation decisions. The Federal Highway Administration initiated research in 1982 to review approaches to estimating motor vehicle crash costs to facilitate highway safety resource allocation decisions. Miller, Reinert, and Whiting (1984) conclude that although "estimates of willingness to pay for life and safety would be theoretically superior to human capital costs for use in benefit-cost analyses...(available) empirical studies of willingness to pay offer widely divergent value-of-life estimates, and most are based on questionable data, assumptions, or estimation procedures" (p. i). Kragh, Miller, and Reinert (1986), building on this earlier research, recommended that willingness-to-pay values of \$1.1 million for the value of a life and \$1.3 million for the cost of a fatal crash be used in benefit-cost decisions. They state that these numbers, while conservative for current economic thought, are in line with the value of a life of \$2 million used by the U.S. Office of Management and Budget and the U.S. Occupational Safety and Health Administration.

In a recent update of the willingness-to-pay approach, Miller, Luchter, and Brinkman (1989) advance the concept of rational investment levels as a basis for benefit-cost analysis of highway safety issues. Rational investment levels for enhancing safety and health refer to estimated values derived from how people behave or say they would behave in risky situations. A major strength of these values is their explicit inclusion of non-monetary crash consequences and transfer payments. The authors point out that such values have been used in every federal regulatory analysis since 1986 that monetized the benefits of saving lives. Thus, these values are consistent with universal federal practice in benefit-cost analysis. Miller et al. identify the appropriate value per life saved for use in resource allocation and benefit-cost efforts to be

approximately \$2 million, a figure considerably larger than those based solely on economic costs.

Federal regulatory agencies were directed by the Office of Management and Budget to consider using willingness-to-pay values in benefit-cost analyses to monetize potential benefits of proposed regulatory changes (Office of Management and Budget, 1988). States have also been encouraged to use crash costs based on the willingness-to-pay approach for economic analyses of highway projects and programs (Federal Highway Administration, 1988). Many analyses, however, inappropriately base investment decisions on the economic costs of crashes to society, misusing cost estimates from the National Safety Council and the National Highway Traffic Safety Administration. The National Safety Council cautions against misuse of its \$290,000 cost estimate of a motor vehicle fatality, stating that its cost figures "are appropriate for measuring the economic loss to a community resulting from past motor vehicle accidents. They should not be used, however, in computing the dollar value of future benefits due to traffic safety measures because they do not include the value of a person's natural desire to live longer or protect the quality of one's life. That is, the economic loss estimates do not include what people are willing to pay for improved safety" (p. 71; National Safety Council, 1989). The Council recommends that estimates of injury costs based on the willingness-to-pay concept be used for benefit-cost analyses wherever feasible.

The National Highway Traffic Safety Administration has used a strict interpretation of the human capital approach to determine the costs of injuries resulting from motor vehicle crashes. Their reluctance to use the willingness-to-pay method stems from the belief that the value of a human life cannot be measured in monetary terms (Luchter, 1986). Landefeld and Seskin (1982), however, present an opposing view. They argue that "while some claim that the value of human life cannot be expressed in monetary terms, the competing demands on scarce public funds require that some value be placed on programs that save lives. Refusal to place an explicit value on life merely forces implicit valuations that are made as part of decisions to fund or not to fund public projects as well as decisions to take other regulatory actions" (p. 555). They report that willingness-to-pay is considered by most economists to be the conceptually correct method to value risks to human life in cost benefit analyses, although controversy continues on the appropriate technique for actually producing these estimates for valuing risks to life. They

propose using the human capital approach, reformulated using a willingness-to-pay criterion, to estimate values for use in benefit-cost analyses of policies affecting risks to life.

In a report to Congress evaluating the impact of injury and associated disability in the United States, Rice, MacKenzie and Associates (1989) make use of both the human capital and willingness-to-pay approaches as well as case studies of the long-term impact of injury. Total lifetime costs of injury were estimated based on the human capital method. The authors note that these costs do not take into account the cost associated with pain, suffering, and reduced quality of life. They suggest that, based on the willingness-to-pay value of \$2 million to avoid death, the American public would be willing to pay considerably more than the total estimated lifetime cost of injury to eliminate all fatal and nonfatal injuries. The authors emphasize that the two approaches, rather than representing alternative methodologies for valuing human life, are conceptually different approaches that capture different aspects of the value of life and are therefore useful for different purposes. The human capital concept assumes a social perspective and employs data that are reliable and readily available. It is a useful approach for answering questions about the economic burden of a disease for a specific time period or for determining the savings of a specific procedure or intervention program. The willingness-to-pay approach assumes an individual perspective and encompasses all aspects of well-being. Its central criticism, the authors contend, is that it requires substantial development prior to implementation, thereby limiting efforts to apply it.

Efforts to measure costs of crime in the United States have been limited by a lack of information about the impact of crime and have generally focused on actual out-of-pocket costs, ignoring consequences such as pain, suffering, and fear experienced by crime victims. An early attempt to measure the economic impact of crime resulted in estimates of total expenditures and foregone production for a number of crime categories (Wickersham Commission, 1931). However, the Commission noted a lack of knowledge about the economic consequences of crime and costs of the criminal justice system. Over thirty years later, the President's Commission on Law Enforcement and Administration of Justice (1967), in estimating monetary losses for a number of crime categories, raised similar concerns about the need for better cost information. In response to this need, the Bureau of Justice Statistics in 1973 began including a series of questions about the economic costs of crime (including medical expenses, property damage, and



theft of property and cash) in the National Crime Survey, an interview survey of 60,000 households throughout the United States. The economic cost estimates derived from the survey focus on those direct, quantifiable costs that victims incur within six months of a crime and do not include costs such as pain, suffering, or emotional trauma that victims cannot quantify (Shenk and Klaus, 1984). For example, numerous cost estimates used in assessing victim compensation programs are derived solely from National Crime Survey findings and necessarily exclude non-monetary costs (Garofalo and Sutton, 1977; Harland, 1980; Jones, 1979).

Phillips and Votey (1981) indirectly estimated monetary costs of individual crimes by assigning dollar values to survey-based rankings of crime seriousness. They used independent observations on crime costs for specific offenses to estimate the relationship between dollars and the seriousness rankings. However, most of the cost estimates came from the President's Commission on Law Enforcement and Administration of Justice (1967) and therefore reflect only actual out-of-pocket losses. McPheters (1979) used income and life expectancy figures from the general national population to estimate human capital costs associated with homicides in the Phoenix metropolitan area. However, he cautions that the human capital characteristics of homicide victims may differ from the general national population. He also stresses that his approach ignores a number of economic costs associated with homicides. Zedlewski (1987) estimated the average societal cost of a crime by summing all published expenditures on crime (including victim losses, criminal justice expenditures, and expenditures for crime protection) and dividing that sum by the number of estimated crimes. This method results in an estimate of \$2,300 per crime (1983 dollars) but does not permit determination of crime-specific costs and ignores costs such as pain, suffering, and fear of victims (although to some extent expenditures for crime protection serve as a proxy for fear related costs).

Although some attempts have been made to address the costs of pain, suffering, and fear resulting from crime, they have typically resulted in estimates of the aggregate cost of crime rather than losses from individual offenses. Efforts to estimate society's willingness-to-pay for reduced crime rates through examination of real estate property values, for example, take into account costs such as fear but have not produced crime specific cost estimates (Naroff, Hellman, and Skinner, 1980; Thaler, 1978). An approach which does yield crime-specific cost estimates, while also addressing other costs, was recently developed by Cohen (1987, 1988a, 1988b).

Cohen's work represents the first systematic attempt to estimate the monetary cost of pain, suffering, and fear caused by individual crimes. He estimated the cost of individual crimes by examining not only direct monetary or out-of-pocket costs, but also the pain, suffering, and fear endured by crime victims as well as their risk of death. Monetary values for pain, suffering, and fear were estimated by combining actual victim injury rates with jury awards in personal injury accident cases. Monetary values for risk of death were estimated by combining crime-related death rates with estimates of the value of life. Cohen's estimates are based on two approaches: (1) the willingness-to-pay approach discussed earlier and (2) the compensation approach (sometimes called willingness-to-accept approach). The compensation approach estimates the amount of money required to fully compensate a victim for his or her loss. Specifically, Cohen's value of life estimates are based on the willingness-to-pay approach while his pain, suffering, and fear estimates are based on the compensation approach. Both approaches seek to account for pain, suffering, and fear in monetary terms, although the willingness-to-pay approach generally yields somewhat lower values. Cohen emphasizes that the real utility of his estimates is not simply to reinforce the seriousness of the crime problem. His estimates represent a fuller accounting of the costs of crime, thus they have important policy applications. In particular, they enhance the process of benefit-cost analysis of programs and policies related to crime.

The review of the literature on traffic crashes and crime points to the need to understand the full economic impact of both crashes and crime on society before making decisions about how scarce financial resources should be allocated to alleviate these problems. To fully capture the consequences of crashes and crime, cost estimates must go beyond direct monetary costs. Both the willingness-to-pay and compensation approaches produce cost estimates that address direct monetary costs as well as other individual and societal consequences of traffic crashes and crimes. Despite their shortcomings, they allow us to explicitly value human life rather than accept implicit valuations. The use of estimates from willingness-to-pay and compensation approaches facilitates more rational decision-making processes.

## Methods

The goal of this study is to identify the economic impact of two societal problems: traffic crashes and index crimes. Index crimes serve as indicators of a state's crime experience and include murder, rape, robbery, aggravated assault, burglary, larceny, motor vehicle theft, and arson. In brief, selected traffic crash and index crime incidence data were obtained from the Michigan State Police and were subset by county. Costs for crashes and index crimes were generated by leading experts in the fields of economics of crime and traffic crashes. These cost estimates were applied to incidence data to create statewide and county specific costs for crashes and index crimes. Charts describing the relative costs of traffic crashes and index crimes as well as crash and index crime incidence frequencies were generated.

### Data Collection

Data on motor vehicle crashes in Michigan were obtained from the Michigan State Police. Records were obtained for all crashes reported to local or state police agencies in 1988. Injury severity data are coded in Michigan crash reports using the "KABCO" injury severity scale. K-level injuries are injuries caused by the crash that result in death within 90 days of the incident. A-level injuries are incapacitating injuries which prevent injured persons from walking, driving, or normally continuing activities they were capable of performing prior to the injury. B-level injuries include nonincapacitating injuries that are evident to observers at the scene of the crash in which the injury occurred. C-level injuries are possible injuries reported or claimed which are not fatal, incapacitating, or nonincapacitating evident injuries. O-level refers to incidents in which no occupants were injured (property damage only; National Safety Council, 1984).

Data on index crimes (those involving murder, rape, robbery, aggravated assault, burglary, larceny, and motor vehicle theft) for 1988 were obtained from Michigan's Uniform Crime Reporting (UCR) program, operated by the Michigan State Police. The index crime of arson was excluded from our analyses because this crime is often intentionally committed against one's own property, complicating societal cost estimation. Descriptions of the index crimes analyzed are presented in Table 1.

**Table 1**  
**Description of Index Crimes**

Murder	The willful killing of one human being by another. Suicides, accidental deaths, assaults to murder, and attempted murders, and justifiable homicide are not counted in this classification.
Rape	The carnal knowledge of a person, forcibly and against that person's will; or where the victim is incapable of giving consent because of his or her temporary or permanent mental or physical incapacity. Assault to rape and attempted rape are included in this classification. Other types of sexual penetration are not.
Robbery	The taking or attempting to take anything of value from the care, custody, or control of a person or persons by force or threat of force or violence and/or putting the victim in fear.
Aggravated assault	An unlawful attack by one person upon another for the purpose of inflicting severe or aggravated bodily injury. This type of assault is usually accompanied by use of a weapon or by means likely to produce death or great bodily harm.
Burglary	The unlawful entry of a structure to commit a felony or a theft. Breaking and entering into motor vehicles is not included within this classification.
Larceny	The unlawful taking, carrying, leading, or riding away of property from the possession or constructive possession of another.
Motor vehicle theft	The theft or attempted theft of a self-propelled vehicle that runs on land and not on rails. Joyriding is included in this classification.

Source: Michigan Department of State Police, 1989

Underreporting of traffic crashes and index crimes is a serious problem which affects estimation of costs associated with crashes and index crimes and valuation of programs intended to address them. Unfortunately, because available measures of traffic crashes and index crimes are less than perfect, it is nearly impossible to assign meaningful numeric values to underreporting to estimate the actual incidence of crashes and index crimes. Therefore, in developing our cost estimates, we include only traffic crashes and index crimes reported to police agencies. Research evidence suggests that rates of underreporting for traffic crashes and index crimes are similar.

Hauer and Hakkert (1988) reviewed 18 studies of underreporting of traffic crashes. They found that while estimates of underreporting differ widely, crashes involving injury are more likely to be reported than property damage only crashes and reporting increases as the seriousness of the injury increases. Other factors found to affect reporting include age of victim, role of the victim (i.e., driver, passenger, nonoccupant), and number of vehicles involved. The authors conclude from these studies that police records underestimate injuries that require hospitalization by about 20%, and underestimate injuries that do not require hospitalization by up to 50%.

The Bureau of Justice Statistics, comparing police reported data with data from the National Crime Survey, found the likelihood of reporting a crime to police is strongly related to the seriousness of the crime (Harlow, 1985). This held true for a variety of crime types and circumstances (i.e., violent crimes, household crimes, crimes of personal theft, attempted crimes, completed crimes, existence and degree of injury, amount of loss, or personal confrontation with the offender). According to Harlow's study, about 75% of robberies and assaults resulting in serious injury were reported to police, but a smaller proportion of such crimes resulting in minor injuries were reported. Crimes in which the economic loss was \$250 or more were twice as likely to be reported to police than crimes with no loss. Almost 75% of crimes involving an economic loss of \$250 or more were reported to police.

Underreporting makes it impossible to ascertain the totality of incidents of traffic crashes and index crimes, and thus leads to an underestimate of the totality of costs associated with both crashes and index crimes. However, police report data do capture those incidents with the greatest potential impact on costs. The probability that victims will report traffic crash and index crime incidents increases as the economic and injury consequences of those incidents increases. Through this self-selection process, incidents which are not reported are most likely to be those with limited impact on the victim and one could therefore conclude, society.

## Estimation of Costs for Traffic Crashes and Index Crimes

In estimating costs of traffic crashes and index crimes, we focus on those costs generated *directly* by traffic crash or index crime incidents. We do not include those costs associated with society's response to crashes or crime (i.e., those costs society incurs in its attempt to deter or prevent future incidents). The rationale for excluding these latter costs is detailed in the Discussion. Costs generated directly by traffic crashes and index crimes are broken down into two categories in this study: (1) direct costs and (2) quality-of life (or pain and suffering) costs. Direct costs (as defined for the purpose of this study) include direct losses in property damaged or stolen, direct medical costs including physician, hospital, prescription drugs, etc., mental health expenditures, cost of ambulance service, cost of police emergency response and follow-up investigation, administrative costs associated with insurance, as well as productivity losses (lost workday and value of household production) due to injury, administrative and legal process, and repairing broken property.

Quality-of-life costs were estimated using two strategies: (1) Miller's willingness-to-pay approach, and (2) Cohen's jury award (compensation) approach (each of which are described in greater detail in the Introduction and Background). Both of these cost estimation strategies were used because they are each best for estimating costs for which they were originally developed. Miller originally used his approach to estimate costs of traffic crashes, while Cohen's approach was developed to estimate costs of crime. Applying both cost approaches to traffic crash and index crime incidence allows us to generate a range of costs for both crashes and index crimes. Additional detail on the estimation of costs of traffic crash and index crime incidence can be found in Cohen and Miller (1990) and Cohen (1990).

One possible consequence of crime is that the victim will be killed. Although the criminal responsible for the victim's death may eventually be charged with a homicide, Cohen (1987) recommended apportioning these deaths and associated costs to the precipitant crime. We have done this in our analysis. For example, if a homicide occurred in the commission of a

robbery, the costs associated with that homicide are included in the costs for robbery. Apportioning deaths and their associated costs to precipitant index crimes provides a clearer understanding of the context in which the deaths occurred and their impact on society.

We applied costs for productivity loss and quality-of-life loss to precipitant index crimes in accordance with the estimated risk of death associated with each precipitant index crime. Risk of death was calculated as the number of index crimes of a specific type involving a homicide divided by the total number of crimes of that specific type (i.e., homicides per index crime). Productivity and quality-of-life costs associated with a homicide were multiplied by the risk-of-death figure for each crime to produce a cost estimate for the risk of death for each crime. Homicide incidents were added to the frequency calculated for the appropriate precipitating index crime. Homicides which occurred during a nonindex crime were assigned as aggravated assaults. Homicides in which the precipitating crime was unknown were distributed among index crime categories based on the distribution of homicides with known precipitating crimes. Table 2 describes the cost estimates for index crime incidence. Table 3 describes cost estimates for traffic crash incidence.

**Table 2**  
**Costs of Index Crimes (Per Incident)**

<u>Crime</u>	<u>Direct Costs<sup>1</sup></u>	<u>Quality-of-life Costs</u>		<u>Total Costs</u>	
		<u>Compensation Approach</u>	<u>Willingness to pay</u>	<u>Compensation Approach</u>	<u>Willingness to pay</u>
Rape	\$7,002	\$47,676	\$34,608	\$54,678	\$41,610
Robbery	2,931	15,185	11,830	18,116	14,761
Aggravated assault	5,255	31,066	26,757	36,321	32,012
Burglary	1,265	92	92	1,357	1,357
Larceny	309	0	0	309	309
Motor-vehicle theft	4,354	48	48	4,402	4,402

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<sup>1</sup>Direct costs include property loss and damage, direct medical and mental health costs, ambulance and police services, insurance administrative costs, as well as productivity loss.

**Table 3**  
**Costs of Traffic Crashes (Per Incident)**

<u>Injury Severity</u>	<u>Direct Costs</u> <sup>2</sup>	<u>Quality-of-life Costs</u>		<u>Total Costs</u>	
		<u>Compensation Approach</u>	<u>Willingness to pay</u>	<u>Compensation Approach</u>	<u>Willingness to pay</u>
Fatal	\$426,272	\$1,602,710	\$1,602,710	\$2,028,982	\$2,028,982
A-level	16,251	80,988	51,032	97,239	67,283
B-Level	4,177	15,232	9,598	19,409	13,775
C-level	2,761	6,776	4,270	9,537	7,031
Property damage only	1,415	360	227	1,775	1,642

### Data Analysis

Costs for traffic crashes and index crimes were applied to incidence data for each county and for Michigan as a whole. Because the compensation and willingness-to-pay approaches to cost estimation apply only to the quality-of-life (or pain and suffering) cost estimates, direct costs for both approaches were identical. Quality-of-life costs were estimated using both the compensation and willingness-to-pay approaches described earlier. Total incidence frequencies for each index crime were multiplied by appropriate cost figures to generate costs for each index crime category, then summed to generate the direct and total costs for index crimes. Frequencies for traffic crash outcomes were generated based on the number of occupants killed or injured (KABC) as well as the number of vehicles involved in crashes in which no occupants were injured (property damage only). These frequencies were multiplied by appropriate cost figures to generate costs for each crash outcome category, then summed to generate the direct and total costs for traffic crashes.

Charts were developed for each county and the state which present frequencies and proportions of traffic crashes and index crimes by crash outcome and crime category. Charts were also developed for each county and the state to depict costs of traffic crashes and index

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<sup>2</sup>Direct costs include property loss and damage, direct medical and mental health costs, emergency services, administrative costs, as well as productivity loss.



crimes by outcome or category (rounded to the nearest \$1,000). Cost estimates depicted in these charts were based only on the willingness-to-pay approach. This was done for the following reasons. First, given the multitude of counties for which cost estimates were derived, it made sense to present only one set of cost estimates for the ease of the reader. Second, the two approaches yielded identical or nearly identical estimates for three index crimes whose costs were largely comprised of direct costs (burglary, larceny, and motor vehicle theft). For the remaining index crimes (rape, robbery, and aggravated assault), the willingness-to-pay approach consistently yielded cost estimates that were lower than the compensation approach and therefore results in a more conservative estimate of the magnitude of the problems of traffic crashes and index crimes.



## Results

### Costs Associated with Index Crimes

Table 4 presents direct and total costs for index crimes for the State of Michigan using both the willingness-to-pay and compensation approaches. Cost estimates contained in the table confirm that index crimes pose a serious problem for the state as measured by societal costs. In 1988, index crimes resulted in \$853 million in direct costs and \$2.4 billion in total costs (based on the willingness-to-pay approach). Total costs for index crimes based on the compensation approach were \$2.7 billion.

**Table 4**  
**Costs of Index Crimes for the State of Michigan**

<u>Source</u>	<u>Direct Costs</u> <sup>3</sup>	<u>Quality-of-life Costs</u>		<u>Total Costs</u>	
		<u>Compensation Approach</u>	<u>Willingness to pay</u>	<u>Compensation Approach</u>	<u>Willingness to pay</u>
Index crimes	\$852,849,000	\$1,876,456,000	\$1,549,277,000	\$2,729,306,000	\$2,402,127,000

Information about index crime incidence and costs (based on the willingness-to-pay approach) for the state and for each of Michigan's 83 counties is contained in charts in the Appendix. Several interesting observations can be made. Larceny and burglary together comprised nearly three-quarters or more of all index crime incidents (excluding arson) within the state overall and within each county in 1988. However, proportions of larceny and burglary incidents varied across counties. Proportions of remaining index crime incidents also varied across counties, although rape and robbery generally accounted for the smallest proportions of total index crime. Wayne County's index crime profile is distinctive because the relative contributions of motor vehicle theft and robbery to total index crime were greater than in most

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<sup>3</sup>Direct costs include property loss and damage, direct medical and mental health costs, emergency services, administrative costs, as well as productivity loss.

other counties. Because Wayne County accounts for a large proportion of all index crimes in Michigan, its index crime profile has a sizable affect on the profile of the state overall.

Cost distributions for index crimes differed markedly from their corresponding incidence distributions. Aggravated assault and rape incidents contributed disproportionately to total index crime costs. For example, in the state overall, aggravated assault comprised less than ten percent of total index crime incidents but over half of all index crime costs. Rape comprised only one percent of index crime incidents but over ten percent of index crime costs. Because of the disproportionate effect of certain index crime incidents on costs, a seemingly small change from one county to the next in the distribution of incidents by type had a considerable effect on the distribution of costs by type.

### Costs Associated with Traffic Crashes

Direct and total costs for traffic crashes for the State of Michigan using both the willingness-to-pay and compensation approaches are presented in Table 5. In 1988, traffic crashes in Michigan resulted in \$2.3 billion in direct costs and \$7.1 billion in total costs (based on the willingness-to-pay approach). Total costs for traffic crashes based on the compensation approach were \$8.4 billion.

**Table 5**  
**Costs of Traffic Crashes for the State of Michigan**

<u>Source</u>	<u>Direct Costs</u> <sup>4</sup>	<u>Quality-of-life Costs</u>		<u>Total Costs</u>	
		<u>Compensation Approach</u>	<u>Willingness to pay</u>	<u>Compensation Approach</u>	<u>Willingness to pay</u>
Traffic crashes	\$2,332,071,000	\$6,030,574,000	\$4,810,249,000	\$8,362,645,000	\$7,142,319,000

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<sup>4</sup>Direct costs include property loss and damage, direct medical and mental health costs, emergency services, administrative costs, as well as productivity loss.

Charts in the Appendix contain information about traffic crash incidence and costs (based on the willingness-to-pay approach) for the state and for each county. Property-damage-only incidents accounted for fully three-quarters or more of all crash outcomes within the state overall and within each county in 1988. Proportions of crash outcomes involving injury were fairly consistent across counties. The more serious the outcome, the smaller its contribution to overall crash incidence. Fatal incidents comprised no more than a few percent of total crash incidents in any county.

There were striking differences between traffic crash costs distributions and their corresponding incidence distributions. Fatal injuries, which accounted for only a few percent of crash outcomes, comprised nearly half or more of all crash costs. Property-damage-only incidents generally accounted for over three quarters of all crash outcomes but were responsible for only about one-eighth or less of crash costs.



## Discussion

Our findings underscore the magnitude of the problems of traffic crashes and index crime for the State of Michigan. More importantly, incidence and cost data contained in this report provide an important tool for decision making. These data enable decision makers to study the unique experiences of traffic crashes and index crimes in their own communities and to identify crash and crime outcomes which pose particular problems in terms of both incidence and cost. This information can be utilized in combination with information about the political environment, current resource allocation patterns, and potential benefits of program interventions to facilitate program and policy development in each problem area. Thus, cost data, while not the sole determinant of policy, are an appropriate contribution to the decision making process.

As an example of how program, policy, and resource allocation decisions in the area of traffic safety can be enhanced by a better understanding of how different crash outcomes contribute to the total crash problem, we can look at incidence and cost data for Alcona County. In 1988, fatal injuries accounted for over half of all crash costs. At first glance a decision maker might consider focussing primarily on prevention of fatal crashes to reduce the overall crash toll in this county. However, the actual number of fatal incidents in 1988 was small (3), making it difficult to target efforts to prevent future fatal crashes. Such efforts could prove to be very costly. Programs targeted to other crash outcomes might prove to be more effective in the long run, depending on their costs and potential outcomes.

In addition to enhancing internal decision making, incidence and cost data can assist decision makers in responding to the broader environment in which they function. For example, such data are useful in informing city-boards, county commissions, the state legislature, and other governmental bodies about county specific program and financial needs.

The costs estimates identified in this analysis are not intended to represent the totality of costs of traffic crashes or crime to society. First, the crime component of our analysis is limited to index crimes other than arson. We know that nonindex crimes such as fraud, embezzlement,

gambling, prostitution, and offenses against family and children also impose a heavy burden on society. While some of these crimes, such as gambling and prostitution, are arguably considered victimless crimes, others, such as child abuse, have lifetime consequences for their victims and society that are extremely difficult to measure.

Second, our analysis is limited to costs generated directly by traffic crashes and index crimes. We have not included those costs associated with society's response to crashes or crime (i.e., those costs society incurs in its attempt to deter or prevent future incidents). Our cost data are best used to assist decision making about programs that are likely to have limited impact on crashes and crime. No single program or set of programs is likely to wholly eliminate crimes or crashes. While the programs can reduce the public's fears associated with these issues, some level of fear will always remain. Therefore, the costs most affected by such programs will be those associated with the direct consequences of crashes and crime. We recognize that the costs of society's response to both crashes and crime are considerable. While costs associated with efforts to prevent crime (e.g., deterrence, incapacitation, and rehabilitation of offenders and preventive measures by potential victims) are perhaps more visible, preventive costs associated with traffic crashes (e.g., special traffic enforcement, increased vehicle safety standards, and automated safety features such as antilock brakes) are also substantial.

The cost estimates contained in this report are intended to assist decision makers confronting the problems of traffic crashes and index crimes in their communities. Used in combination with other necessary and valuable information, these cost estimates contribute to a more rational decision making process.



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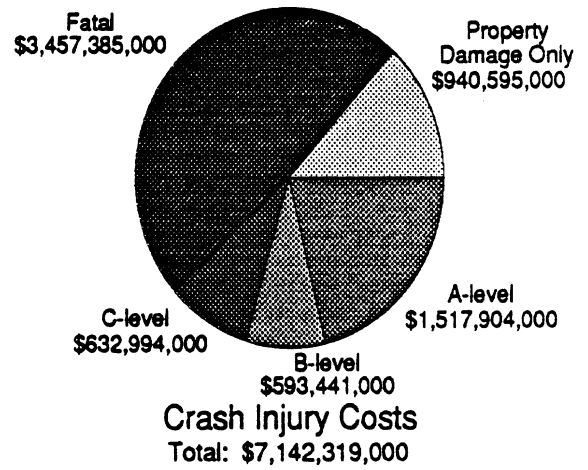
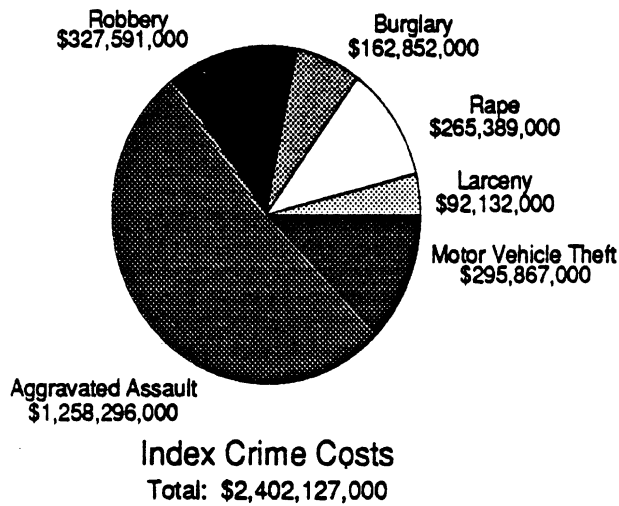
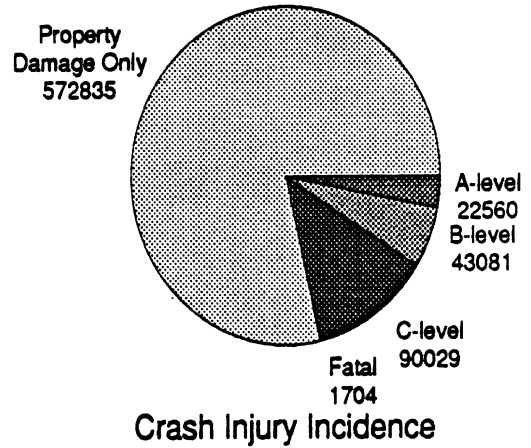
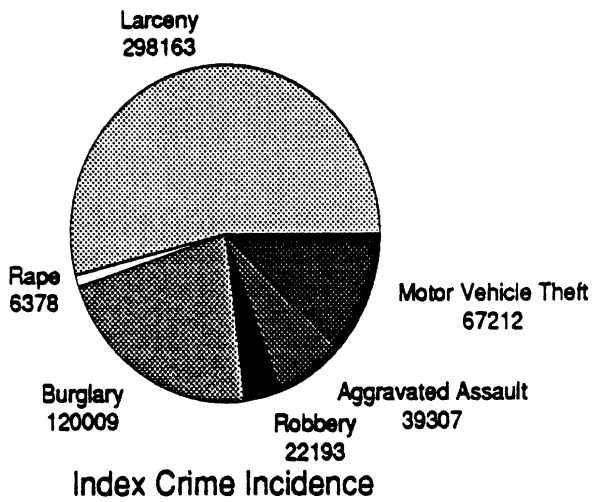
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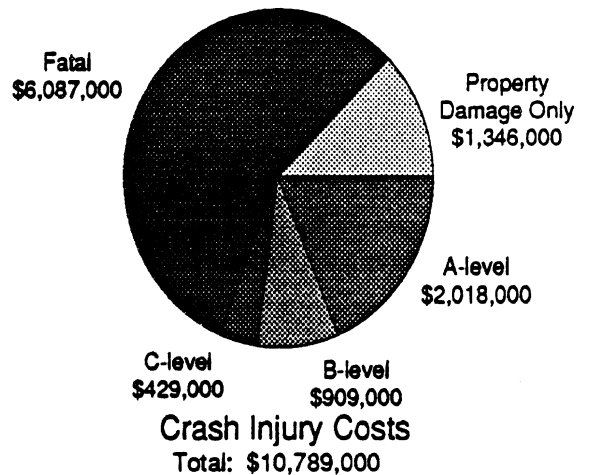
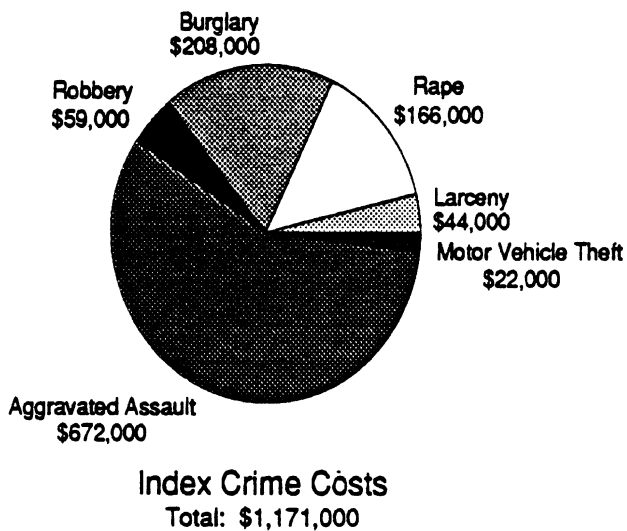
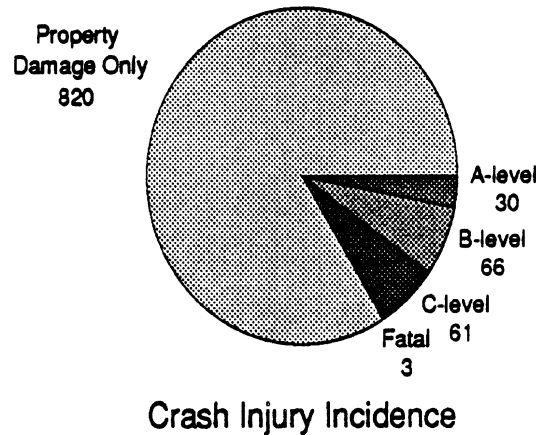
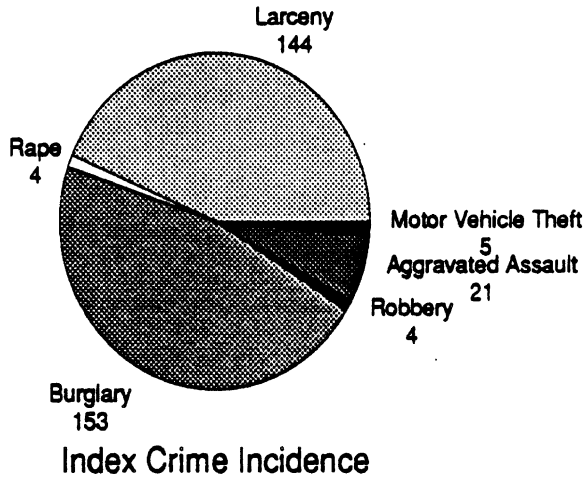
**Appendix**  
**Incidence and Cost Charts**



# State of Michigan

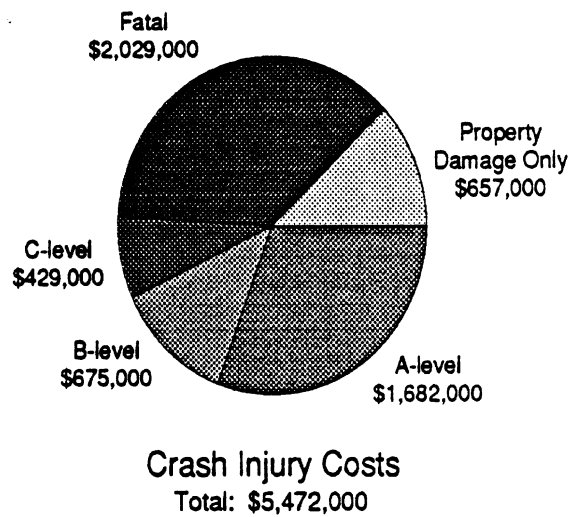
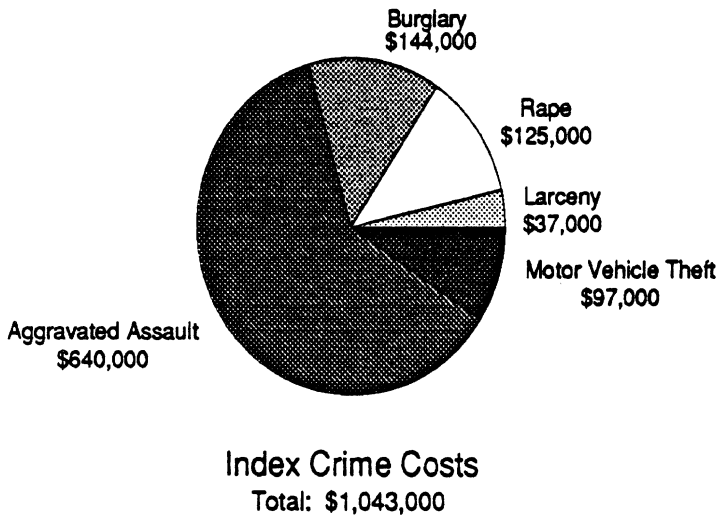
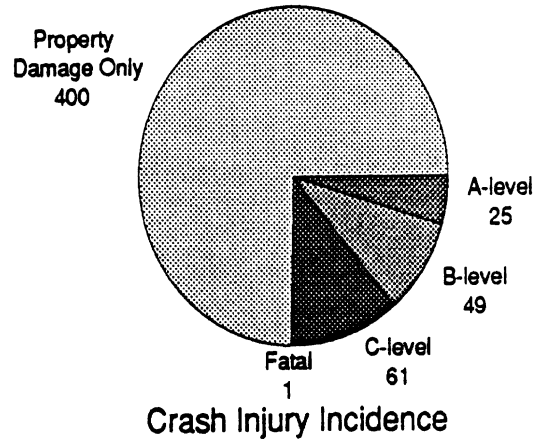
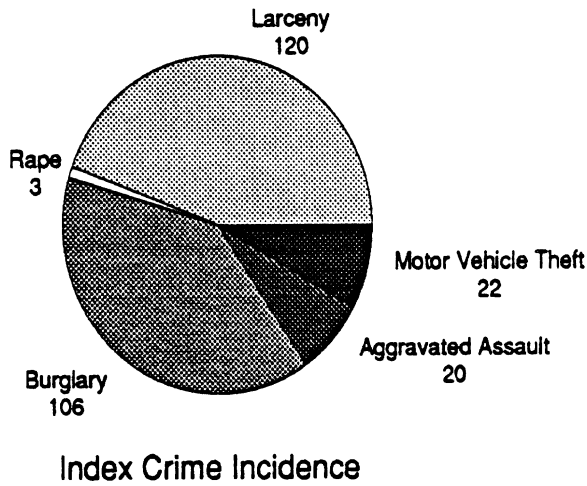


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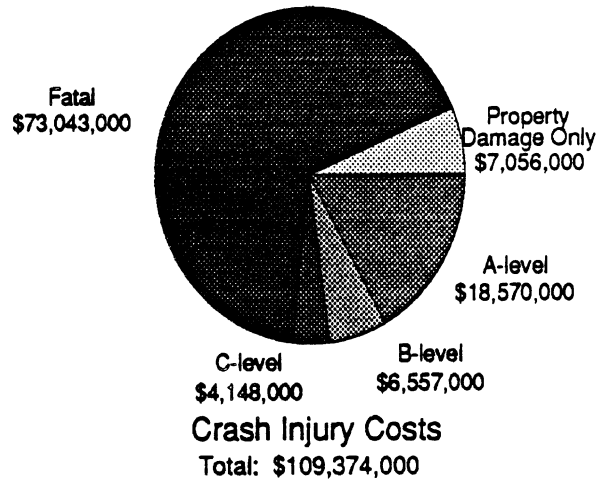
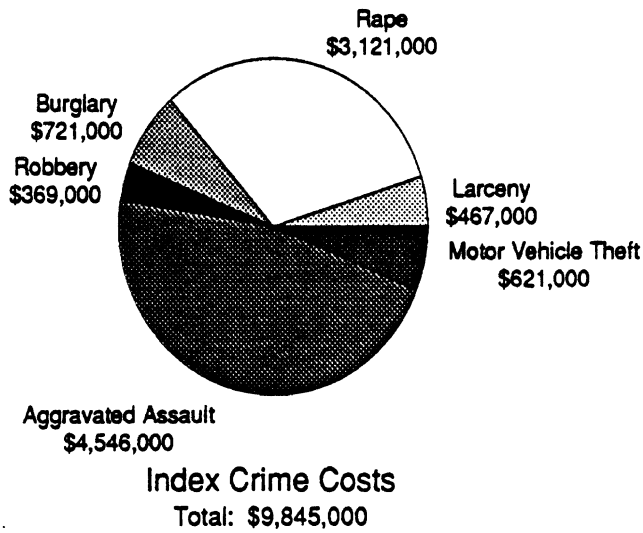
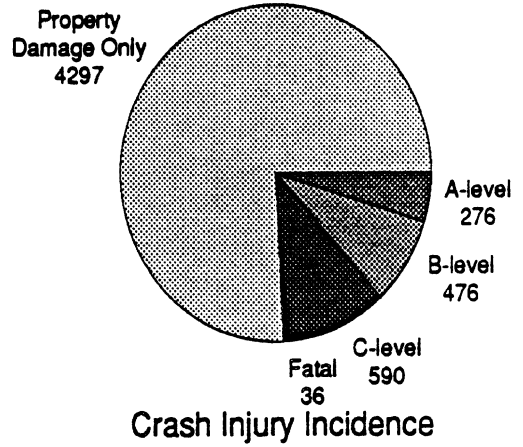
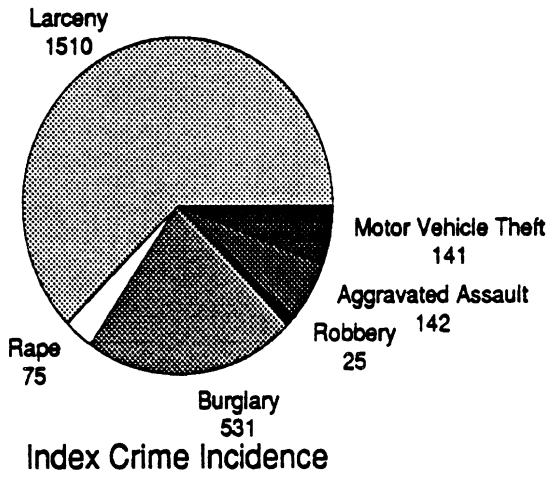




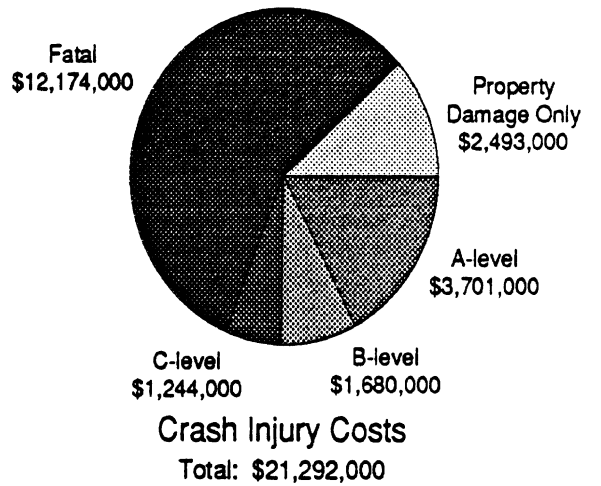
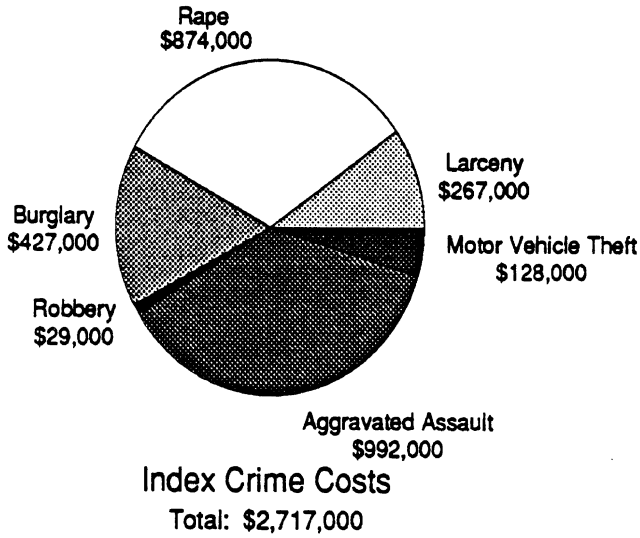
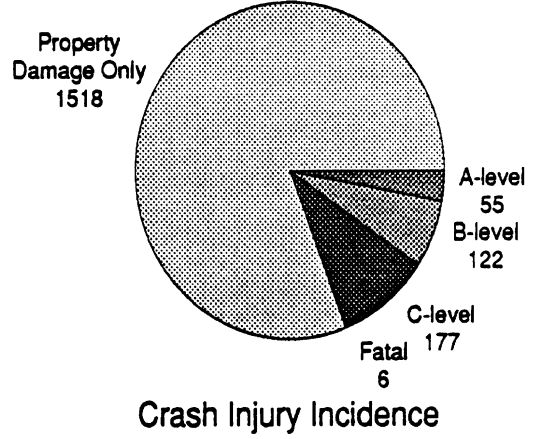
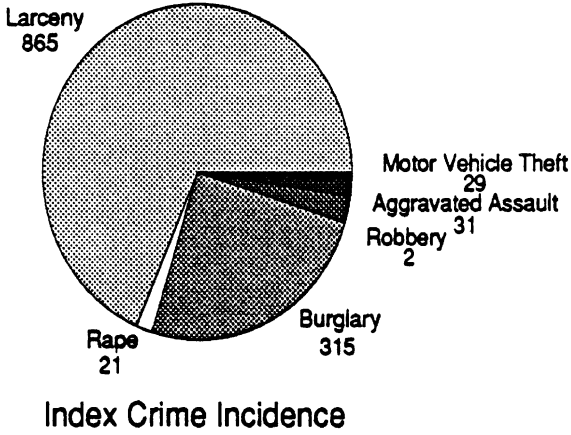
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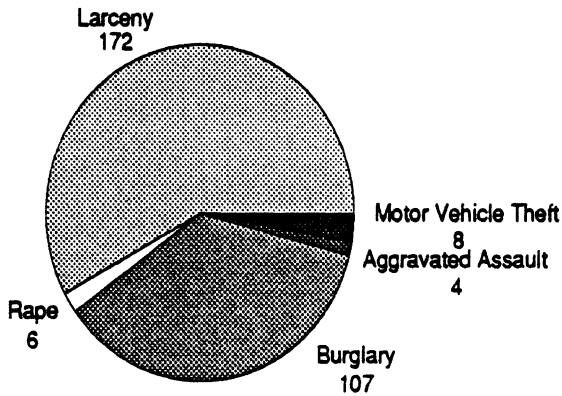
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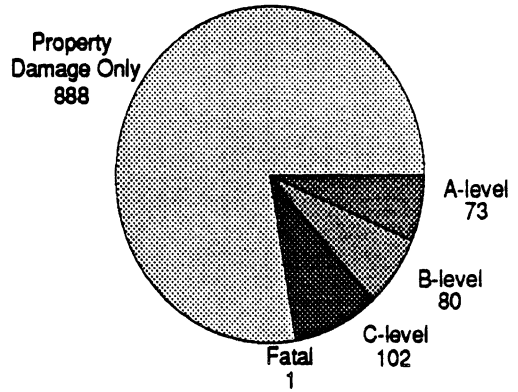
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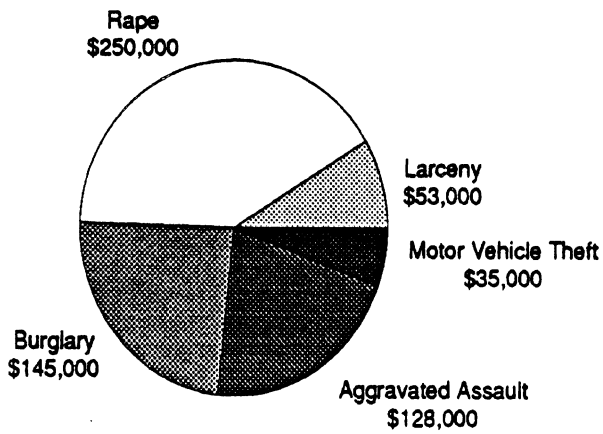
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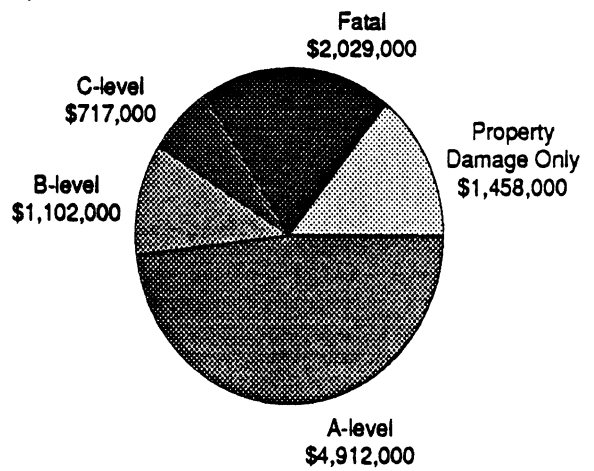
Index Crime Incidence



Crash Injury Incidence

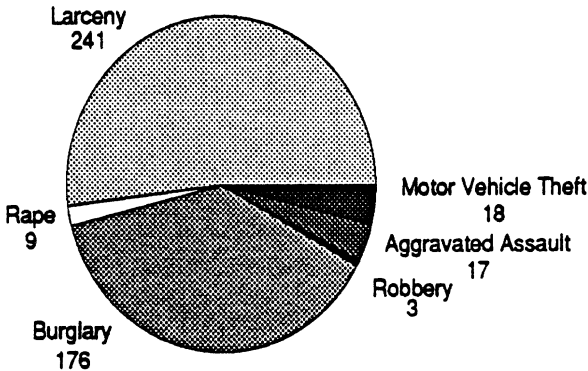


Index Crime Costs  
Total: \$611,000

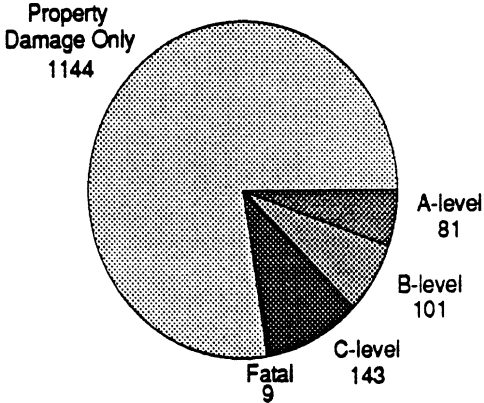


Crash Injury Costs  
Total: \$10,218,000

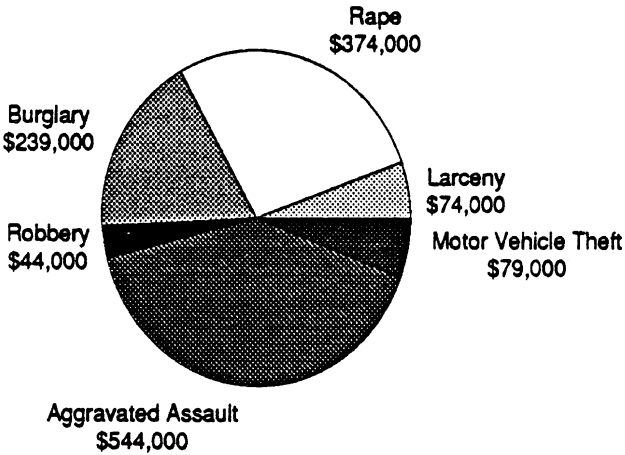
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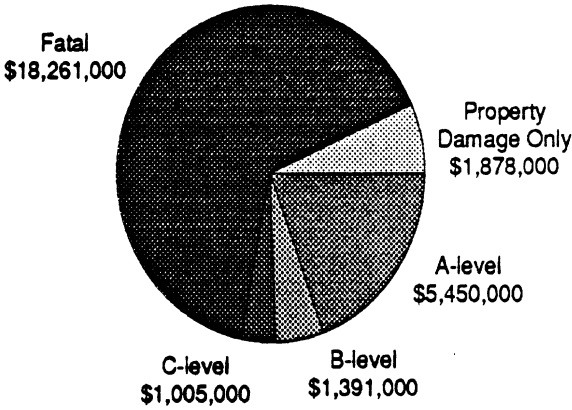
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Crash Injury Incidence

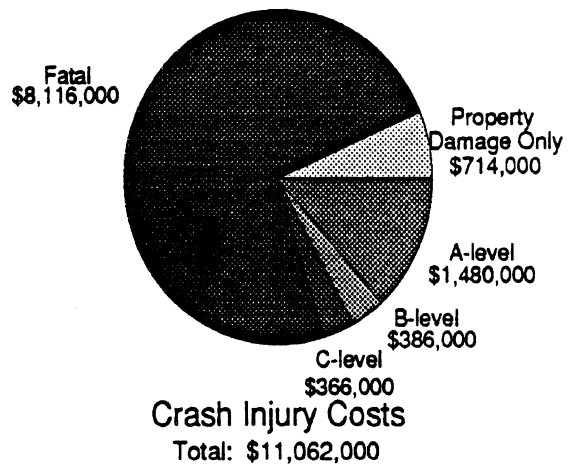
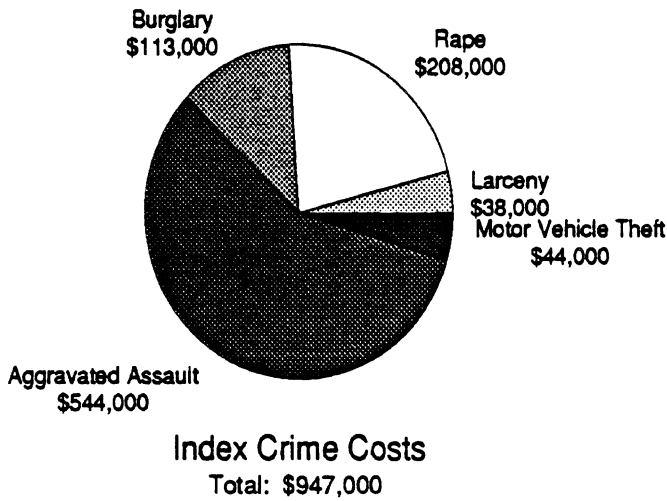
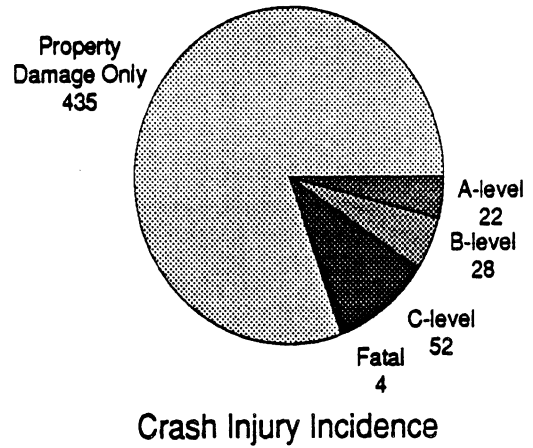
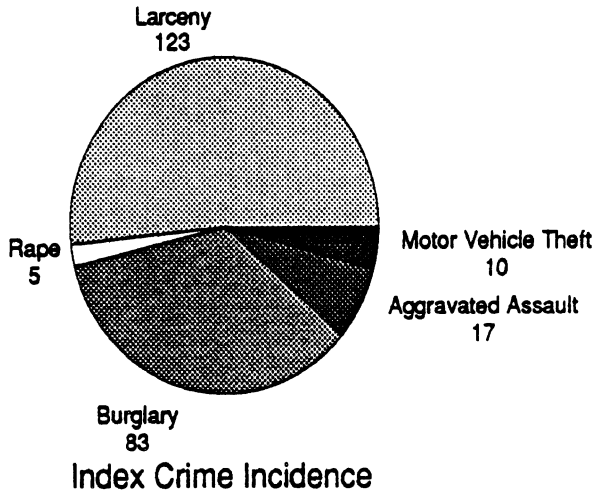


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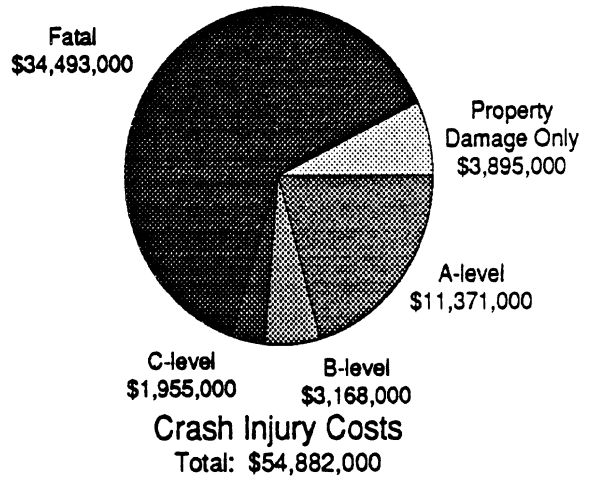
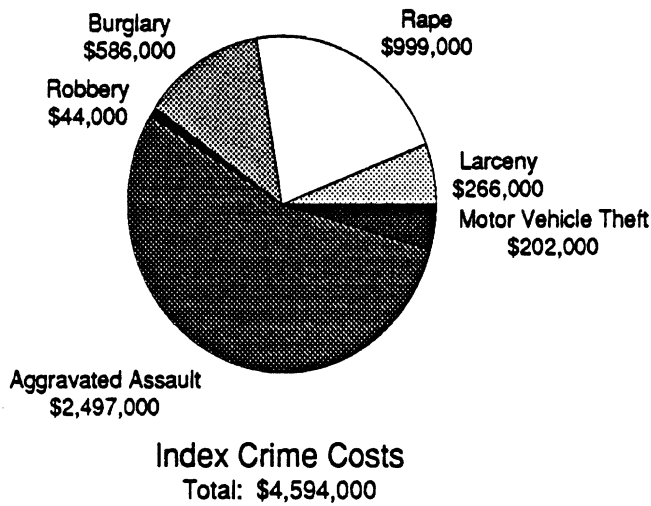
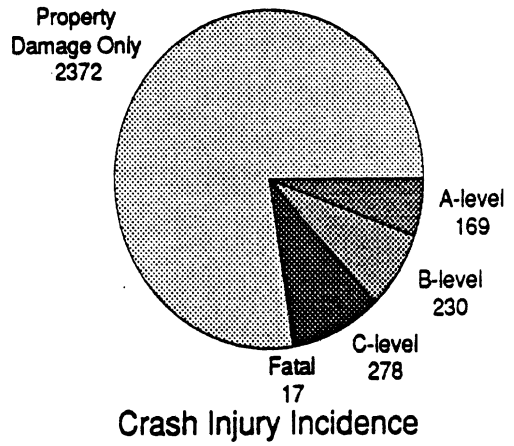
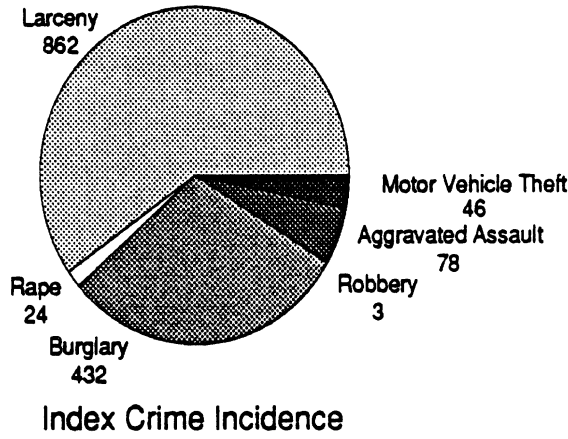


Crash Injury Costs  
Total: \$27,985,000

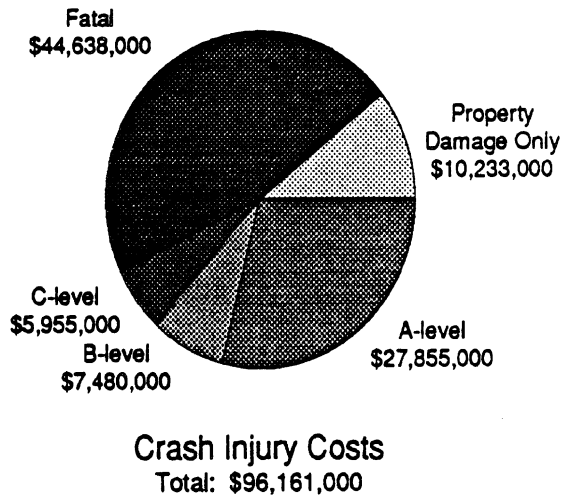
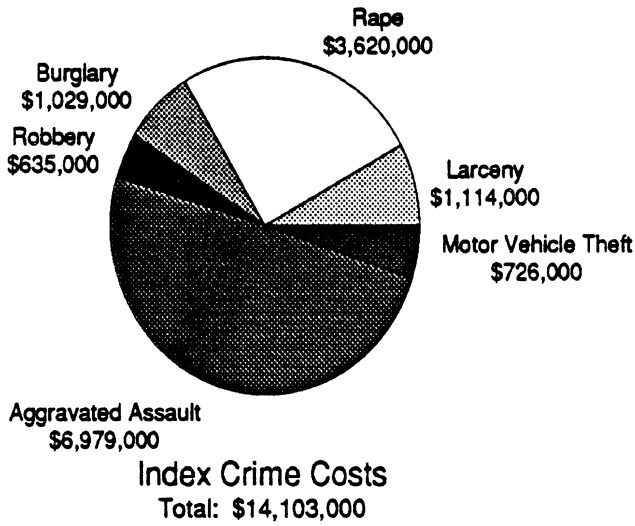
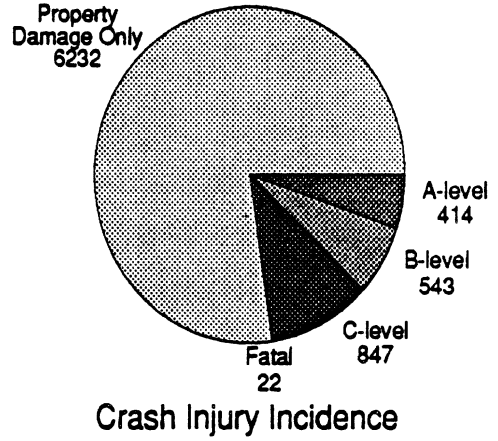
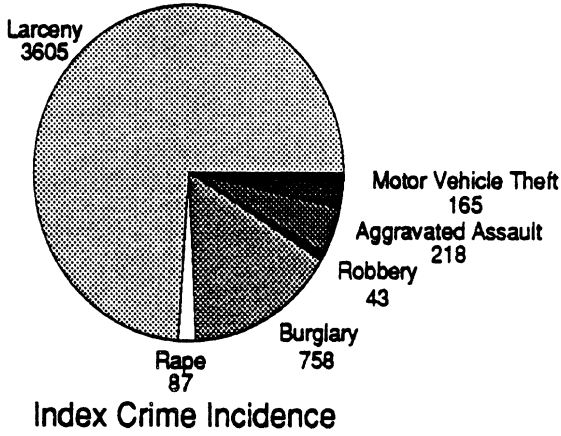
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# Barry County

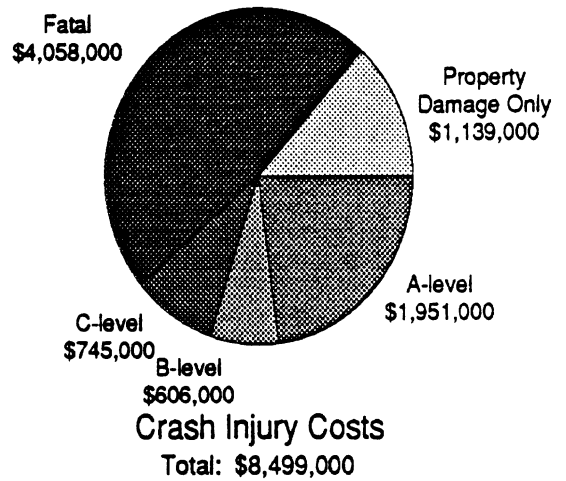
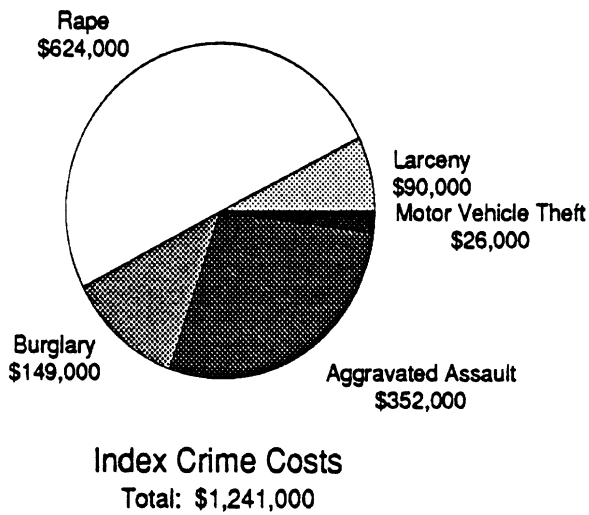
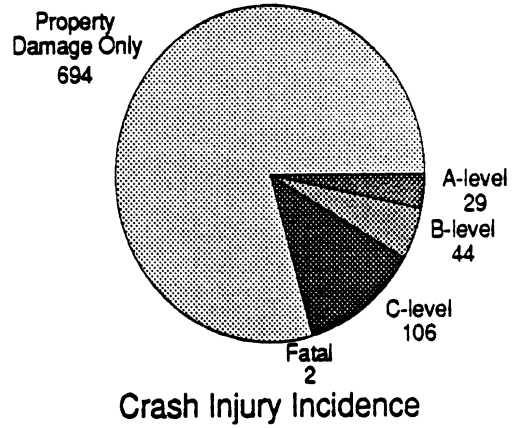
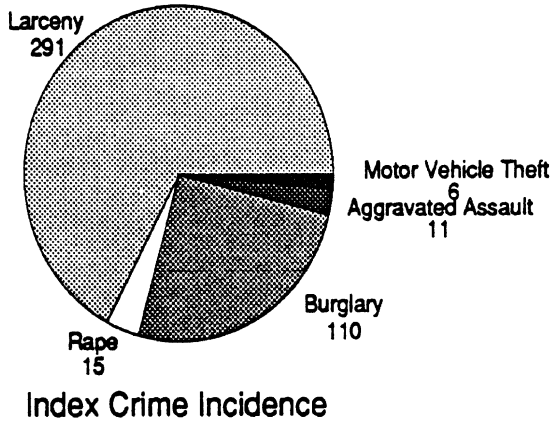


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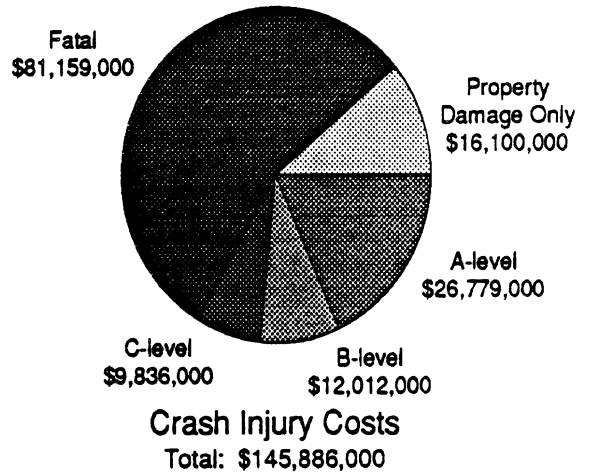
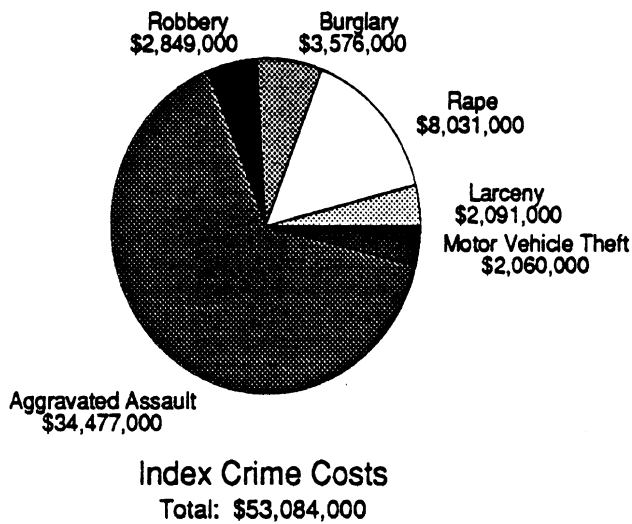
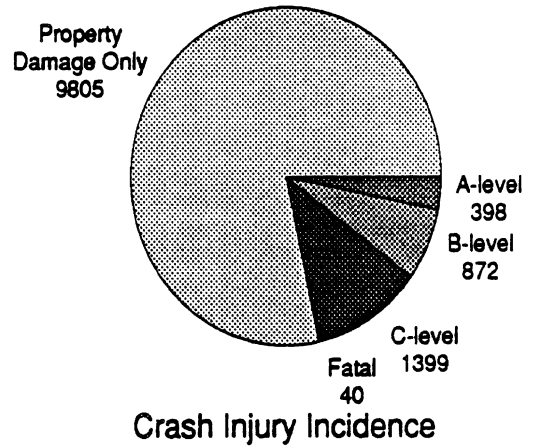
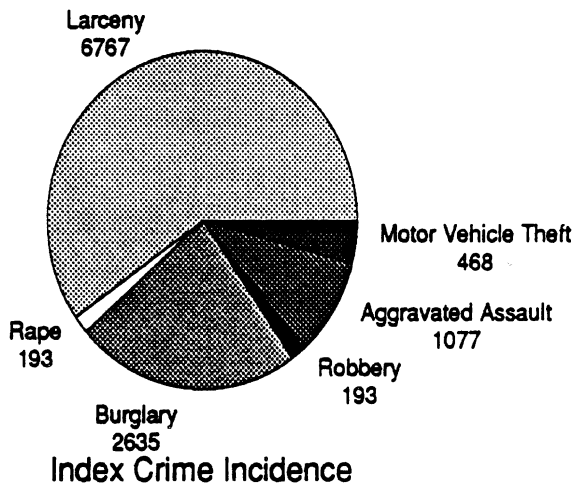




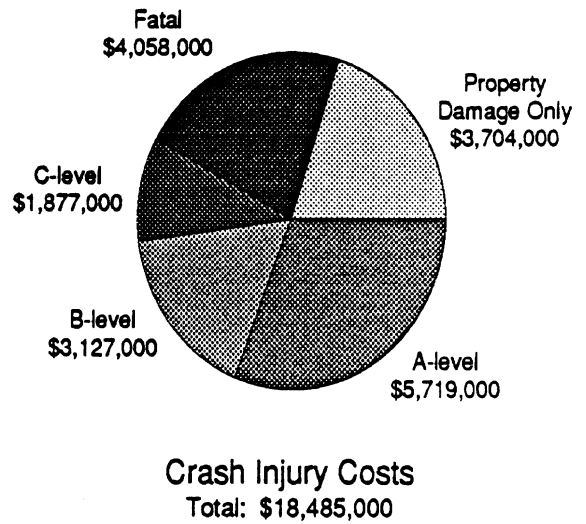
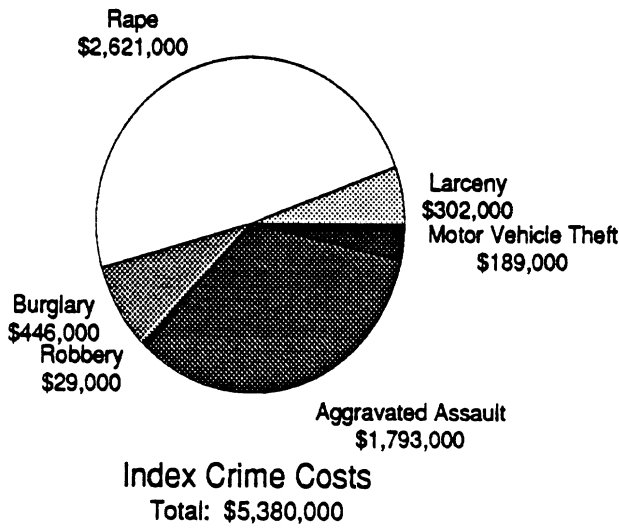
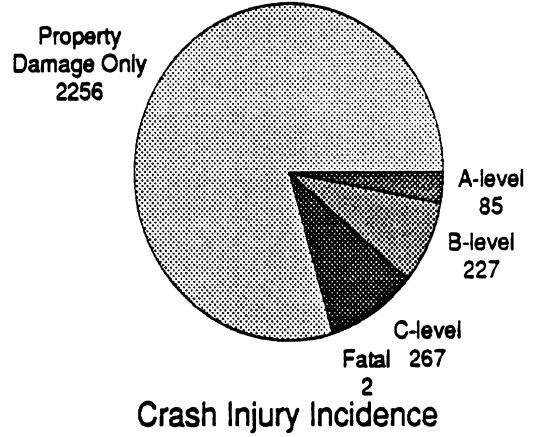
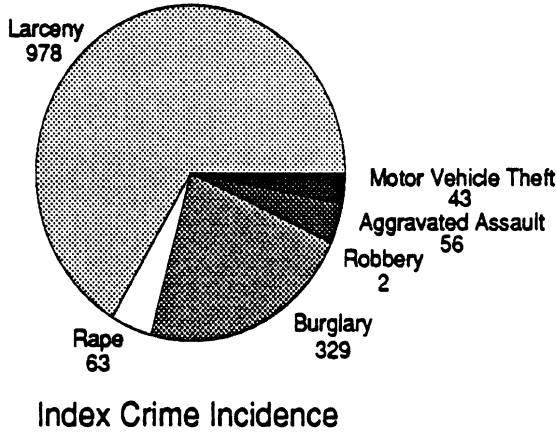
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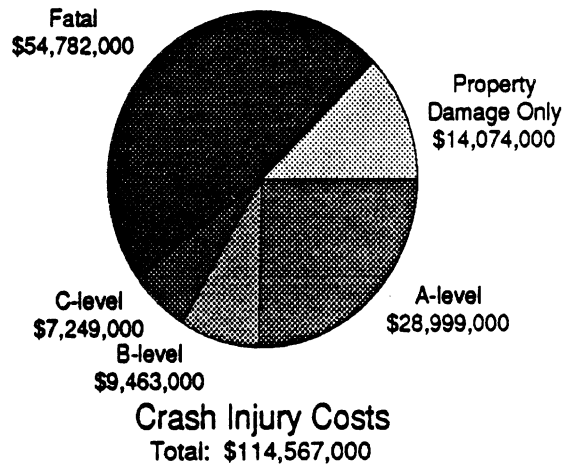
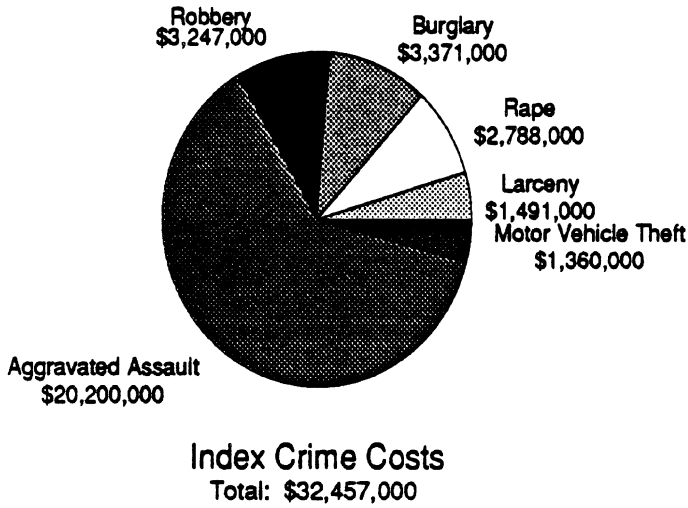
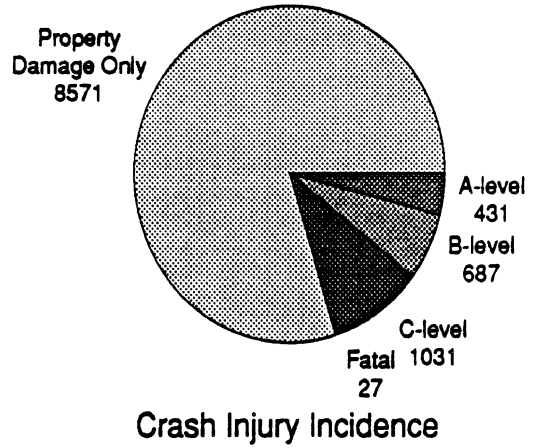
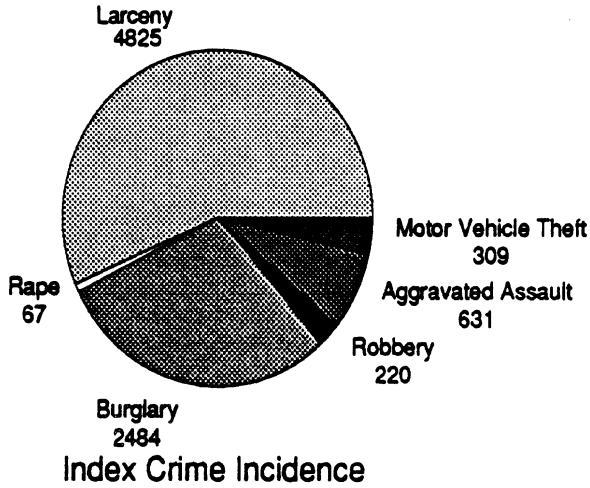
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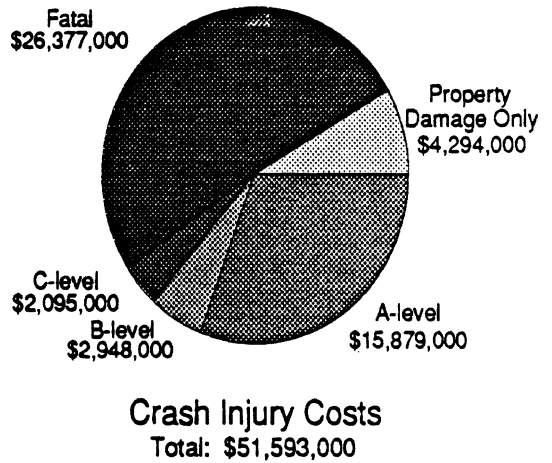
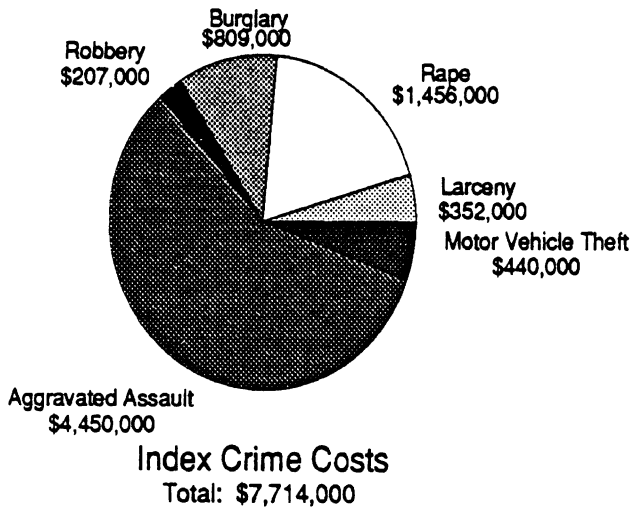
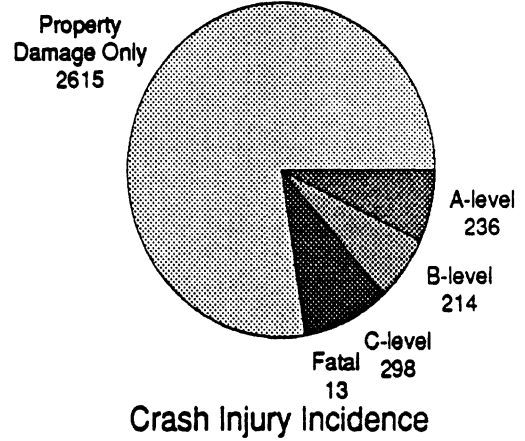
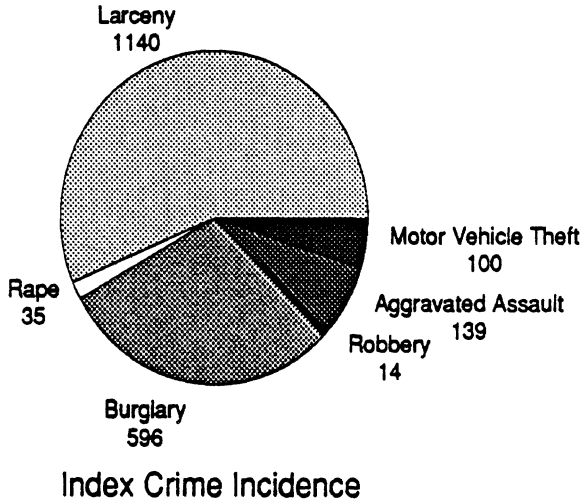
# Branch County



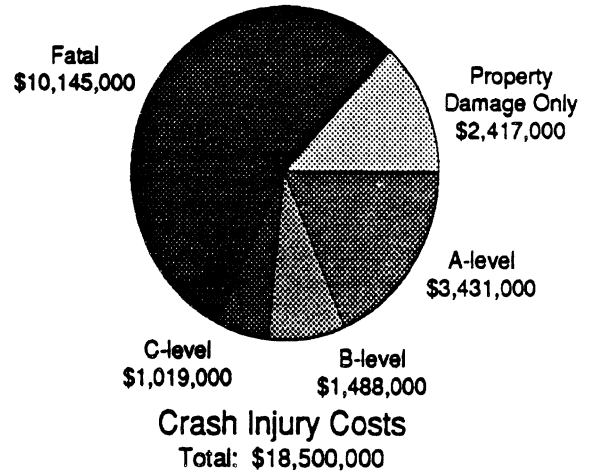
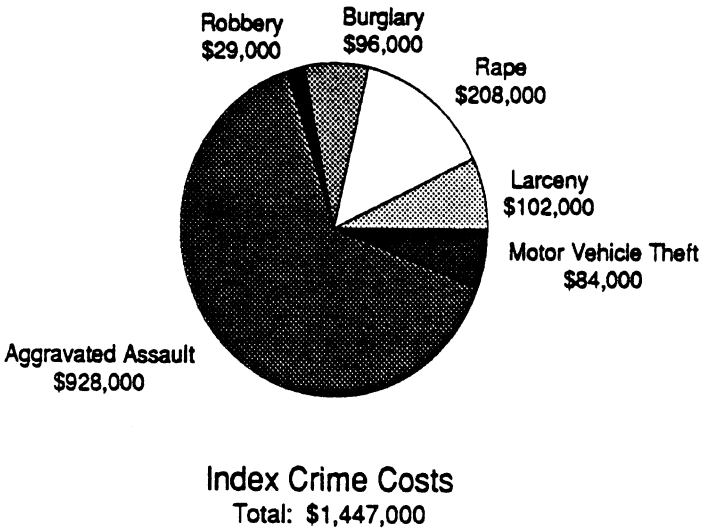
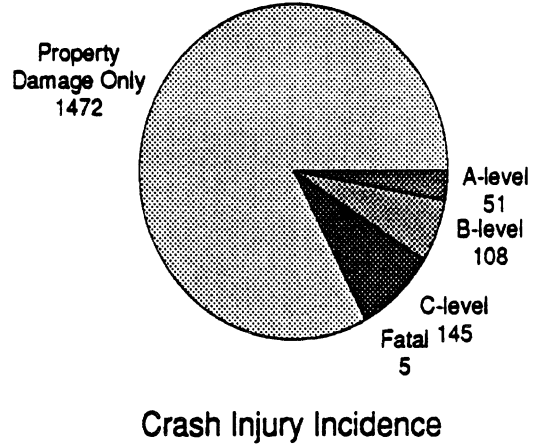
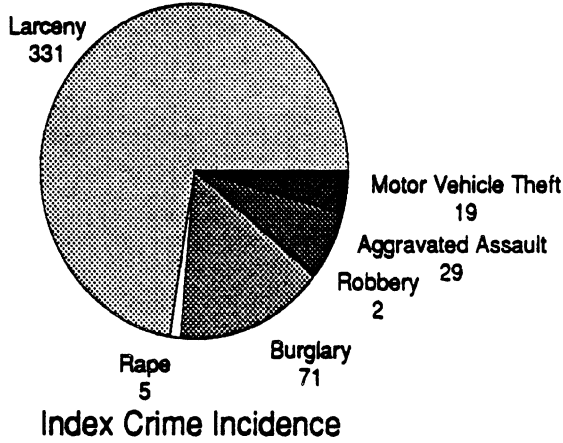
# Calhoun County



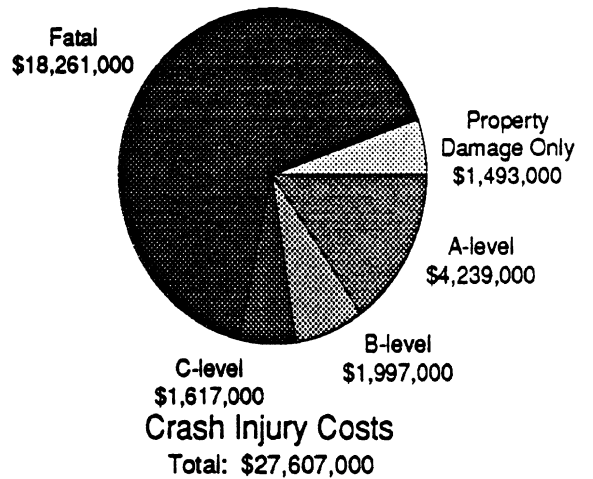
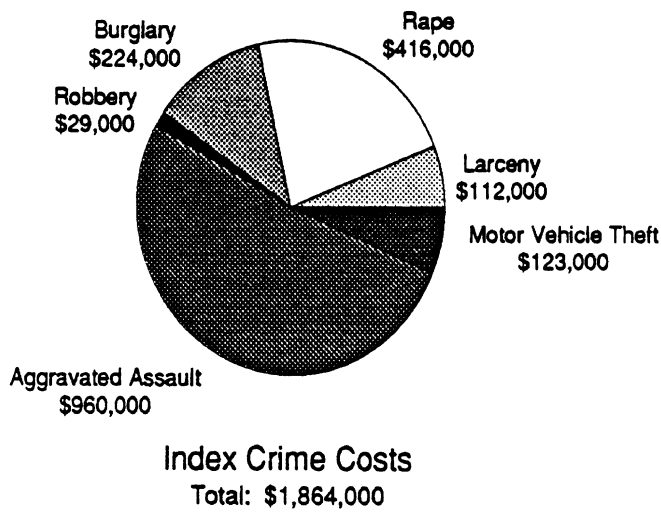
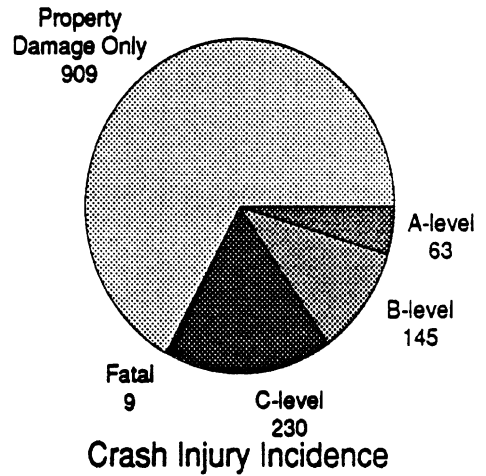
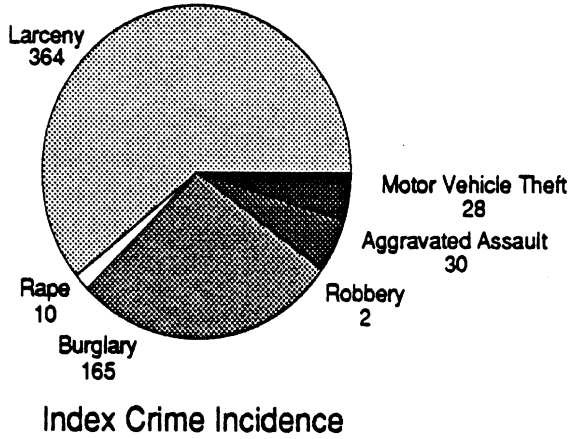
# Cass County



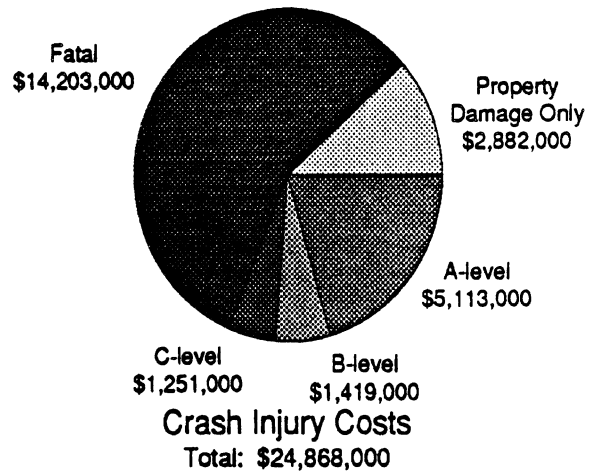
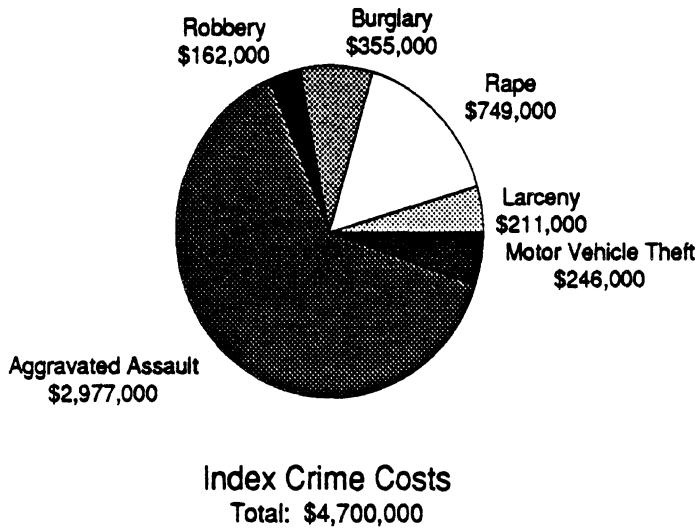
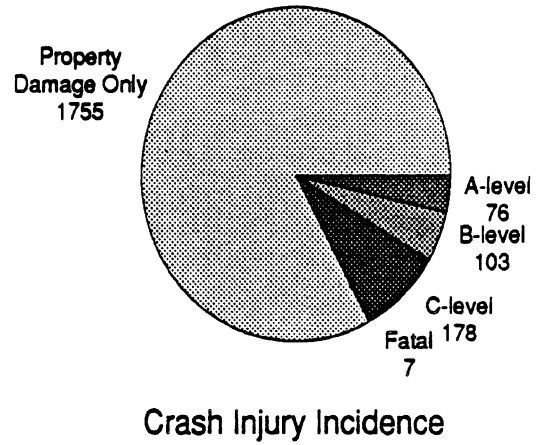
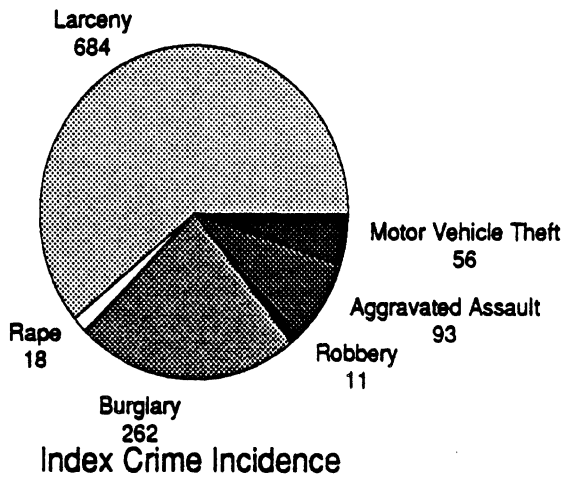
# Charlevoix County



# Cheboygan County

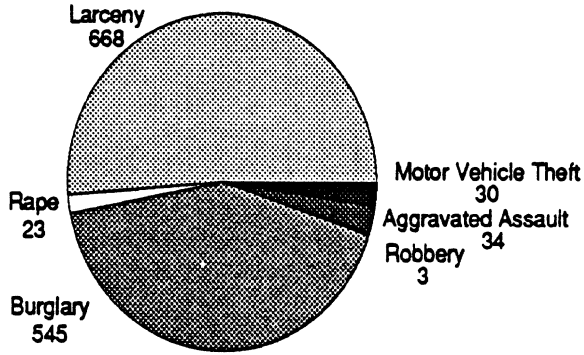


# Chippewa County

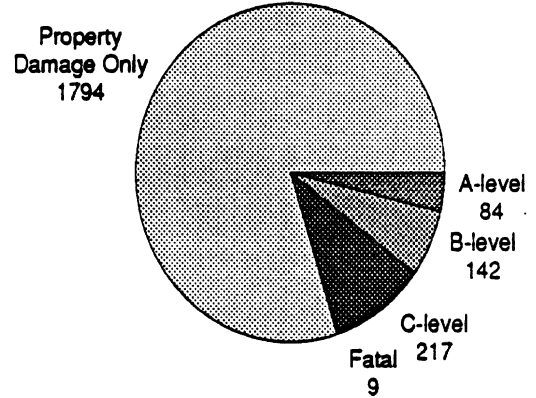




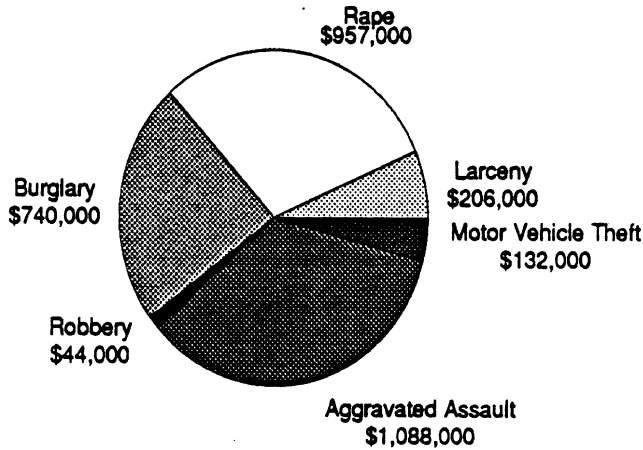
# Clare County



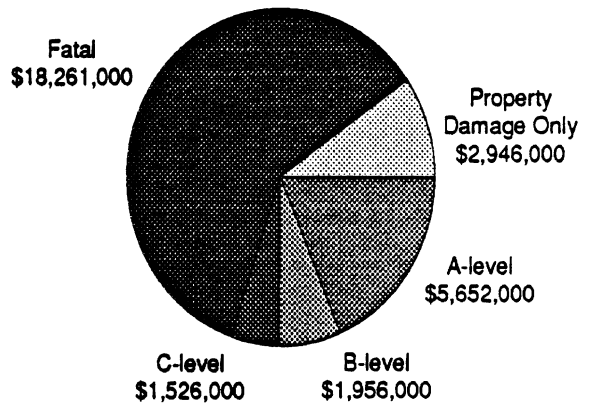
Index Crime Incidence



Crash Injury Incidence

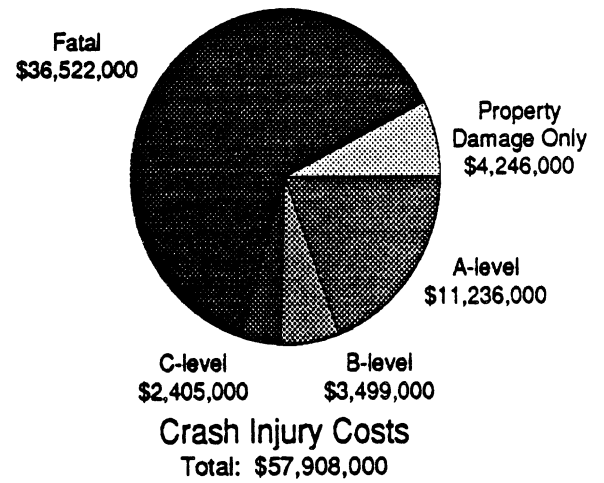
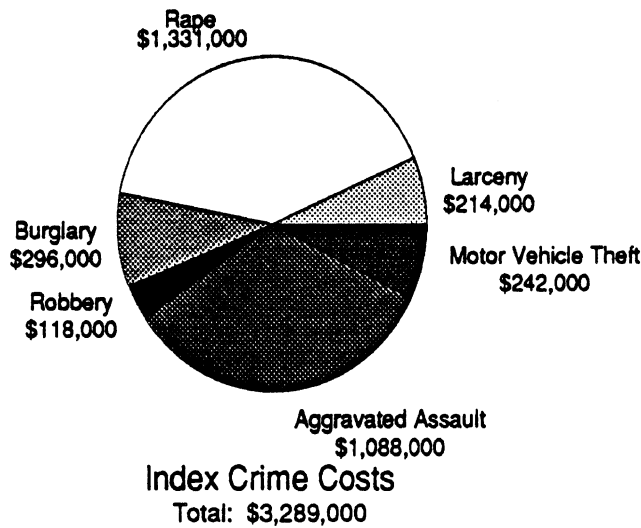
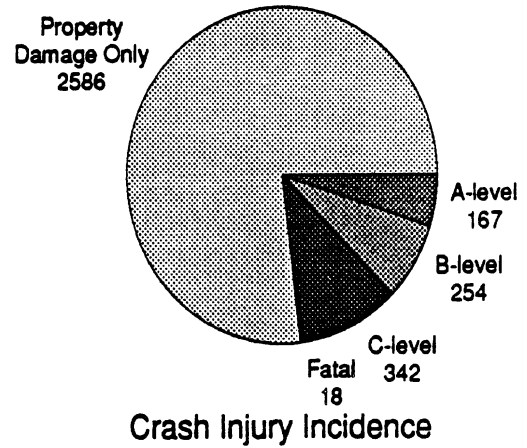
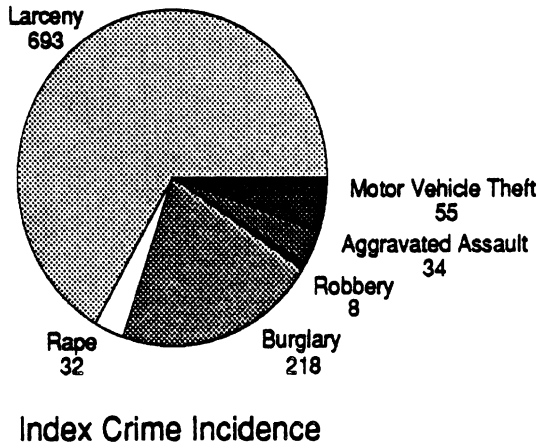


Index Crime Costs  
Total: \$3,167,000

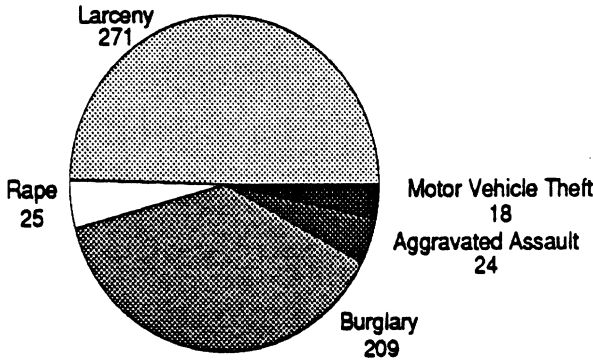


Crash Injury Costs  
Total: \$30,341,000

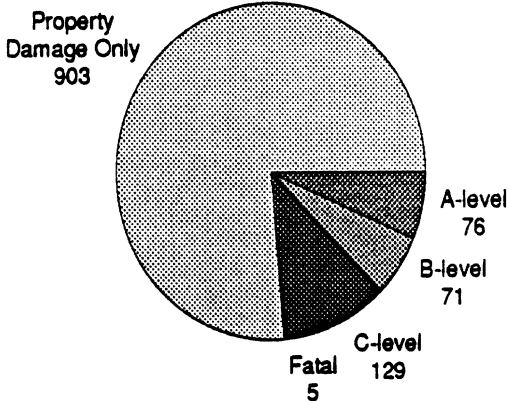
# Clinton County



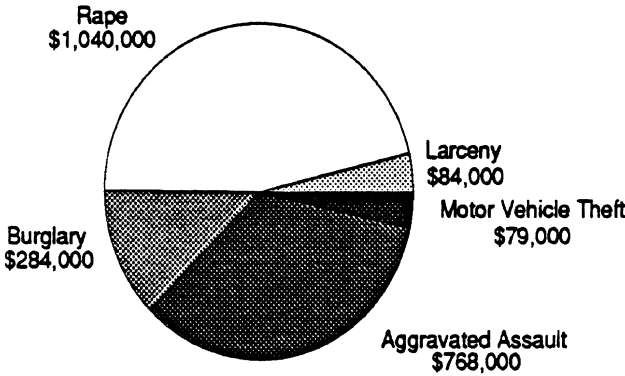
# Crawford County



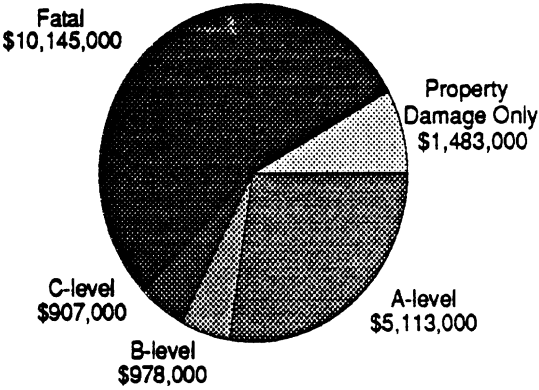
Index Crime Incidence



Crash Injury Incidence

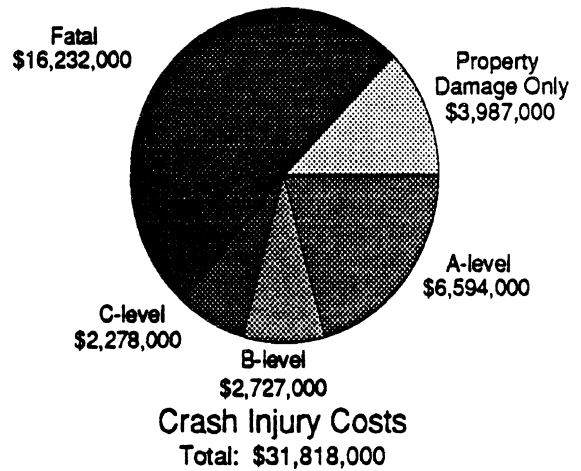
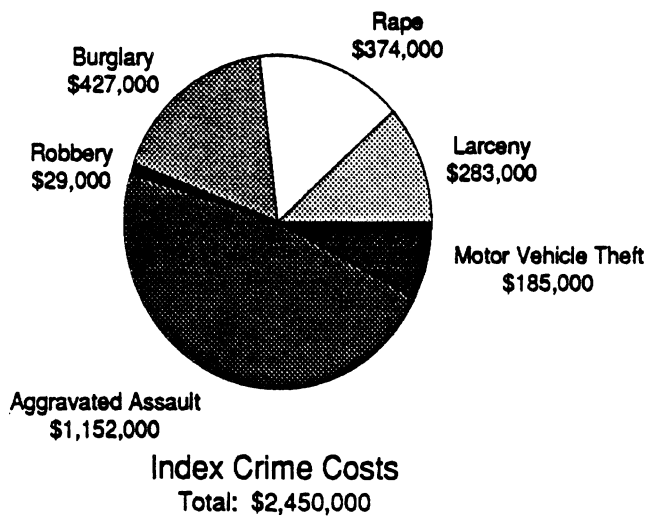
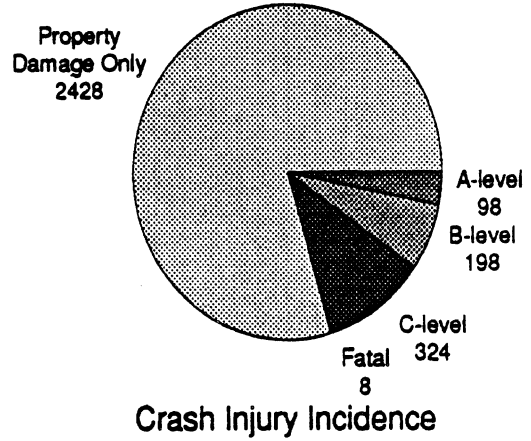
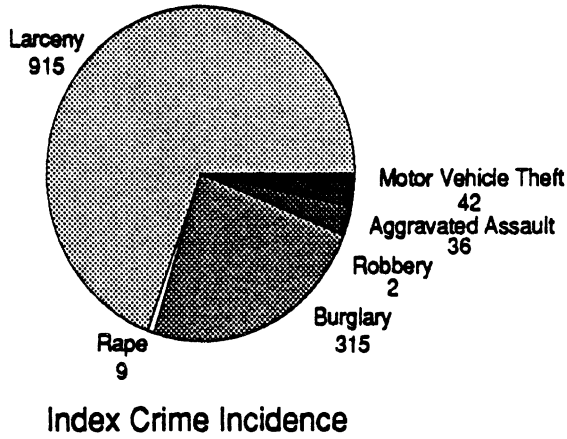


Index Crime Costs  
Total: \$2,255,000

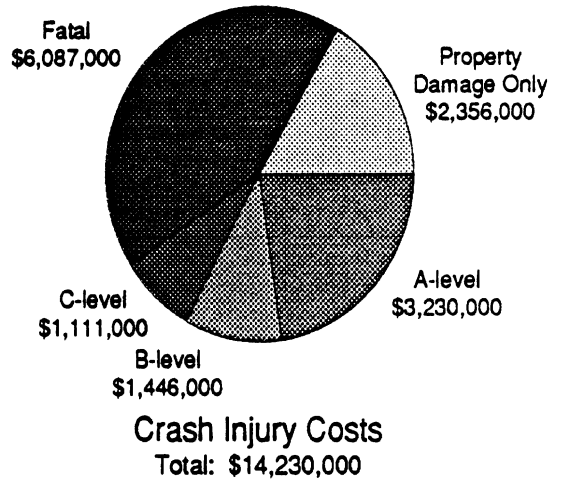
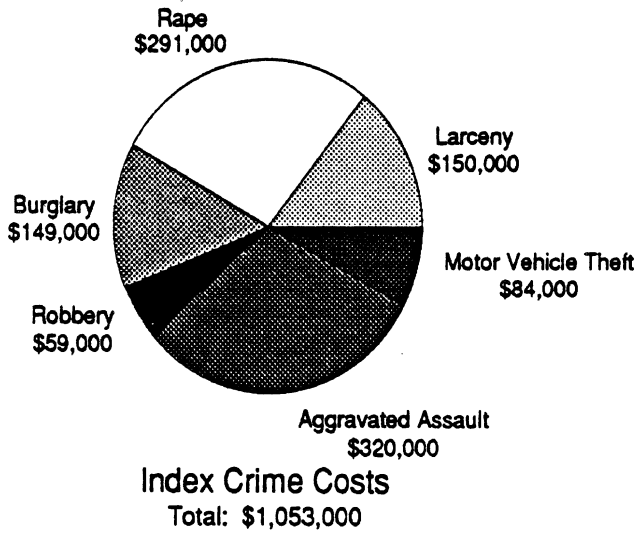
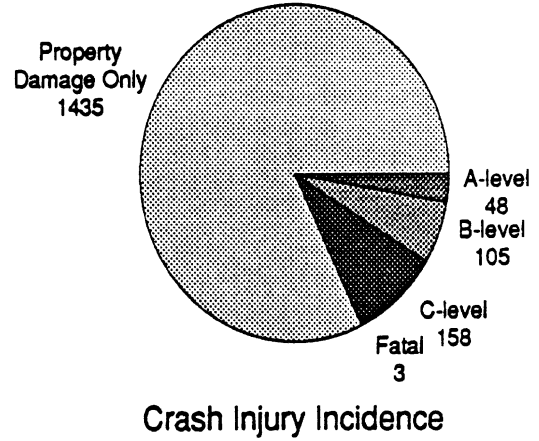
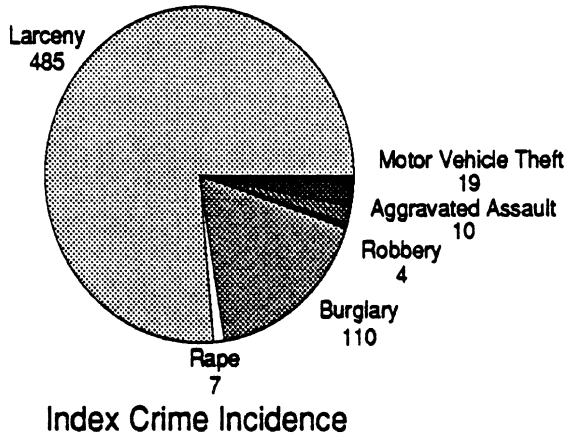


Crash Injury Costs  
Total: \$18,626,000

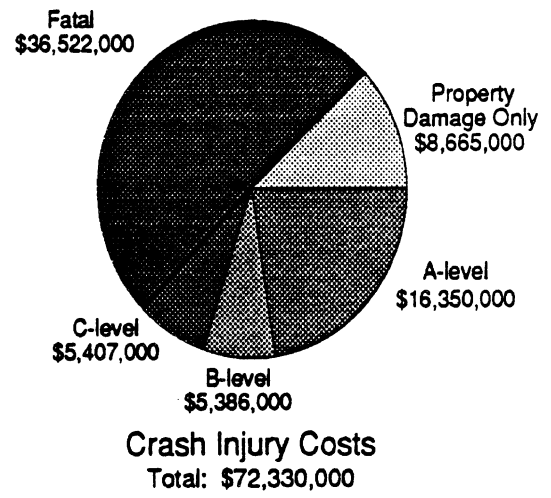
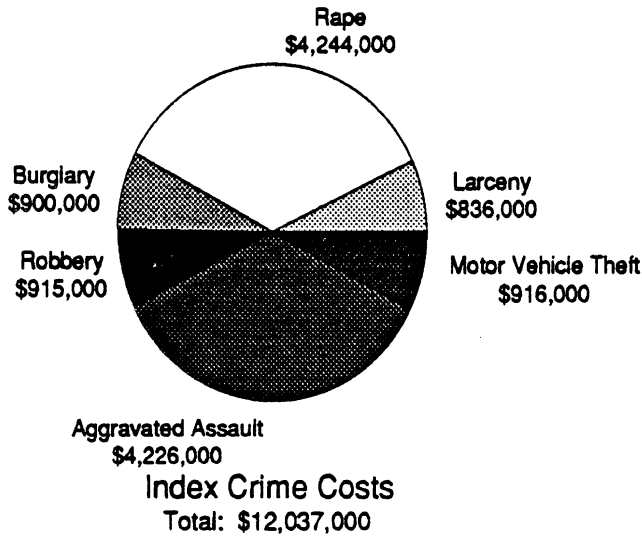
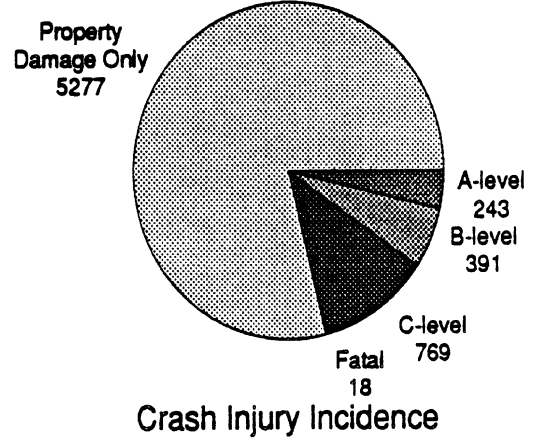
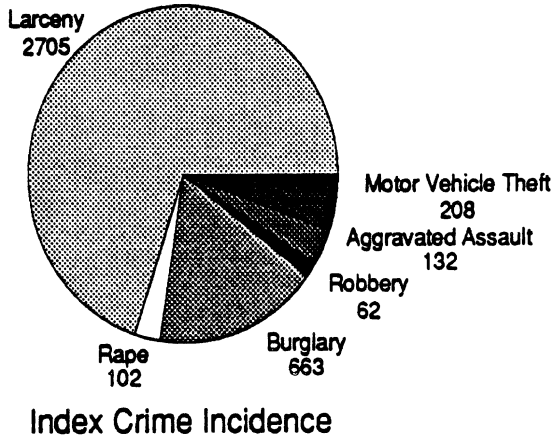
# Delta County



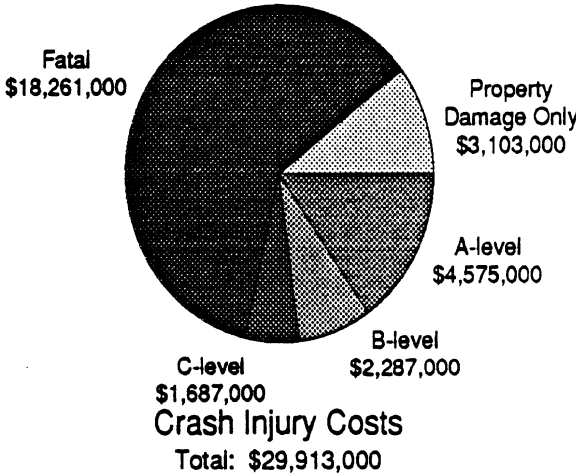
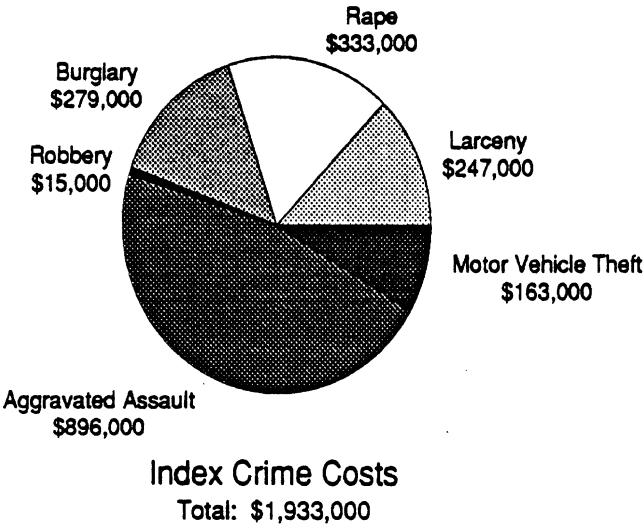
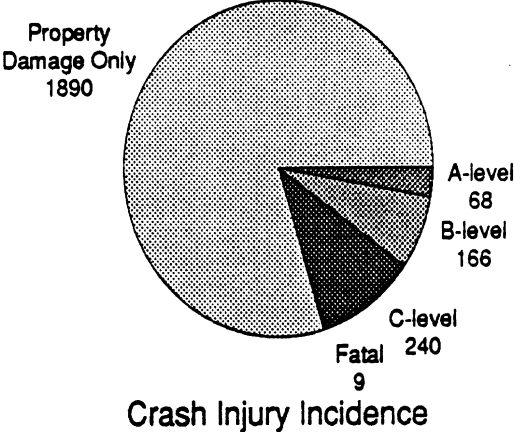
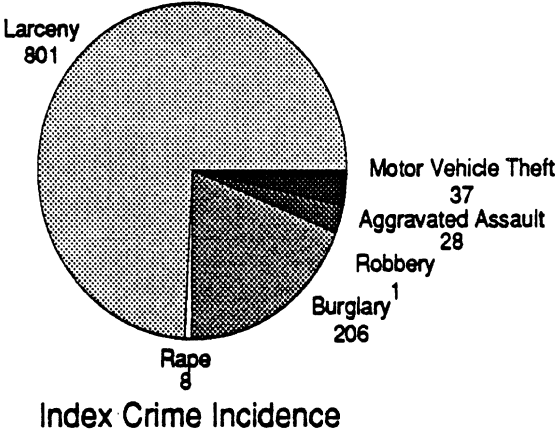
# Dickinson County



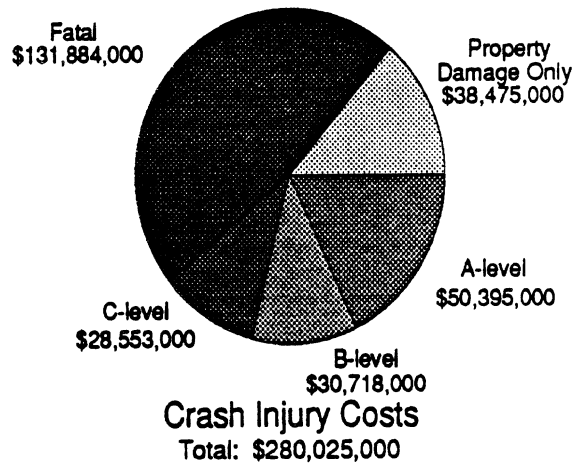
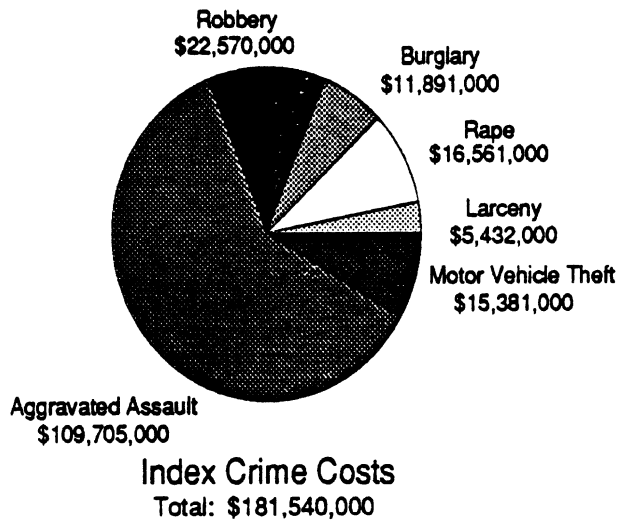
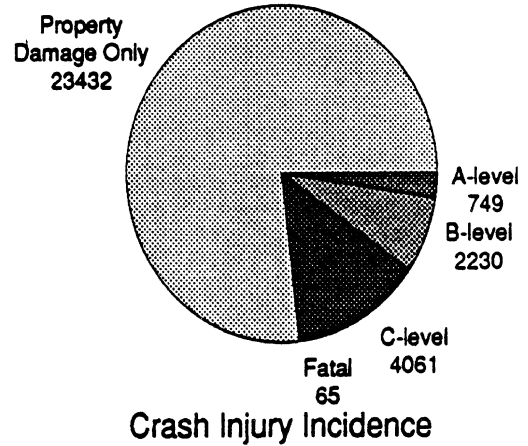
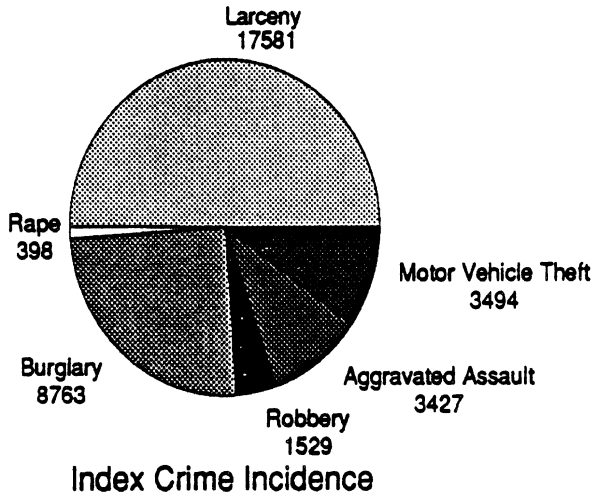
# Eaton County



# Emmet County

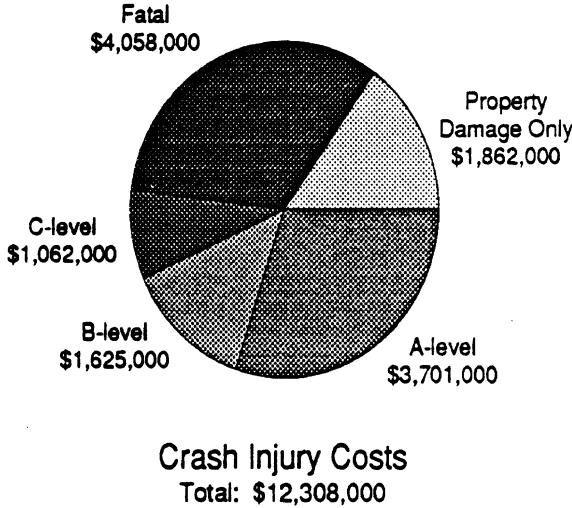
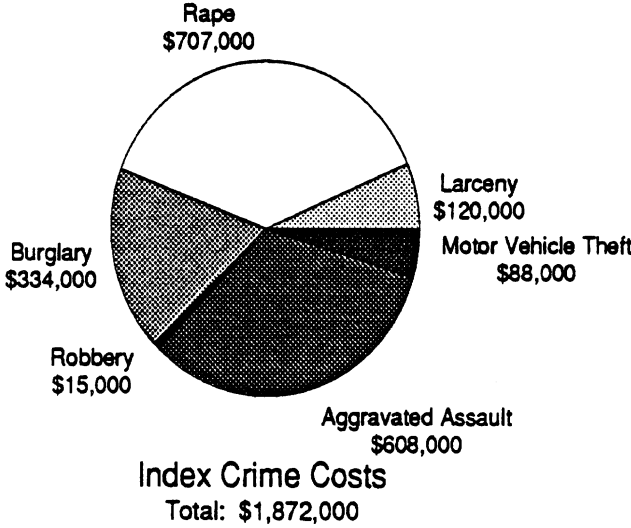
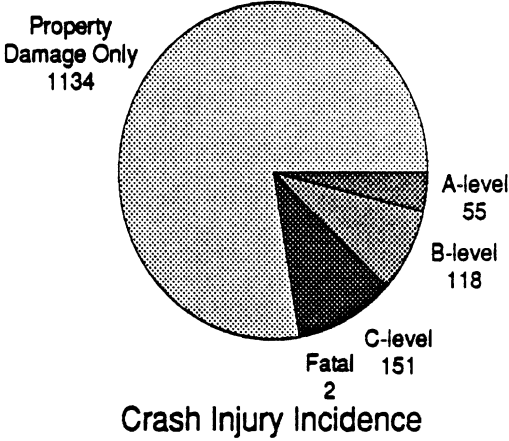
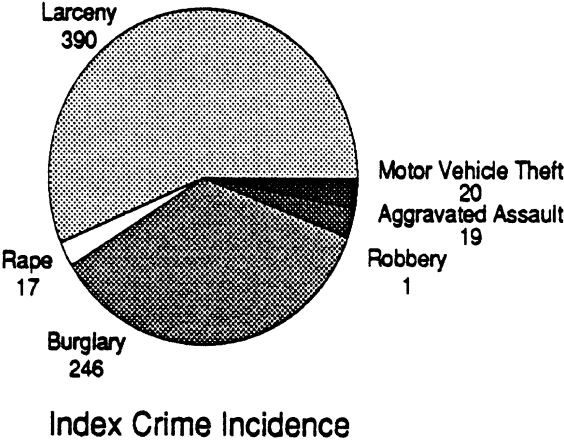


# Genesee County

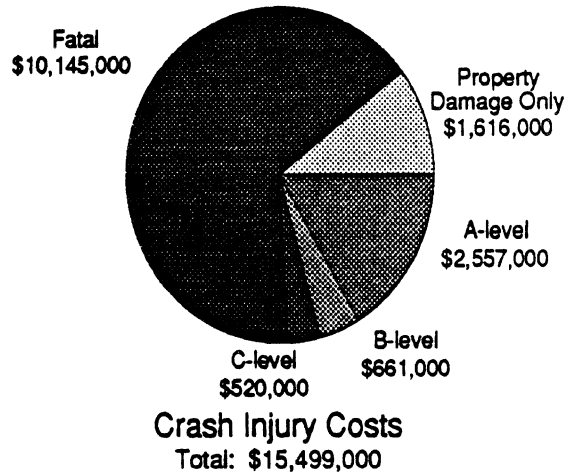
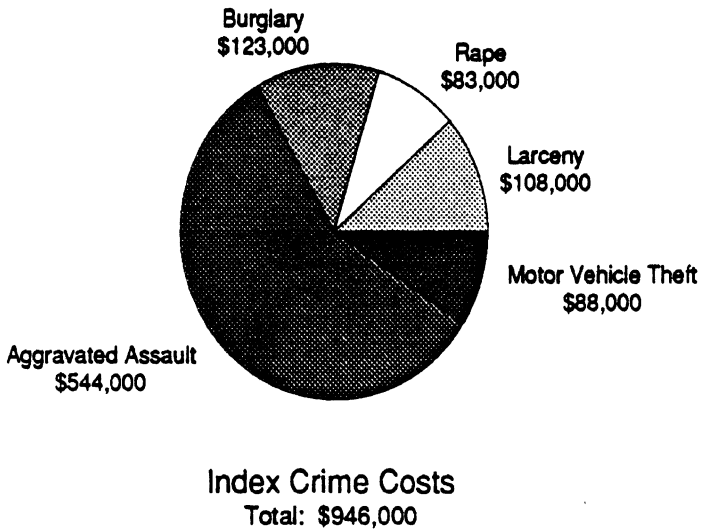
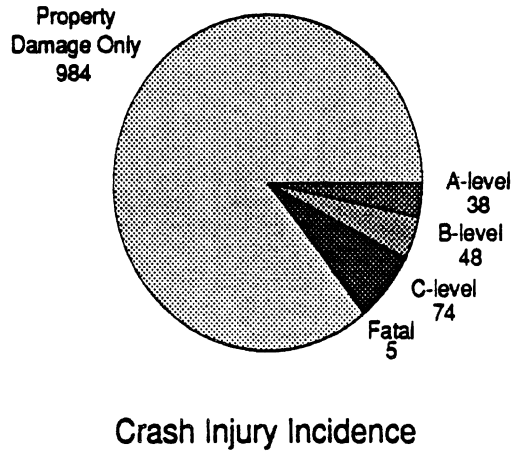
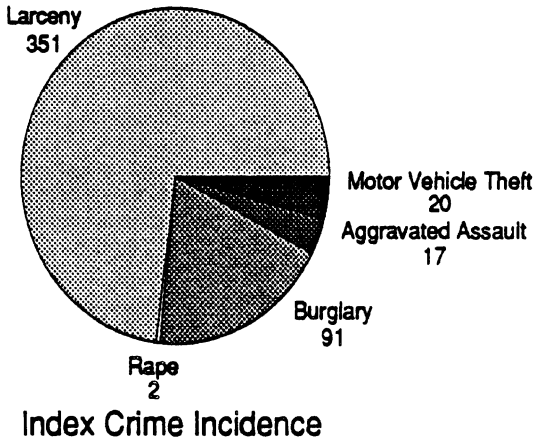




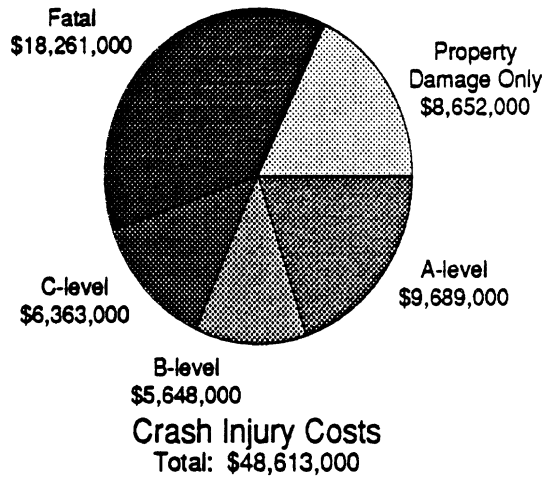
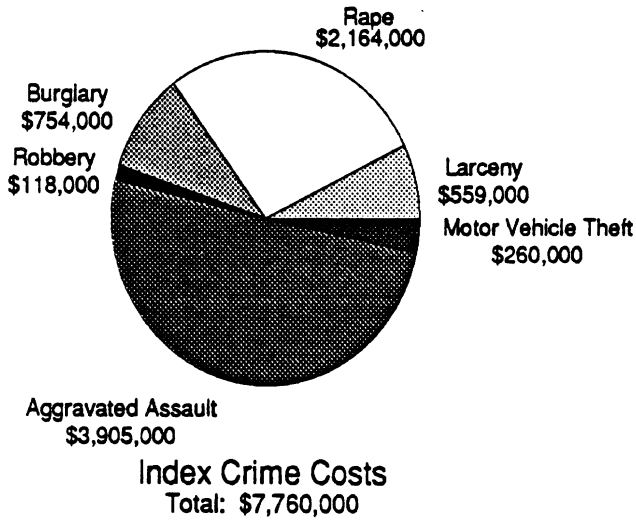
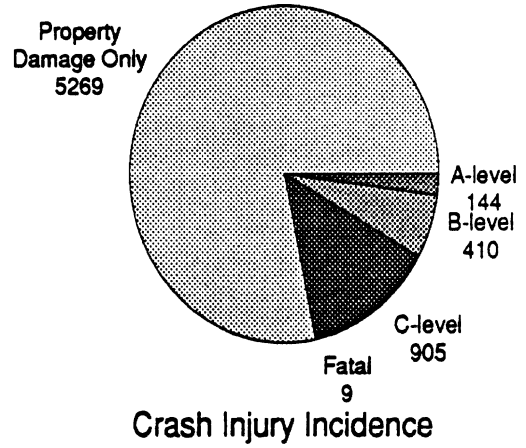
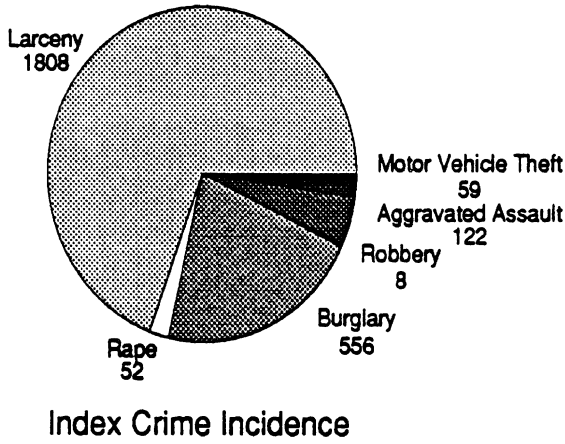
# Gladwin County



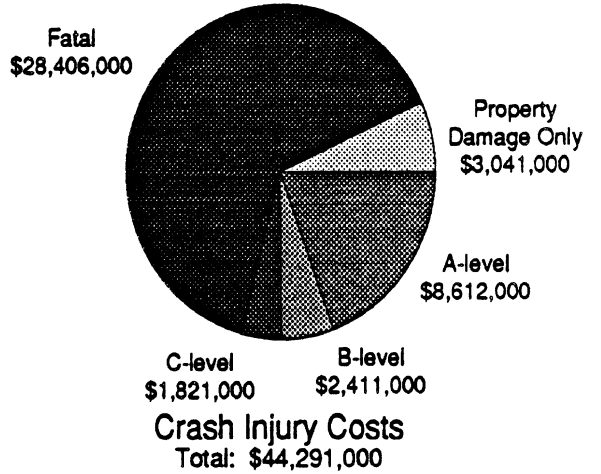
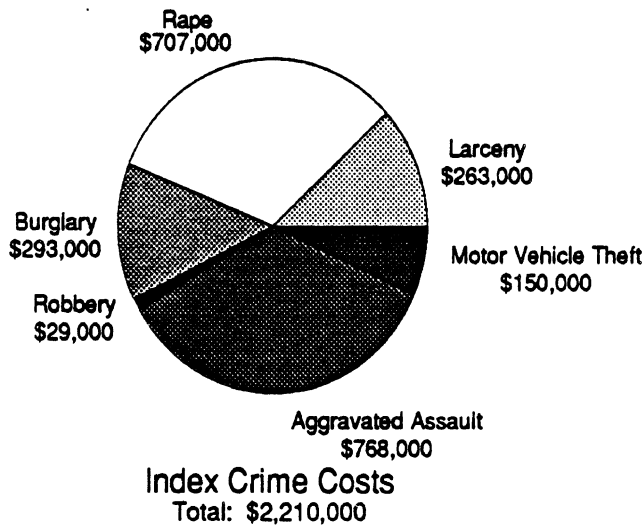
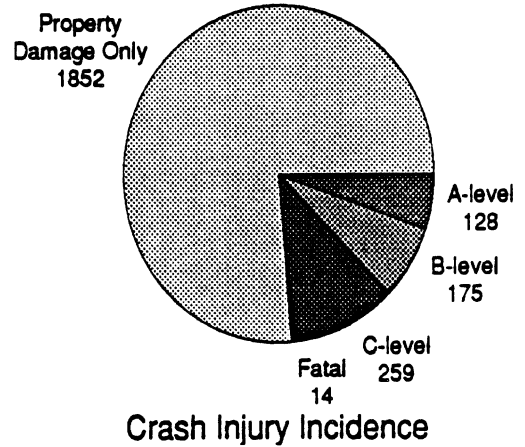
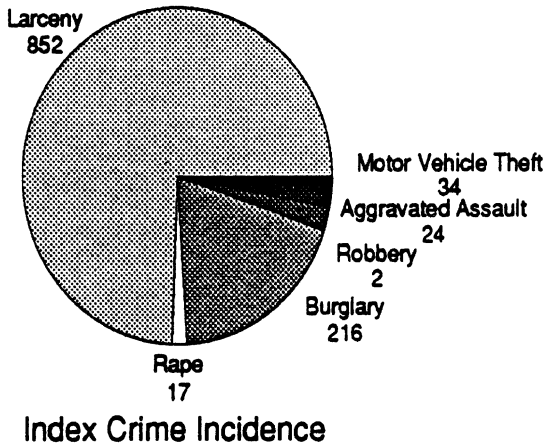
# Gogebic County



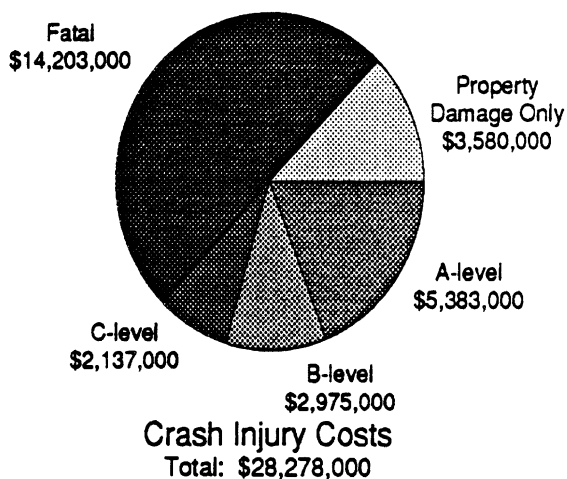
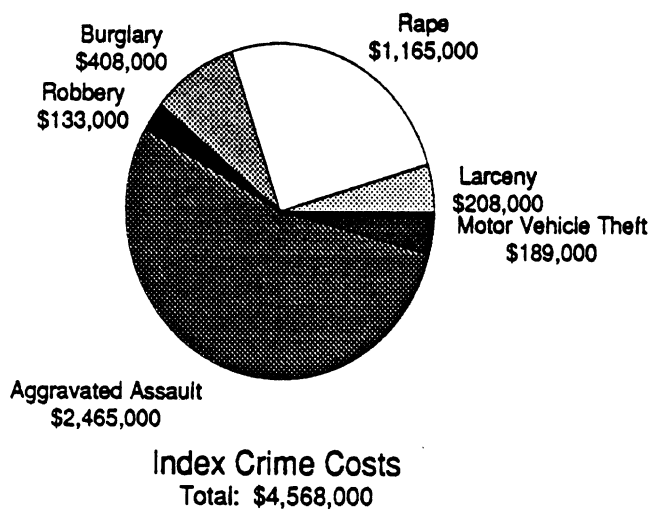
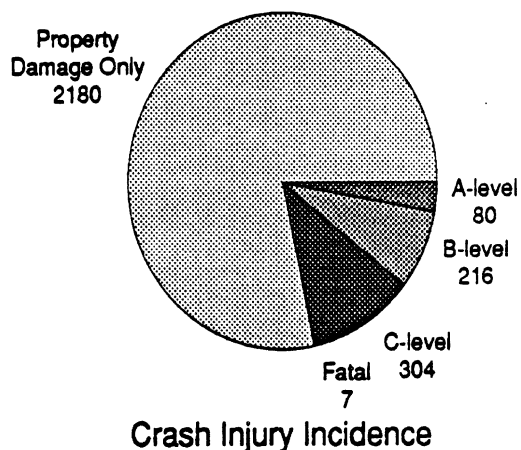
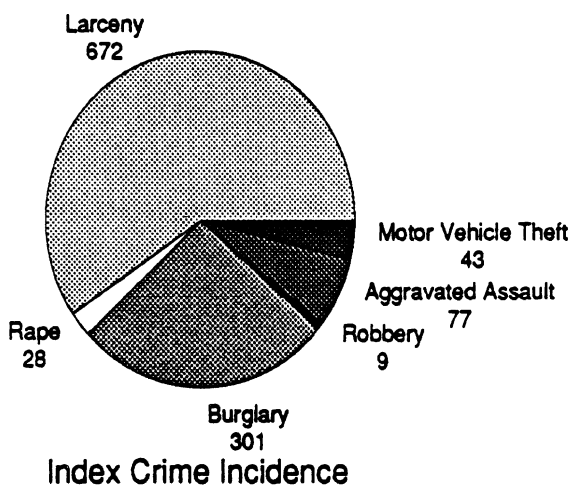
# Grand Traverse County



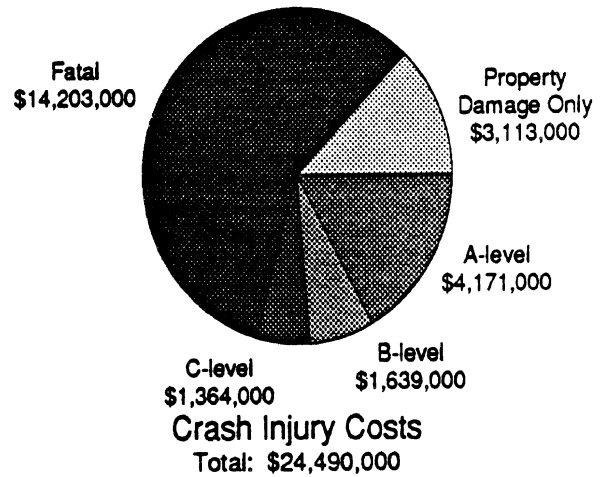
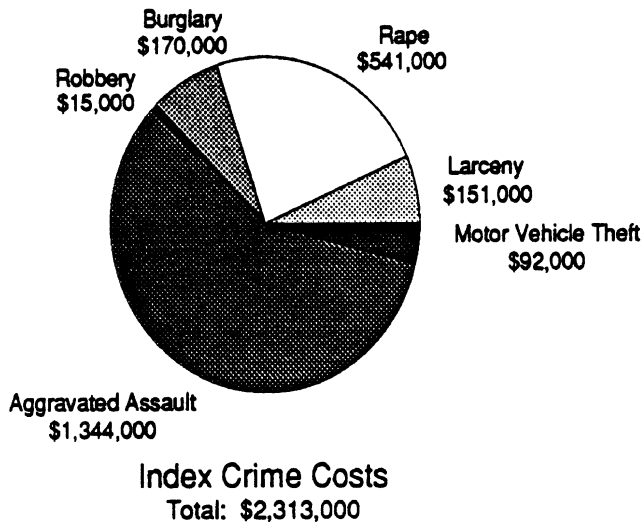
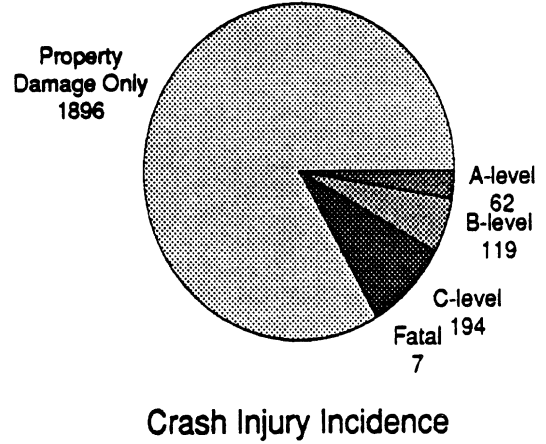
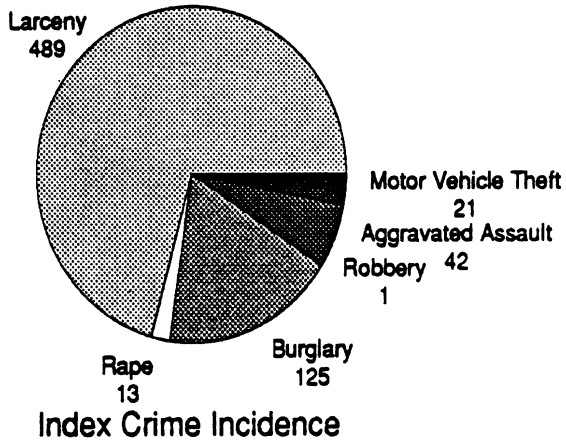
# Gratiot County



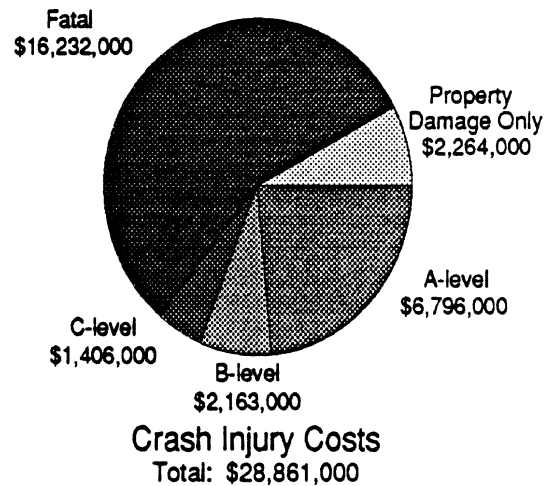
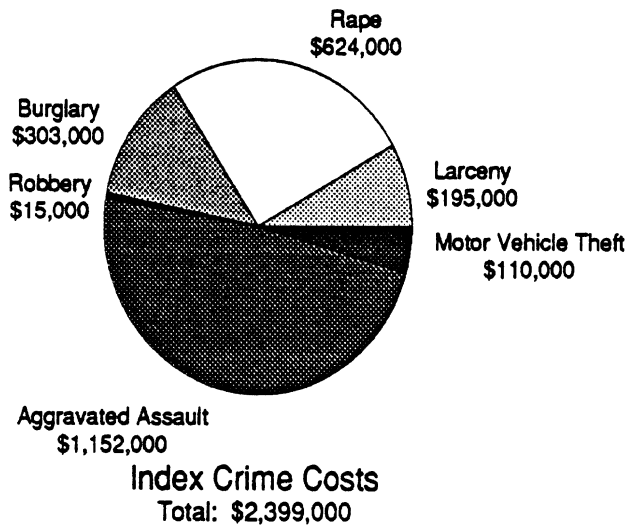
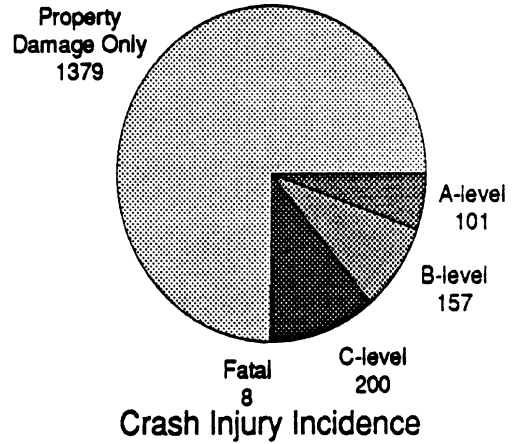
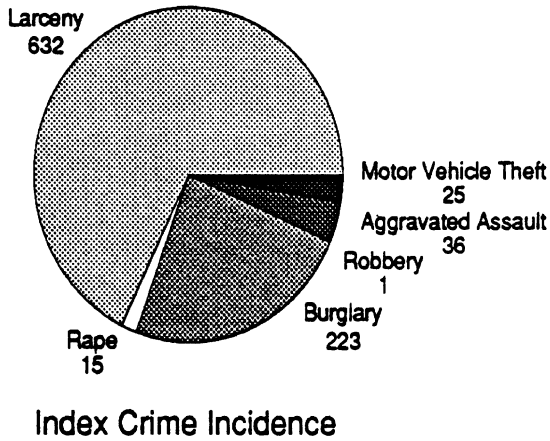
# Hillsdale County



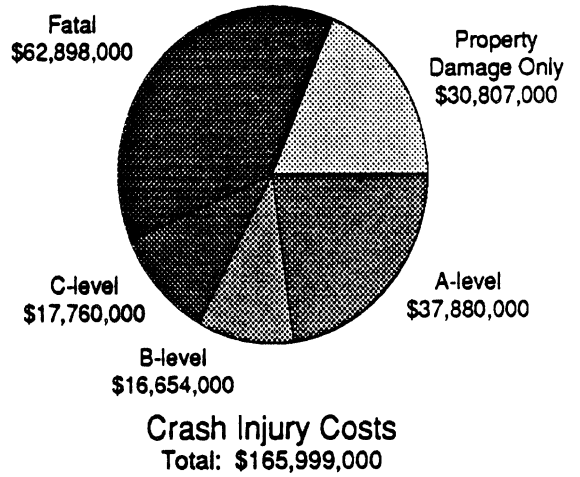
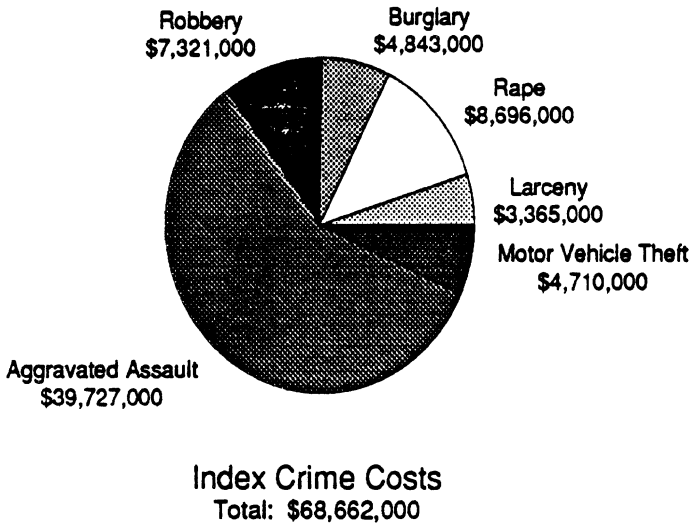
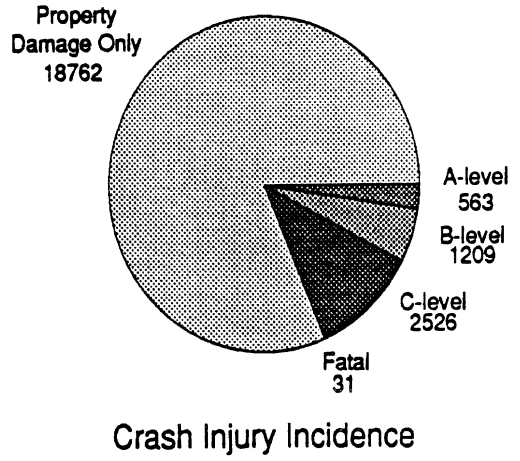
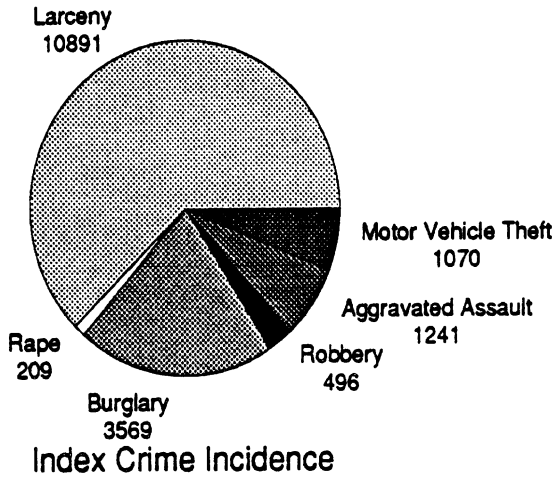
# Houghton County



# Huron County

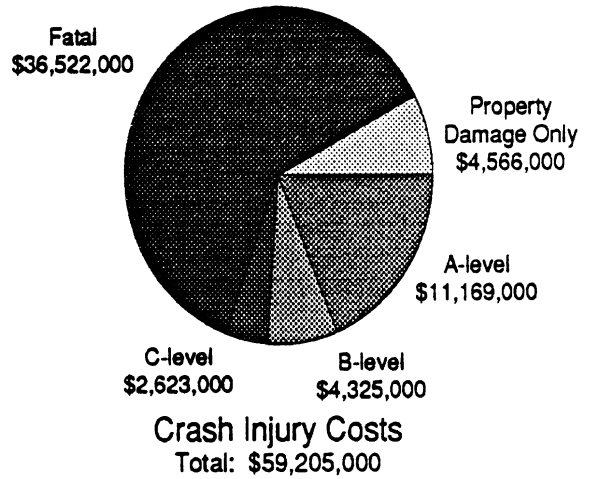
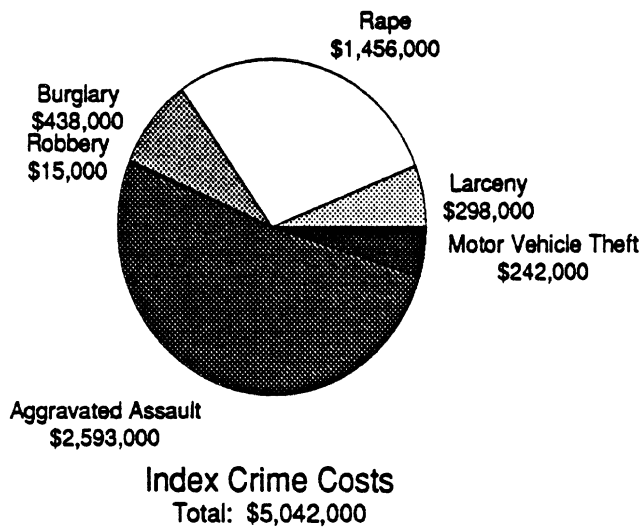
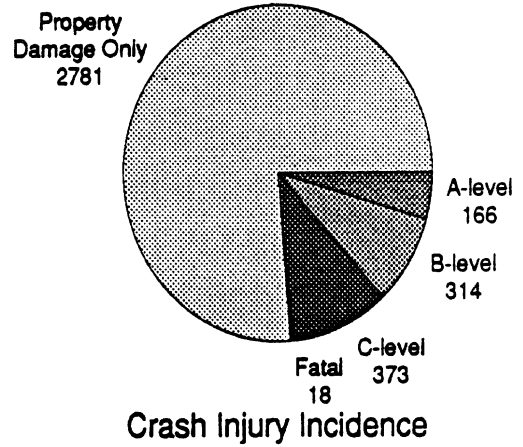
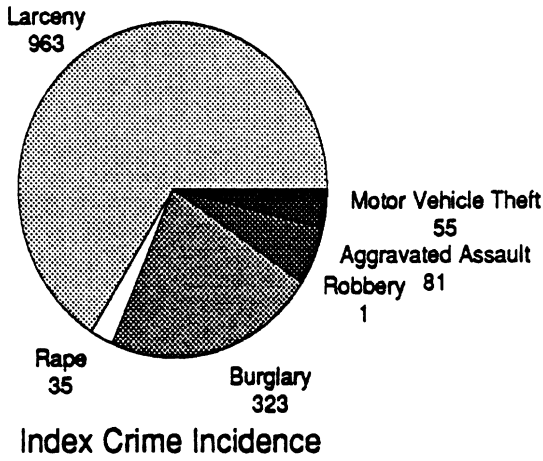


# Ingham County

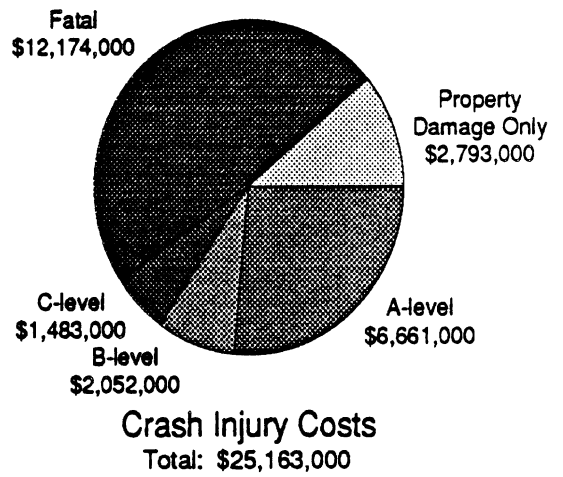
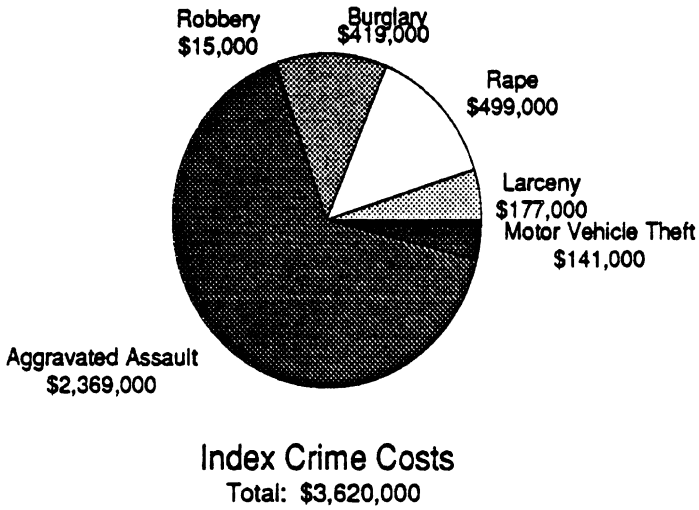
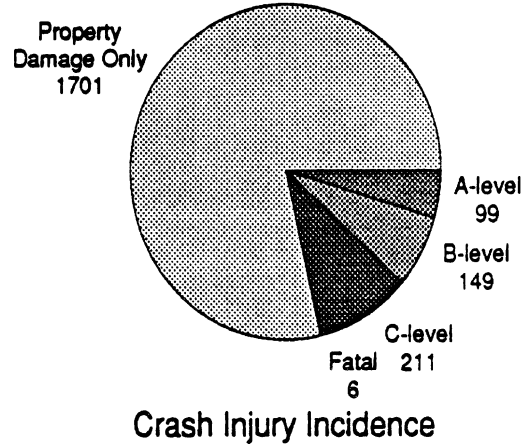
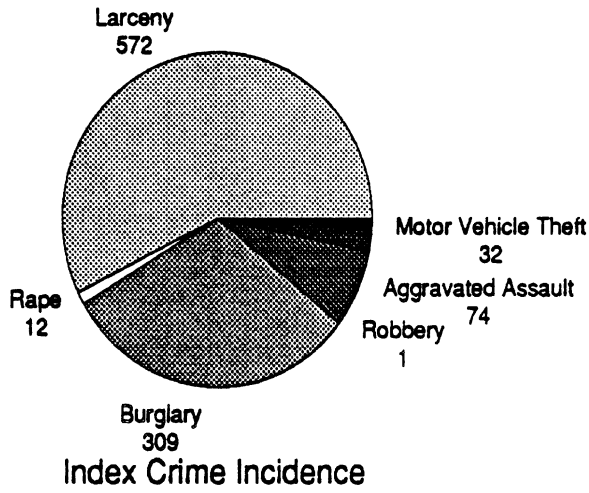




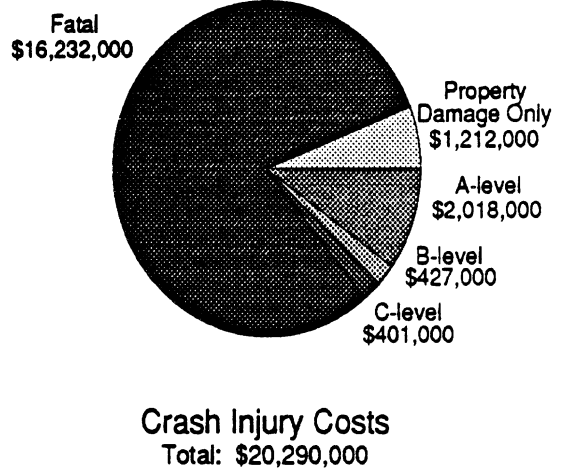
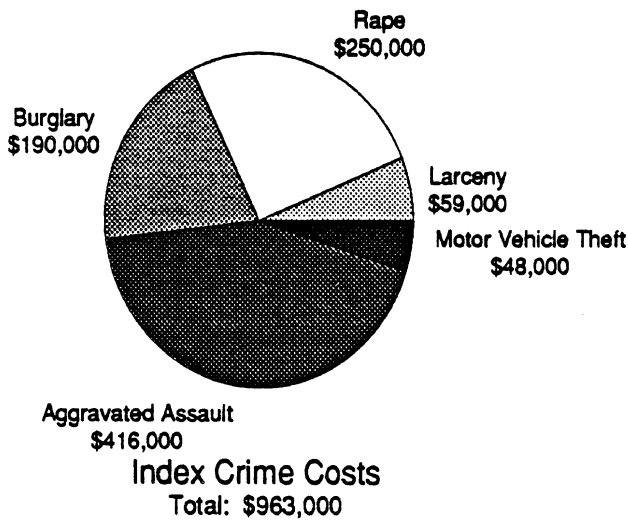
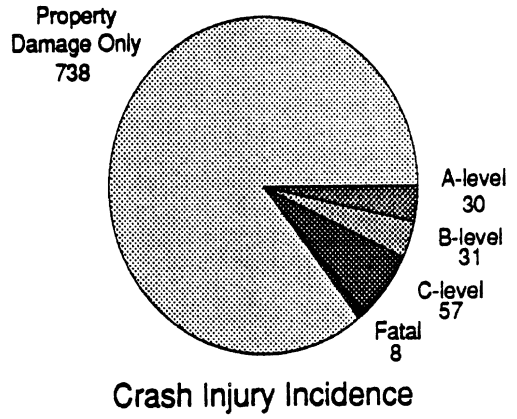
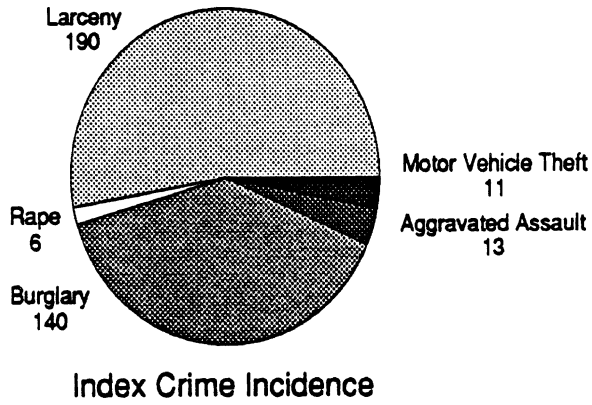
# Ionia County



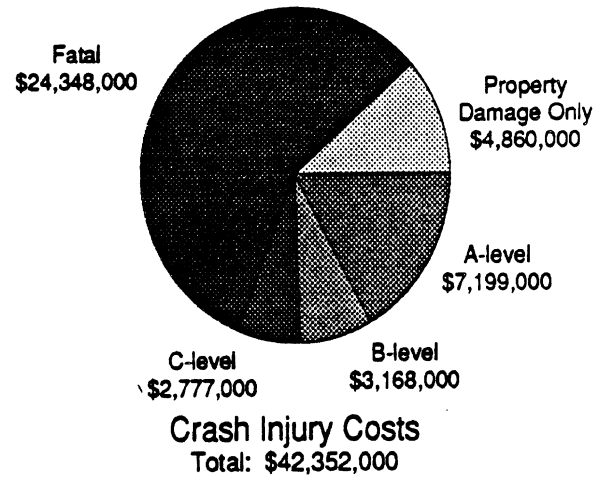
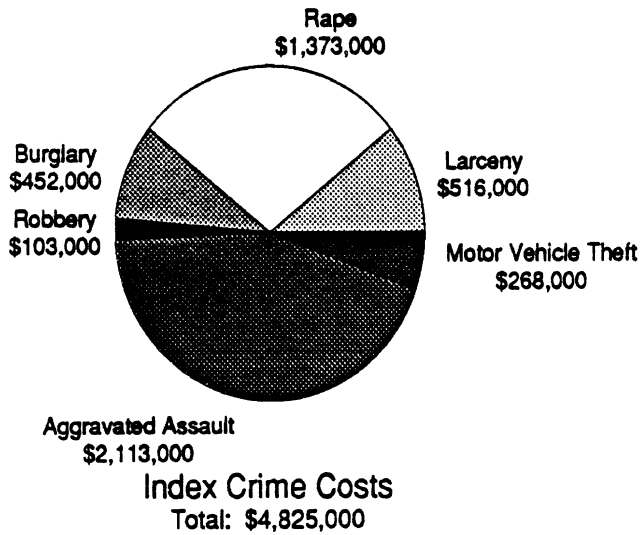
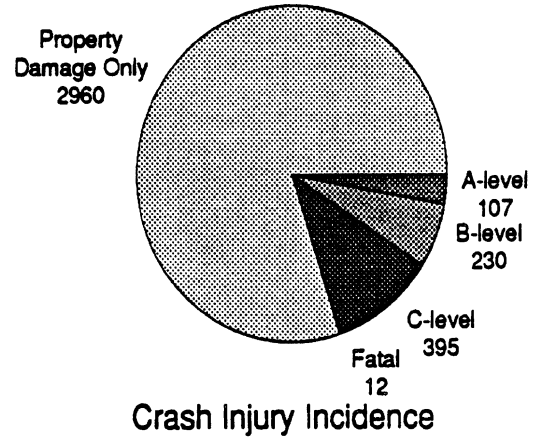
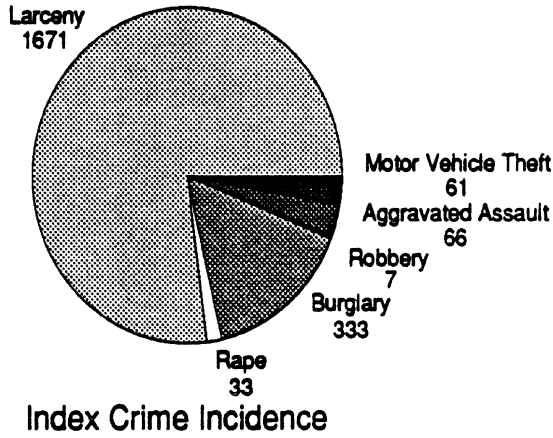
# Iosco County



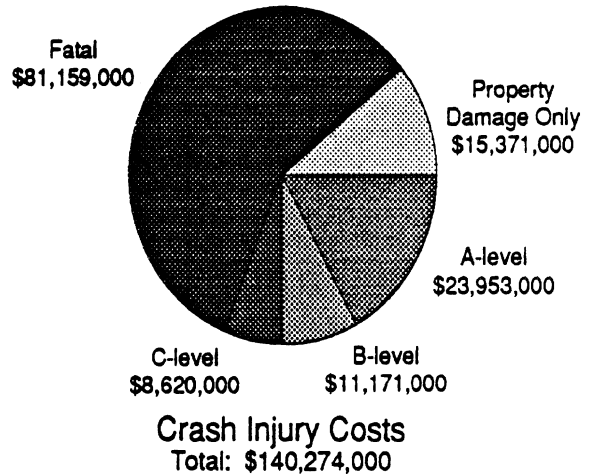
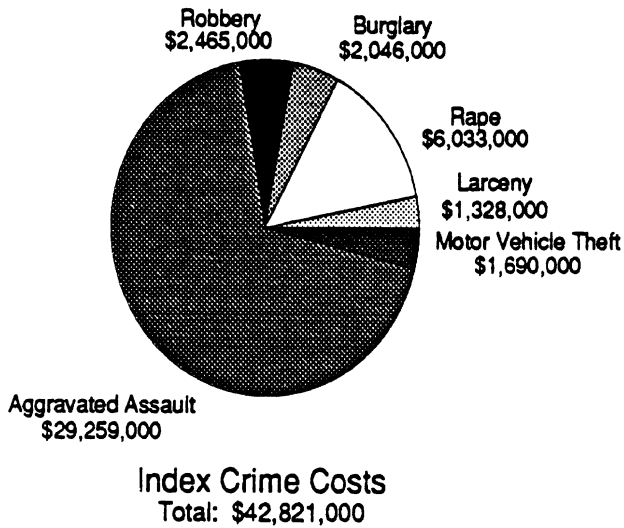
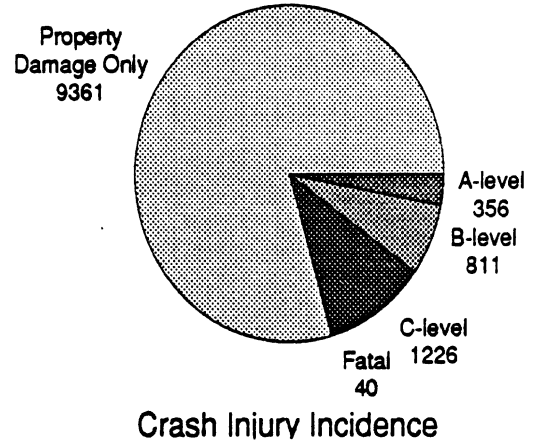
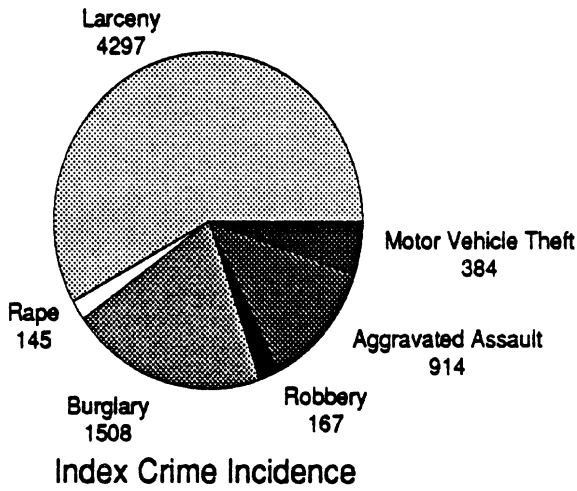
# Iron County



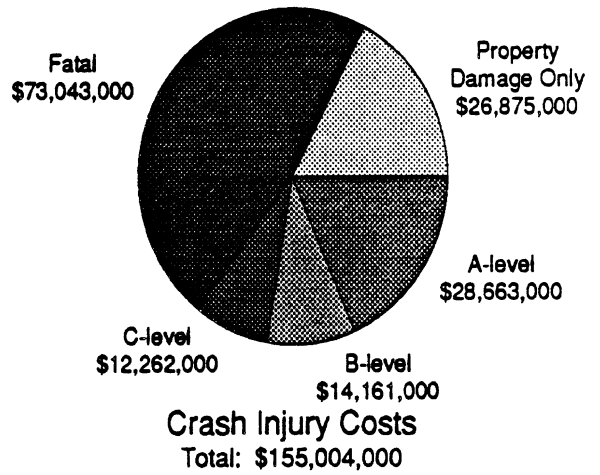
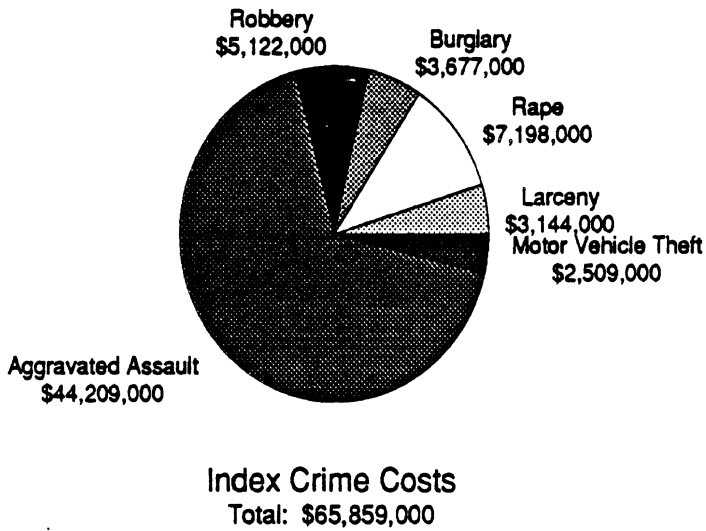
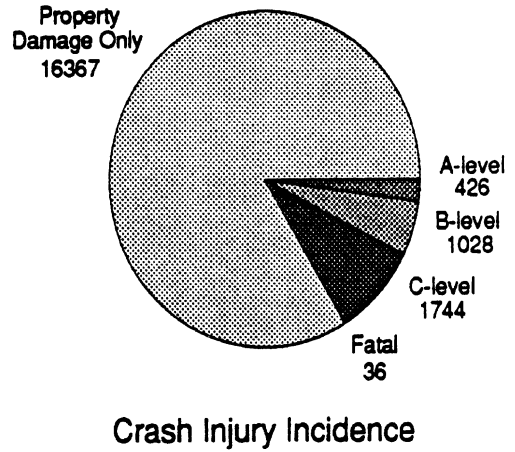
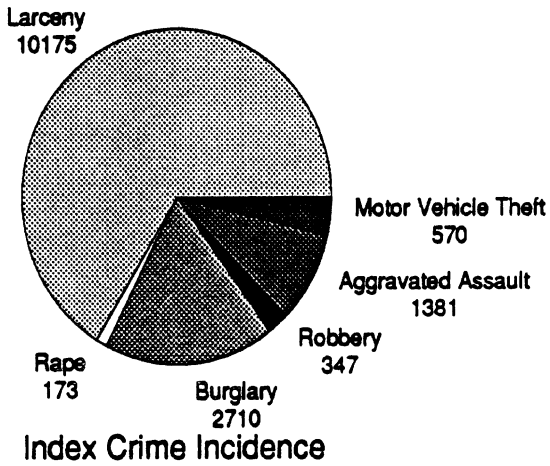
# Isabella County



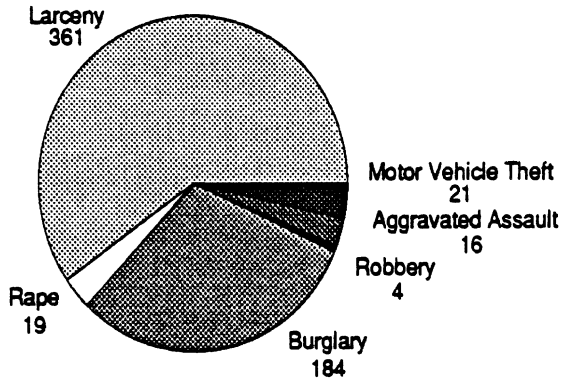
# Jackson County



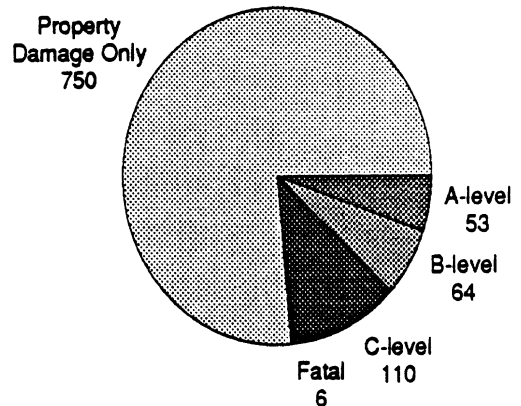
# Kalamazoo County



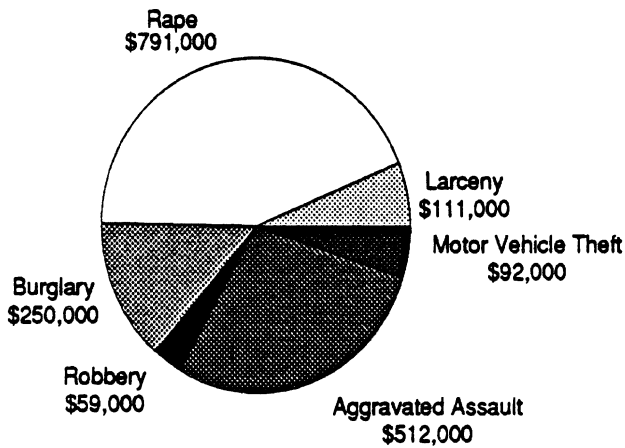
# Kalkaska County



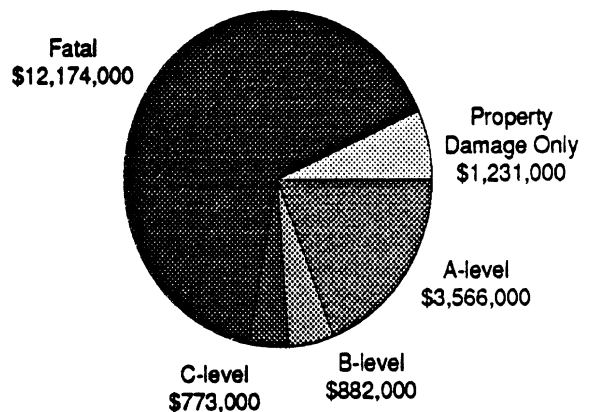
Index Crime Incidence



Crash Injury Incidence

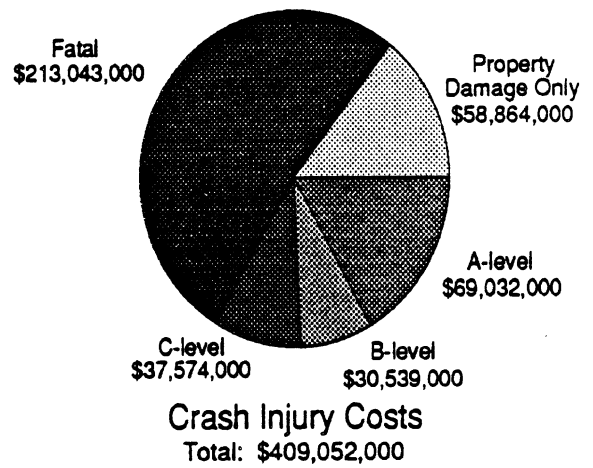
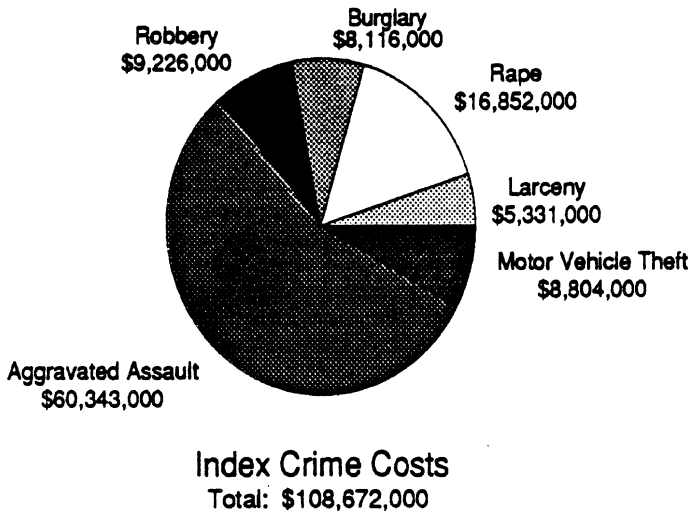
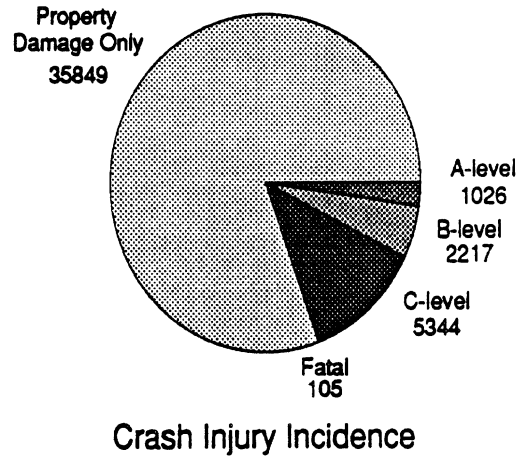
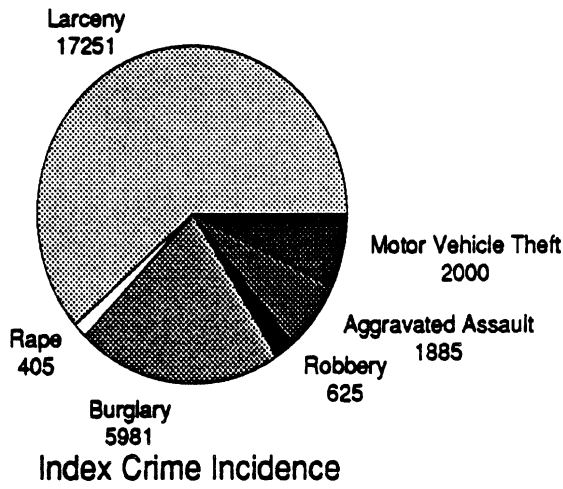


Index Crime Costs  
Total: \$1,815,000



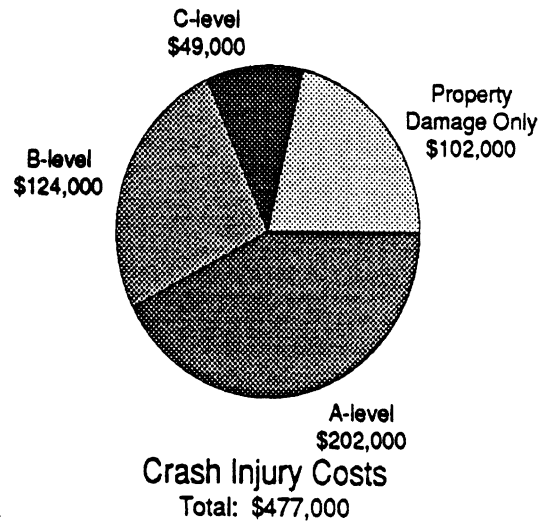
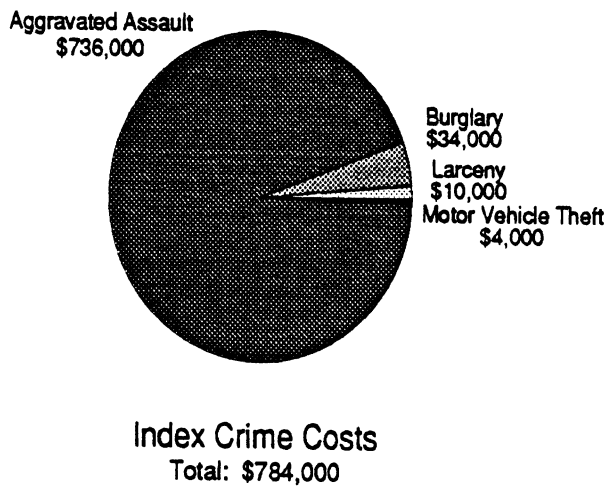
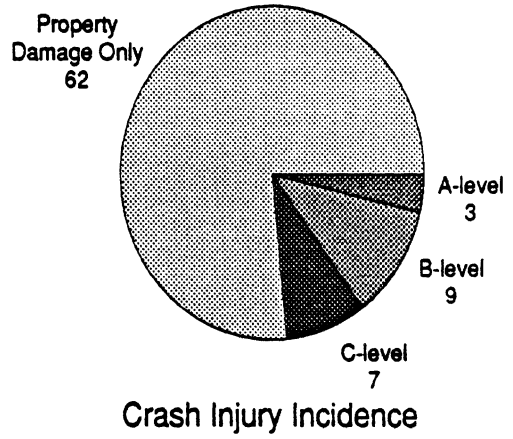
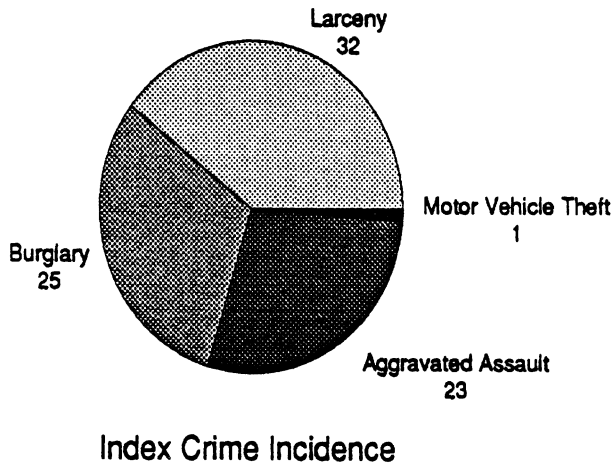
Crash Injury Costs  
Total: \$18,626,000

# Kent County

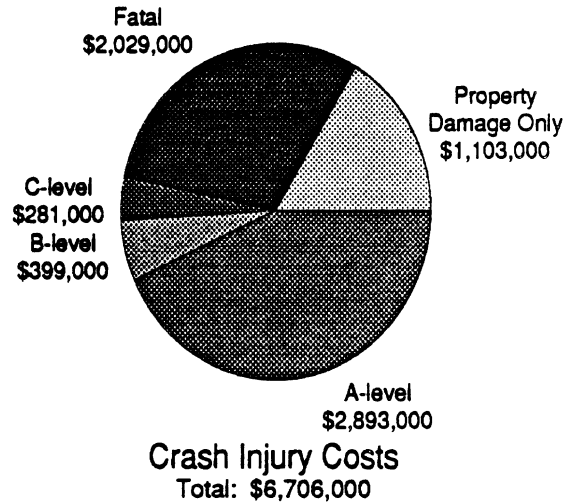
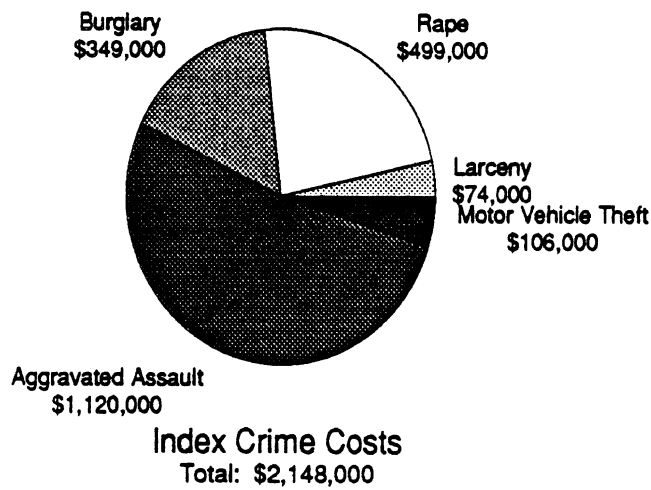
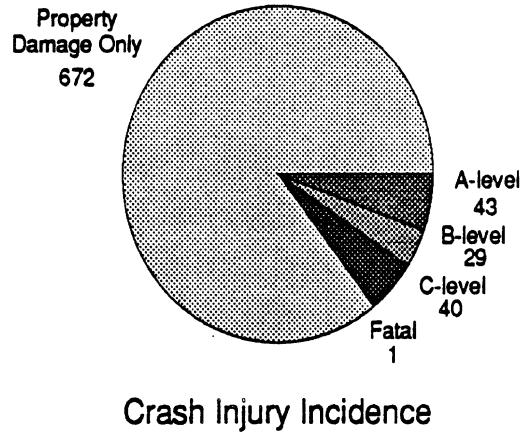
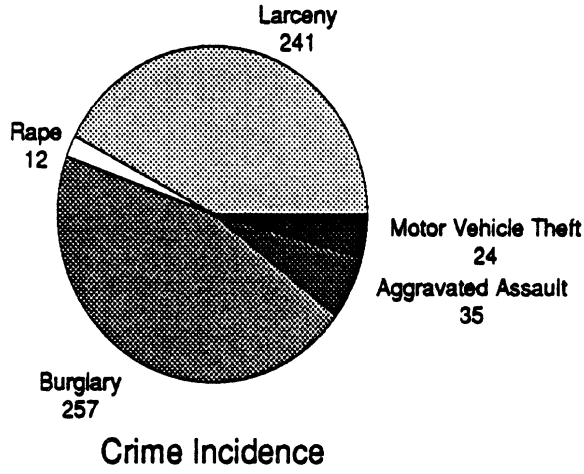




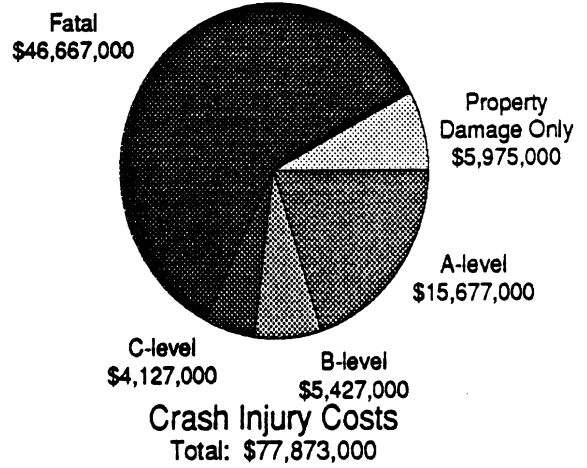
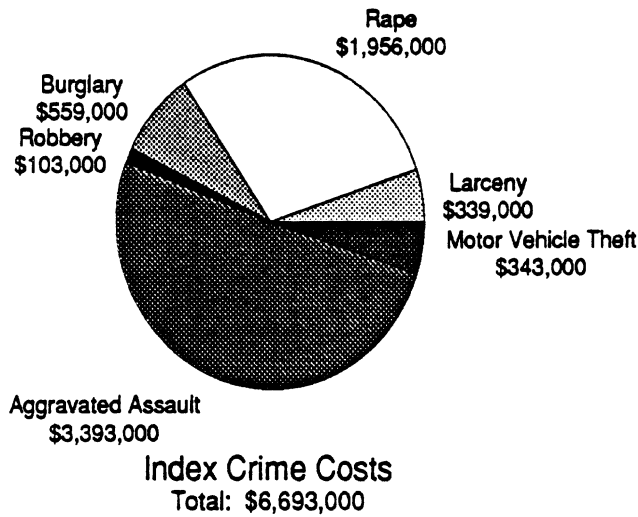
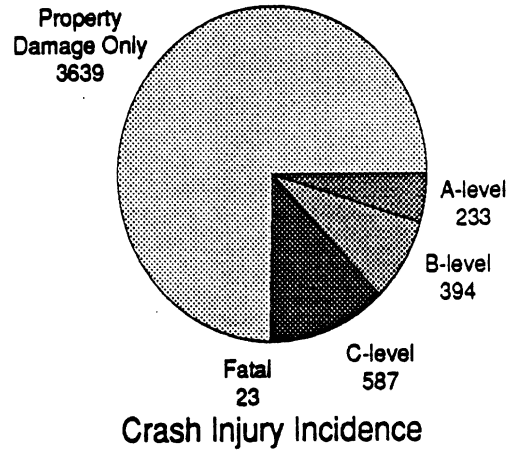
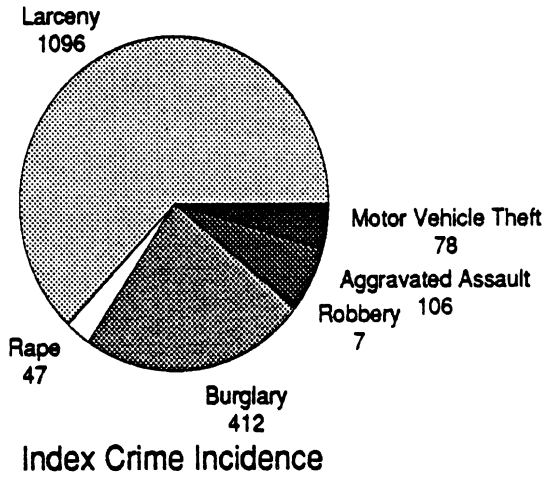
# Keweenaw County



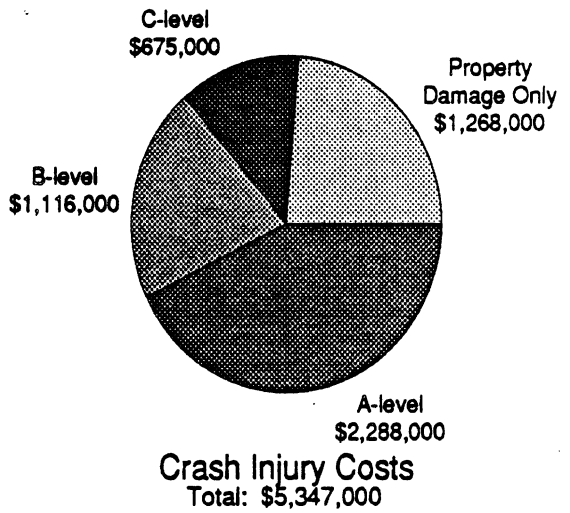
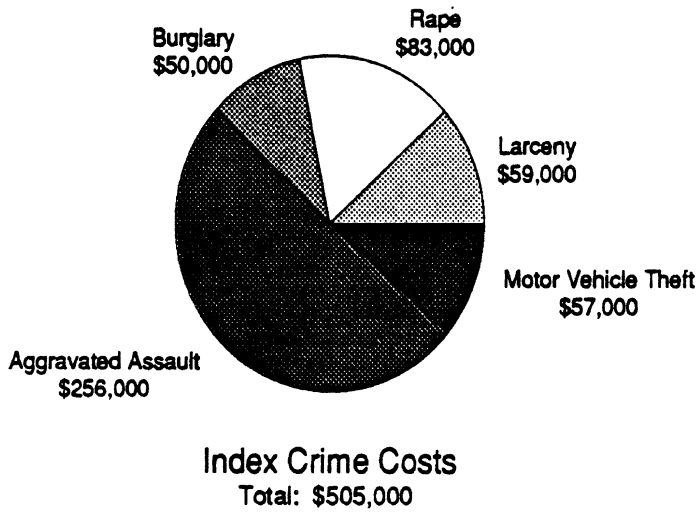
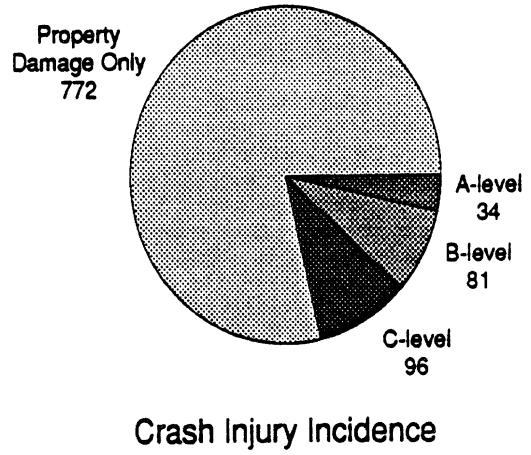
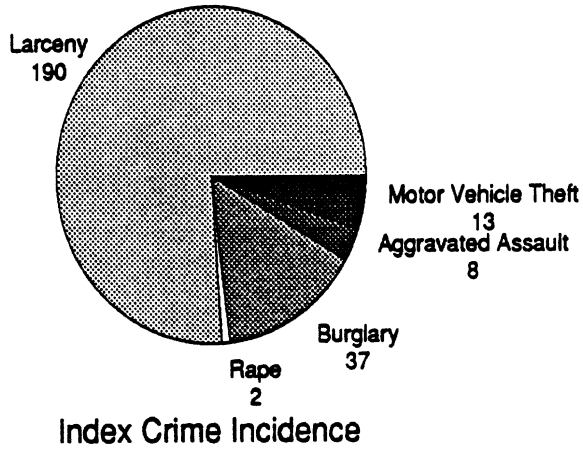
# Lake County



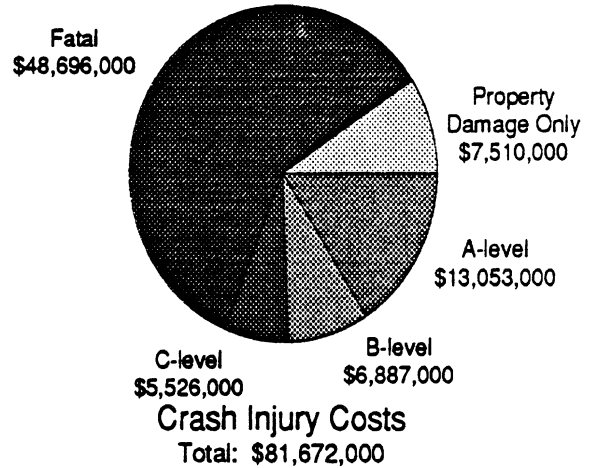
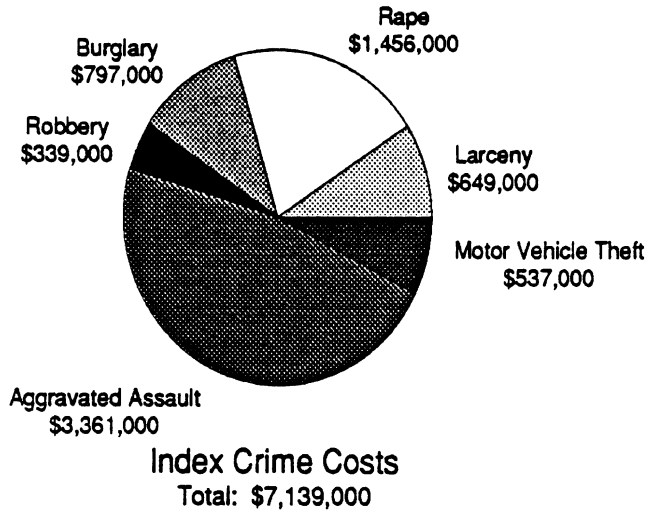
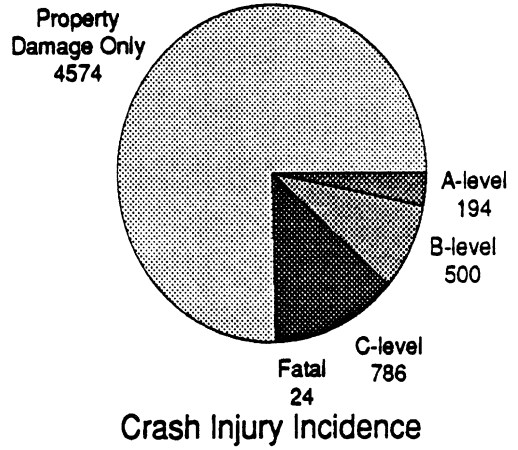
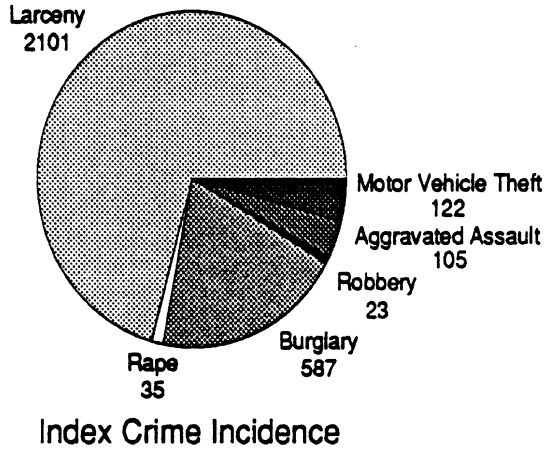
# Lapeer County



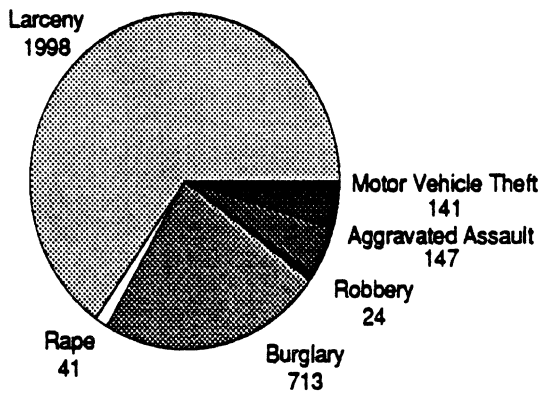
# Leelanau County



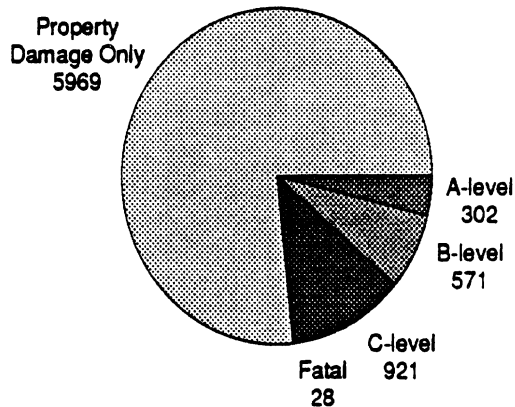
# Lenawee County



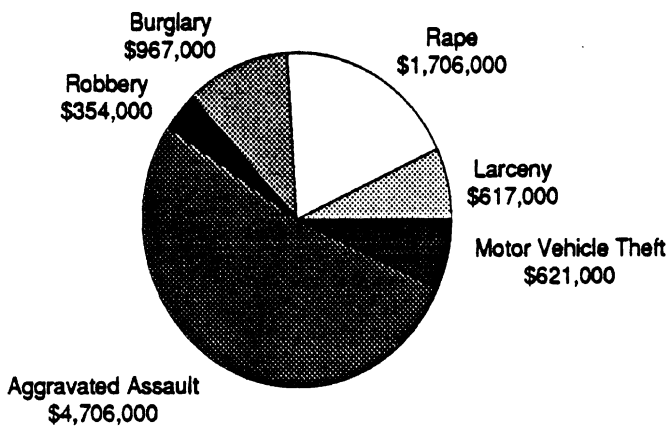
# Livingston County



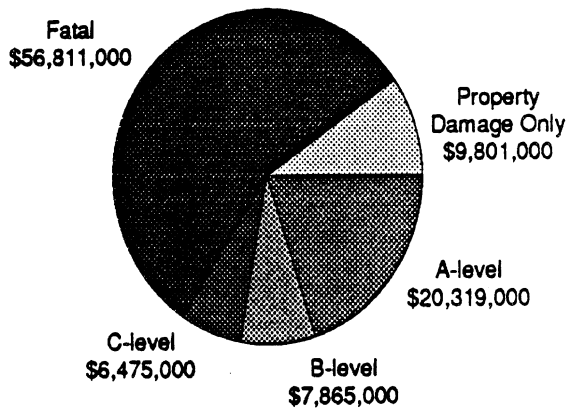
Index Crime Incidence



Crash Injury Incidence

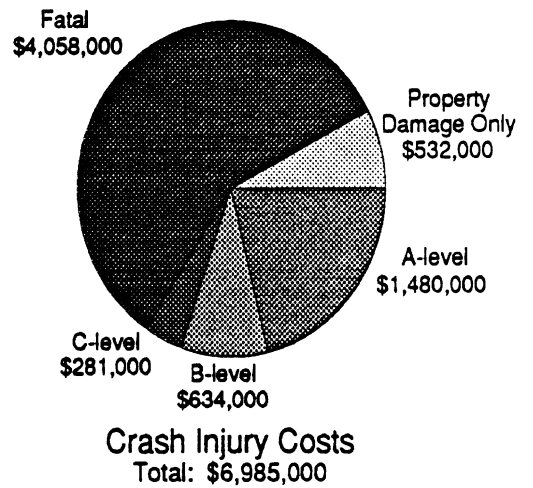
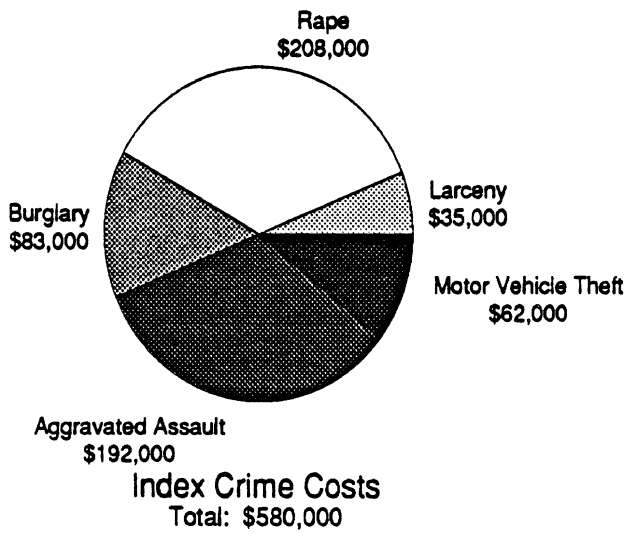
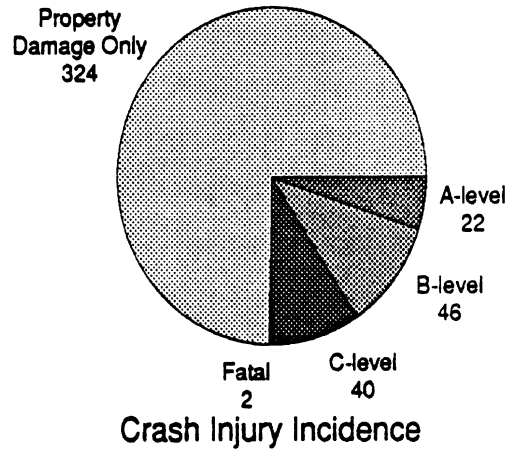
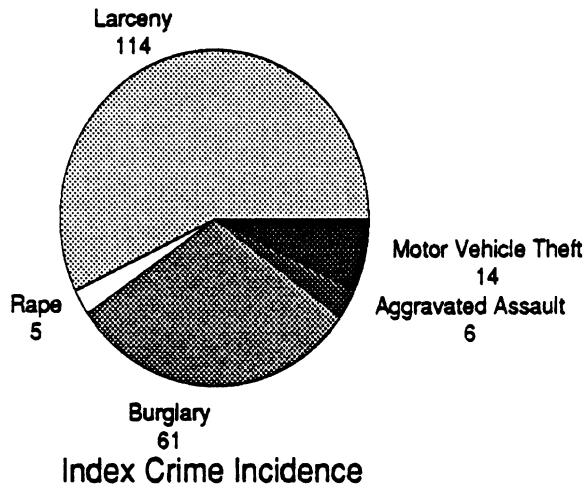


Index Crime Costs  
Total: \$8,971,000

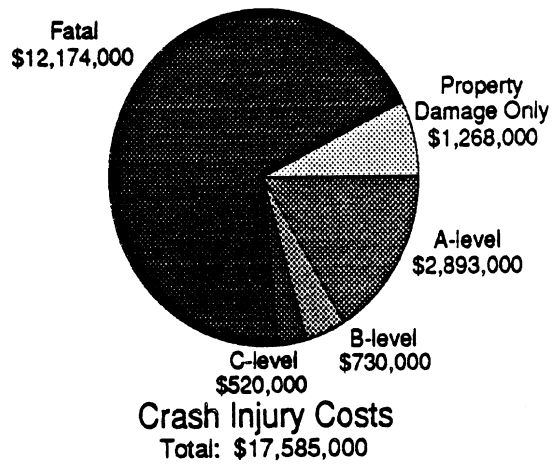
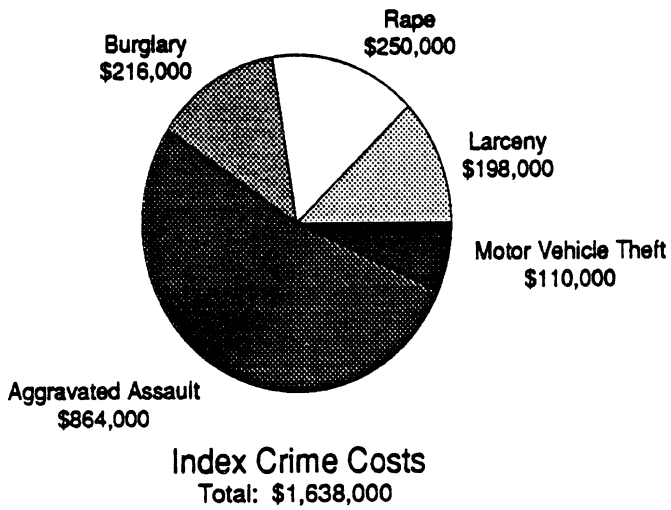
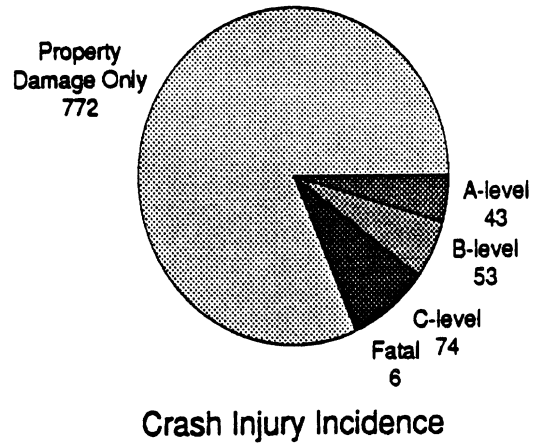
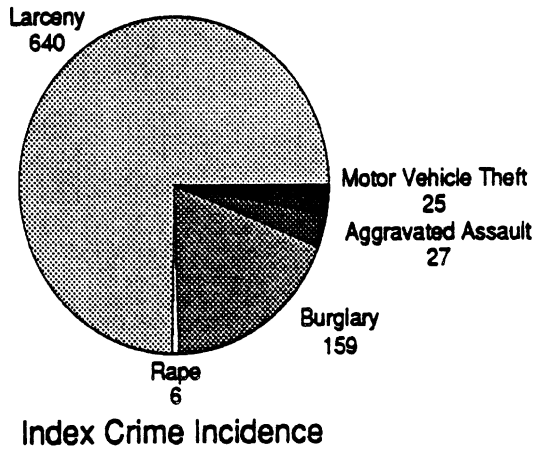


Crash Injury Costs  
Total: \$101,271,000

# Luce County

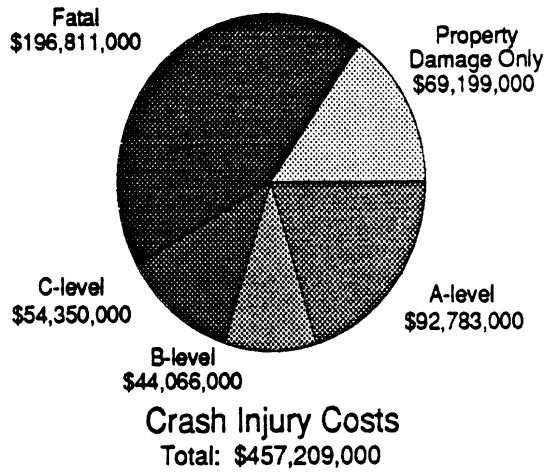
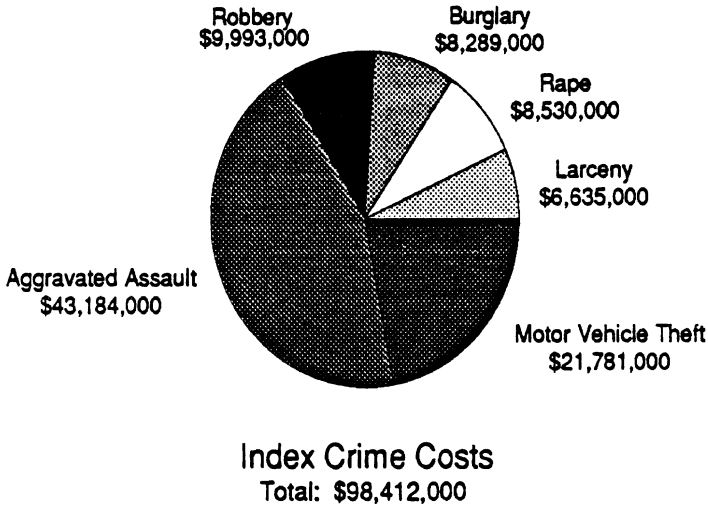
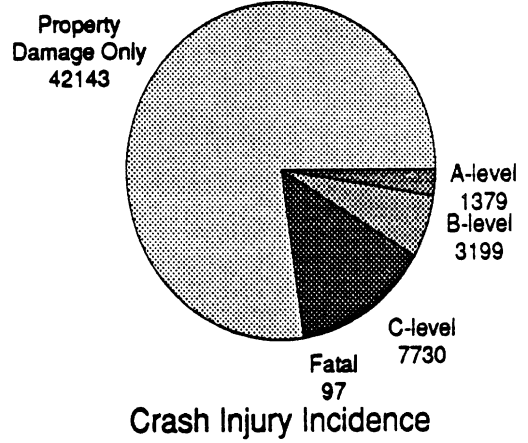
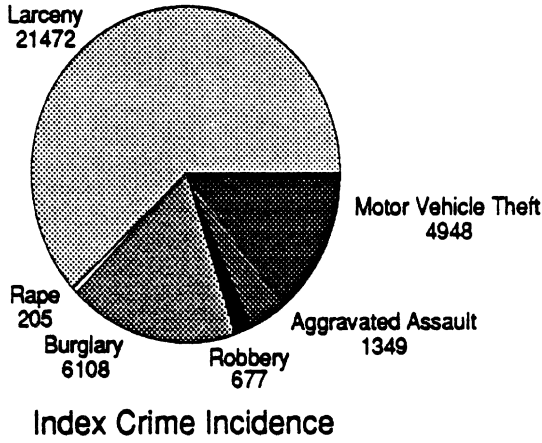


# Mackinac County

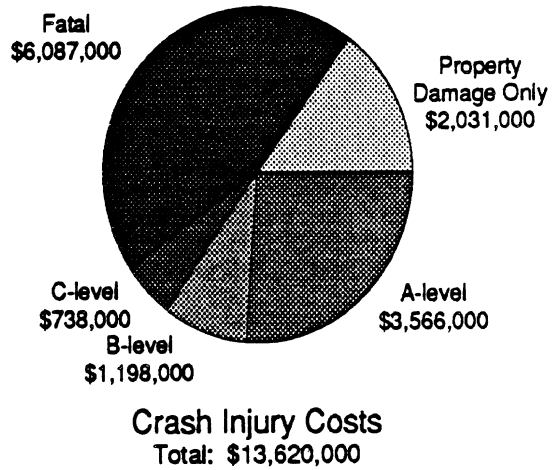
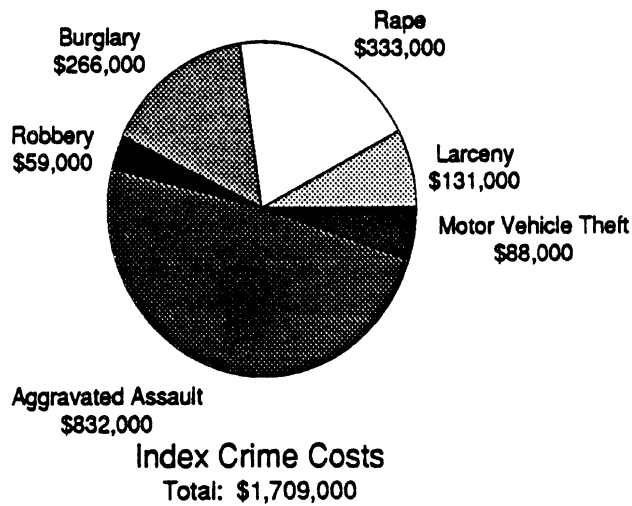
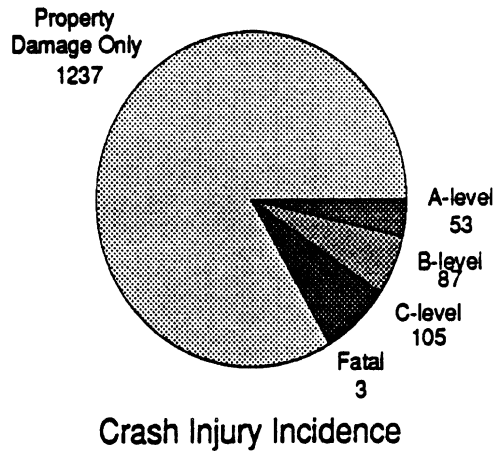
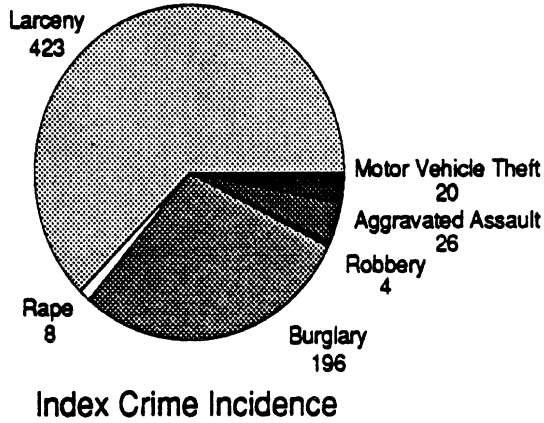




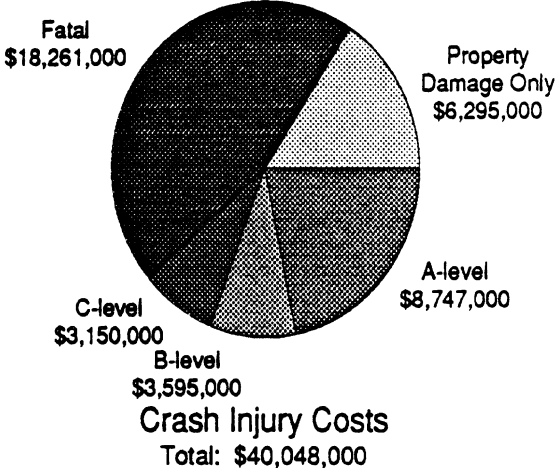
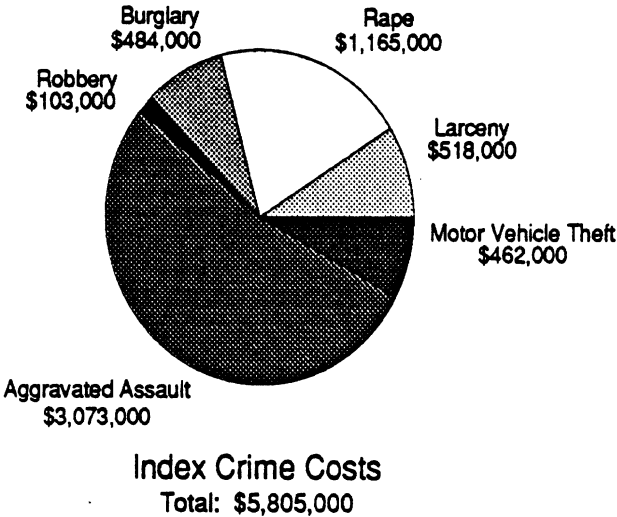
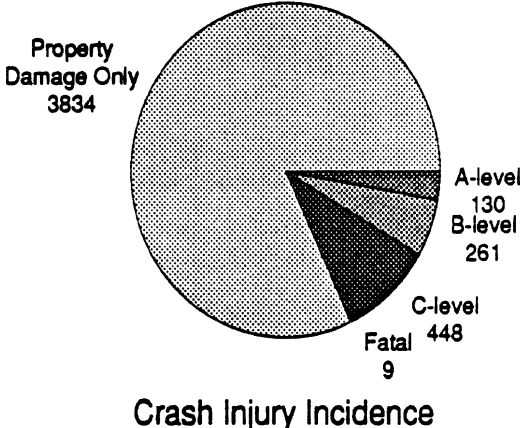
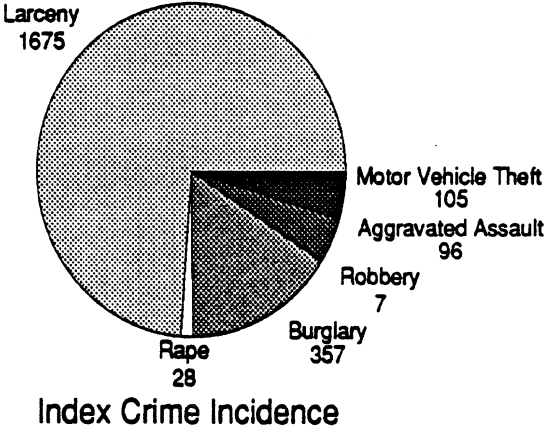
# Macomb County



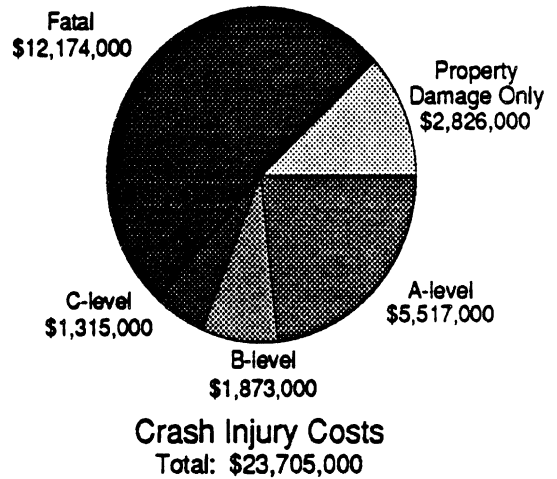
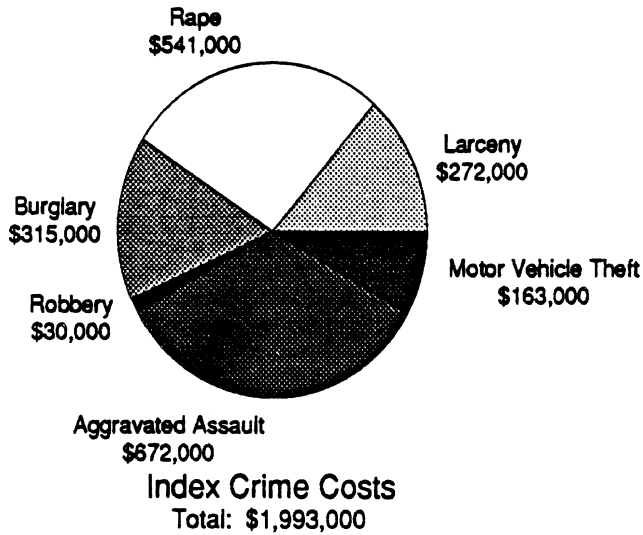
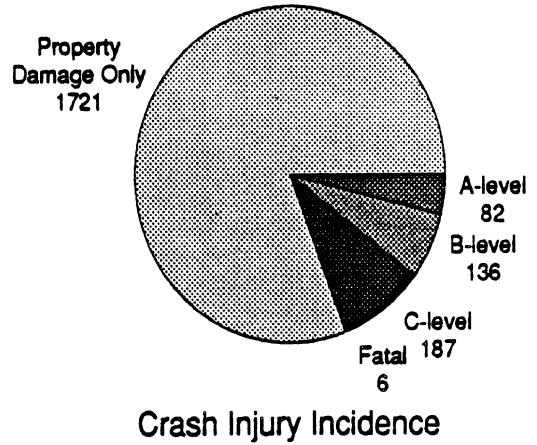
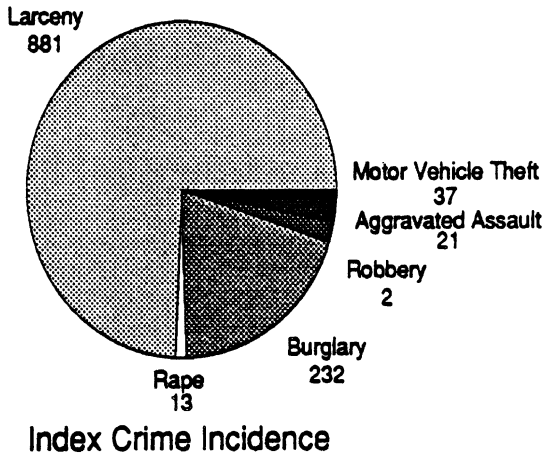
# Manistee County



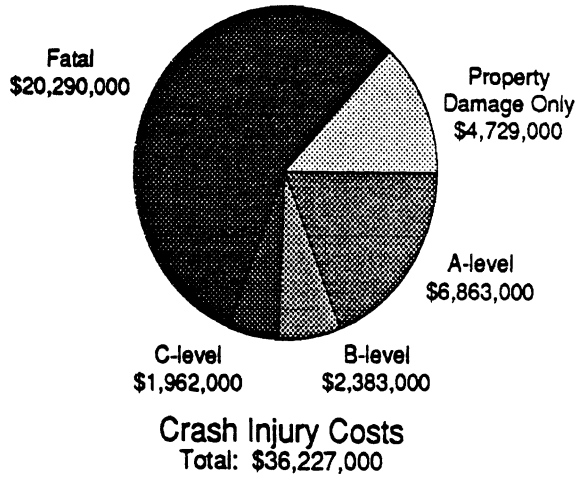
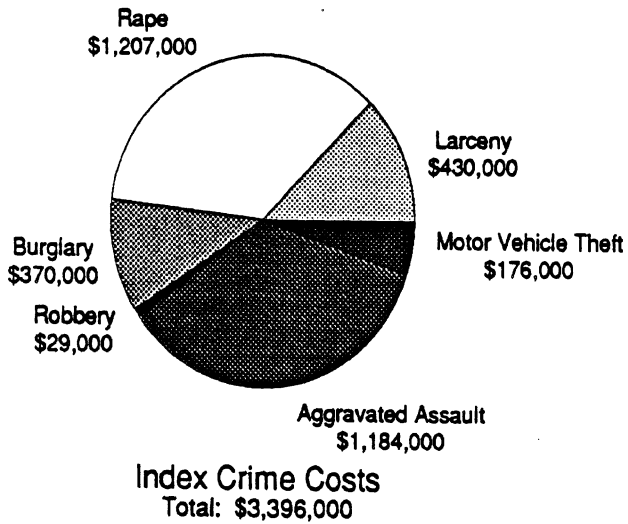
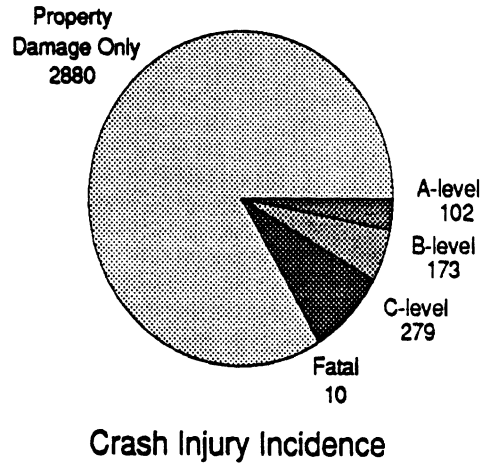
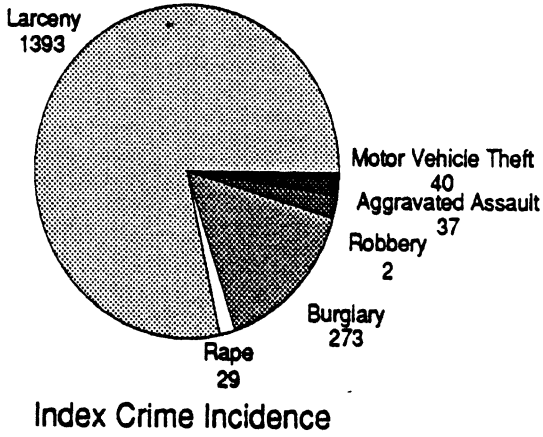
# Marquette County



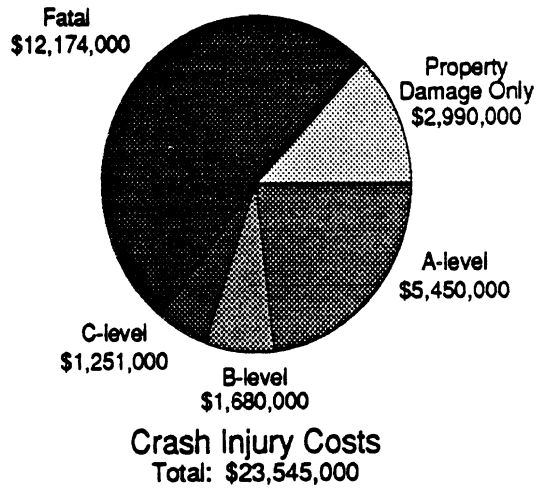
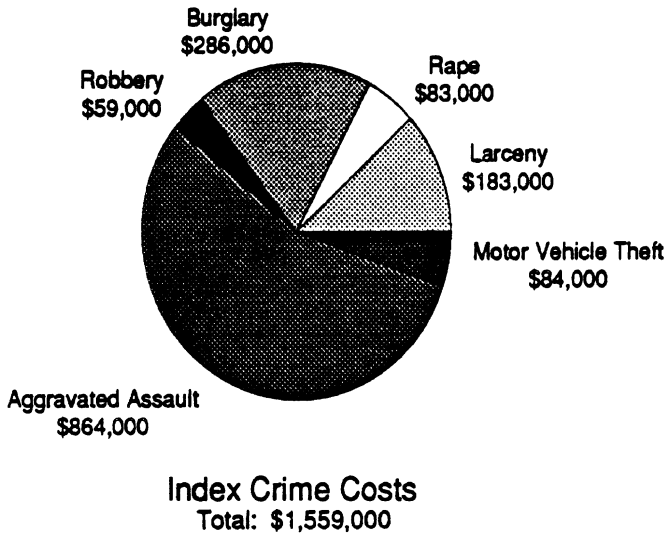
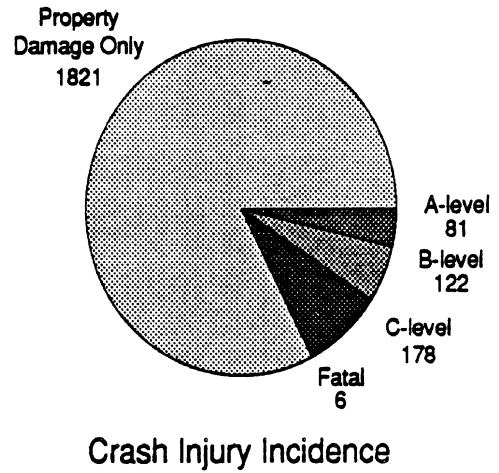
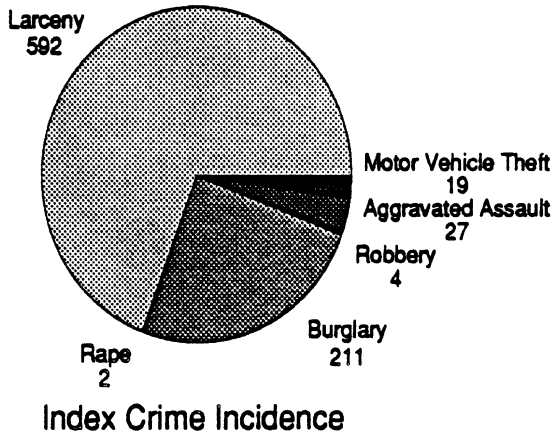
# Mason County



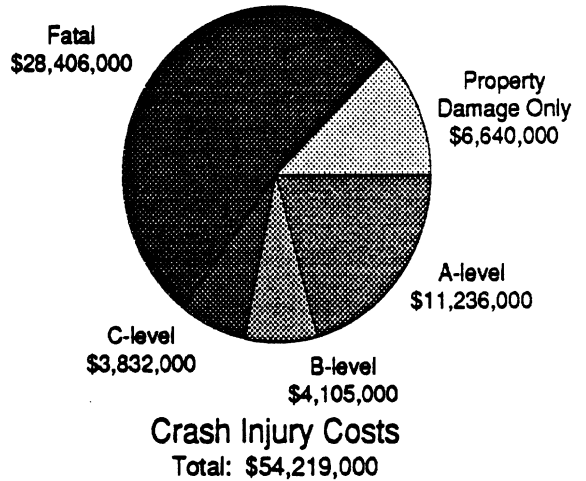
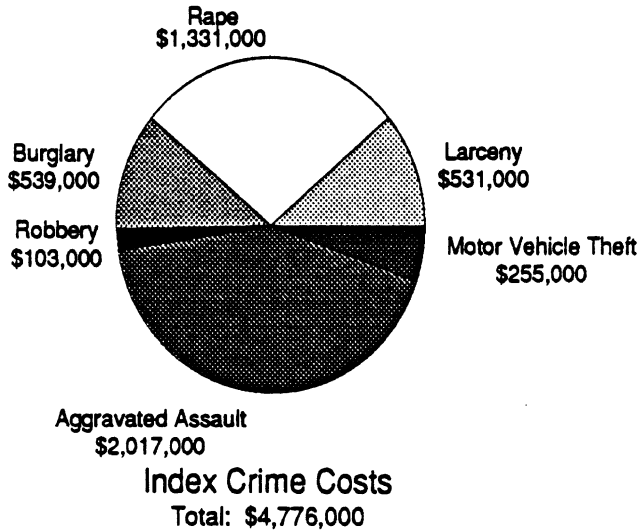
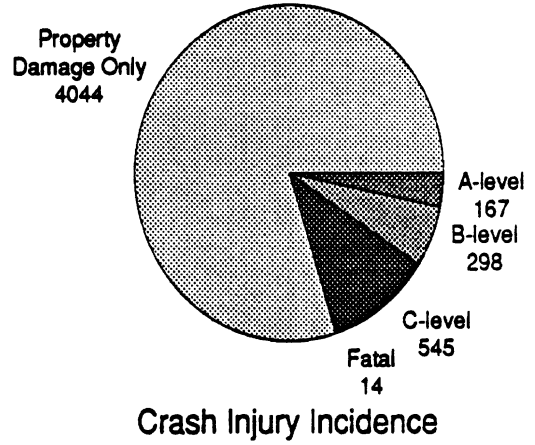
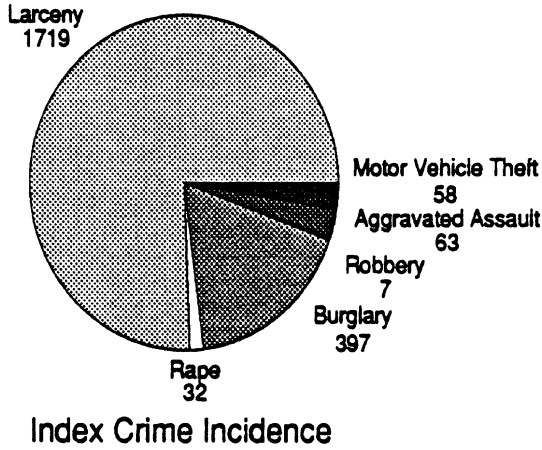
# Mecosta County



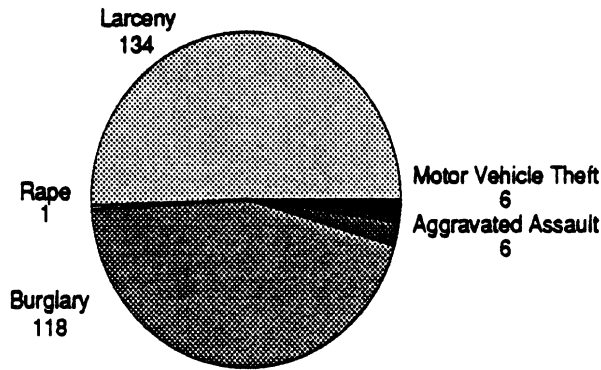
# Menominee County



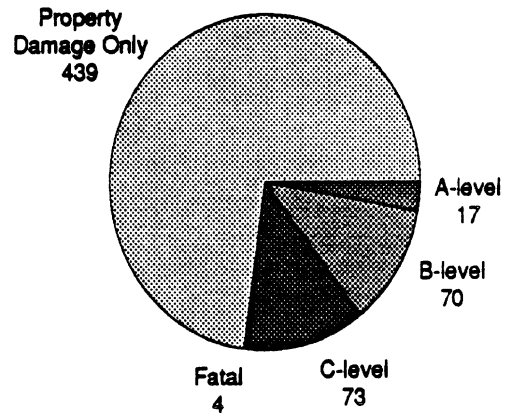
# Midland County



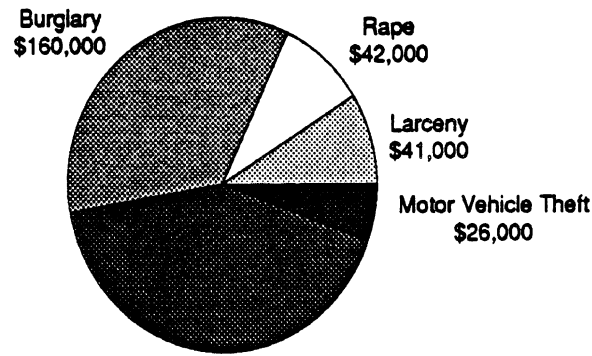
# Missaukee County



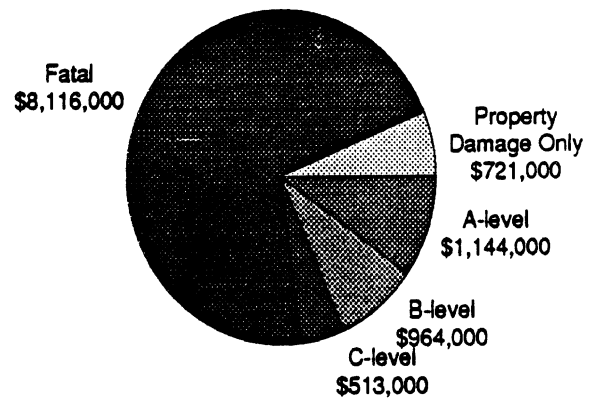
Index Crime Incidence



Crash Injury Incidence



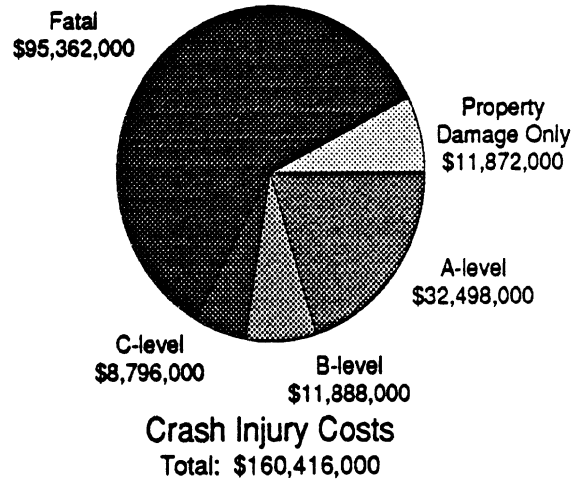
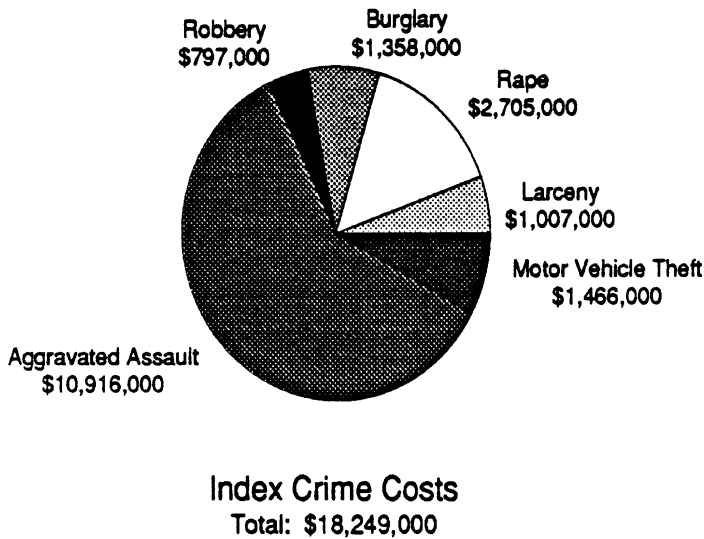
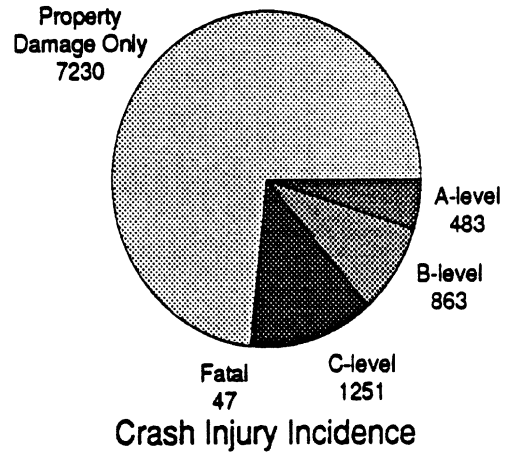
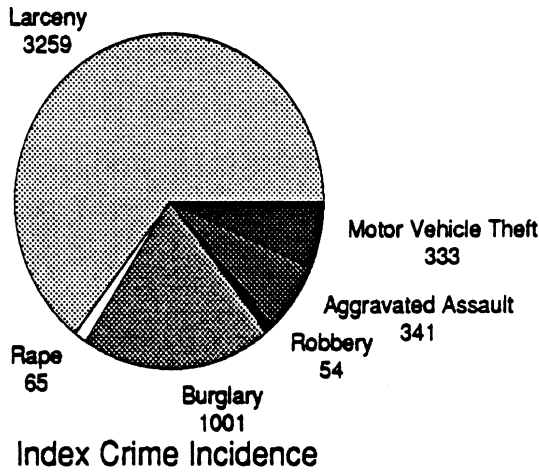
Index Crime Costs  
Total: \$461,000



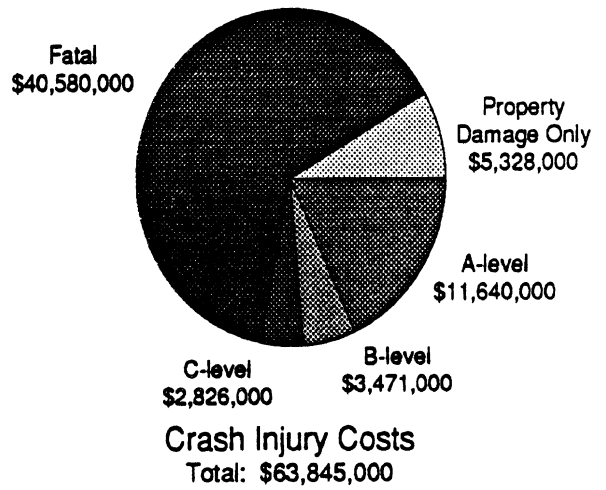
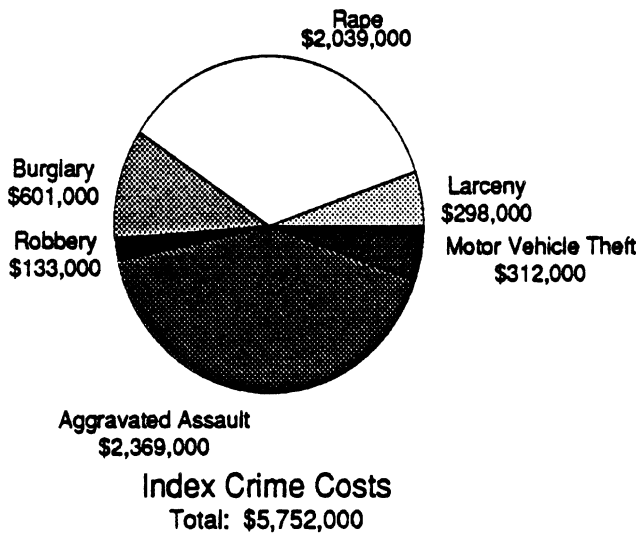
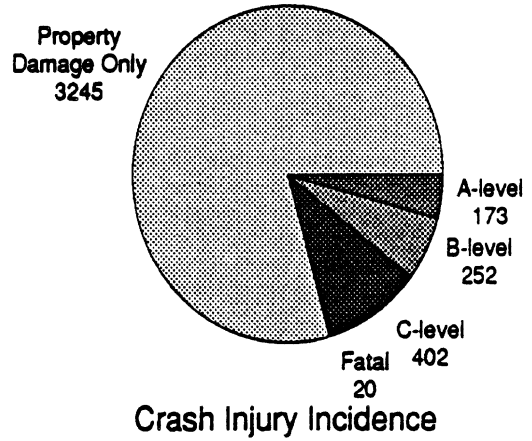
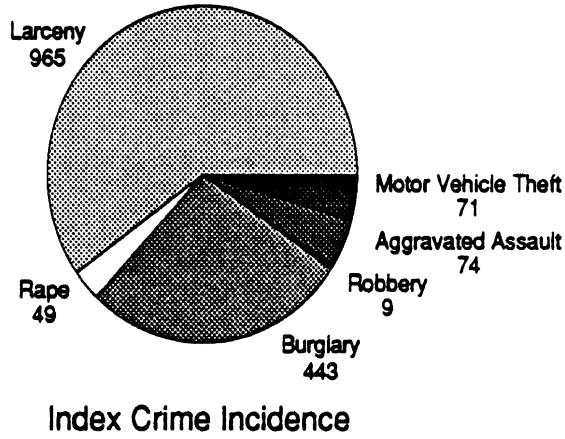
Crash Injury Costs  
Total: \$11,458,000



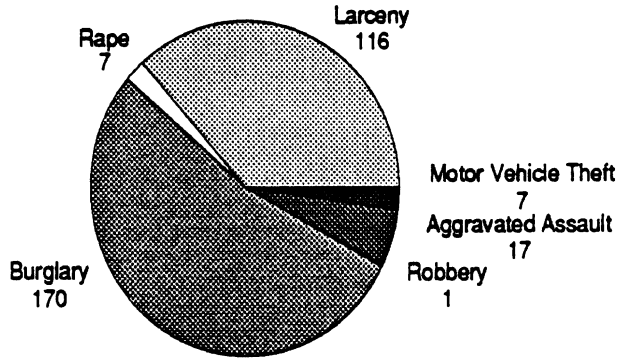
# Monroe County



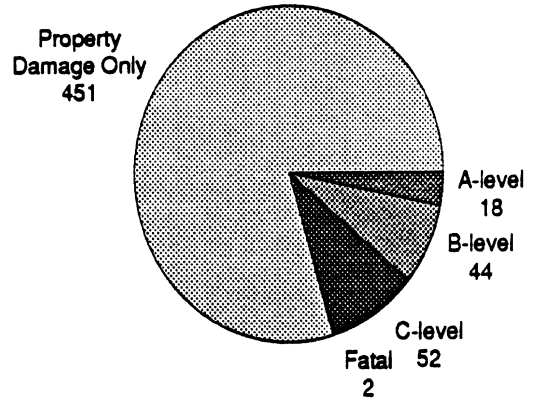
# Montcalm County



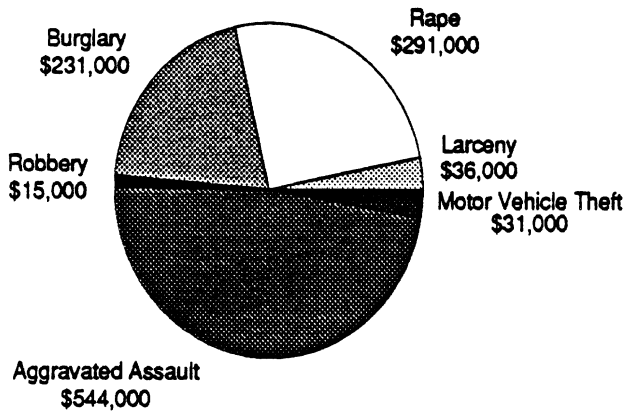
# Montmorency County



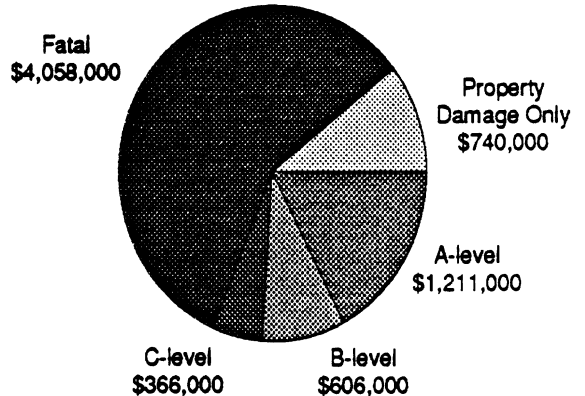
Index Crime Incidence



Crash Injury Incidence

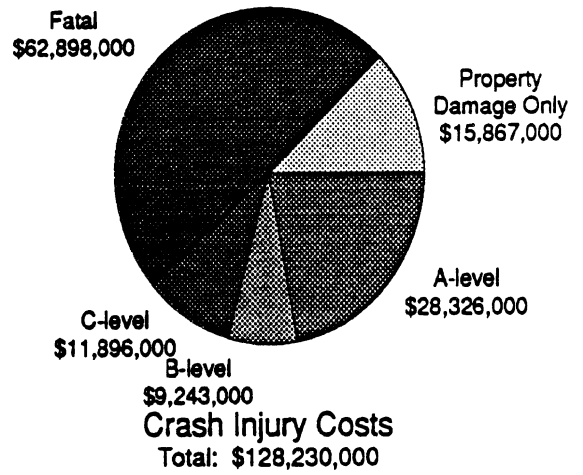
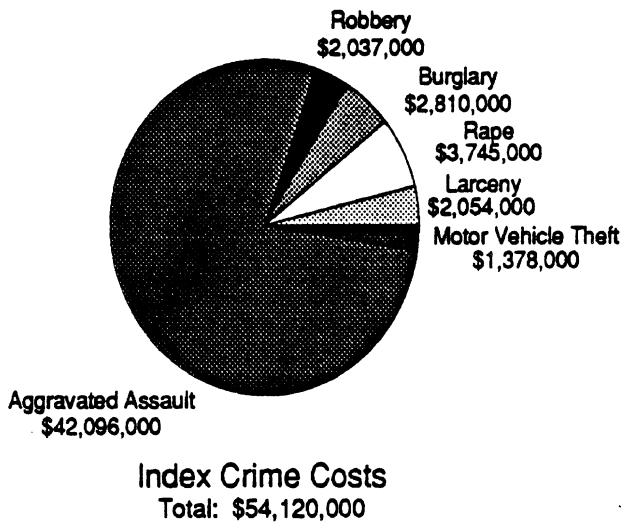
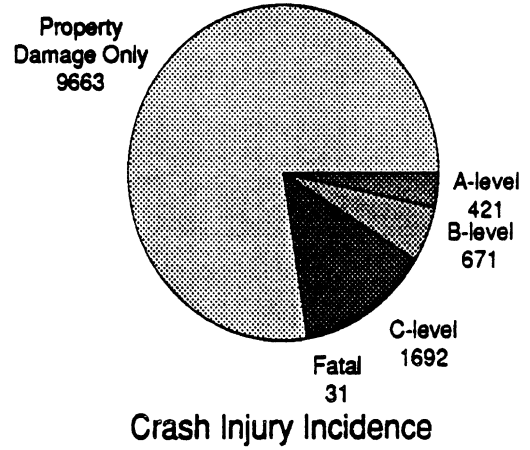
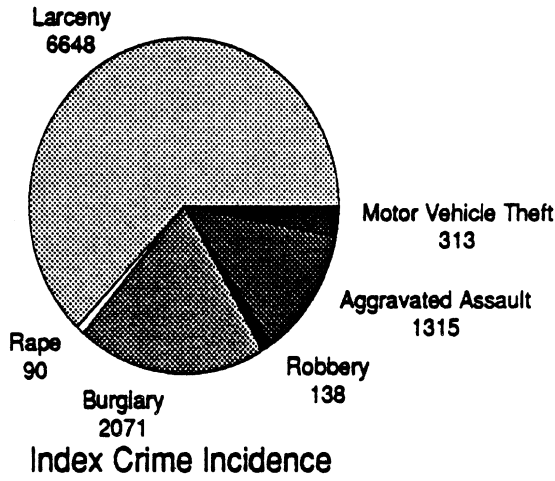


Index Crime Costs  
Total: \$1,148,000

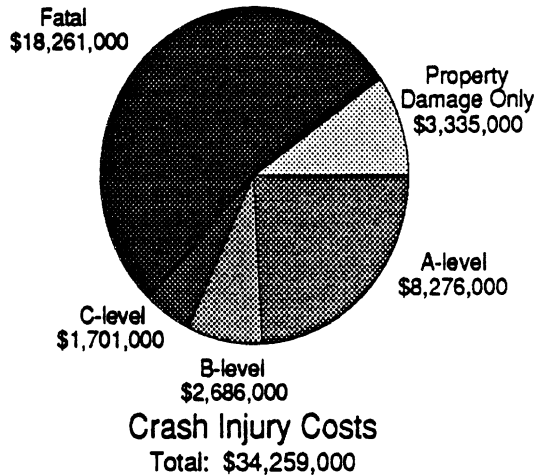
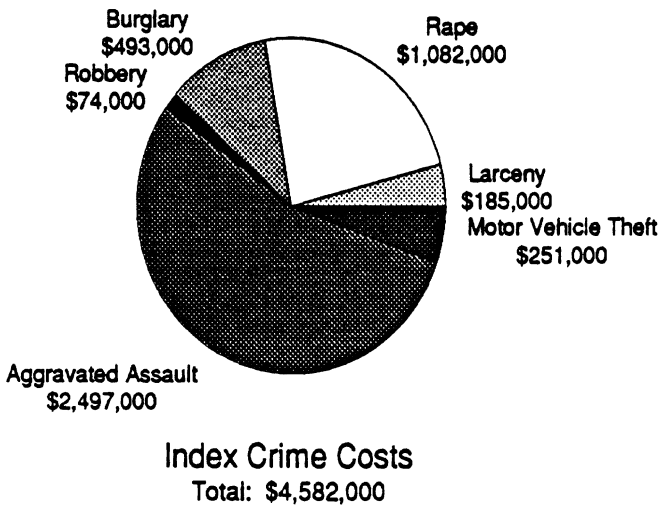
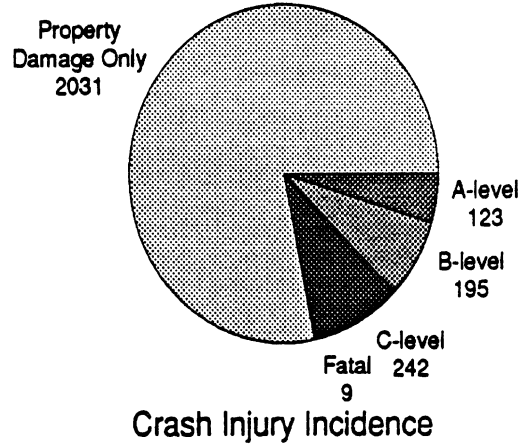
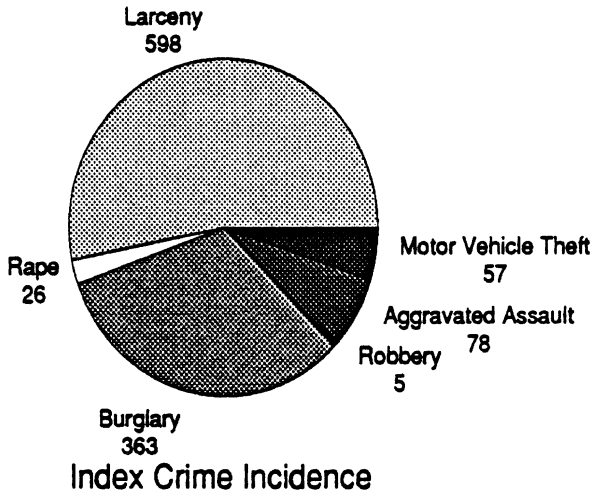


Crash Injury Costs  
Total: \$6,981,000

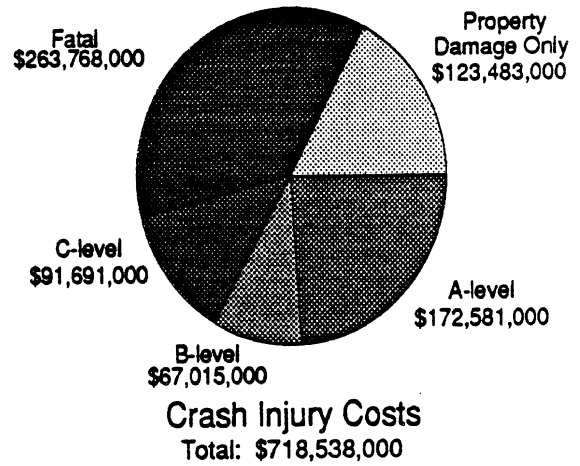
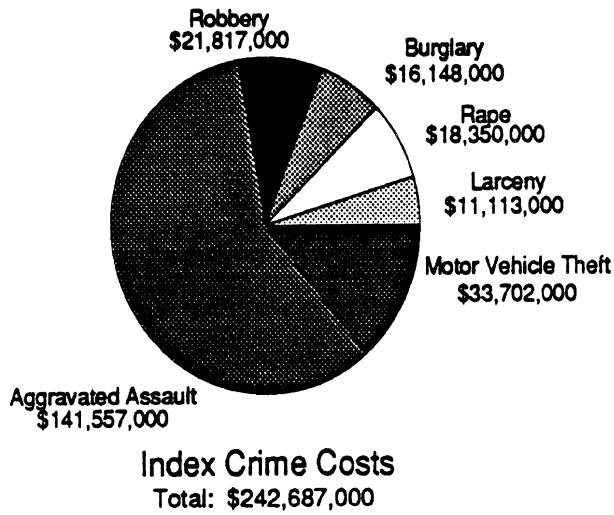
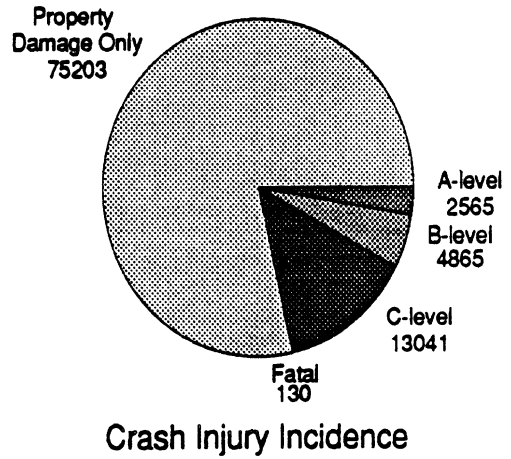
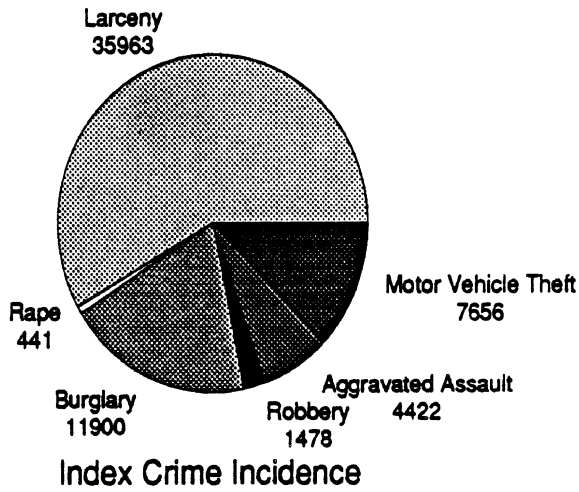
# Muskegon County



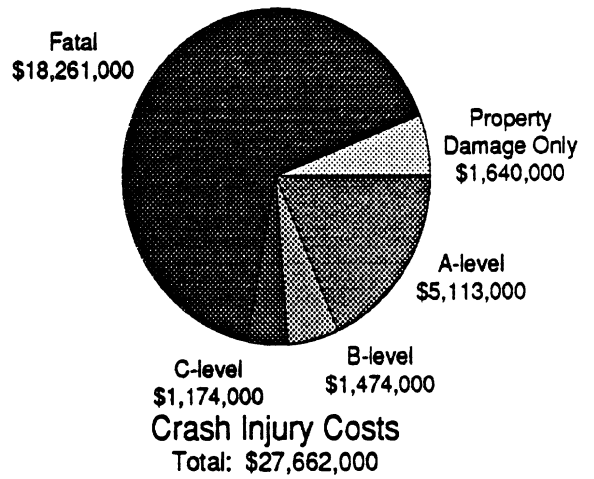
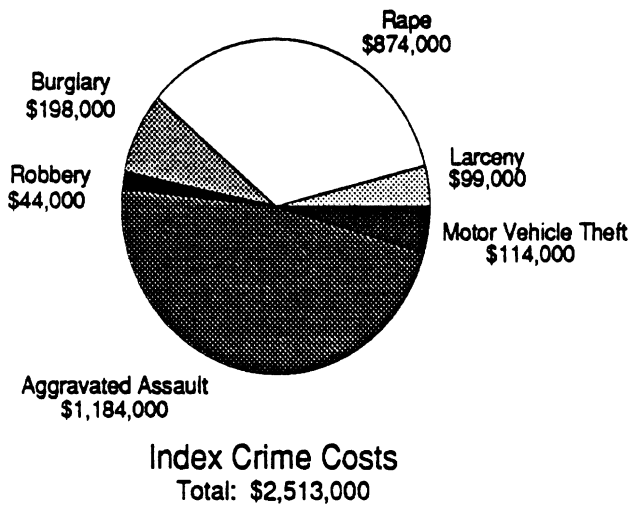
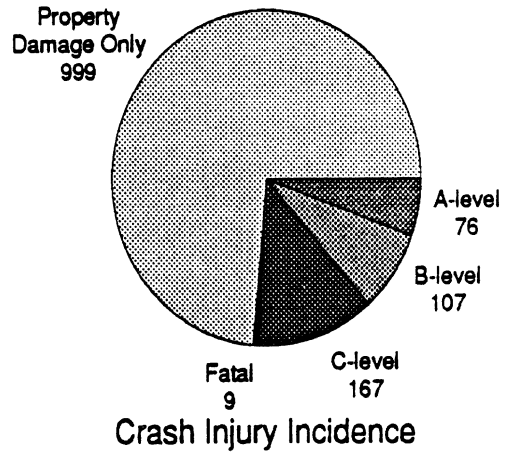
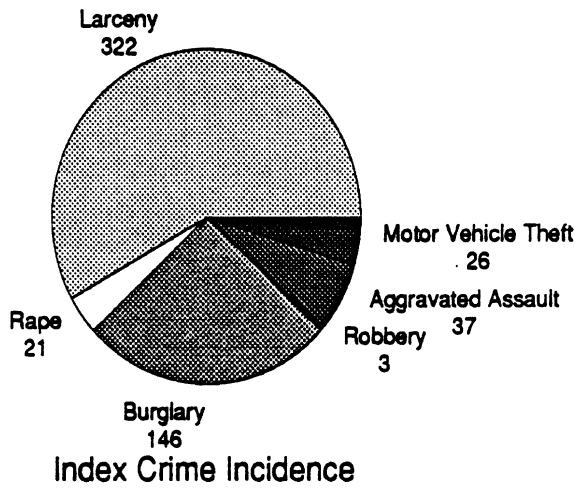
# Newaygo County



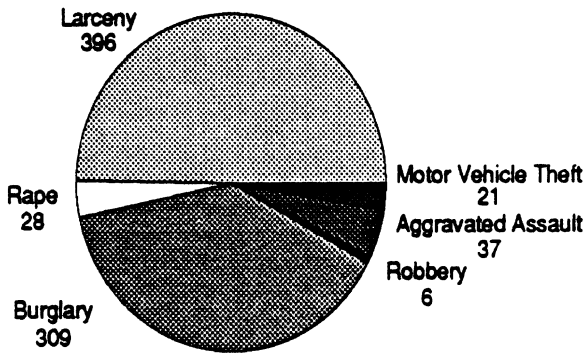
# Oakland County



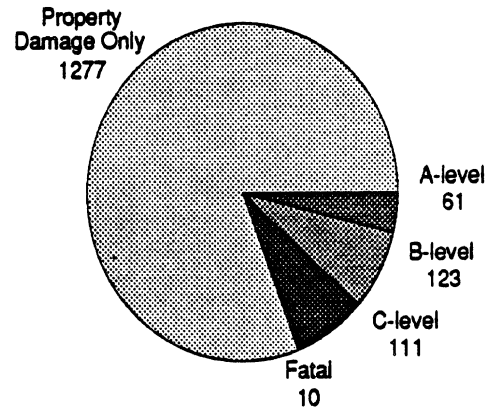
# Oceana County



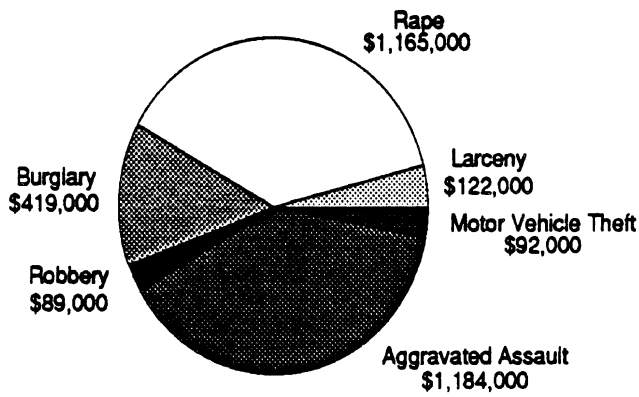
# Ogemaw County



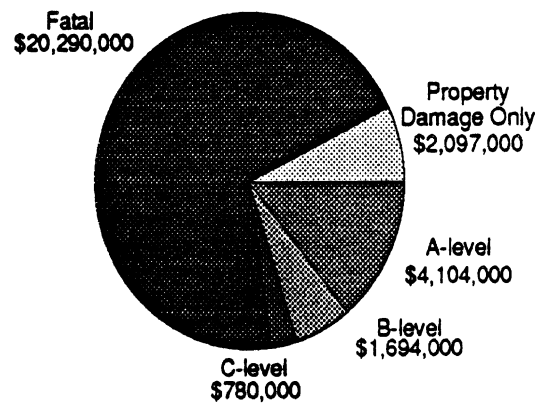
Index Crime Incidence



Crash Injury Incidence



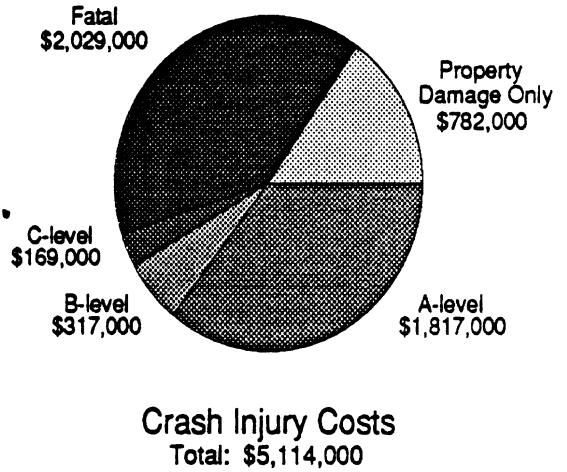
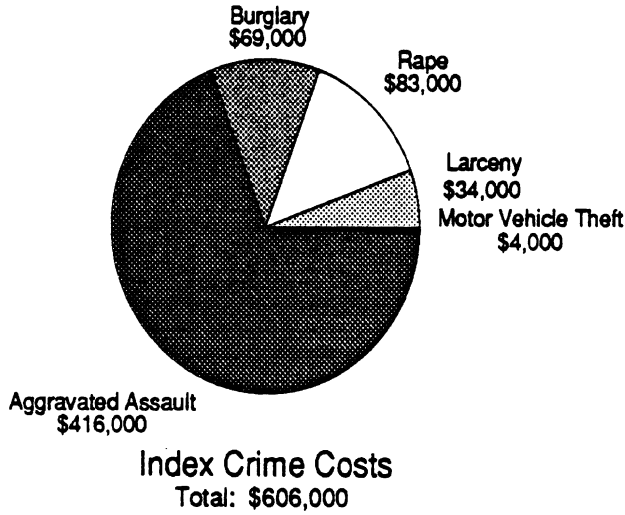
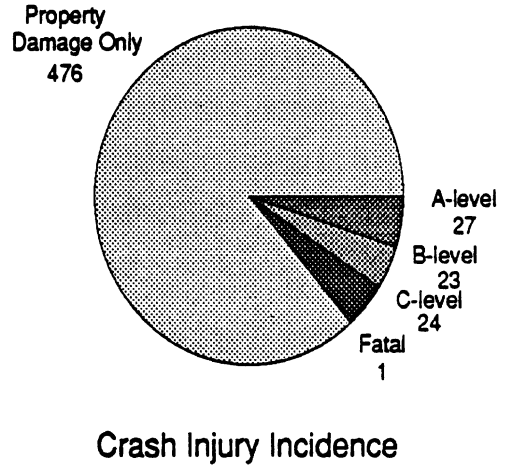
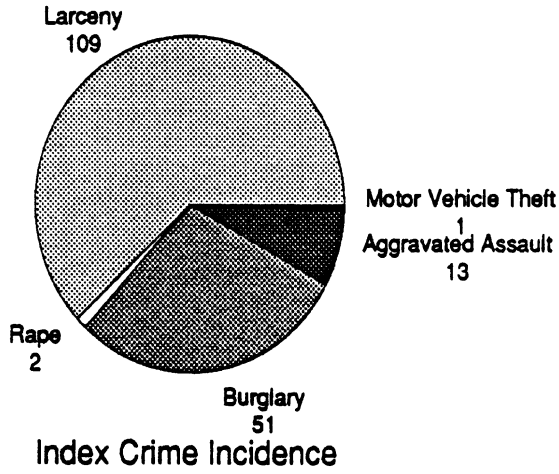
Index Crime Costs  
Total: \$3,071,000



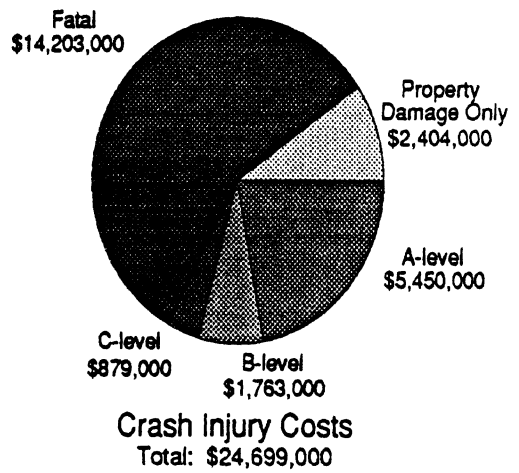
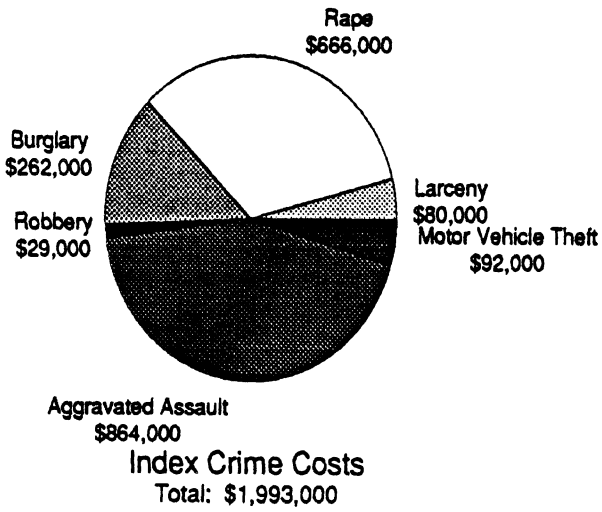
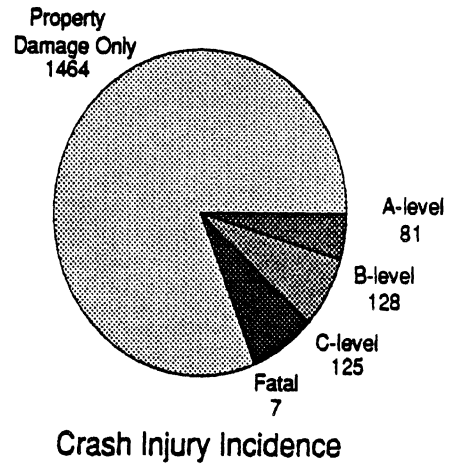
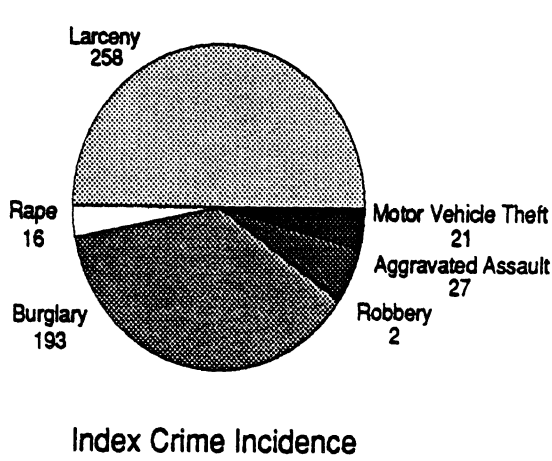
Crash Injury Costs  
Total: \$28,965,000



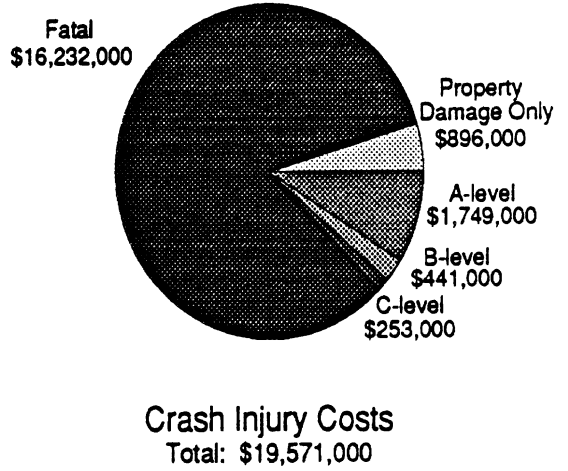
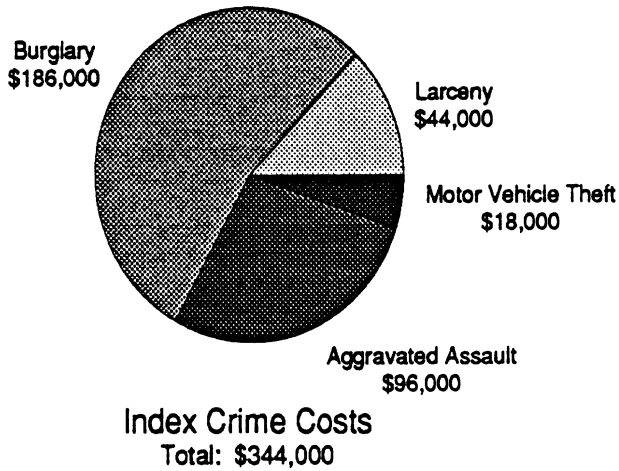
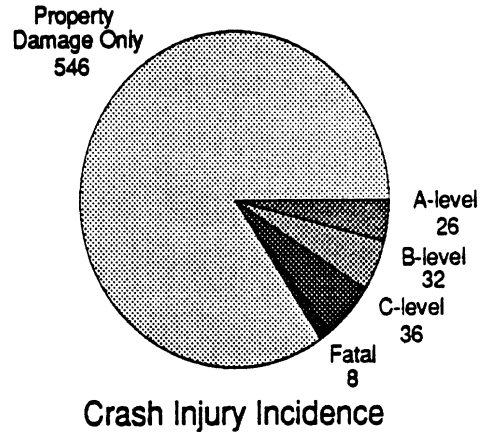
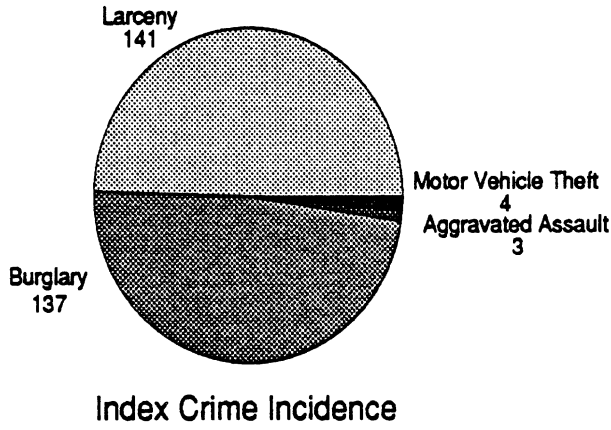
# Ontonagon County



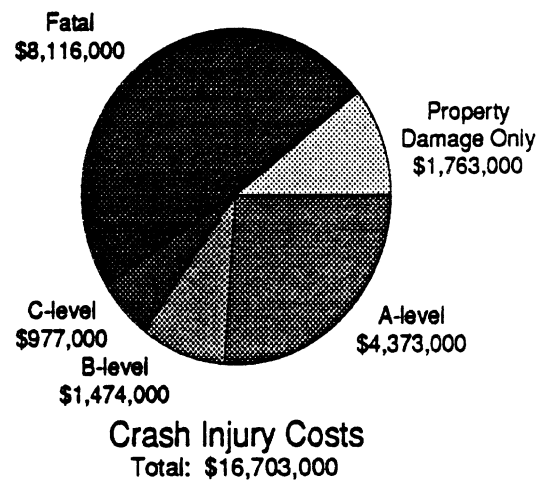
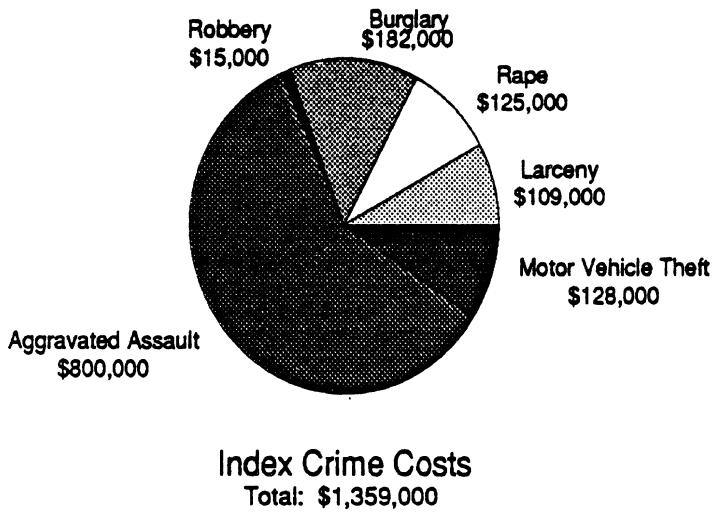
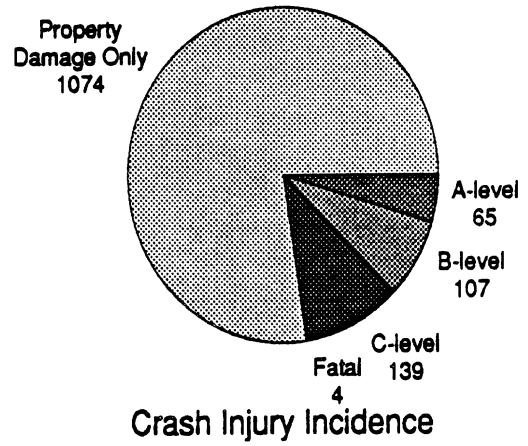
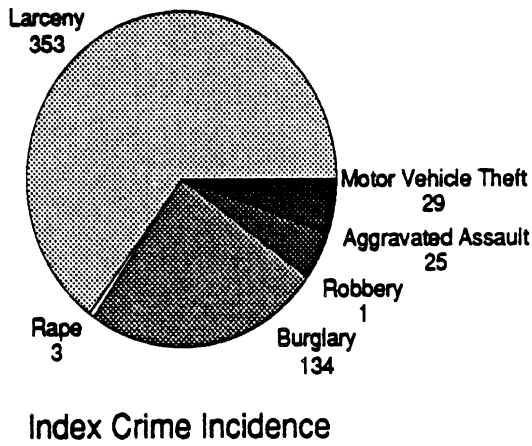
# Osceola County



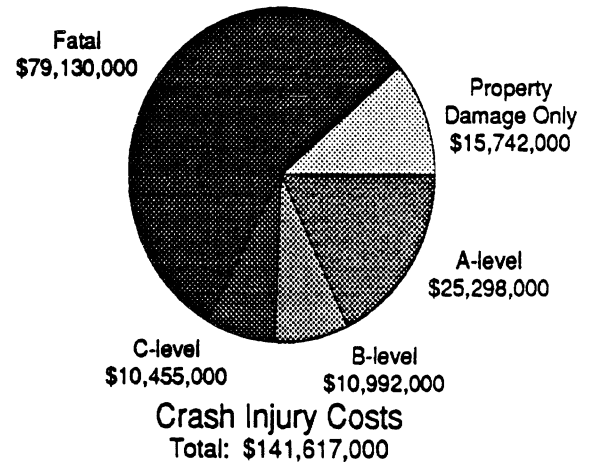
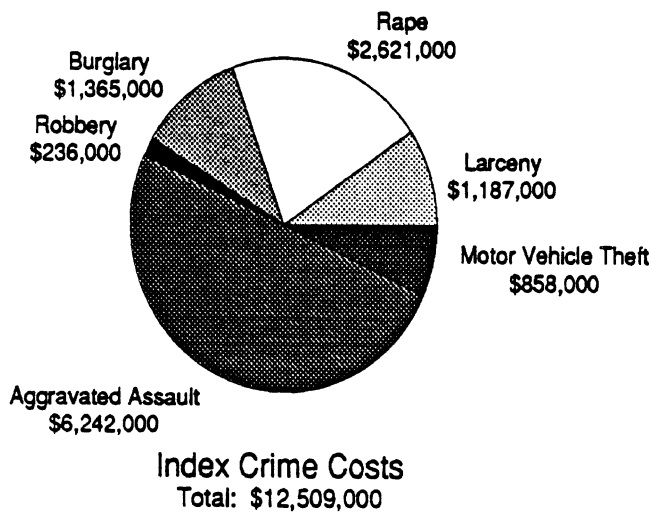
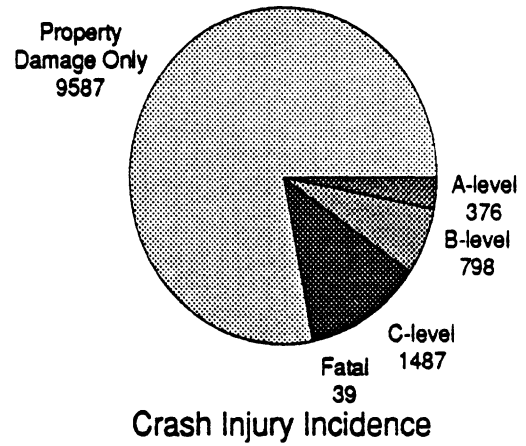
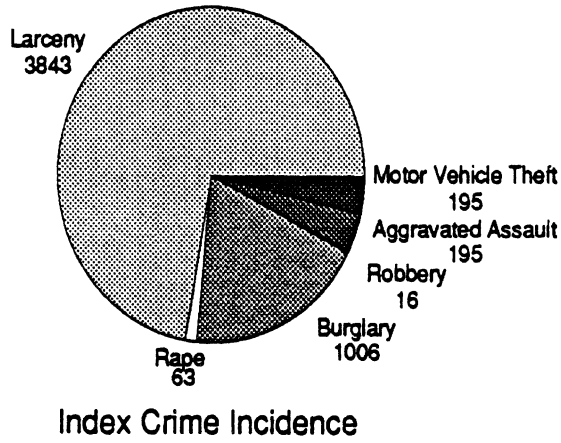
# Oscoda County



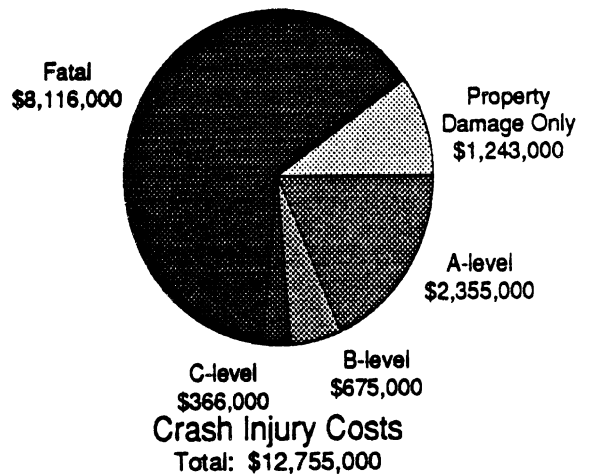
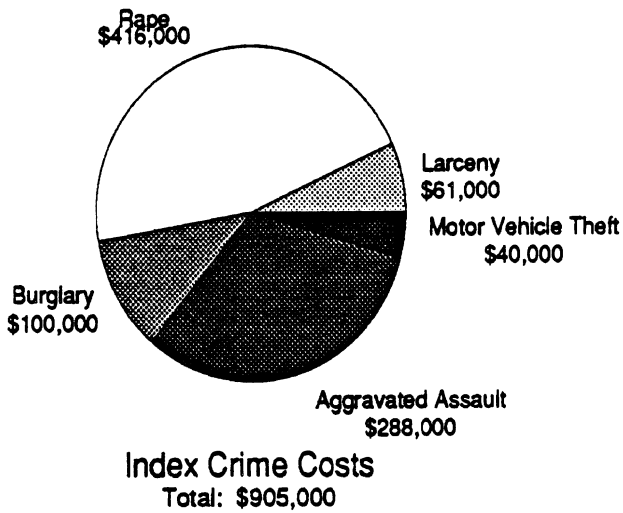
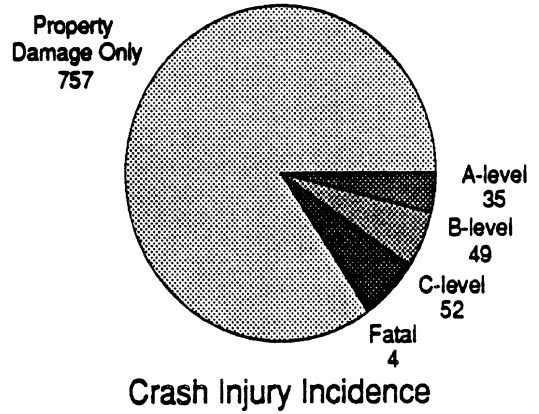
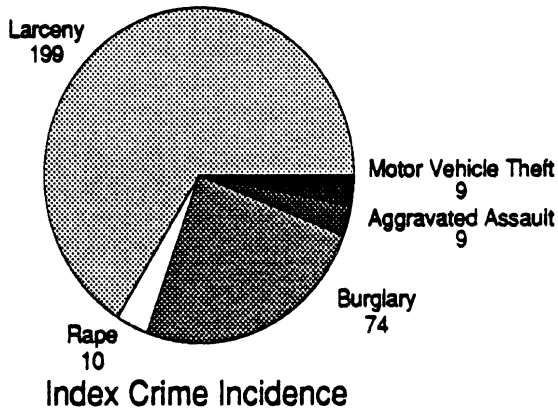
# Otsego County



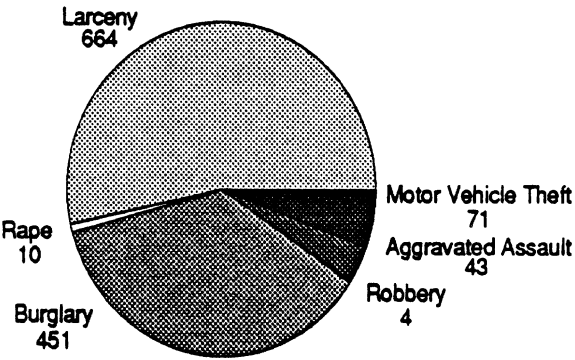
# Ottawa County



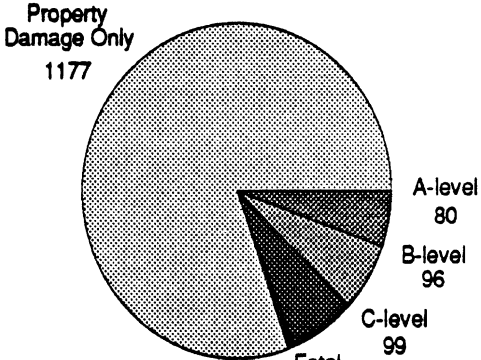
# Presque Isle County



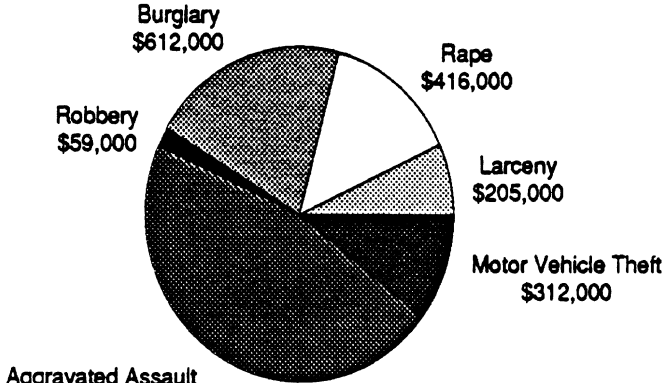
# Roscommon County



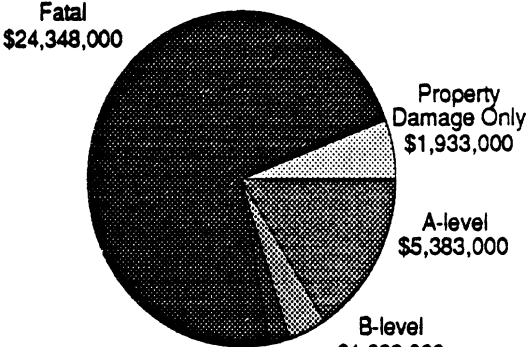
Index Crime Incidence



Crash Injury Incidence

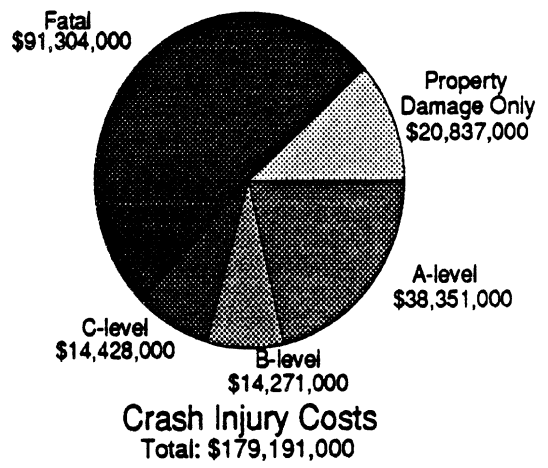
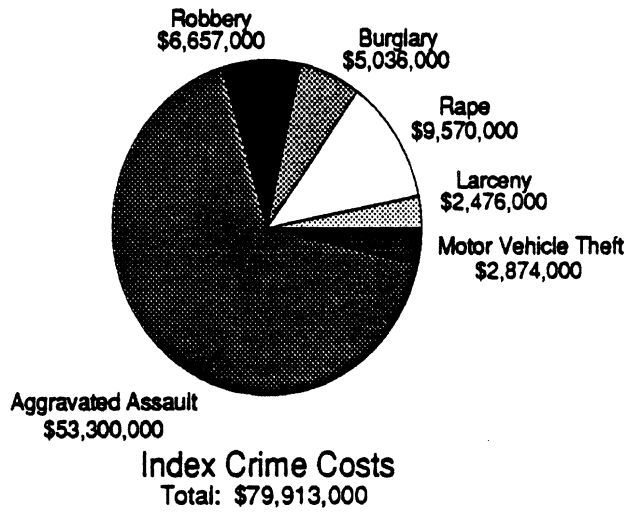
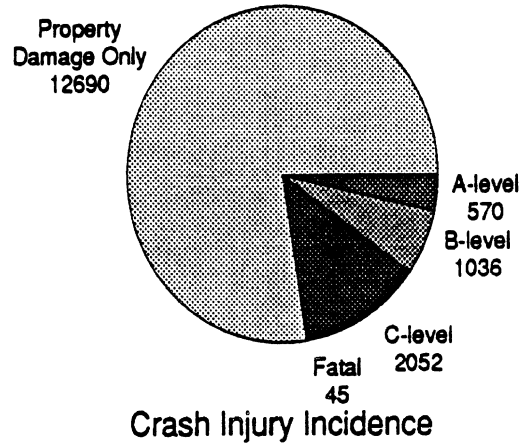
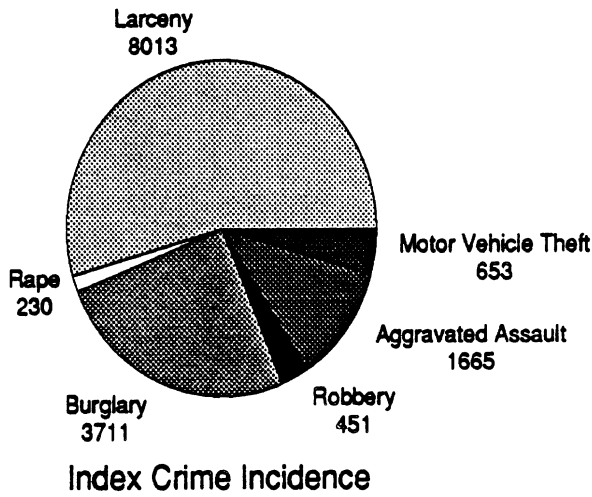


Index Crime Costs  
Total: \$2,980,000



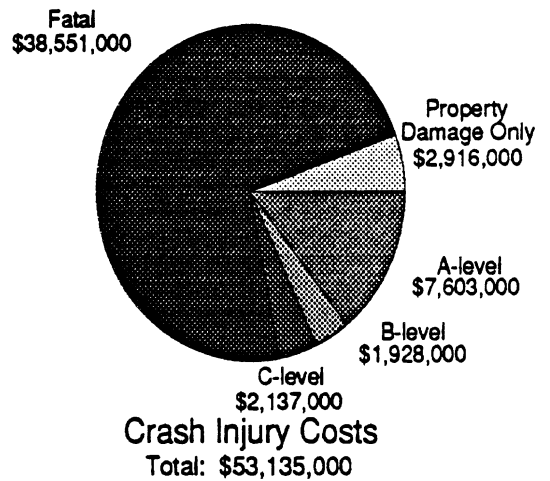
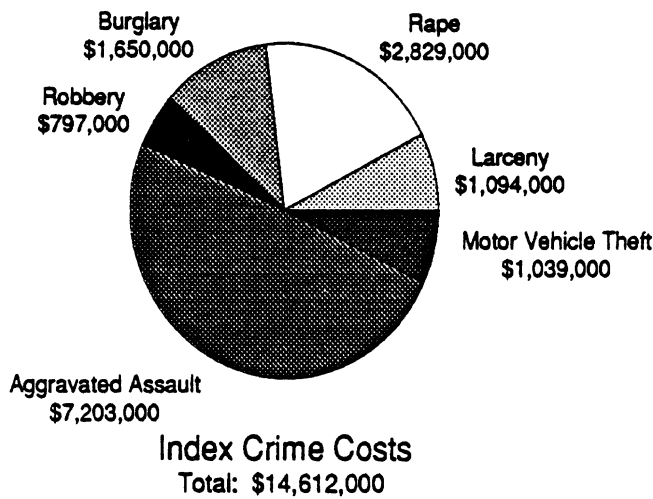
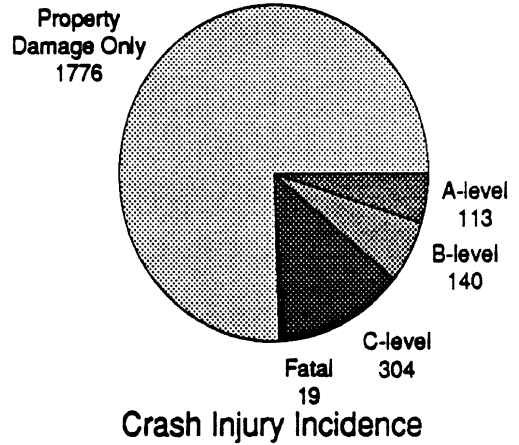
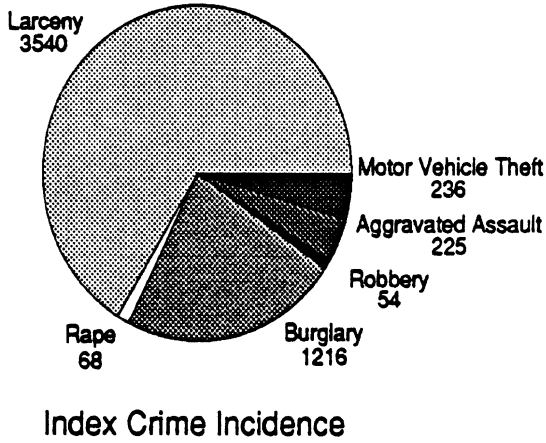
Crash Injury Costs  
Total: \$33,682,000

# Saginaw County

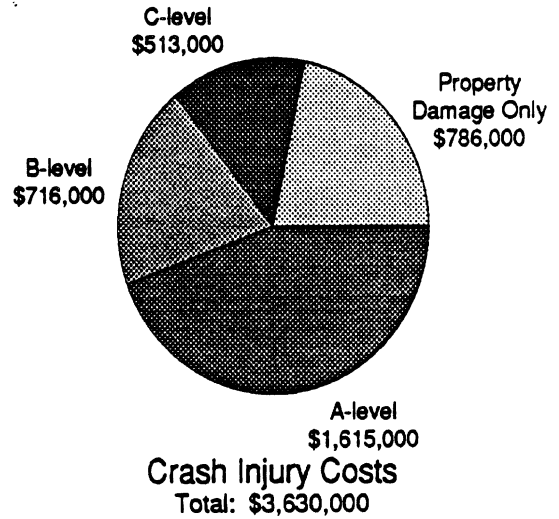
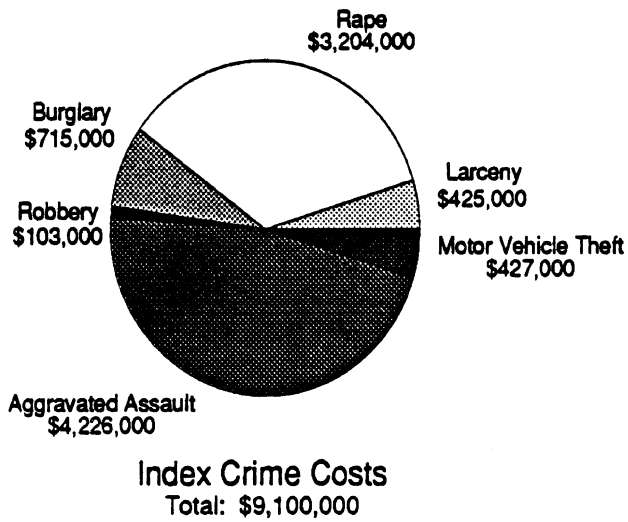
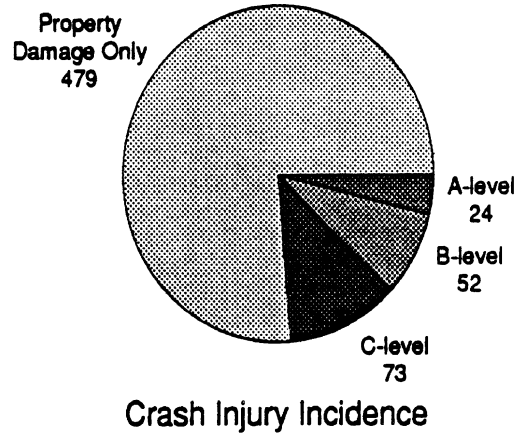
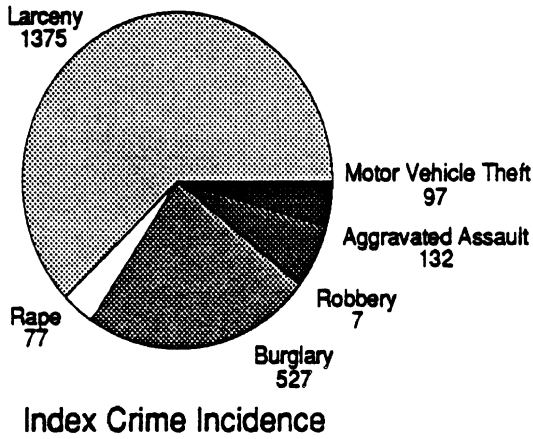




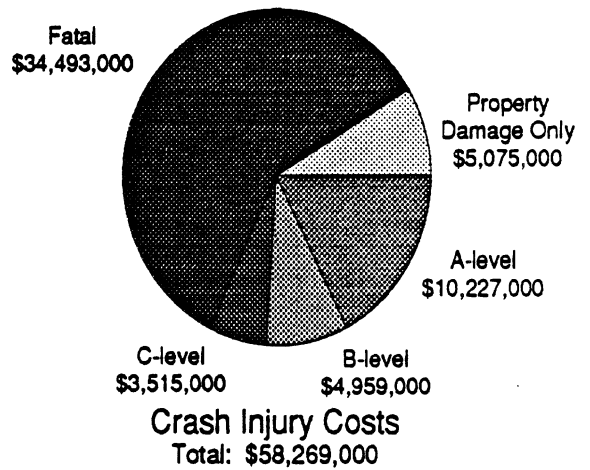
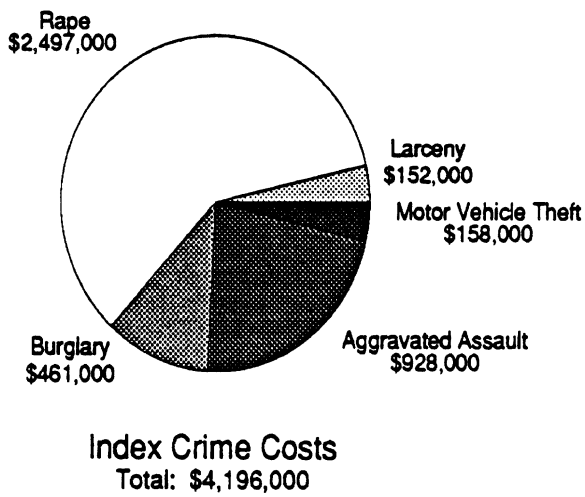
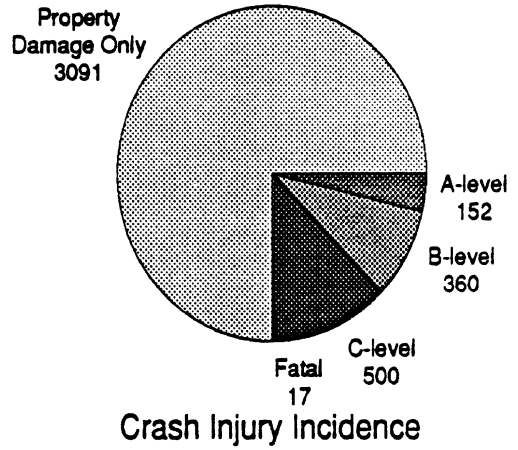
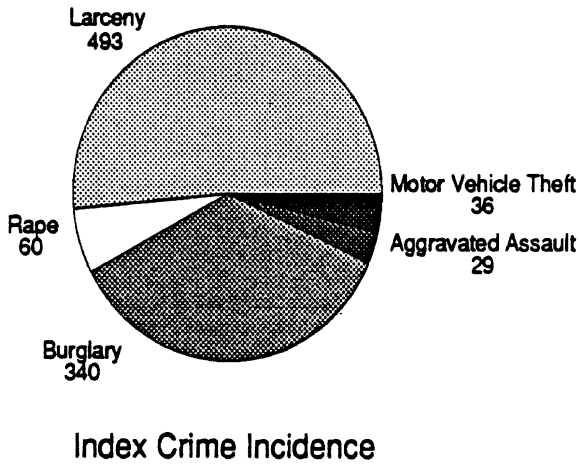
# Sanilac County



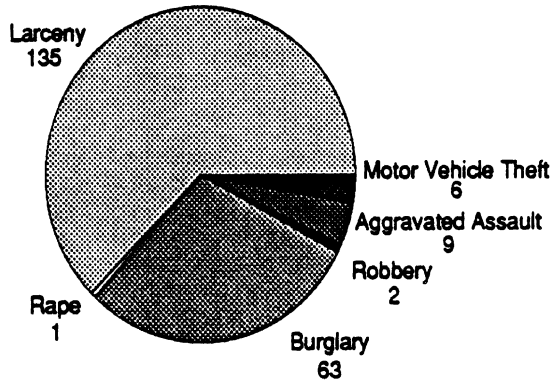
# Schoolcraft County



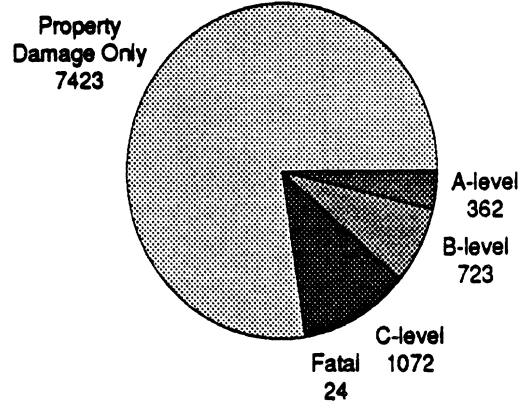
# Shiawasse County



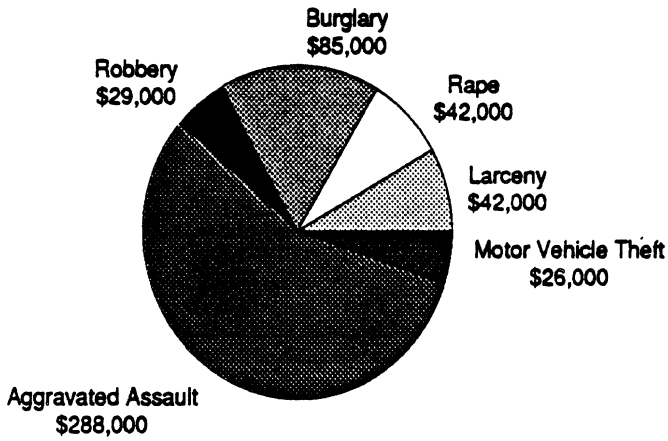
# St. Clair County



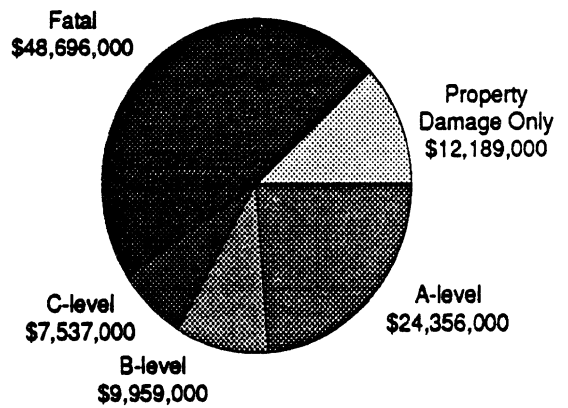
Index Crime Incidence



Crash Injury Incidence

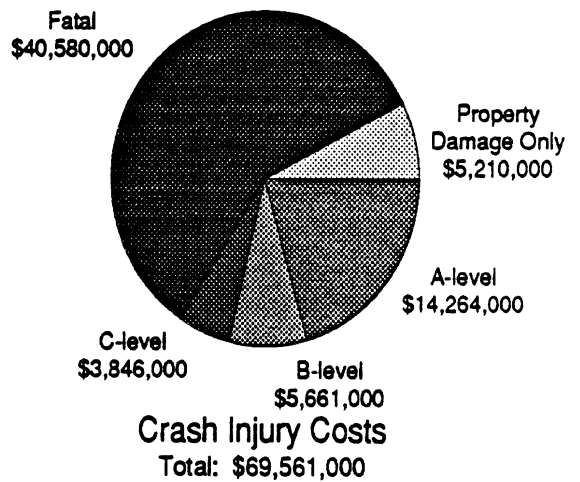
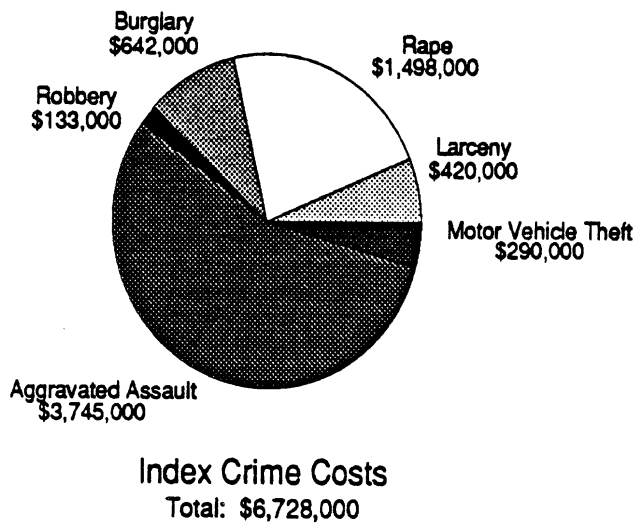
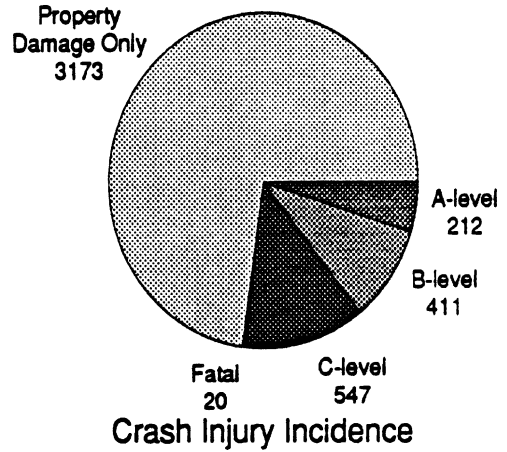
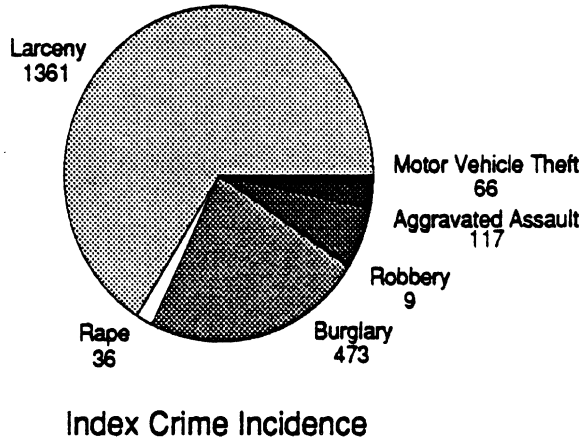


Index Crime Costs  
Total: \$512,000

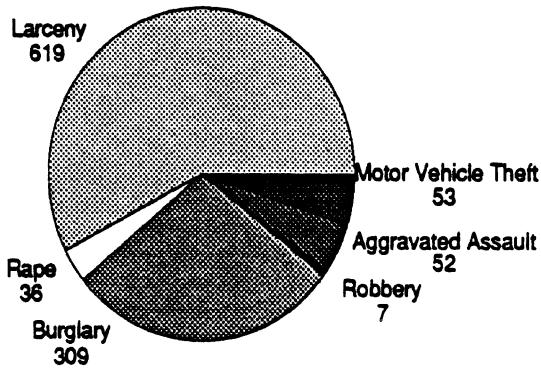


Crash Injury Costs  
Total: \$102,737,000

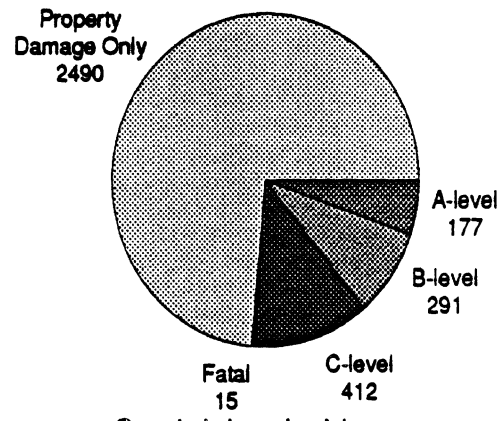
# St. Joseph County



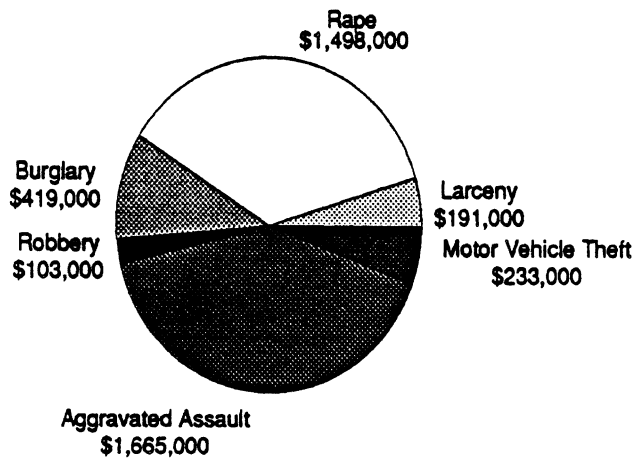
# Tuscola County



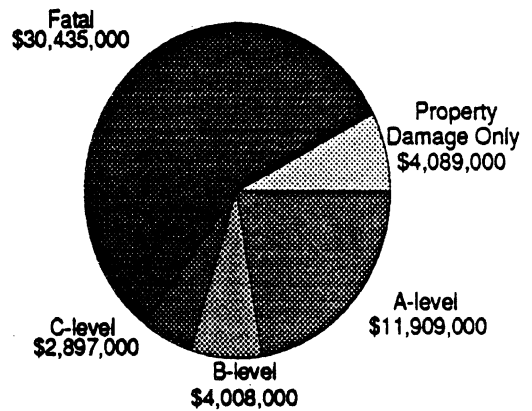
Index Crime Incidence



Crash Injury Incidence

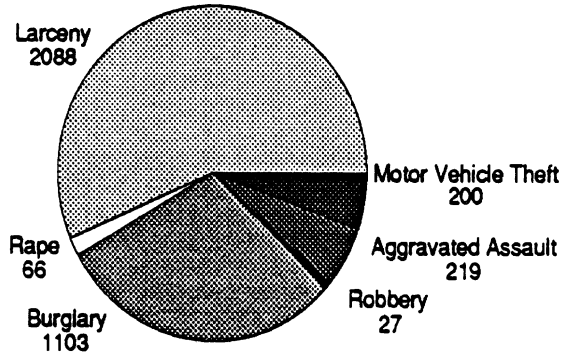


Index Crime Costs  
Total: \$4,109,000

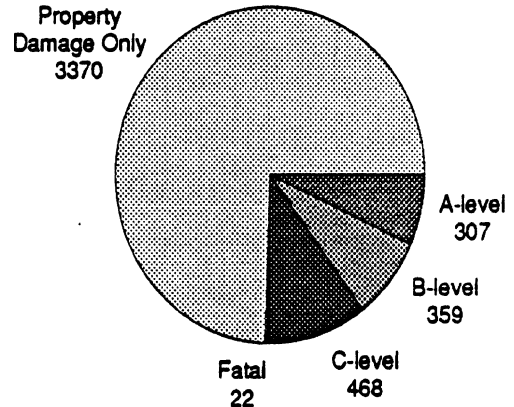


Crash Injury Costs  
Total: \$53,338,000

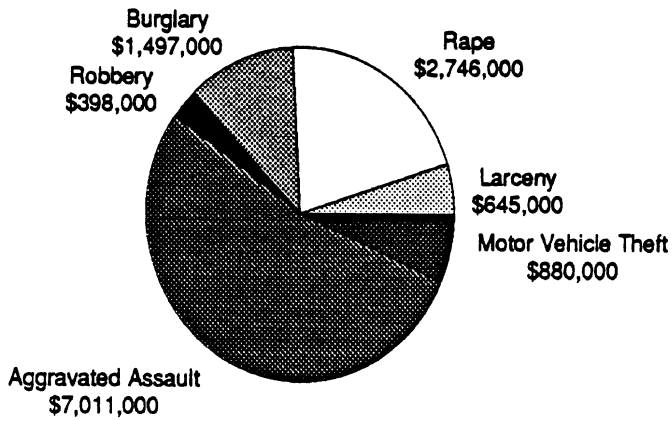
# Van Buren County



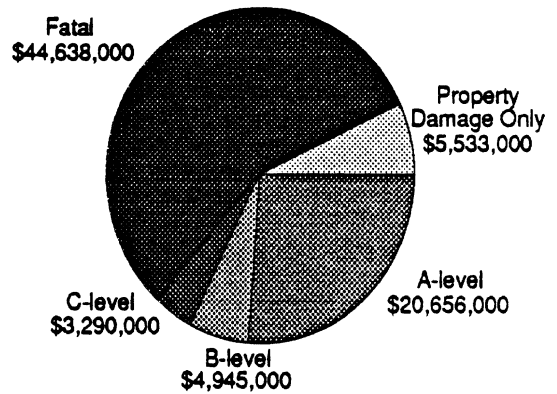
Index Crime Incidence



Crash Injury Incidence

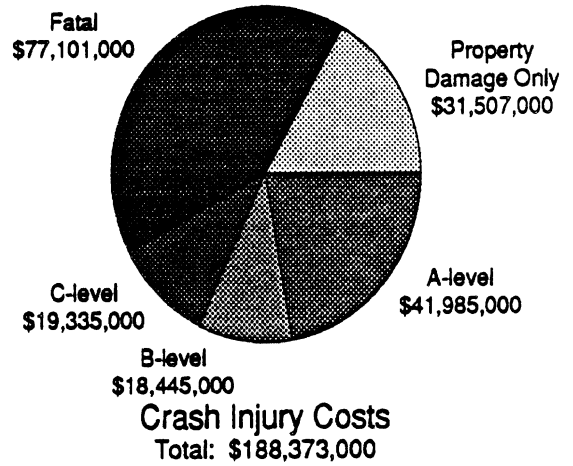
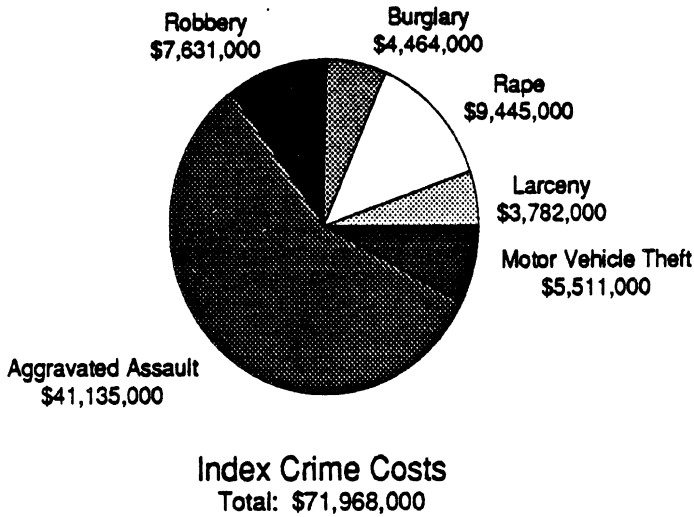
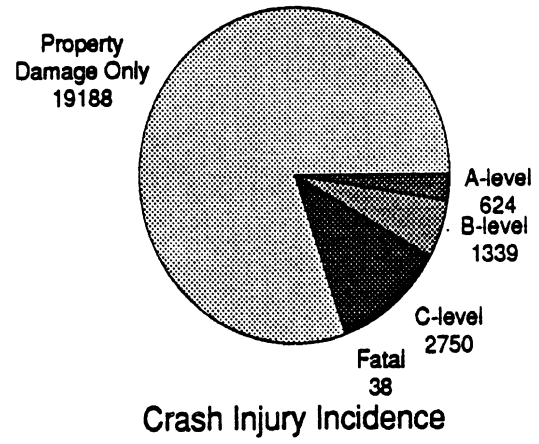
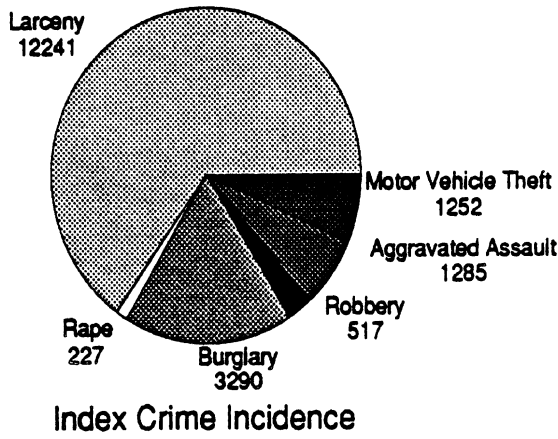


Index Crime Costs  
Total: \$13,177,000



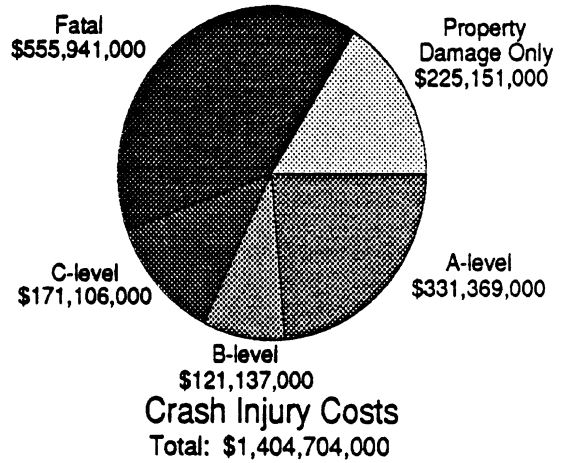
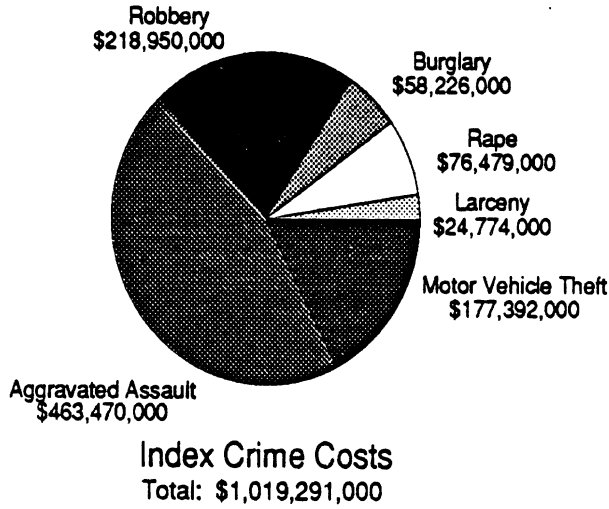
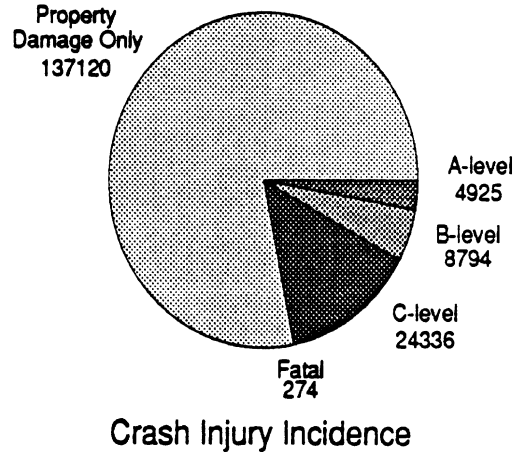
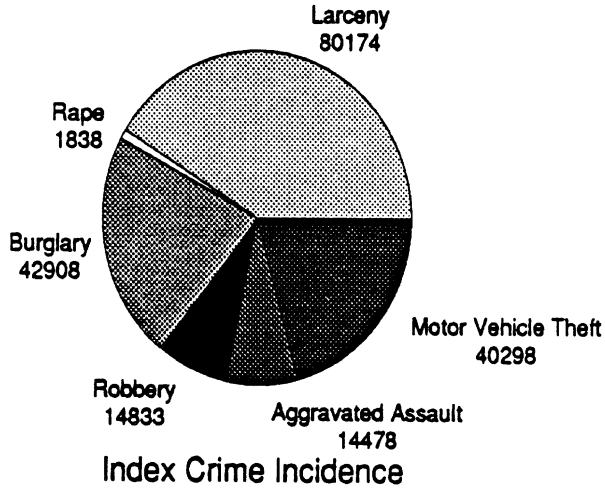
Crash Injury Costs  
Total: \$79,062,000

# Washtenaw County





# Wayne County



# Wexford County

