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Chasing Until the Wheels Fall Off: Developing a Typology of High-Risk Police Pursuits in Georgia

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CHASING UNTIL THE WHEELS FALL OFF:

DEVELOPING A TYPOLOGY OF HIGH-RISK

POLICE PURSUITS IN GEORGIA

by

Lee Miller Wade

Abstract of a Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
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ABSTRACT

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The goal of this research project was to examine the potential variables associated with high-risk police pursuits in the state of Georgia. The objectives of the research project were to develop a typology of high-risk pursuits, ascertain the usage of pursuit termination techniques, and inform on the current status of pursuits amongst accredited agencies in the state of Georgia. The Georgia Association of Chiefs of Police (GACP) initiated data collection of pursuits among accredited agencies as a result of the decision in *Scott v. Harris* 2007. A sample of 2,155 pursuit reports from 2007 to 2009 was analyzed using descriptive and chi-square analyses, as well as binary logistic regression. To identify salient variables within the data, a content analysis of news articles also was conducted for the same time period to provide for a contextualization/framing of the data evaluation. Variables associated with negative pursuit outcomes then allowed for the construction of a typology for high-risk pursuits. The findings are limited by the sample, which originated from approximately 100 GACP accredited police agencies per year. Implications of findings related to policy evaluation and training are discussed, as well as suggestions for future research.

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DEDICATION

I would like to thank my family for their support and inspiration throughout this entire process. Thank you to my three beautiful children Amy, Will and Tyler for providing me with the motivation to keep working hard towards the finish line. Thank you to my mother for her belief in me and support over the years. I owe the most thanks to my beautiful wife, Sarah, who spent the last several years working harder than me in raising our children while I was in graduate school. She is really my inspiration, my counselor, and my best friend. Without her, I would not be here at this point in my life -- this is her reward – much more than mine.

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CHAPTER I

INTRODUCTION

American culture is fascinated by police work. Numerous scholars indicate an insatiable consumption of news media depicting high-risk action by law enforcement officers, or the influx of television shows concerning ‘procedural’ drama unfold with an infusion of specifics of science, legal procedures, and emotions (Cavendar & Deutsch, 2007; Lawrence, 2000). One aspect of law enforcement action that garners the attention of the media, the public, and scholars is the police pursuit. The imagery of law enforcement chasing a criminal has historical significance – from sheriffs chasing bandits on horseback to the LAPD chasing the infamous white Ford Bronco of O.J. Simpson.

Media reports and television shows notwithstanding, the imagery of police pursuit crashes has not escaped concerns of the public and policymakers. News media has covered this controversial topic in their effort to report on police pursuit that satiate public desires and result in ratings (Cavendar & Deutsch, 2007; Lawrence, 2000). As Ferrell (2003) has indicated, the desire by the public to promote policies in police chases can outweigh the dangers and collateral damage that largely escape the public consciousness. A relative majority of society supports the process of the police chase, policies behind it, and the goal of catching criminals at the expense of potential tragedy (MacDonald & Alpert, 1998). MacDonald and Alpert (1998) in their research of public attitudes on police pursuits indicated approval rates between 60-90% from lower offenses (traffic) to higher offenses (aggravated felonies), but also found that as the public becomes more informed on the risks associated with pursuits, public support wanes.

Therefore, when corresponding imagery of negative outcomes of police pursuits are presented to the public, policymakers and scholars must react to stakeholder scrutiny.

Scrutiny of pursuit tactics is relevant insofar as public confidence with police agencies can be enhanced by positive pursuit outcomes or eroded by negative pursuit outcomes. Police pursuit policies are of vital interest to the public as stakeholders, but also because the driving public is a relevant factor to consider in police pursuit incidents. According to Alpert, Kenney, Dunham, Smith and Cosgrove (1996), one of the variables to consider in all police pursuit incidents is the public as innocent third party victims. If the fleeing driver or the public are at risk during these incidents, then pursuits are a form of coercive action in the use of force continuum. Public consideration is essential when examining all factors in police pursuit incident policies (Alpert & Dunham, 1989).

The Problem

According to data from the National Highway and Traffic Safety Administration (2010), 54 people died in crashes related to emergency vehicle pursuits in 2008. Not captured by these and other statistics are the number of third party injuries and property damage related to these pursuits. Awareness of the destruction caused by high-speed pursuits has been heightened by media reports of the events. The increase in exposure to third party damage and injuries caused by police pursuits has been correlated with an increase in public fear and risk associated with driving on the highways (Alpert et al. 1996; Crew & Hart, 1999). Proper policy and management strategies within the law enforcement profession must evaluate objectives in police pursuits (Alpert et al., 1996, Alpert, 1997; Alpert & Smith, 1999).

Reticence on the part of the U.S. Supreme Court (e.g. *Scott v. Harris*, 2007) and state legislatures to establish guidelines have compelled state and local law enforcement administrators to develop variations of pursuit policies which are largely dependent on department culture, leadership and legal liability history (Alpert, 1998, Alpert & Smith, 1999). Practitioners and administrators understand that officers need guidance in both policy and model formulation when use of force is an issue (Alpert et al., 1996).

Purpose of the Study

Guided by prior research and a review of policies on police pursuits, this project evaluated police pursuit data with the goal of developing proper management techniques for pursuit situations. To accomplish this goal, data were obtained from one state's pursuit database (Georgia) and a national database concerning past police pursuits. The evaluation of this data should reveal relationships among variables that influence driving behavior, probability of damage or injury, and successful pursuit outcomes.

As a form of force, police pursuits can create perceived havoc by the public within the highways and streets of America. Development of a risk assessment typology would hopefully contribute to proper decision-making in the midst of such incidents. To investigate the possible effects of risk assessment typology, research exploring variables and their role in police pursuit decision-making is imperative. To accomplish this important goal, the following research questions were evaluated:

1. What variables are correlated with negative outcomes in police pursuits?
2. Are these variables amenable to constructing a prediction typology for officers making decisions?

3. What are the various levels of risk associated with levels of police pursuits?

In answering these research questions, data were evaluated from the Georgia Association of Chiefs of Police (GACP) state certification program, which operates as a state-wide accrediting authority to promulgate professional standards. In anticipation of a sweeping decision by the U.S. Supreme Court in *Scott v. Harris* (2007), the GACP issued a new standard in its accreditation process mandating the collection of pursuit statistics. Data from approximately 100 agencies between 2007 and 2010 were evaluated with particular focus on three dynamic factors common to all pursuits: officer characteristics, suspect characteristics, and environmental characteristics (Alpert & Dunham, 1989). These factors are essential to understanding all of the variables that contribute to the development of a high-risk typology, and are listed in their conceptual form below:

List of Concepts/Terms/Variables

The IACP (Lum & Fachner, 2008) defines a police pursuit as: "An active attempt by an officer in an authorized emergency vehicle to apprehend a fleeing suspect who is actively attempting to elude the police" (p. 88). The other variables and concepts to be evaluated may also include:

- pursuit officer experience
- pursuit officer demographics
- nature and extent of pursuit training
- suspect demographics
- nature of initial violation
- length of pursuit
- type of vehicle used in pursuit

- maximum speeds of pursuit
- number of officers in pursuit
- road conditions
- injuries or damage to officer/suspect/third-party
- how the pursuit was terminated.

Limitations

To determine the scope of this study, certain limitations must be drawn. The most recent comprehensive studies involving variables of pursuit come from two major sources. First, the IACP report from 2008, included data from 56 agencies in 30 states collected between 2001 and 2007 (Lum & Fachner, 2008). The report's intent was to provide a more representative national sample of police pursuit incidents than had been previously available. Second, Geoffrey Alpert – a much cited researcher on the topic of police pursuits -- collected data in four cities in the Mid-West and Southeastern United States. Data from these four samples resulted in the evaluation of standardized variables relevant to pursuit incidents (Alpert et al., 1996; Alpert, 1997; Lum & Fachner, 2008).

This particular project used data drawn from Georgia law enforcement agencies that participate in the state's professional certification program. The number of participating agencies that contribute to the Georgia database is approximately 100. Although much larger in size than the IACP database, the Georgia database is limited to agencies representing a particular state's pursuits, variations in their pursuit policies, and officer characteristics. These limitations are counterbalanced by several facts. First, Georgia is among the most dangerous states for driving (NHTSA, 2010). Second, Georgia law enforcement is committed to professional law enforcement accreditation.

Third, the state was the location for one of the landmark Supreme Court cases concerning police pursuits – specifically, *Scott v. Harris* (2007). Therefore, this project did focus solely on the data provided by the GACP from years 2007 to 2010.

Assumptions

Data from the IACP national database was compared with the GACP data. Most variables were similarly conceptualized and operationalized for inferential statistics. The data from Georgia should indicate a graded or progression in stages of risk toward negative outcomes in police pursuits. Due to the sample of agencies participating in the Georgia law enforcement accreditation process, the nature of these pursuits should (with little doubt) is influenced by the 'model policies' required as part of the certification program. Therefore, these subsets of pursuits may not reveal the more egregious portion of pursuits associated with negative outcomes. Furthermore, the data collected from Georgia law enforcement is collected by an agency official responsible for overseeing the accreditation process in each respective agency, who in turn, may collect said data from individual officers or shift supervisors. The bias associated with the collection of this data may influence objectivity in determining variable values. Because one of the main goals of accreditation is to promote reliable data collection strategies, however, this concern may be alleviated to a certain extent.

Pursuits in the State of Georgia

Because the background of police pursuits relies solely upon local statutory authority, one must first analyze Georgia's law on the matter. Section 40-6-6 of the Official Code of Georgia (Annotated) states in relevant part:

The driver of an authorized emergency vehicle or law enforcement vehicle, when responding to an emergency call, when in the pursuit of an actual or suspected violator of the law, or when responding to but not upon returning from a fire alarm, may exercise the privileges set forth in this Code section. (a) The driver of an authorized emergency vehicle or law enforcement vehicle may:

(2) Proceed past a red or stop signal or stop sign, but only after slowing down as may be necessary for safe operation; (3) Exceed the maximum speed limits so long as he or she does not endanger life or property; and (4) Disregard regulations governing direction of movement or turning in specified directions. (c) The exceptions granted by this Code section to an authorized emergency vehicle shall apply only to vehicles making use of an audible signal and use of a flashing or revolving red light visible under normal atmospheric conditions from a distance of 500 feet to the front of such vehicle, except that a vehicle belonging to a federal, state, or local law enforcement agency and operated as such shall be making use of an audible signal and a flashing or revolving blue light with the same visibility to the front of the vehicle. (d)(1) The foregoing provisions shall not relieve the driver of an authorized emergency vehicle from the duty to drive with due regard for the safety of all persons. (2) When a law enforcement officer in a law enforcement vehicle is pursuing a fleeing suspect in another vehicle and the fleeing suspect damages any property or injures or kills any person during the pursuit, the law enforcement officers' pursuit shall not be the proximate cause or a contributing proximate cause of the damage, injury, or death caused by the fleeing suspect unless the law enforcement officer acted with reckless disregard for

> proper law enforcement procedures in the officer's decision to initiate or continue the pursuit. Where such reckless disregard exists, the pursuit may be found to constitute a proximate cause of the damage, injury, or death caused by the fleeing suspect, but the existence of such reckless disregard shall not in and of itself establish causation. (3) The provisions of this subsection shall apply only to issues of causation and duty and shall not affect the existence or absence of immunity which shall be determined as otherwise provided by law. (4) Claims arising out of this subsection which are brought against local government entities, their officers, agents, servants, attorneys, and employees shall be subject to the procedures and limitations contained in Chapter 92 of Title 36 (O.C.G.A. § 40-6-6, 2012, p.1)

This statute was originally passed in 1974 and last amended in 2012. This law establishes the legislative limit and involvement in police pursuit policies by enacting the statutory authority and guidelines under which law enforcement officials can pursue those who abscond. The statute also provides the procedures for civil action against governments sued in conjunction with police pursuits.

In terms of police policies in Georgia, many are written to provide procedures for officers to follow in pursuits. Due to the high liability involved and the filing of several significant lawsuits over the years, most departmental policies understandably provide strict criteria to initiate, continue, and terminate pursuits.

The decision-making calculus performed by the initiating officer can undoubtedly have dynamic and direct effects on the outcome of a given pursuit incident. Although the policy restrictions can (and no doubt do) influence the initiating officer's decision-making process, s/he still retains considerable power regarding the use of force to terminate the pursuit in virtually any given manner as illustrated by recent case law (Alpert & Smith, 2008).

Scott v. Harris, 550 U.S. 372 (2007)

In 2001, a Coweta Georgia County Deputy was running radar to detect speeders. Victor Harris, whose license happened to be suspended, fled from the deputy attempting to pull him over for speeding. A pursuit ensued, and other deputies responded to assist. Harris fled into a shopping center, then turned around and attempted to exit. As the deputies attempted to block Harris' path, he struck a patrol vehicle before resuming the chase in the direction of a more heavily populated area. Deputy Scott, whose vehicle had been intentionally struck by the attempt to evade arrest, assumed leadership of the chase and asked the on-duty supervisor for permission to *PIT* Harris' vehicle. The supervisor stated: *take him out*, and Scott (who at the time had no PIT training) attempted to physically contact Harris' vehicle. (*PIT* - Pursuit Immobilization Technique: method by which one car pursuing another can force the pursued vehicle to abruptly turn sideways to the direction of travel, causing the driver to lose control and stop. See Zhou, Lu, & Peng, 2008). Instead of properly executing the intended PIT maneuver with the rear-quarter panel of the fleeing vehicle, Deputy Scott collided with the rear bumper causing suspect Harris to crash out of control off the side of the road. As a result of the crash, Harris was seriously injured and later became a quadriplegic losing use of both arms and legs (Alpert & Smith, 2008; *Scott v. Harris*, 2007).

Harris initially sued Scott and the Coweta County Sheriff's Office under Title 42 USC section 1983 in Federal District Court. Deputy Scott asserted a "qualified immunity" defense requesting summary judgment, but the Federal District Court ordered that the matter be decided by a jury. Deputy Scott appealed to the U.S. Appeals Court for the same district, and the lower court's decision was affirmed. In that opinion, one of the justices reasoned that under the Fourth Amendment's reasonableness standard, the actual *touching* of vehicles constituted a use of force. Consequently, Deputy Scott's *ramming* constituted a use of deadly force defined in *Tennessee v. Garner* (1985). By analogy, the *Garner* decision held that deadly force cannot be used against a fleeing felon without posing a threat to the officer or a third party. As such, the use of deadly force in this situation constituted a violation of the Fourth Amendment. As both this statute and decision dictate, law enforcement officers can only use deadly force when they reasonably believe that a suspect will cause serious bodily injury or death to themselves or a third party. Because the Appeals Court found no third party involved in the pursuit, and they moreover believed Scott's maneuver was more akin to a crude "ramming technique," they reasoned that a constitutional violation had occurred and agreed with the lower federal district court (Alpert & Smith, 2008; *Scott v. Harris*, 2007).

The Court's Decision

After the Georgia Association of Chiefs of Police submitted their amicus brief to the Court, they and the entire law enforcement community awaited a decision on the interpretation of such force in police chases. Much to the surprise of the GACP and others, the decision was eight to one in favor of Deputy Scott as plaintiff. In doing so, the Supreme Court relied heavily on the deputy's in-car videotape as evidence. Some of the Justices characterized the chase, in oral arguments, as one seen in many Hollywood films. Justice Scalia stated the suspect vehicle traveled in such a reckless manner that he placed "police officers and innocent bystanders alike at great risk of serious injury" (Alpert & Smith, 2008; *Scott v. Harris*, 2007, p. 7).

The Supreme Court stated that Harris' driving placed other motorists in danger, and they ruled that Deputy Scott did not violate Harris' Fourth Amendment protection when he rammed him on two grounds. First, if the deputies ceased the pursuit, Harris, who could have thought his pursuers were engaging in an alternate measure or taking a short cut, would have continued on his reckless path still wreaking havoc on other innocent motorists. Second, the majority rejected the common suggestion of terminating the chase, and they did not want to issue a blanket rule of pursuit termination as soon as any criminal absconds from law enforcement. Scalia cited *Tennessee v. Garner* (1985) as well and analogized the use of force there to protect third parties in the present case (Alpert & Smith, 2008; *Scott v. Harris*, 2007).

After the decision in *Scott v. Harris*, the GACP recommended tighter restrictions on policy development coupled with advanced and specialized training. The notion among officers in Georgia that 'ramming' was a proper pursuit termination technique was problematic, and agencies sought pre-emptive steps to prevent similar incidents. To this important end, the acquisition of pursuit incident data would indicate the frequency with which these types of termination techniques are used. The need for a decision matrix or more restrictive policies was thus viewed as exceedingly important in the minds of administrators and policymakers regarding police pursuits in the state of Georgia.

Structure of Project

The extant body of literature on police pursuits consists primarily of policy evaluations, policy variations, and perspectives of these incidents within society.

Secondly, the literature evaluates the constitutional and liability issues associated with police departments, police officers and government entities. By comparison, there is scant research involving police pursuit policy formulation and decision-making typologies. Accordingly, this project seeks to supplement the existing literature by evaluating a high-risk typology of police pursuits that can contribute toward improved decision-making and for policy development/policy restrictiveness. A typology is the classification, in qualitative terms, of empirical relationships that can be characterized (Kluge, 2000). “Balancing the need to immediately apprehend a fleeing suspect with the risk created by the chase forms the foundation of police pursuit policies” (Schultz, Hudak & Alpert, 2010, p. 6). Policy implications should focus on the application of this risk assessment structure in developing a high-risk typology for agencies to implement and supervisors and officers to utilize in pursuit decision-making situations.

To coherently connect the literature in a manner that achieves these goals, the literature involving pursuits, the use of force, policy variations, and elements of pursuit incidents will be evaluated. Chapter II consists of a review of this literature, the connections toward policy implications, and justification of a high-risk typology for practitioners to easily identify and utilize in decision-making processes. Thus, Chapter III focuses on the methodology of this study to include research design, sampling frame, operationalization of variables, procedures, limitations, and data analysis of pursuit variables. Chapter IV indicates the results of the data analysis, which shall be evaluated using descriptive statistics, and bivariate and multivariate tests of hypotheses, as well as ancillary findings. Chapter V includes discussion of conclusions and limitations of the study as well as recommendations for future research and policy implications.

CHAPTER II

LITERATURE REVIEW

Fatality Rates

Estimates regarding fatality rates involving police pursuit incidents vary widely within the United States. Issues related to under-reporting, correct reporting, and data collection strategies prohibit reliable and valid reports of fatalities associated with police pursuits. Critics relate this problem with data collection strategies by the National Highway and Traffic Safety Administration and the Fatality Accident Reporting System (FARS) (Charles, Falcone, & Wells, 1997). Furthermore, NHTSA data do not capture the injury rate related to pursuit incidents, and this figure relies on inferential estimations. From the available data, researchers have estimated that the *injuries* related to all non-reported pursuits could be anywhere from 20,000 to 50,000 incidents per year. In their initial research on NHTSA data, Charles et al. (1992) indicated there were approximately 300 *deaths* per year attributed to police pursuits in 1989 and 1990. In a follow-up of data accessible by the public in the FARS database, NHTSA (2009) data concerning deaths by emergency vehicles are divided into two categories: *in emergency-use* and *not in emergency-use*. The term *emergency use* refers to a vehicle traveling with emergency signals in use (red lights blinking, sirens sounding, etc.)" (NHTSA, 2009, p. 96).

Rivara and Mack (2004) evaluated fatality rates data for a nine-year period provided by the Fatality Accident Reporting System (FARS) and the Crashworthiness Data System (CDS) -- both of which are managed by NHTSA. Of the two, the CDS reveals more complex data than FARS, insofar as it takes information conducted by traffic investigators from a stratified random sample of approximately 5,000 serious injury crashes per year (Rivara & Mack, 2004; NHTSA, 2009). The sample (as well national) data for those nine years were evaluated by Rivara and Mack for comparison of simple descriptives and frequencies of certain variables. In the study period (1994-2002), there were over 3,100 fatalities; and of those, approximately 946 were third-party individuals, with 102 pedestrians and bicyclists. There were approximately 265 to 300 pursuits per year that resulted in a fatality. This finding supports the assertion by Charles et al. (1992) that fatality rates nationwide are approximately 300 annually.

This estimate is well above the most recent annual data reported by NHTSA (2010), which may be attributable to what Wells and Falcone (1997) refer to as the 'dark-figure' of police pursuits in that there is a strong potential for discrepancy on 'definitions' and reporting when relying solely on department-level data. In their study of pursuit incidents in Illinois, the authors uncovered certain data collection discrepancies between pursuits recorded via radio dispatch, officer self-reported data, and departmental reports. From this they contend that a thorough content analysis of radio log data, semi-structured interviews, incident reports, and questionnaire data should lead toward increased validity in existing data collection strategies.

Use of Force

The use of coercive force by law enforcement represents actions that encompass a wide range of both authority and discretion (Alpert, 1997). Furthermore, many law enforcement agencies do not keep track of force incidents that occur in the field – a situation that can encumber researchers who genuinely seek to analyze data for legitimate scientific evaluation (Alpert & Smith, 1999). For those departments that do track information on use of force incidents, considerable variation exists in collection methods

(Wells & Falcone, 1997). At a minimum, all agencies should collect rudimentary data on location, persons, and offender/suspect conduct leading to use of force.

Alpert and Smith (1999) advocate collecting information about all relevant facts and circumstances leading up to the event, all variables and sequences in chronological order of occurrence, and then the results of interviews from follow-up investigations. The Miami-Dade model of interviewing attempts to capture information from the officer and suspect, and it also collects data from witnesses not only gives a sense of oversight. When data is collected in such a manner from various perspectives, variables lend themselves to theoretical modeling that can be analyzed with various statistical techniques, and in turn lead to proper policy development.

In police pursuit incidents, three manifest categories directly influence the outcome for three distinct parties involved (driver, vehicle, and environment) in which the pursuit occurs. According to Alpert et al. (1996), these three variables are an *interactive triangle*, because as one changes, so do the other two. Those involved with training related to police pursuits know that of the three, only officer behavior can be controlled. To reduce liability, trainers, administrators, and related officials should thus focus attention squarely upon training regarding pursuit policies and procedures. To be most effective, these policy and procedures guidelines must consider departmental culture in order to increase officer *buy-in* at the time of implementation.

Policy Development

Many campus law enforcement agencies patrol several miles of roadway -- both internal and external to college property. Additionally, many campus police agencies arguably function similar to the municipal agencies which they closely mirror.

Therefore, the risks associated with police pursuits equally apply to campus law enforcement, college administration and state interests (Bromley, 2000).

In a study of the largest campus police departments, 67 different agencies were evaluated on the basis of their police pursuit policy. In the context of model police pursuit policies from national sources like the Commission on Accreditation for Law Enforcement Agencies (CALEA) and the International Association of Chiefs of Police (IACP), campus policies were measured for comparison of specific content items and policy elements (traffic conditions, multi-jurisdictional situations, weather conditions, role of supervisor, communications, etc). There was much variation in the length of each policy, ranging from one to 15 pages in length. The findings indicated that the sample of campus policies on police pursuits overwhelmingly followed municipal agencies when law enforcement authority is shared. There were minor stipulations in some policies from campus agencies that focused on pedestrian safety, and a few policies that indicated a *no chase* policy or turning responsibility over to municipal law enforcement.

Crew, Kessler, and Fridell (1995) analyzed pursuit policies on the dimensions of restrictiveness and non-compliance by officers. Administrators must be concerned that officers may respond to more restrictive changes in pursuit policies by not reporting relevant data or the event altogether. Because accidents are a potential outcome of pursuits, the liability associated with them necessitates a reporting system. However, other studies (Wells & Falcone, 1997) have indicated an under-reporting of pursuits as a result of change in policy within a department. Crew et al. (1995) evaluated data from the Aurora, Colorado Police Department to monitor this trend. An analysis of the ratio of reported accidents to pursuits remained unchanged through two iterations of change in which the policy became more restrictive. The findings thus indicated no resistance by officers to restrictive policy changes in the form of underreporting pursuit events, and the department actually reduced its number of pursuits.

Hicks (2006) indicated the lack of research into the variety of pursuit policies in contemporary law enforcement agencies, specifically state law enforcement agencies. Utilizing exploratory factor analysis, the author analyzed variables that contributed toward the most efficient policy development in comparison with current liability issues and court rulings. Particular elements of each policy that were consistent loaded into both administrative and operational factors. The study concluded that these factors are relevant to proper pursuit policies in the context of reducing legal liability.

Hicks (2006) noted important liability areas of concern for administrators for policy formulation that evaluate the following variables: seriousness of offense, termination of pursuit, and training. Administrative elements that incorporated safety restrictions were included in all policies. However, approximately 87% were found to operationalize elements that included language to terminate pursuits, and approximately 27% had elements associated with training.

Variables and Pursuits

When seeking solutions to negative outcomes involving police pursuits, careful attention should always be given to analysis and interpretation of pursuit information. Routine decision-making based upon experience can help solve short-term issues, but the scope of issues surrounding police pursuits require adequate decision-making skills derived from empirical assessments. The combination of the three main parties involved in pursuits (police, suspect, and public as third party) can create unexpected possibilities that lead to negative outcomes. Discretionary decision-making is the principal factor influencing outcomes of police-pursuits. Data involving pursuits must lend directly toward proper decision-making with a direction toward the most influential party in the incident, the police officer (Alpert & Dunham, 1989).

During such events, vague policies contribute to variability of actions on behalf of the pursuing police officer, whereas more restrictive policies safeguard against unpredictable police decision-making and actions. There are three general models of police pursuits: judgmental, restrictive, and discouragement. Judgmental policies rely on officer decision-making regarding pursuit initiation, tactical maneuvers, and termination. Restrictive policies place specific restrictions on each phase of the pursuit incident. Discouragement policies caution against or completely discourage pursuits except for in the most extreme scenarios (Alpert & Dunham, 1989).

In 1989, Alpert and Dunham reported data from 300 pursuits that occurred in Dade County, Florida during 1987. Discriminant analysis models were used to categorize pursuits into groups of injury or no injury. The most significant findings indicated that younger officers were more likely to be involved in injurious pursuits, higher numbers of police units involved were more likely to be involved in negative outcomes, and rural locations for pursuits were more likely to be involved in injuries. One interesting discovery was that there existed no significant relationship between length of the pursuit and injury outcome. Pursuits with elapsed times between one to five minutes and greater than 10 minutes were less likely to result in injury, but pursuits lasting six to nine minutes had the greatest chance of negative outcomes to participants. This study also illustrates that the proverbial *cost/benefit* ratio must be continually evaluated when deciding to continue or terminate pursuits. The data from this particular study indicated that approximately 75% of fleeing violators were apprehended. Of those, 48% led to an escalation of felony charges from the initiating factor of minor traffic offenses.

Officer Variables

Homant, Kennedy, and Howton (1994) evaluated the link between risk taking, sensation seeking, and police pursuits using a sample of officers from a mid-sized police department. Utilizing Zuckerman's Sensation Seeking Scale (a risk-taking questionnaire) and hypothetical pursuit scenarios, 69 police officers with pursuit experience were evaluated. With regard to risk taking, over 90% of the officers indicated they enjoyed the risks associated with police work. Roughly three of four officers also indicated that the job could not be done without some element of risk. Findings revealed a significant positive correlation between scores on the sensation-seeking and pursuit scales. The same was true of the relationship between risk taking and pursuit scales. The researchers noted that the sample was not generalizable, and unlike hypothetical situations, many other variables could influence the decision to pursue in reality.

Research into police physiology indicates a rise in adrenaline, stress, and contention within officers during and after police pursuits (Crundall, Chapman, Phelps, & Underwood, 2003; Crundall, Chapman, France, Underwood, & Phelps, 2005). Across several agencies, research has indicated variations in perceptions of use and utility of force, as well as appropriate levels after a pursuit incident. This extensive range of perceptions by officers, supervisors, and suspects indicates a need for proper reform measures by agency administrators. Reform measures for this issue are progressive change in policies for *after pursuit* uses of force, training on stress in critical incidents, and accountability systems such as follow-up investigations, review boards, and in-car camera reviews. The role of the supervisor is central to accountability, training, and implementation of policy. One suggested policy is that the 'second car' in the chase affects the arrest, or the supervisor does so if available, so that the officer in the 'primary car' can resolve any momentary issues of stress, rage and adrenaline (Alpert, Kenney, & Dunham, 1999).

Visual stimuli account for an overwhelming majority of the information drivers' process at both normal and high speeds (Crundall et al., 2003). For drivers and especially police officers, the recognition of driving hazards is important for driving safety. Sharps (2010, p. 101) states that "there's a continuity in the nervous system" in relation to physiology and police officer interpretation of visual input. This implies that all senses and experience relate to cognitive decision making, or what he refers to as 'cognitive mediation' in interpretation of stimuli in complex or high-risk incidents. He further indicated a trade-off in feature-intensive cognitive recognition (slow) and gestalt cognitive recognition (fast). The desired (or positive) outcome beneficial in high-risk incidents is more likely achieved with feature-insensitive processes. However, this process is slow and not desired in tactical incidents, and a more instinctive process is thus required. Tactical driving is a fast process, but training that focuses on the feature-insensitive processes or strategic evaluation may reduce the error during cognitive mediation. The dynamics of decision-making is a fast, cognitive process in tactical driving best supplemented with strategic planning in training and familiarization of dangers in the driving environment.

Crundall et al. (2003) posited that experience and training can improve this recognition process during hazardous driving conditions. Electro-dermal responses (EDR) and oculomotor (eye-tracking) movements were tracked over several videos of police pursuits that occurred in different environments with road/traffic conditions. Participants included novice drivers, experienced police officers with pursuit training, and experienced civilian drivers who had similar characteristics of the officers. Electro-dermal responses were elevated for police officers compared to the other groups. Furthermore, oculomotor measures indicated a longer scanning history for police officers compared to other drivers. That is, the officers spent less time fixated on the pursuit vehicle and more time scanning horizontally compared to other groups. An interesting finding was the difference in fixation periods on the pursuit car during night-time scenarios compared to day-time scenarios, which led to a subsequent study.

Special attention must be made by all drivers on public roads, and focus of visual stimuli is of great importance to police officers driving at high speeds (Crundall et al., 2003; Sharps, 2010). Concurrently, police officers must have a wide visual focus on all aspects of conditions during a police pursuit. This study notes the relative differences between police and the general public on visual focus, and more importantly whether training and experience influence visual cognitive capture at high-speed driving. In simulated videos of high-speed pursuit driving and control driving, participants' oculomotor eye movements were tracked. Both civilians and police had equal gaze duration on the fleeing vehicle, but police maximized their scanning time for additional traffic conditions and stimuli. Police also conducted more visual scanning of the road ahead during daytime pursuits compared to nighttime pursuits, thereby indicating a focus on the road ahead and less focus on other traffic related stimuli (signs, pedestrians, etc.). Crundall et al. (2005) note that police training could contribute to more efficient scanning of road hazard stimuli, and police can rely on experienced schemas to reduce visual scanning of traffic controls. The authors also indicated that focused scanning of visual stimuli is not related to accident liability, but an increased understanding of this process can contribute to safer police driving.

Suspect Variables

Utilizing a sample of offenders (n=146) who agreed to participate in surveys and follow-up interviews regarding their pursuit incident, Dunham, Kenney, Alpert, and Cromwell (1998) were able to gauge the perceptions of offenders involved in police pursuits. With regard to pursuit outcomes, 30% of suspects reported terminating the pursuit on their own either by surrendering or abandoning the vehicle, or instead flee on foot. Of the total sample, 25% of the offenders who outran police (foot or vehicle) got away, while another 30% crashed their vehicle during the pursuit. The chances of apprehension were greatest for those suspects who crashed or were forced to stop by the police. Approximately 42% reported being under the influence of alcohol or drugs. The reasons cited why suspects fled were varied, but the most common responses were that they were driving a stolen vehicle (32%), driving on suspended license (27%), or had just committed a criminal offense (27%). Of those who fled while under the influence, 27% reported fear of getting a DUI citation as the primary reason for fleeing.

Questions also were asked about the respondents' reasoning for risk-taking. For instance, 67% of respondents indicated they would still run if pursued aggressively, and slightly more than half (53%) stated they would *run at all costs*. However, 71%

indicated they were concerned for their own safety, with 63% also reporting concurrent concern for the safety of other drivers. Three-fourths of the sample indicated they would have slowed down if they felt they were at a safe distance from law enforcement pursuing them (2 blocks in municipalities, 2.5 miles on highways).

By analyzing survey responses with logistic regression, models indicated variables that contributed to a suspect's willingness to take risks in the pursuit. First, those suspects who had been previously apprehended in pursuits were approximately seven times more likely to risk flight. Second, suspects who contemplated punishment during the chase were five times more likely to risk flight, while those who thought about their own safety (being beaten by police officers) were twice as likely to risk flight during the pursuit. Finally, those suspects who were under the influence of alcohol or drugs were 1.75 times more likely to engage in extreme risks during the pursuit incident. These findings indicate that punishment for offenses related to police pursuit remain more of an incentive to flee than any deterrence effect (Dunham et al., 1998).

Toward a High-Risk Typology of Pursuits

Previous research has focused on one agency or policy-related data from multiple agencies. A comprehensive NIJ study conducted a survey of 436 agencies, where officers (with experience ranging from rookie patrol officers to supervisors) were respondents on various aspects of police pursuits. Further, data from three metro-area agencies were obtained on 1,200 police pursuits to correspond with 126 interviews of incarcerated suspects who were involved in pursuits within those areas. Ninety-one percent of those agencies surveyed had written policies on pursuits, but almost half were never updated. Of those with updated policies, 87% indicated they had revised them to be more restrictive. Of the 436 agencies, only 135 regularly recorded data on their pursuits, with only 5% of the states represented by the sample indicating that data collection was mandatory. With regard to training, only 60% of agencies mandated a pursuit course at police academies, and the average amount of time allocated to the topic was approximately 14 hours. Very few agencies indicated more than three hours per year of training on pursuits after basic academy training (Alpert, 1997).

The respondents included opinions on initiating and terminating pursuits for rookie officers, supervisors, and veteran officers. All three groups indicated a gradual approval of continuing pursuits as the need for apprehension or seriousness of the offense increased. Also, all three groups were likely to terminate chases as the level of risk increased due to weather and traffic conditions. Recruit officers overwhelmingly indicated that they would engage in pursuits for most offenses prior to training, and after training in basic mandate, three of four recruits indicated they would engage in pursuits under low risk conditions for any offense (Alpert, 1997).

Of the 146 suspects chased by law enforcement, approximately 70% indicated they would have decreased their speed when they outdistanced the patrol cars. Approximately three of four suspects were concerned for their own safety, while more than half (approximately 52%) indicated they also were concerned for the safety of others during the pursuit. However, slightly more than one-half (52%) and approximately two thirds (64%) of the suspects responded they would run at all costs and would not be caught (Alpert, 1997).

According to Alpert (1998), there are four critical factors to be considered during a police pursuit: known violation, area of pursuit, weather conditions, and traffic conditions. In a comprehensive survey of 1,055 officers representing four major municipalities, he found interesting results through utilizing factor analysis which scaled items into the following variables (risk factors): area, violation, and road conditions. Logistic regression was then used to assess the likelihood to pursue or not to pursue (the dichotomous dependent variable). Alpert's findings indicated that officers were three times more likely to pursue for DUI over other traffic offenses. There were no significant differences between highway or commercial areas, but officers were less likely to pursue in residential areas compared to main freeways. Officers were three times more likely to pursue in non-congested traffic conditions, but only 1.7 times more likely to pursue on dry road conditions. Overall, both supervisors and officers indicated apprehension as the most important factor in deciding to initiate or continue pursuit of a suspect. A key factor in understanding risk factors versus need to apprehend is the consideration of terminating the chase in favor of follow-up investigative procedures.

Hoffman and Mazerolle (2005) analyzed pursuit data from Queensland Police Services in Australia. Data were obtained on approximately 1,200 pursuits across two years (2000-2002). Approximately 50% of the pursuits were initiated due to traffic offenses, and approximately 25% were due to stolen cars. Of all pursuits, approximately 11% resulted in death or injury, and two persons, on average, died each year as a result of police pursuits. However, data from charges filed after the pursuit indicated that the most frequent additional charge was driving while intoxicated or driving while unlicensed. The study found that an important aspect of balancing public safety versus offender apprehension is seriousness of the offense. Further consideration of policies in *restricting pursuits* for traffic offenses would reduce these incidents by half, and a further level of restriction against *chasing* stolen cars would reduce *pursuit incidents* an additional 25%. Despite advances in technological pursuit devices (PIT, stop sticks etc), policy restrictiveness is likely to have a greater impact on public safety.

Becknell, Mays, and Giever (1999) evaluated the relationship between negative police pursuit outcomes and pursuit policy restrictiveness. This evaluation was conducted within the framework of the use of force model related to police pursuits. Briefly described, the use of force model establishes guidelines for officers to follow in resolving confrontational contacts with the public. In applying the model, an officer can escalate or de-escalate the use of force depending upon the non-verbal, verbal and/or physical reactions of a subject. Unfortunately, however, police pursuits do not lend themselves to a fluid use of force continuum because such events are usually an 'all or nothing' tactic in response to a fleeing driver. When contrasting day-to-day use of force instances with police pursuit models, it is important to note that the use of deadly force is present in both. A random sample of 800 municipal and county police departments were used from a nationwide survey conducted by the Police Executive Research Forum (PERF). The survey focused on the following topics: mandatory policies, extent to which agencies collect data, negative outcomes of pursuits (e.g., injuries/damage), policies pertaining to alternative actions/terminations of pursuits, the amount of pursuit training provided, and investigative and disciplinary procedures.

In evaluating the PERF data, Becknell et al. (1999) identified four-criteria for evaluating each agency on their pursuit policy and implementation. First, each policy was rated on a continuum similar to that employed by Alpert et al. (1996) ranging from a judgmental (or restrictive) policy to discouragement-type policy. Second, each agency's policy was rated for clarity and specificity. Third, each agency was rated on thoroughness of training on police pursuits (initiation of pursuit, driving techniques, alternatives, and termination of pursuits). Finally, each agency was evaluated on its own methods for administratively tracking and monitoring pursuits and related outcomes (reporting pursuits, keeping statistics on each pursuit, and discipline of officers.

After each agency was rated, the four evaluative scales were used as independent variables in a subsequent OLS regression model seeking to explain the variance in three dependent variables: rate of pursuits for each agency, rate of pursuits involving accidents, and rate of pursuits involving deaths (where rates were determined by number of pursuits versus number of officers per agency). Findings from these analyses indicated a significant inverse relationship between increasing policy restrictiveness and overall number of pursuits.

Crew and Hart (1999) evaluated the costs and benefits of police pursuits by improving their associated measures for decision-making. Further, these authors evaluated data that points toward negative pursuit outcomes given certain factors during the chase. The goal of their research was to predict outcomes, by evaluating both high cost and low cost pursuits. While a relationship between reduction in crime rates and arrests affected by successful police pursuits has not been made, the authors indicated that arrests themselves, as a measure to prevent future crime, can be seen as a benefit. Crew and Hart admit they utilize an imperfect strategy to assess a monetary value to the benefits of arrest -- which is a mean value of medical, property, and mental health costs to victims. The authors utilized estimates of civil damages to assess the costs of negative outcomes in police pursuit incidents. Data were obtained from the average claim for both property and injuries sustained from police pursuits, which encompass medical costs, property damage costs, and loss of productivity at work.

To evaluate this cost/benefit strategy, Crew and Hart (1999) utilized police pursuit data from the state of Minnesota during 1989 to 1996. In over 6,700 pursuits, approximately 77% resulted in arrests, which was also the most frequent outcome of pursuits. “Therefore, if you accept the argument that the arrest of a person who has committed a crime is punishment that is equal in value to the average cost of a crime, the benefit to Minnesota of police during the period 1989 through 1996 was $11.1 billion” (p. 61). In looking at costs versus benefits, the authors create a ratio of probability that a pursuit will likely result in a capture divided by the probability of a negative outcome (defined as accident, injury or death). From the Minnesota data, pursuits were approximately 2.5 times more likely to end in an arrest (benefit) than a negative outcome. Logistic regression revealed that those factors with the greatest likelihood of negative outcomes were pursuits initiated due to suspected DWIs or felony offenses, which occurred during night-time hours. An interesting finding was neither length nor duration of pursuit was found to be significant variables in these models. While Crew and Hart indicated a crude measure for cost/benefit analysis in decision-making of police pursuits, they at least created some degree of estimation for policymakers to consider regarding the legal liabilities associated with negative pursuit outcomes.

Best and Eves (2005) investigated 64 cases of police pursuit-related fatalities in the United Kingdom. The U.K. police utilize follow-up investigations to learn lessons from fatal events after pursuits. Research into these cases indicated that only 14% recommend policy changes, and only two incidents required officers to receive a reprimand. The authors compared follow up investigations with pursuit data, and indicated discrepancies where policies were violated. Despite a need and lack of national data in the UK for police pursuits, they indicated several national policy guidelines regarding pursuit incidents. In their research, they note one common violation of policy in pursuits which requires both officer and supervisor risk assessments: “The lack of continual risk assessment between the driver and the control room prevented the dangerousness of the pursuit from being adequately assessed...” (p. 44). Best and Eves concluded that the pursuit policies lacked clarity toward understanding escalation and de-escalation of pursuit, which prohibits a proper risk assessment evaluation. They further imply that more evidence-based evaluations should be utilized by oversight agencies.

McGue and Barker (1996) assessed the connection between the progression of pursuit policy restrictiveness and forcible stop techniques. In an attempt to survey the population of law enforcement agencies in the state of Alabama (n =389), the researchers received a sample of pursuit policies used by a range of departments characterized as small (11 officers or less) to large departments (more than 100 officers). From their sample, 28% of the agencies responded with sample policies and survey responses. Of the 188 responding agencies, 47% indicated they viewed their policy as ‘somewhat restrictive,’ where as 25 agencies responded that their policy was ‘very restrictive’, and the remainder indicated ‘not very restrictive (note: only four agencies responded that their policy was not restrictive, all of which were classified as small agencies). A very restrictive policy was defined in the study as a prohibition against officer judgment in initiating a pursuit unless there was a life-threatening scenario. Approximately 44% of the responding agencies indicated they authorize forcible stop techniques in pursuit policies, and a corresponding amount of agencies indicated they provide formal training for forcible stop techniques. The authors suggest a pursuit policy continuum minimizing officer discretion and increasing restrictiveness in situations that may result in a negative pursuit outcome. However, the authors imply that forcible stop techniques should not be considered as options toward positive outcomes in pursuits.

Madden and Alpert (1999) developed a ‘pursuit calculus’ in their analysis of pursuit incident variables associated with data collected at the Miami Police Department. This data spanned from 1990 to 1994 and included variables from over 1,000 pursuit incidents. Approximately 25% of the pursuits resulted in property damage and 20% of the pursuits resulted in personal injuries to those involved. From these pursuits, the authors examined the following variables: area, reason for pursuit, speed of pursuit, time of day, and number of police units that pursued. Road conditions were not analyzed due to the low percentage (5%) of total pursuits where inclement weather was a factor. Considering the two-factor outcome of property damage and personal injury, log-linear models were utilized to evaluate both categorical and scale data, and these models account for the interaction effect each have on pursuit outcomes. For property damage, most pursuit characteristics did not have a statistically significant effect, but number of pursuit units and pursuit during the day increased the odds of property damage to 3.88 to one. For personal injury, the models indicated that more than one unit in pursuit coupled with speeds in excess of 65 mph and traveling from a residential area to a commercial area resulted in an increase of odds for injuries to parties (2.50 to 1). It is important to note that in some pursuit conditions, pursuits initiated for traffic offenses resulted in increased odds of injury versus pursuits for more serious offenses, but the effect was not significant and odds decreased for various pursuit conditions. Therefore, these variables interact to mediate the effects towards the likelihood of a negative outcome (property damage or injury).

For the pursuit decision calculus, Madden and Alpert (1999) indicated the model policy would utilize a cost/benefit analysis where the lowest offense (traffic) would necessitate a pursuit with the lowest risk to the public, and continuing up the scale model, an offense for a felony would call for law enforcement to consider a higher risk pursuit. To impute the economic models for cost/benefit odds, the authors divided the model policy into three scales (A, B, C). A profile-A pursuit would be utilized for low cost / risk decisions for traffic offenses and property damage. A profile-B pursuit would be utilized for medium cost/risk decisions for pursuits involved in property damage to felonies, and a profile-C pursuit would be the riskiest pursuit for those suspects who have committed violent felonies. For policy implications, Madden and Alpert contend that similar analyses need to be conducted across other law enforcement agencies toward development of a pursuit decision calculus. Furthermore, officers and supervisors are unaware of the cost/benefit odds associated with increasing risks during pursuit incidents, and data collection associated with proper training and policy development can help them make safer decisions in assessing pursuits as they develop quickly.

> Once a data-driven pursuit calculus is computed, the results must be translated into policy, training, and supervision directives. That is, the more management knows about its pursuits, the better it can design a plan to maximize benefits and minimize costs (Madden & Alpert, 1999, p. 40).

Termination Techniques

Moore (1990) indicated that technology is the key toward proper safety in pursuit incidents. Keeping future technological advances in mind, policies and statutes can utilize these measures as ways to both prevent and terminate pursuits safely. Some advances evaluated by Moore are electro-magnetic pulses to disrupt the fleeing vehicle, radio signals to slow the fleeing vehicle, and facial recognition in on-board police vehicle cameras. Despite these patents and advances, there are more conventional and less technological tools that police have utilized over the years to terminate pursuits: stop (spike) sticks, rolling-road blocks, the precision immobilization technique (PIT), and the tactical vehicle intervention. With varying levels of success, there are corresponding variation of uses, policies, and controversies with each method. As pursuit termination strategies emerge with technological advances, policy development also needs to evolve or develop to implement these strategies. In *Scott v. Harris* (2007), the U.S. Supreme Court evaluated the attempted PIT maneuver and tactical vehicle intervention (TVI) as analogous to deadly force.

Legal Evaluation

As pursuits have become more controversial in their dynamics since the 1960s, litigation has increased throughout the years (Alpert, 1998). The first lawsuit against the police regarding pursuits originated in 1941, and since then numerous cases have come forth evaluating the culpability and liability risk of the police (Alpert & Smith, 2008). Most of the litigation surrounds the federal statute involving liability of the police officer. The Federal government (*42 U.S.C. 1983*) enumerates the provisions and remedies that citizens can seek concerning violations of federal and Constitutional protections.

> Title 42 Sec. 1983. Civil action for deprivation of rights
>
> Every person who, under color of any statute, ordinance, regulation, custom, or usage, of any State or Territory or the District of Columbia, subjects, or causes to be subjected, any citizen of the United States or other person within the jurisdiction thereof to the deprivation of any rights, privileges, or immunities secured by the Constitution and laws, shall be liable to the party injured in an action at law, suit in equity, or other proper proceeding for redress, except that in any action brought against a judicial officer for an act or omission taken in such officer's judicial capacity, injunctive relief shall not be granted unless a declaratory decree was violated or declaratory relief was unavailable. (*42 U.S.C. 1983*, 2011)

Those citizens seeking damages under liable conditions set forth under 42 U.S.C. 1983 will file for suit in federal district court. However, the doctrine concerning liability under the federal statute also invokes qualified immunity against liability for police officers in the performance of their job. The compelling issue concerning qualified immunity rests with ascertaining if a public official committed a violation of constitutional or federal protections. In use of force situations, the Supreme Court in *Graham v. Connor* (1989) indicated a two-prong test. First, the plaintiff must allege a violation of the 4th Amendment, and second, the plaintiff must allege a police officer acting in the performance of their duties (known as *color of law* in the statute) caused the violation of the Constitutional right (Hughes, 2001).

Leading up to the *Scott v. Harris* (2007) decision, there were two landmark U.S. Supreme Court cases concerning violations of the 4th and 14th Amendments that occurred from police pursuits. *Brower v. County of Inyo* (1989) concerned the termination technique of stationary roadblocks and whether this method constituted a ‘seizure’ under the 4th Amendment. The U.S. Supreme Court indicated that a stationary roadblock does constitute a seizure under the 4th Amendment because of the law enforcement intention to restrict freedom of movement. After *Brower v. County of Invyo*, many police departments had to revise their policies to restrict the use of stationary roadblocks. The second landmark decision, *Sacramento County v. Lewis* (1998) concerned the 14th Amendment and the violation of due process after a police pursuit. Because the Supreme Court expressed in *Brower* that law enforcement have to intend to restrict movement, the Supreme Court indicated in *Sacramento County v. Lewis* that accidental crashes, where officers make contact with a party during a pursuit, does not constitute a seizure. In *Sacramento County v. Lewis*, the plaintiff alleged a violation of due process under the 14th Amendment. The U.S. Supreme Court decided that a violation of due process during a police pursuit occurs when: “only a purpose to cause harm unrelated to the legitimate object of arrest will satisfy the element of arbitrary shocking of the conscience, necessary for a due process violation” (Hughes, 2001, p. 139; *Sacramento County v. Lewis*, p. 1051).

As indicated in *Scott v. Harris* (2007), the Supreme Court has likened pursuits to deadly force situations where officers can claim ‘qualified immunity’ after a negative outcome. Despite this interpretation toward various aspects of police pursuit incidents, no ruling has specifically granted complete immunity (or complete liability) regarding an officer’s actions or a department’s policy. Without clear guidance, many police departments have remained restrictive despite an increased authority on how to terminate pursuits and a high standard to clearly establish liability for law enforcement. To address the liability of negative outcomes of police pursuits with the goal of having a proper policy, a sample of police pursuit incidents or pursuit database should be evaluated.

IACP National Pursuit Study

Lum and Fachner (2008) evaluated police pursuits with a national level perspective in their comprehensive study: *Police Pursuits in an Age of Innovation of Reform: The IACP Police Pursuit Database.* The study conducted on behalf of the International Association of Chiefs of Police (IACP) was to evaluate the current dynamics of police pursuits nationwide. The content of this report indicated previous literature research concerning police pursuit, and the researched indicated the need for innovation in technological advances that lead to increased data collection strategies of pursuit variables, and the need for reform measures for police pursuit policies. The report reviews case law, content analyses of police pursuit policies nationwide, and analyzes the national police pursuit database, which contains pursuit incident variables from participating agencies of that national database.

> The IACP Police Pursuit Database is a voluntary, web-based, and secure system in which agencies can submit reports of individual pursuits. Data provided in reports are organized into a database on a secure server, which then allows agencies to access their own data as well as information on other agencies of similar size (the names of other agencies are not identified) or across larger regional areas, to examine broader trends. Being able to standardize and access both their own data as well as information from other agencies, gives participating police departments the ability to make more informed decisions at both the micro

> (individual pursuit situations) and macro (pursuit policy) levels. (Lum & Fachner, 2008, p. 44)

Of the 56 agencies representing 30 states, the IACP Police Pursuit Database contains pursuit variables from 7,737 pursuits from 2001 to 2007. The participating IACP agencies were of varying size and represented by a number of officers (in descending order): 1000 officers or more (10.7%), 500-999 (12.5%), 250-499 (7.1%), 100-249 (16.1%), and 1-99 (53.6%). The types of agencies represented in the database were: municipal (78.6%), sheriffs' (7.1%), state police (8.9%) and other (5.4%). The annual average of submitting agencies was 23, and the initial amount of pursuits increased from years 2003 to 2006, and then dropped off in 2007 (Lum & Fachner, 2008).

The data collected in the national database focused on officer, administrative, suspect, and environmental variables: supervisor and termination techniques, road conditions, demographics from all parties, negative pursuit outcomes, and pursuit conditions. It was interesting that approximately 23% had negative outcomes, and 9% resulted in injuries to the officer, suspect, or third party civilians. Of the 900 injuries, 81% (720) were minor, 16% (144) were serious, and 3% (23 deaths) were fatal. For road conditions, approximately 75% (675) of all injury-related pursuits occurred in light-road conditions. Speed was a significant variable, in that more than 78% (702) of all negative outcomes occurred when the pursuit speed exceeded 25 mph over the limit. Finally, another interesting finding is that 94% (n=7,272) of the pursuits ended without a termination technique, but tire deflation devices were the primary method in which officer terminated pursuit with very few agencies utilizing the PIT maneuver, rolling/stationary roadblocks, and other methods (Lum & Fachner, 2008).

This study evaluated many aspects concerning pursuit outcomes, conditions of pursuits, and descriptive variables of those involved in these dynamic incidents. Lum and Fachner (2008) indicate that theirs is not a representative national sample of pursuits, but point out correlations to other studies that assess pursuits, variables, and content analyses of policies (Alpert, 1997; Hicks, 2006). Despite these limitations, this database represents the largest collection of statistics on pursuits currently to be evaluated. The variables used for this comprehensive study are a guide, and the major basis for the current project to be studied in Georgia.

The body of literature regarding police pursuits is relatively new and thus very concise in its scope. Historically, the literature focused heavily on legal implications toward policy reform. The research to date is directed toward practitioner usage in developing or refining pursuit policies that benefit both agencies and the public. However, there is very little research that utilizes actual pursuit variables. Those researchers who have utilized pursuit variables in their examinations have alluded to further research with similar methodology (Alpert & Dunham, 1989; Alpert & Smith, 2008; Charles et al., 1992; Hoffman & Mazerolle, 2005; Lum & Fachner, 2008; Madden & Alpert, 1999). Building on the body of literature concerning police pursuits, with acknowledgement of the lack of variables, certain research questions arose that could possibly contribute to existing studies.

CHAPTER III

METHODOLOGY

The goal of this research is to understand the extent to which certain variables are associated with negative police pursuit outcomes. The purpose of the current project is thus multi-fold. This project examined the relationship of several variables (e.g. suspect/officer demographics along with pursuit characteristics) with a high-risk typology of pursuit incidents that lead to a negative outcome (e.g. crash, fatality). In doing so, decision-makers involved in these incidents can accurately identify pursuits that lead to negative outcomes and make decisions accordingly. After examining frequency and descriptive differences between state and national samples, non-parametric analyses were conducted. The analyst evaluated categorical variables from frequency pursuit data. Chi-square tests of independence were conducted to determine how demographics and pursuit characteristics are associated and indicate odds of negative pursuit outcomes.

The Data

The data analyzed for this project originated from the Georgia Association of Chiefs of Police state certification program, which operates as a state-wide accrediting authority to promulgate professional standards. In 2007, the state certification program required agencies to begin recording statistics on their police pursuits. Data collection years are from 2007 to 2010 with over 100 agencies participating. As part of the state certification process, each agency is required to have one officer be trained (by the GACP) as a certification manager and who will be responsible for providing evidence that the agency has met standards in accordance with the accreditation process. The certification manager and agency chief executive thus have a vested interest in obtaining state certification. According to the GACP (2011), there are several benefits to Georgia State Certification status:

The benefits of certification include:

1. Confirmation that agency practices are consistent with progressive professional standards;
2. Greater operational and administrative effectiveness;
3. Enhanced understanding of agency policies and practices;
4. Greater public confidence in the agency;
5. Recognition in the field of outstanding achievement;
6. Reduced liability potential; and
7. Greater governmental and community support.

There are approximately 128 standards that each agency must comply with annually o achieve/maintain certification status. In 2007, the GACP, in anticipation of the *Scott v. Harris* decision, added the following standard to the requirements for certification.

Standard 5.35

The agency shall submit an annual written report of all vehicle pursuits on the Annual Pursuit Data Collection form as provided by the Director of State Certification by March 1st for the preceding calendar year.

Commentary.

The Georgia Association of Chiefs of Police (GACP) Pursuit Data Collection Form was instituted to collect statewide pursuit information to assist in the formulation of policies, rules, and regulations. If the agency has had no

> pursuits within the assessment period, a letter on agency letterhead can be submitted in lieu of the written annual report indicating no pursuits have occurred. The data provided to GACP on this form is not maintained for each individual agency, but rather tabulated for the entire state. (GACP, 2011, p. 43)

To comply with standard 5.35, each certification manager compiles a spreadsheet of police pursuit variables.

Data Collection Issues

When researchers utilize information collected by others, it is called secondary data analysis. Primary investigators that conduct criminal justice research under government funds are normally required to provide funds for public use. Many researchers may utilize this data, but must acknowledge that the primary investigator collected the data for a purpose that is usually different from the secondary researcher (Maxfield & Babbie, 2010).

Wells and Falcone (1997) discussed the advantages of multiple data collection strategies concerning police pursuits. In their discussion, the researchers indicated problems with secondary data analysis on police pursuits:

1. Police have a general dislike for ‘extra’ paperwork.
2. Police may believe that pursuit incident forms represent *administrative control*.
3. Police work is closed in nature to the general public – especially with high-risk issues.
4. Police deviance tends to eliminate evidence that will result in liability.

Wells and Falcones' (1997) solution to this problems is to verify pursuit reports before analysis. The researchers utilized radio logs of pursuit incidents to verify information recorded on police pursuits. Their findings indicated that pursuits logged over radio traffic were comparable to the information included on the sample of pursuit incident reports, and although there were no pursuits not reported in their sample, the use of verification is an important strategy to alleviate weaknesses in these secondary data collection methods. In all, much post-hoc recording of data by police on pursuits may contain bias, and administrative oversight coupled with verification can address these validity concerns.

Although Wells and Falcones' (1997) article was the only one found which related to data collection for police pursuits, there are other data collection issues to address in secondary analysis. According to Kiecolt and Nathan (1985), there are many advantages to secondary data analysis. The first advantage is that analysts who evaluate secondary data save resources (time/money) on survey design, response rates, and costs of implementation. The second advantage of utilizing secondary data is that there can be only one primary researcher who evaluates data, thereby eliminating the need for other research investigators. The third advantage of secondary data analysis is that most data collected in this form are readily available for computer analysis. Secondary data can also alleviate survey collection problems, and are readily available and collected by government entities for both national representative and regional samples.

There are some disadvantages to secondary analysis. The first disadvantage is how such data is often collected. Many researchers settle with the availability of the sample, population, or amount of data observations recorded in a database. Therefore, many researchers -- depending on their research topic -- may not have a proper sample or data to test hypotheses or explore research questions. The second disadvantage is that secondary data may be collected for purposes other than that of those interested in research. If government agencies collect data in one manner, it may not coincide with the data analysis strategy desired for the principal investigator (e.g. aggregate data versus ratio data). A third disadvantage to secondary data analysis is controlling the time in which it is collected. Many researchers must wait for the primary data collector to finish the collection process and publish the data for the public. The final and primary disadvantage to secondary data analysis is data accuracy in its collection phase. The primary data collector may not operationalize their measurements, and as such data may not be as reliable as the secondary researcher desires (Kiecolt & Nathan, 1985).

Remedies to Data Issues

Maxfield and Babbie (2010, p. 330) stated an important lesson to be learned in analyzing secondary data: “Expect the unexpected.” If unexpected patterns emerge when analyzing secondary data then the researcher should review the data collected. Wells and Falcone (1997) add that verification must take place, as they did when using radio logs to verify the veracity of pursuit reports. Kiecolt and Nathan (1985) also indicated verification of records as a possible remedy to data accuracy issues confronting primary researchers. Verification of a sample of cases can ease validity and reliability concerns of the researchers: such remedies are necessary because the advantages of secondary data analysis outweigh the disadvantages for social science research (Kiecolt & Nathan, 1985; Maxfield & Babbie, 2010; Wells & Falcone, 1997).

To address the issues of analyzing secondary data collected by a third party, Wells and Falcone (1997) suggested *triangulation* as a remedy. Given the number of fatalities that occurred during the data collection period, a search of media reports during that time frame should corroborate and reveal similar characteristics that may lead toward a typology of high-risk pursuits in Georgia. This research task should also verify data accuracy issues concerning the dependent variable – injuries/fatalities reported.

The researcher is familiar with the data collection process utilized by agencies to capture statistics since the requirement was instituted in 2007. An example is as follows: First, the incident occurs and the shift supervisor records a police pursuit incident report and reports variables for each category. Second, the officer who supervises the patrol division reviews the report for completeness and forwards a copy to both the agency chief or sheriff and the certification manager. Third, the certification manager reviews the report and the incident to ensure data completion and accuracy. Finally, the certification manager inputs the data from the pursuit incident into that year's collection of pursuit incident reports. From this process, there are safeguards to verification of data -- which was the purpose of the system established by the accreditation/certification authority. For further verification, the researcher confirms the frequency and number of certain agency reports as submitted. Verification of individual cases is not possible because the collection by GACP is in aggregate numbers and coded for the entire year without agency specific identification. The researcher relied heavily on the established procedure set forth by the GACP and inferred that certification manager verification has taken place in each year's dataset.

Data Description and Procedures

From 2007 to 2009, the GACP collected data on all pursuit incidents submitted by law enforcement agencies under the state certification program. The variables were categorized as follows: officer characteristics, suspect/offense characteristics, and pursuit characteristics. Under each main category, the following variables were captured per pursuit incident report and recorded for each pursuit incident during a one year period: These variables included, but are not limited to:

- pursuit officer experience
- pursuit officer demographics
- relevant pursuit training
- demographics on suspect
- violation that initiated the pursuit
- length of pursuit
- maximum speeds of pursuit
- number of officers in pursuit
- road conditions
- injuries or damage to officer/suspect/third-party
- how the pursuit was terminated.

Most of the variables from each incident are continuous or categorical, but they were collected in aggregates. The sample of agencies from 2007 to 2009 is approximately 300, from which 2,180 pursuits were reported. Each report contained approximately 11 variables of research interest yielding approximately 38,000 data values for analysis. The data is complete with no missing values. Either an event was reported or it was recorded as zero, and the frequency of the variable was recorded accordingly.

Research Questions

The goals of this project were to determine the variables which correlated with outcomes that may lead to proper decision making by law enforcement. This was accomplished by evaluating and analyzing variables from the pursuit incident sample from GACP to answer research questions/hypotheses. The project sought to discover the relationship between pursuit incident variables associated with a negative or positive outcome while leading toward a risk-assessment model. For this project, negative pursuit outcomes were variables related to officer/suspect/third party injuries and/or fatalities.

Research Question 1: *What are the variables that correlate with negative outcomes in police pursuits?* Based upon the literature, specific variables (i.e., officer demographics, suspect demographics, pursuit characteristics) should lead toward a negative outcome (Alpert & Dunham, 1989; Alpert, 1998; Crundall et al., 2005; Lum & Fachner, 2008).

Research Hypothesis #1a:

Variables related to officer experience will significantly relate to negative pursuit outcomes.

Research Hypothesis #1b:

The violation that initiated the pursuit will significantly relate to negative pursuit outcomes.

Research Hypothesis #1c:

Time of day will significantly relate to negative pursuit outcomes.

Research Hypothesis #1d:

Length of pursuit in distance will significantly relate to negative pursuit outcomes.

Research Hypothesis #1e:

Length of pursuit in time will significantly relate to negative pursuit outcomes.

Research Hypothesis #1f:

Speed of pursuit will significantly relate to negative pursuit outcomes.

Research Hypothesis #1g:

Road conditions will significantly relate to negative pursuit outcomes.

Research Hypothesis #1h:

Number of vehicles used will significantly relate to negative pursuit outcomes.

Research Hypothesis #1i:

The way in which the pursuit ended will significantly relate to negative pursuit outcomes.

Research Question 2: *Is there a high risk typology associated with pursuit variables?*

Research Hypothesis #2:

A combination of variables can create a ‘risk typology’ that will likely result in negative pursuit outcomes.

Research Question 3: *How have termination techniques changed in frequency since the decision of Scott v. Harris (2007)?*

Research Hypothesis #3:

There has been an increase in frequency of termination techniques since *Scott v. Harris* (2007).

Analysis Plan

To assess how two categorical variables are associated, a Pearson chi-square test for independence is indicated (Daniel, 1978). Chi-square tests of independence were conducted to measure association amongst all relevant pursuit variables (road conditions, officer, suspect and outcomes) in this study to evaluate the hypotheses associated with research question one. According to Pearson's statistical technique, chi-square will indicate larger values as the minimum association between differences is zero, which shows evidence of a stronger relationship among variables and greater support against the null hypothesis. The characteristic of the chi-square distribution of values is that the mean is the same as the degrees of freedom in the sample. Because there are no negative numbers, the distribution is positively skewed, but approaches normality as degrees of freedom increase (Agresti, 1996). Values that exceed the critical table value of significance within the sample's degrees of freedom can be obtained, and an inference can be made that an association exists between variables (Thompson, 2001). Chi-square analyses have assumptions and limitations. First, the sample size must be random, large and in frequency form. Second, cases must be assigned to at least one cell in the analysis, either observed or expected. A limitation to chi-square analyses is that it measures the degree of association between variables but little else (Agresti, 1996).

Agresti (1996) and Field (2005) both indicated that Cramer's V is a statistic that can further evaluate association by squaring the Pearson chi-square statistic and dividing by both sample size and rows/columns. For this project, the dependent variables associated with negative pursuit outcomes were utilized with independent variables of interest to calculate both Pearson's chi-square statistic and values for Cramer's V.

Frequency distributions are the most efficient method for organizing data for comparison, but cannot be used for inferential purposes. Univariate analyses describe one variable and how well it is distributed across measures of central tendency (Maxfield & Babbie, 2010). To evaluate research question two, the analysis utilized both qualitative and quantitative findings to create an overall typology. The qualitative component of this analysis assessed a parallel typology of pursuit-related deaths depicted in the media. A content analysis of news reports on this topic was conducted for the time period consistent with the quantitative component (2007-2009). The reported variables (if accessible) were then compared to similar categories as data from the GACP. This methodology was used to verify the typology indicated by statistical analyses.

With 2,180 reports and 11 variables per report, one can infer this sample to be large. In turn, the power of the statistical test for this analysis might be problematic and contribute to type I error. To address this issue, a random sample was drawn post-hoc from the original sample of reports. Chi-square tests of independence were then used to determine the power of the test to the sample is appropriate. The Pearson chi-square test of independence evaluated the purposive sample by measuring the association of pursuit variables with the dependent variable (damage, injuries, or fatalities). By examining the relationship of several variables (e.g. suspect/officer demographics along with pursuit characteristics) from police pursuit data and news reports, a 'typology' of high-risk pursuits should emerge. To evaluate research question three, a comparison of frequency distributions was conducted among salient variables important to the project's goals. Descriptive statistics concerning variables related to termination techniques were analyzed for each year. A more detailed step by step procedure and explanation of analyses for research replication will be provided in the Chapter IV: Analyses.

CHAPTER IV

ANALYSES

Data Descriptives

Prior to chi-square analysis of categorical values, an assessment was conducted of each year's pursuit data from the sample (2007 to 2009) for descriptive analysis (reported in Table 1).

Table 1

Descriptives

	2007	2008	2009
Number of Reporting Agencies	82	100	97
# of Pursuits (mean)	8.7	7.62	7.05
Number of Pursuits	709	762	684
daylight	253/35%	257/34%	239/35%
night	468/65%	514/66%	444/65%
0801-1600	161/22%	192/24%	151/22%
1601-2400	293/40%	302/39%	253/37%
0001 - 0800	278/38%	294/37%	280/41%
Injuries and Deaths			
injuries to officers	3/.004%	15/.002%	11/.016%
injuries to suspects or passengers	53/.07%	57/.07%	66/.10%
deaths to suspects or passengers	12/.016%	14/.018%	12/.017%
death to persons 3rd party vehicle	1/.001%	3/.003%	0/0%
Officer's Age			
18-21	20/3%	5/1%	8/1%
22-29	273/36%	276/35%	246/33%
30-37	266/35%	315/40%	252/34%
38-45	149/19%	156/20%	165/22%
46 and above	50/7%	40/4%	68/10%
Suspect's Gender			
Male	558/91%	613/94%	546/92%
Female	58/9%	45/6%	44/7%
Suspect's Race			
White	223/33%	241/32%	241/42%
Black	361/53%	388/51%	332/58%
Other	13/2%	5/1%	4/<1%
Unknown	81/12%	103/14%	72/11%
Suspect's Age (when known)			
Less than 21	162/27%	167/26%	139/26%
22-29	176/30%	241/38%	194/34%
30-37	129/22%	102/16%	112/20%
38-45	70/12%	81/13%	68/12%
46 and above	47/8%	43/7%	50/8%

The data displayed in Table 1 show frequency values recorded for overall pursuits and demographics of the sample from those respective years (2007 to 2009). Some categorical values were recorded more than once for certain variables. For instance, violation may have two values for "reason of the pursuit" from just one report. The department recording the data submits the total numbers for values for each year. In contingency tables for chi-square analysis of frequency data, values may exceed the number of pursuits reported in this three-year sample of reports. An overview of these descriptive values indicated little variation over the three year period. The frequencies of the values recorded in this data collection process appear to be consistent, and thus all three years were combined. Comparing these data to other states is problematic as each state compiles data differently with each accreditation process.

Evaluating Hypotheses

To evaluate research question one, the sample of 2,155 pursuit reports were further separated into each variable of interest to assess the association of the independent variable with the dichotomous dependent variable, agencies reporting injury/fatality and those that did not. In the chi-square analyses, tables will indicate a value of 1 for injury/fatality reported, and a value of zero for agencies not reporting injury/fatality. The association was assessed by Pearson's chi-square test of independence. Again, this statistical analysis measured association by standardizing the deviation for each observation (or value) reported versus the expected value. For simplification, the findings included a table and indicated a report of the significance of the chi-square test (*Note*: values for the chi-square statistic have no direct or intuitive value, except to say that as values grow larger, so too does the likelihood of rejecting the null hypothesis).

The findings reported a value named *Cramer's V,* which was suggested by Pearson as an appropriate measure of the strength of the association with the effect size of the sample. The range of values for Cramer's V are from .01 to .05 (no relationship), .06 to .10 (weak relationship), .11 to .15 (moderate relationship), .16 to .25 (strong relationship), and .26 or higher (very strong relationship) (Field, 2005).

Research Question 1: What are the variables that correlate to negative pursuit outcomes in police pursuits?

Officer Experience in Years

It was hypothesized that variables related to officer experience would significantly relate to negative pursuit outcomes. This hypothesis was assessed by measuring the association between experience of the primary officer in the pursuit and the dependent variable, negative pursuit outcomes. Values (n = 2,278) were recorded across experience ranges from less than one year and up to 32 years or more. The ranges were recorded in increments of 11 years for each of the three categories of experience (each chi-square table has a *Note* to explain assignment of values- e.g. 1=0 to 11 years). Table 2 reveals that 1,865 officers in the sample (82%) had fewer than 12 years experience. Of the remaining officers, 372 (16%) had between 12 and 23 years of experience, and 41 (2%) had 24 or more years of experience. From Table 2, chi-square analysis indicated no relationship between the likelihood of negative pursuit outcomes and officer experience [χ^2 (2, 2,278) = 4.74, p = .789]. With the range of frequencies reported similarly across all ranges, and a non-significant chi-square value, there is very little support for this hypothesis.

Table 2

Officer Experience in Years

			1.00	2.00	3.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(668)	(139)	(16)	823
		Expected	(673)	(135)	(15)	823.0
			35.8%	**37.4%**	**39.0%**	**36.1%**
	1.00	Count	(1197)	(233)	(25)	1455
		Expected	(1192)	(237)	(26)	1455.0
			64.2%	**62.6%**	**61.0%**	**63.9%**

Note: χ^2 (2, 2,278) = 4.74, p = .789 .
1=0 to 11yrs, 2=12 to 23yrs, 3=24 to 32yrs or more

Violation That Initiated Pursuit

It was hypothesized that the violation which initiated the pursuit would significantly relate to negative pursuit outcomes. This hypothesis was evaluated by obtaining recorded values from the reports pertaining to the criminal violation leading to the pursuit. These values were separated into seven categories in Table 3: traffic stop, felony/property crime, forcible felony, stolen vehicle, drug-related, hit & run, and other. Traffic stops made up approximately 58% of the total recorded violations that initiated pursuits. Values for felonies that initiated the pursuit (property, forcible and stolen vehicle) were approximately 26% of total violations recorded. Chi-square analysis indicated a significant relationship between violation that initiated pursuit and negative outcomes of pursuits within the sample [χ^2 (6, 2,304) = 22.695, p = .001]. Specifically, there was a higher than expected count for negative outcome pursuits and offenses involving felony/property crime, forcible felonies, and hit and run violations. Cramer's V for this analysis was .100 (weak relationship), and as such there is little practical value associated with this finding.

Table 3

Violation that Initiated Pursuit

		1.00	2.00	3.00	4.00	5.00	6.00	7.00	Total
1=yes 0=no; injuries reported by agency during year	Count	(519)	(37)	(73)	(82)	(27)	(11)	(95)	844
	Expected	(491.6)	(55.3)	(90.8)	(71.4)	(26.0)	(16.1)	(92.7)	844
		38.7%	**24.5%**	**29.4%**	**42.1%**	**38.0%**	**25.0%**	**37.5%**	**36.6%**
	Count	(823)	(114)	(175)	(113)	(44)	(33)	(158)	1460
	Expected	(850.4)	(95.7)	(157.2)	(123.6)	(45.0)	(27.9)	(160.3)	1460
		61.3%	**75.5%**	**70.6%**	**57.9%**	**62.0%**	**75.0%**	**62.5%**	**63.4%**

Note: χ^2 (6, 2,304) = 22.695, p = <.001. Cramer's V = .100
1=traffic violation, 2=felony/property crime,3=felony forcible,4=stolen vehicle,5=drug related,6=hit & run,7=other

Time of Day

It was hypothesized that the time of day in which the pursuit occurred would significantly relate to injury/fatalities reported by agencies. From Table 4 one can deduce that approximately 39% of total pursuit values occurred between the hours of 12:01 a.m. and 8:00 a.m., 38% of total values occurred between 4:01 p.m. and midnight, and 23% of total pursuits occurred between 8:01 a.m. and 4:00 p.m. Chi-square analysis indicated a significant relationship between time of day and negative outcomes of pursuits within the sample [χ^2 (2, 2,229) = 6.872, p = .032]. Specifically, there was a higher than expected count for negative outcome pursuits occurring between 1 minute past midnight and 8:00 a.m. Cramer's V for this analysis, however, was only.05 (minimal to no relationship), and as such there is little practical value associated with this finding.

Table 4

Time of Day

			1.00	2.00	3.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(290)	(200)	(322)	812
		Expected	(318)	(183)	(311.5)	812.0
			33.3%	**39.8%**	**37.7%**	**36.4%**
	1.00	Count	(582)	(302)	(533)	1417
		Expected	(554)	(319)	(543.5)	1417.0
			66.7%	**60.2%**	**62.3%**	**63.6%**

Note: χ^2 (2, 2,229) = 6.872, p= .032. Cramer's V = .05
1=00:01 to 08:00, 2=08:01 to 16:00, 3=16:01 to 24:00

Length of Pursuit in Distance

It was hypothesized that length of pursuit in distance would significantly relate to negative pursuit outcomes. This hypothesis was assessed by measuring the relationship between length in miles traveled during the pursuit and the dependent variable, negative outcomes of pursuits. From Table 5, one can deduce the majority of pursuits (92%) were 9 miles or less for both groups of agencies, and approximately 6% for both groups' recorded pursuits were 10 to 21 miles. For ranges of pursuits 22 to 30 miles or more, the values were approximately 2% for total pursuit values in this sample.

Table 5

Length of Pursuit – Distance

			1.00	2.00	3.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(740)	(52)	(9)	801
		Expected	(739.3)	(47.8)	(14.0)	801.0
			36.8%	**40.0%**	**23.7%**	**36.7%**
	1.00	Count	(1272)	(78)	(29)	1379
		Expected	(1272.7)	(82.2)	(24.0)	1379.0
			63.2%	**60.0%**	**76.3%**	**63.3%**

Note: χ^2 (2, 2,180) = 3.383, p = .184.
1=< 1mile to 9 miles, 2=10 to 21 miles, 3=22 to 30miles or more

In Table 5, the counts for agencies reporting pursuits with negative outcomes and those that did not were similar. Chi-square analysis indicated no significant relationship between distance of pursuit in miles and pursuits with negative outcomes [χ^2 (2, 2,180) = 3.383, p = .184]. Therefore, there is no practical value associated with this finding.

Length of Pursuit - Time

It was hypothesized that the length of pursuit in time would significantly relate to pursuits with negative outcomes. Research points toward the logic that longer pursuits increase the likelihood there will be a negative outcome. From Table 6, one can observe that approximately 72% of the 2,681 values recorded from pursuit reports were less than 8 minutes in duration. Frequency values for pursuits in the range of 9 to 15 minutes were approximately 25% of total pursuits, and for pursuits in the range of 16 minutes or more were approximately 3% of total pursuits.

Table 6

Length of Pursuit – Time

			1.00	2.00	3.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(679)	(80)	(27)	786
		Expected	(564.7)	(199.4)	(22.0)	786.0
			35.3%	**11.8%**	**36.0%**	**29.3%**
	1.00	Count	(1247)	(600)	(48)	1895
		Expected	(1361.3)	(480.6)	(53.0)	1895.0
			64.7%	**88.2%**	**64.0%**	**70.7%**

Note: χ^2 (2, 2,681) = 135.479, p = <.001. Cramer's V = .225
1=< to 8 minutes, 2=9 to 15 minutes, 3=16 or more minutes

Chi-square analysis indicated a significant relationship between length in time of pursuit and negative outcomes within the sample [χ^2 (2, 2,681) = 135.479, p = <.001]. Specifically, there was a higher than expected count for pursuits with negative outcomes and duration of pursuits that last 9 to 15 minutes. Cramer's V for this analysis was .225 (strong relationship), and as such there is practical value associated with this finding.

Speed of Pursuit

It was hypothesized that speed of pursuit would significantly relate to negative outcomes. Approximately 51% (see Table 7) of the total pursuits from both groups of agencies were in the range of posted speed limit to 30 mph over the limit. Also, approximately 20% of the total pursuits were in the mid-range of speeds recorded (31 mph to 50 mph over). Values for speeds of 51 mph or more over the speed limit were approximately 29% of the total pursuits reported. Chi-square analysis indicated a significant relationship between speed of pursuit and negative outcomes of pursuits within the sample [χ^2 (6, 2,211) = 14.080, p = .029].

Table 7

Speed of Pursuit

			1.00	2.00	3.00	4.00	5.00	6.00	7.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(119)	(168)	(116)	(86)	(95)	(73)	(141)	798
		Expected	(107.9)	(162.1)	(137.2)	(77.2)	(84.1)	(71.1)	(158.4)	798.0
			39.8%	**37.4%**	**30.5%**	**40.2%**	**40.8%**	**37.1%**	**32.1%**	36.1%
	1.00	Count	(180)	(281)	(264)	(128)	(138)	(124)	(298)	1413
		Expected	(191.1)	(286.9)	(242.8)	(136.8)	(148.9)	(125.9)	(280.6)	1413.0
			60.2%	**62.6%**	**69.5%**	**59.8%**	**59.2%**	**62.9%**	**67.9%**	63.9%

Note. χ^2 (6, 2,211) = 14.080, p = .029. Cramer's V = .08
1=posted to 9over ;2=10 to 19over;3=20 to 30over;4=31 to 40over;5=41 to 50 over;6=51 to 60 over;7=61 or more over

Specifically, there was a higher than expected count for pursuits with negative outcomes and speeds in the range of 20 to 30 mph over the speed limit and 61 or more mph over the speed limit. Cramer's V for this analysis, however, was .08 (weak relationship), and as such there is minimal practical value associated with this finding.

Road Conditions

Pursuit reports from this sample recorded nominal values from incidents that occurred in city limits or outside limits and data for road conditions: wet, dry, and type (number of lanes). From Table 8, one can observe that approximately 64% of total pursuits recorded (1,404 of 2,201) occurred within city limits, and approximately 65% of pursuits occurred during night-time road conditions (1,420 of 2,169).

Table 8

Road Conditions during Pursuit

			1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(592)	(192)	(275)	(493)	(732)	(41)	(529)	(220)	(27)	(18)	(43)	3162
		Expected	(505)	(287)	(270)	(511)	(728)	(53)	(477)	(198)	(47)	(38)	(46)	3162
			42%	**24%**	**37%**	**35%**	**36%**	**28%**	**40%**	**40%**	**20%**	**17%**	**34%**	36%
	1.00	Count	(812)	(605)	(474)	(927)	(1291)	(107)	(796)	(330)	(105)	(88)	(83)	5618
		Expected	(898)	(510)	(479)	(909)	(1294)	(94)	(848)	(352)	(84)	(68)	(80)	5618
			58%	**76%**	**63%**	**65%**	**64%**	**72%**	**60%**	**60%**	**80%**	**83%**	**66%**	64%

Note. χ^2 (10, 8780) = 121.193, p = <.001. Cramer's V = .117
1= city limits, 2=outside city limits, 3=daylight conditions, 4=night conditions, 5=roadway DRY
6=roadway WET, 7=2 lane roadway, 8=4 lanes or more, 9=interstate w/median, 10=interstate w/barrier, 11=other

Chi-square analysis indicated a significant relationship between road conditions and negative pursuit outcomes within the sample [χ^2 (10, 8780) = 121.193, p = <.001]. Specifically, there was a higher than expected count for pursuits with negative outcomes and outside city limits, during night-time conditions, on wet roads, on interstate roadways, and other. Cramer's V for this analysis was .117 (moderate relationship), and as such there is practical value associated with this finding. For the analysis in the sub-sample, many of the categories in this table had to be collapsed due to thin cells.

Number of Vehicles Involved

It was hypothesized that number of pursuit vehicles would relate significantly to pursuits with negative outcomes. Table 9 addresses these pursuit issues (number of vehicles, number of agencies).

Table 9

Number of Vehicles Involved

			1.00	2.00	3.00	4.00	5.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(396)	(235)	(72)	(33)	(11)	747
		Expected	(357)	(312)	(55)	(15)	(6)	747
			36%	**24.3%**	**42%**	**70%**	**58%**	**32%**
		Count	(715)	(734)	(101)	(14)	(8)	1572
	1.00	Expected	(753)	(657)	(117)	(32)	(13)	1572
			64%	**76%**	**58%**	**30%**	**42%**	**68%**

Note: χ^2 (4, 2,319) = 77.942, p = <.001. Cramer's V = .183
1=1agency1vehicle, 2=1agency-2 or >vehicles, 3=2 agencies-2 or > vehicles, 4=3 agencies-2 or > vehicles,
5=4 or more agencies - multiple vehicles

Approximately 48% of the pursuits included just one police vehicle from one agency, while approximately 42% of the pursuits included one agency that included two or more vehicles. Very rarely was there more than two agencies and two or more vehicles utilized in pursuits. Chi-square analysis indicated a significant relationship between number of vehicles and negative pursuit outcomes within the sample [χ^2 (4, 2,319) = 77.942, p = <.001]. Specifically, there was a higher than expected count for pursuits with negative outcomes for one agency with two or more vehicles. Cramer's V for this analysis was .183 (strong relationship), and as such there is practical value associated with this finding.

Termination Techniques

It is hypothesized that the way in which the pursuit ended would significantly relate to pursuits with negative outcomes. Pursuit termination is an important factor in many pursuits as indicated in the literature as well as the basis of both public sentiment on the topic and judicial review of proper legal standards (Alpert & Smith, 2008). An important issue for administrators is the method for which their officers decide how to terminate a pursuit. Termination techniques of pursuit were categorized in Table 10 to include: pursuit discontinued, suspect stopped, vehicle wrecked, the utilization of stop sticks, pursuit intervention technique, both rolling and stationary roadblocks, and other. From Table 10, one can deduce that approximately 64% of the 2,267 pursuit values were terminated by discontinuation or the suspect stopping their vehicle. Stopping techniques (stop sticks, PIT, and roadblocks) in an effort to capture the suspect comprised less than 7% of total pursuits. Approximately 23% of the total pursuit values resulted in the suspect vehicle crashing in some manner. Chi-square analysis indicated a significant relationship between termination techniques and negative outcomes of pursuits within the sample [χ^2 (6, 2,267) = 55.663, p = <.001]. Specifically, there was a higher than expected count for pursuits with negative outcomes and the PIT maneuver, vehicle crashes, stop sticks and other termination techniques. Cramer's V for this analysis was .157 (moderate relationship), and as such there is practical value associated with this finding. These techniques are further evaluated in hypothesis number three. The findings for this specific variable are of interest to practitioners who provided data for this research project.

Table 10

Termination Techniques of Pursuits

			1.00	2.00	3.00	4.00	5.00	6.00	7.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(215)	(377)	(135)	(26)	(6)	(10)	(41)	810
		Expected	(210)	(311)	(186)	(26.8)	(16)	(9)	(49.3)	810
			36%	**43%**	**26%**	**35%**	**13%**	**37%**	**30%**	**36%**
	1.00	Count	(377)	(493)	(385)	(49)	(39)	(17)	(97)	1457
		Expected	(380)	(559)	(334)	(48.2)	(29)	(18)	(88.7)	1457
			64%	**56%**	**74%**	**65%**	**87%**	**63%**	**70%**	**64%**

Note. χ^2 (6, 2,267) = 55.663, p = <.001. Cramer's V = .157
1=pursuit discontinued, 2=suspect stopped, 3=vehicle wrecked, 4=stop sticks, 5=PIT, 6=roadblock(both), 7=other

Post-Hoc Analysis

With such a large sample, the question of the power of the statistical test utilized might contribute to type I error reporting. To alleviate this concern, a post-hoc analysis of a comparable sub-sample was conducted. SPSS software was used to obtain a random sample of approximately 35% of the original sample. Then, chi-square tests of independence were used in the same analysis technique in the new sample. Fisher's Exact Test or Yates Correction is automatically applied if expected cell counts are below 5 for more than 80% of the cells (Field, 2005; Preacher, 2001). The desired result is that the associations that were significant in the larger sample would remain significant in the smaller sample. The following tables indicated the results of those tests, and are viewed as a comparison in a later table.

Violation – Random Sample

The first variable that showed a significant relationship with pursuits with negative outcomes was violation. A random sample drawn from the original sample yielded a total of 966 values. From Table 11, one can observe that frequency totals are proportional to Table 3 for the variable *violation* in the larger sample.

Table 11

Random Sample of Variable: Violation

			1.00	2.00	3.00	4.00	5.00	6.00	7.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(436)	(54)	(59)	(45)	(13)	(14)	(81)	702
		Expected	(422.9)	(47.2)	(59.6)	(51.6)	(17.4)	(13.8)	(89.4)	702
			75%	**83%**	**72%**	**63.3%**	**54.1%**	**73.6%**	**65.8%**	72.6%
	1.00	Count	(146)	(11)	(23)	(26)	(11)	(5)	(42)	264
		Expected	(159.1)	(17.8)	(22.4)	(19.4)	(6.6)	(5.2)	(33.6)	264
			25%	**17%**	**28%**	**36.7%**	**45.9%**	**26.4%**	**34.2%**	27.3%

Note. χ^2 (6, 966) = 15.152, p = .019. Cramer's V = .125
1=traffic violation, 2=felony/property crime,3=felony forcible,4=stolen vehicle,5=drug related, 6=hit & run,7=other

Chi-square analysis indicated a significant relationship between violation that initiated pursuit and negative outcomes of pursuits within the sample [χ^2 (6, 966) = 15.152, p = .019]. Specifically, there was a higher than expected count for pursuits with negative outcomes and forcible felonies, stolen vehicles, drug related, and 'other' violations. Cramer's V for this analysis was .125 (moderate relationship), and as such there is practical value associated with this finding.

Time of Day – Random Sample

From the original sample, the next variable to indicate a significant association with negative outcomes of pursuits was time of day. From Table 12, one can observe that a random sample (734) of the original sample pursuit data was evaluated.

Table 12

Random Sample of Variable: Time of Day

			1.00	2.00	3.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(94)	(64)	(107)	265
		Expected	(104)	(58.5)	(102.5)	265
			32.6%	**39.5%**	**37.7%**	**36.1%**
	1.00	Count	(194)	(98)	(177)	469
		Expected	(184.0)	(103.5)	(181.5)	469
			67.4%	**60.5%**	**62.3%**	**63.9%**

Note: χ^2 (2, 734) = 2.616, p = .270
1=00:01 to 8:00, 2=8:01 to 16:00, 3=16:01 to 24:00

In the original sample (see Table 4), chi-square analysis indicated a significant (but minimal) relationship with pursuits occurring during the same time period (one minute past midnight and 8:00 a.m.) However, in this random sample, there was no significant relationship [χ^2 (2, 734) = 2.616, p = .270]; and as such adds no practical value for this finding the sub-sample.

Speed of pursuit – Random Sample

Speed of pursuit was found to have a significant relationship with pursuits with negative outcomes in Table 7. Approximately 749 values for speed were obtained by randomly selecting pursuit reports from the original sample.

Table 13

Random Sample of Variable: Speed

			1.00	2.00	3.00	4.00	5.00	6.00	7.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(12)	(20)	(19)	(22)	(39)	(25)	(51)	188
		Expected	(18.1)	(28.4)	(24.6)	(15.8)	(26.6)	(20.3)	(54.2)	188
			16.6%	**17.7%**	**19.3%**	**34.9%**	**36.8%**	**30.8%**	**23.6%**	25.1%
	1.00	Count	(60)	(93)	(79)	(41)	(67)	(56)	(165)	561
		Expected	(53.9)	(84.6)	(73.4)	(47.2)	(79.4)	(60.7)	(161.8)	561
			83.4%	**82.3%**	**80.7%**	**65.1%**	**63.2%**	**69.2%**	**76.4%**	74.9%

Note. χ^2 (6, 749) = 20.343, p= .002. Cramer's V = .165
1=posted;2=10 to 19over;3=20 to 30over;4=31 to 40over;5=41 to 50 over;6=51 to 60 over;7=61 or over

Chi-square analysis indicated a significant relationship between speed and negative outcomes of pursuits within this sub-sample [χ^2 (6, 749) = 20.343, p= .002]. Specifically, there was a higher than expected count for pursuits with negative outcomes for the posted speed limit and ranges of speeds (in mph) over the posted speed limit: 10-19, 20-30, and

61 and over. Cramer's V for this analysis was .165 (strong relationship), and as such there is practical value associated with this finding.

Road conditions – Random Sample

The variable road condition was found to be significant in Table 8 from the larger sample of pursuits. The random sample drawn from the original sample of pursuits resulted in 2,380 values (original comprised 8,780 values). For Table 14, the variable was collapsed into similar categories because the counts were less than 5. There were not higher than expected counts for pursuits occurring on the interstate in this sub-sample.

Table 14

Random Sample of Variable: Road Conditions

			1.00	2.00	3.00	4.00	5.00	6.00	7.00	Total
1=yes 0=no; injuries	.00	Count	(78)	(15)	(47)	(49)	(93)	(52)	(39)	373
		Expected	(60)	(35)	(31.3)	(61)	(92)	(59)	(34)	373
			20%	**7%**	**24%**	**13%**	**16%**	**12%**	**18%**	**15%**
	1.00	Count	(305)	(209)	(153)	(342)	(493)	(324)	(181)	2007
		Expected	(323)	(188)	(168)	(320)	(494)	(317)	(185)	2007
			80%	**93%**	**76%**	**87%**	**84%**	**87%**	**82%**	**84%**

Note. χ^2 (6, 2,380) = 33.915, p = <.001. Cramer's V = .117
1=within city limits, 2=outside city limits, 3=daylight conditions, 4=night conditions, 5=roadway DRY/WET, 6=2 lane roadway, 7=4 lanes/interstate roads/other

Chi-square analysis indicated a significant relationship between road-conditions and negative outcomes of pursuits within this sub-sample [χ^2 (6, 2,380) = 33.915, p = <.001]. Specifically, there was a higher than expected count for pursuits with negative outcomes and pursuits that occurred at night, on 2-lane roadways and outside city limits. Cramer's

V for this analysis was .117 (moderate relationship), and as such there is some practical value associated with this finding.

Number of vehicles – Random Sample

From the original sample, number of vehicles was found to be significantly related to the dependent variable. In Table 15, one can observe that 859 values were analyzed similar to the original sample. Compared to Table 9, this variable was collapsed into four categories for analysis because the counts were less than five.

Table 15

Random Sample of Variable: Number of Vehicles

			1.00	2.00	3.00	4.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(91)	(44)	(22)	(11)	168
		Expected	(76.5)	(79)	(9.2)	(3.3)	168
			23.3%	**10.9%**	**46.8%**	**64.7%**	**19%**
	1.00	Count	(300)	(360)	(25)	(6)	691
		Expected	(314.5)	(325)	(37.8)	(13.7)	691
			76.7%	**89.1%**	**53.2%**	**35.3%**	**81%**

Note. χ^2 (3, 859) = 66.930, p = <.001. Cramer's V = .279
1=1agency1vehicle, 2=1agency-2 or >vehicles, 3=2 agencies-2 or > vehicles, 4=3 or more agencies-multiple vehicle

Chi-square analysis indicated a significant relationship between number of vehicles and negative outcomes of pursuits within this sub-sample [χ^2 (3, 859) = 66.930, p = <.001]. Specifically, there was a higher than expected count for pursuits with negative outcomes and pursuits from one agency with two or more vehicles. Cramer's V for this analysis was .279 (very strong relationship), and as such there is practical value associated with this finding.

Termination Techniques – Random Sample.

The variable "pursuit termination" was evaluated with a smaller sample. From Table 10, there were 2,267 values for termination techniques, which resulted in 862 values in this sub-sample that were evaluated utilizing chi-square test for independence.

Table 16

Random Sample of Variable: Termination Techniques

			1.00	2.00	3.00	4.00	5.00	6.00	Total
1=yes 0=no; injuries by agency during year	.00	Count	(44)	(87)	(32)	(5)	(7)	(10)	185
		Expected	(49)	(69)	(43)	(7.5)	(8)	(8)	185
			19.2%	**26.9%**	**16%**	**14%**	**19%**	**26%**	**21%**
	1.00	Count	(185)	(236)	(168)	(30)	(29)	(29)	677
		Expected	(179)	(254)	(157)	(27.5)	(27)	(30)	677
			80.8%	**73.1%**	**84%**	**86%**	**81%**	**74%**	**79%**

Note. χ^2 (5, 862) = 11.527, p = .042. Cramer's V = .116
1=pursuit discontinued, 2=suspect stopped, 3=vehicle wrecked, 4=stop sticks, 5=PIT & roadblock(both), 6=other

Chi-square analysis indicated a significant relationship between termination techniques and negative outcomes of pursuits within this sub-sample [χ^2 (5, 862) = 11.527, p = .042]. Specifically, there was a higher than expected count for pursuits with negative outcomes and the PIT maneuver, stop sticks, vehicle crashing and the pursuit discontinued. Cramer's V for this analysis in the sub-sample was .116 (moderate relationship), and as such there is practical value associated with this finding.

Length of Pursuit in Time – Random Sample.

From Table 6, length of pursuit in time was found to be significant with negative outcome pursuits. In Table 17, one can observe that the values analyzed within the subsample were quite similar.

Table 17

Random Sample of Variable: Length of Pursuit – Time

			1.00	2.00	3.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(282)	(29)	(15)	326
		Expected	(266.1)	(46.2)	(13.7)	326
			41.5%	**24.6%**	**42.9%**	**39.1%**
	1.00	Count	(398)	(89)	(20)	507
		Expected	(413.9)	(71.8)	(21.3)	507
			58.5%	**75.4%**	**57.1%**	**60.9%**

Note: χ^2 (2, 833) = 12.261, p = .002. Cramer's V = .121
1=< to a minute to 8 minutes, 2=9 to 15 minutes, 3=16 or more minutes

Chi-square analysis indicated a significant relationship between length of time of pursuits and negative outcomes within this sub-sample [χ^2 (2, 833) = 12.261, p = .002]. Specifically, there was a higher than expected count for pursuits with negative outcomes and pursuits that lasted between 9 and 15 minutes, which is similar to the findings in Table 6. Cramer's V for this analysis was .121 (moderate relationship), and as such there is some practical value associated with this finding.

Comparing Samples

Table 18 shows a comparison of variables that showed a significant relationship between the independent variable and dependent variables in the full sample with the level of significance in the random sample.

Table 18

Comparison of Variables between Samples

Variable	Full Sample	Random Sample	Comparison
Officer Experience	.789	not significant	n/a
Violation/Pursuit	<.001**	.019**	.001/.019
Time/Day	.032*	not significant	n/a
Length/Pursuit-Miles	.184	not significant	n/a
Length/Pursuit-Time	<.001**	.002**	<.001**/.002**
Speed/Pursuit	.029*	.002**	.029/.002
Road Conditions	<.001**	<.001**	.000/.000
Number/Vehicles	<.001**	<.001**	.000/.000
Termination Techniques	<.001**	.042*	.000/.042
Officer Age	.003**	n/a	n/a
Suspect Age	.014*	n/a	n/a
Suspect Demographics	.032*	n/a	n/a

Note. * p <.05; **p<.01

For evaluating hypotheses, chi-square analyses of the original sample of 2,180 pursuits indicated a significant relationship between seven independent variables and the dependent variable, pursuits with negative outcomes. SPSS randomly generated a smaller sample of approximately 35% of the original size of pursuit incident reports.

Conducting the same statistical procedure for the smaller sample, six of the seven variables were also found to be significant in the sub-sample. Furthermore, the non-significant independent variables were also evaluated by chi-square analysis from the sub-sample and were found to be not significant. Therefore, this comparison of similar findings should reduce concern for type I error resulting from the power of the statistical technique used in the original larger sample.

Four of the seven variables had a decrease in level of significance from the original sample to the sub-sample (violation that initiated pursuit, length of pursuit in time, time of day of pursuit, and termination techniques). The remaining primary variables of interest (road conditions, number of vehicles, and speed of pursuit) all increased or remained the same in significance from the original to the sub-sample in chi-square analysis. Officer age, suspect age, and suspect demographics were not measured in the sub-sample because they are ancillary variables of interest in the literature and research project.

Ancillary Variables of Interest

As the previous review of literature alluded, the pursuit officer and suspect demographics are important variables (Alpert, Kenney & Dunham, 1999; Best & Eves, 2005). Given the generalized demographic makeup of most police departments, white males comprise most of the population of police forces in the state of Georgia. It was not surprising, then, that 92% of the officers were male and 8% were female (of the 4,452 officers in the sample). Moreover, approximately 87% of the pursuit officers were White, 11% were Black, and the remaining 2% were Asian, American-Indian, or Other.

Officer Age

From the sample at large, there were 2,289 values recorded for ‘officer age,’ and these values were collected in increments of three years in categories ranging from age 18 to 21 up to age 50 and above. The number of officers aged 22 to 33 was approximately 52% of the officers involved in total pursuits (see Table 19). There were small values recorded for officers aged 18 to 21 due to Georgia peace officer requirements.

Table 19

Officer Age

			1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(24)	(113)	(164)	(131)	(162)	(112)	(57)	(27)	(30)	820
		Expected	(12)	(112.8)	(172)	(140)	(159)	(103)	(64)	(25)	(31)	820
			73%	**36%**	**34%**	**33%**	**37%**	**39%**	**32%**	**38%**	**34%**	36%
	1.00	Count	(9)	(202)	(316)	(259)	(281)	(178)	(123)	(43)	(58)	1469
		Expected	(21)	(202)	(308)	(250)	(284)	(186)	(115)	(45)	(56)	1469
			27%	**64%**	**66%**	**66%**	**63%**	**61%**	**68%**	**62%**	**66%**	64%

Note. χ^2 (8, 2,289) = 23.760, p = .003. Cramer’s V = .102
1=age18-21, 2=age22-25, 3=age26-29, 4=age30-33, 5=age34-37, 6=age38-41, 7=age42-45, 8=46-49, 9=age50+

Chi-square analysis indicated a significant relationship between officer age and negative outcomes of pursuits within this sub-sample [χ^2 (8, 2,289) = 23.760, p = .003]. Specifically, there was a higher than expected count for pursuits with negative outcomes and officer age ranges from 26 to 29, 30 to 33, 42 to 45, and 50 and older. Cramer’s V for this analysis, however, was .102 (weak relationship), and as such there is little practical value associated with this finding.

Suspect Age

For suspect demographics, pursuit incident reports included suspect information (when available) for each pursuit. Unlike the age requirements for police officers, the range of ages for suspects was collected at the minimum adult age (17 years old) up to 50 and above.

Table 20

Suspect Age

			1.00	2.00	3.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count Expected	(280) (281.4) **35.6%**	(240) (217.3) **39.5%**	(124) (145.3) **30.5%**	644 644.0 **36%**
	1.00	Count Expected	(506) (504.6) **64.4%**	(367) (389.7) **60.5%**	(282) (260.7) **69.5%**	1155 1155 **64%**

Note: χ^2 (2, 1,799) = 8.586, p = .014. Cramer's V = .069
1=SUSage-17 to 25, 2=SUSage26 to 37, 3=SUSage38 or over

The categories for suspect age were captured in three year increments within those age ranges. Approximately 44% of the total values for suspect age were in the range of 17 to 25, approximately 34% of the total values were in the range of 26 to 37, and the remaining age range of 38 and above accounted for approximately 22% of the total values (see Table 20). Chi-square analysis indicated a significant relationship between suspect age and pursuits with negative outcomes [χ^2 (2, 1,799) = 8.586, p = .014]. Specifically, there was a higher than expected count for suspects aged 17 to 25 and aged 38 and over. Cramer V's for this analysis is .069 (weak relationship), and thus there is little practical value for this finding.

Suspect Demographics

From Table 21, one can deduce that similar categorical fields were collected for gender and race as the suspect demographic variable. Approximately 3,941 suspect demographic values were captured in the larger sample size. Of the total values for gender (1,856), approximately 92% of the suspects were male and 8% were female. Race demographic values for suspects (2,085) were approximately 34% Caucasian, 53% African-American, and the remaining 13% were Asian-American, Native-American, and Unknown. Of the 13% remaining values in this category, approximately 98% were recorded as 'unknown.' Chi-square analysis indicated a significant relationship between suspect demographics and negative outcomes of pursuits within this sub-sample [χ^2 (4, 3,941) = 10.592, = .032]. Specifically, there was a higher than expected count for pursuits with negative outcomes for females, whites and blacks. Cramer's V for this analysis, however, was .05 (weak to no relationship), and as such there is no practical value associated with this finding. Suspect demographics were found to slightly significant in this sample, and it has been found to be significant in other research as well. Due to thin cells, Asian-American and other categories had to be collapsed into other/unknown category for chi-square analysis.

Table 21

Suspect Demographics

			1.00	2.00	3.00	4.00	5.00	Total
1=yes 0=no; injuries reported by agency during year	.00	Count	(632)	(37)	(250)	(392)	117)	1428
		Expected	(620)	(52.2)	(255.8)	(396.8)	(102.9)	1428
			36.9%	**25.7%**	**35.4%**	**35.8%**	**41.2%**	**36.2%**
	1.00	Count	(1080)	(107)	(456)	(703)	(167)	2513
		Expected	(1092)	(91.8)	(450.2)	(698.2)	(181.1)	2513
			63.1%	**74.3%**	**64.6%**	**64.2%**	**58.8%**	**63.8%**

Note. χ^2 (4, 3,941) = 10.592, = .032. Cramer's V = .05
1=male, 2=female, 3=Caucasian, 4=African-American, 5=other/unknown

Binary Logistic Regression

Binary logistic regression is a dependence technique used to predict the probability that an event will occur. Thus, in an analysis where the dependent variable has only two groups, binary logistic regression may be utilized over discriminant analysis because it does not have to meet the strict assumptions of multivariate analysis techniques. For instance, discriminant analysis requires that independent variables are continuous, but for this project, the independent variables are categorical. Therefore, binary logistic regression is indicated in this project. Unlike other statistical techniques, logistic regression is robust to strict assumptions. However, some of the assumptions that it does share with other multivariate techniques are random sampling, linearity, independence of errors, and multicollinearity (Field, 2005)

Like linear regression, a model can predict an outcome variable, but for binary logistic regression, the dependent variable is dichotomous. Due to a dichotomous dependent variable, a linear relationship cannot be established with predictor variables. Logistic regression utilizes the natural logarithm of the data to transform a non-linear relationship into a linear form. Furthermore, logistic regression estimates values of the predictor variables using the maximum-likelihood estimation, and coefficients are selected for each independent variable. Then, the model is assessed on how it fits the data, or more specifically, how it predicts the outcome variable either as an event or non-event -- which is coded in SPSS as one or zero respectively. The measure of assessment for model fit is the log-likelihood statistic -- comprised of the summation of the probabilities between predicted and observed values in the model. Therefore, a large value for the log-likelihood statistic would indicate a higher unexplained observation (or error) in the model. For the maximum-likelihood estimation procedure the model is adjusted to reduce this error, and a comparison between models then occurs as the model changes at each iteration. This comparison utilizes the -2LL statistic to measure improvement of the model by selection of predictor variables based upon significance, and the Wald statistic is the measure for which predictor variables are assessed for entry into the model. Therefore, at each iteration of the model, the analyst hopes to see a decrease in the error of the model (-2LL) (Field, 2005).

Prior to logistic regression analysis, a random sample was obtained from the larger sample of 279 agencies. Approximately 35% of the agencies were selected for analysis resulting in a sub-sample of 99 agencies. The assumption of multicollinearity for the independent variables was assessed by visual inspection of a correlation matrix and a test of the variance inflation factor. As many of the variables were categorical, several were found to be highly correlated with each other. After this assessment, agencies that reported values in the short distance range were transformed into a new variable distance-short utilizing standardized z-scores of their respective values, and agencies reporting pursuits that lasted in a longer range of distance were recomputed to a new variable distance-long: consistent with the categories used in the previous analysis.

For this project, the dependent variable was agencies (1) with injury/fatality pursuits (coded as one) and (2) without injury/fatality pursuits (coded as zero). The following independent variables showed a significant correlation with the dichotomous dependent variable, and were not excluded due to multicollinearity: distance-short and distance-long. Distance-short was highly correlated with the dependent variable using Pearson's product moment coefficient, $r(97) = .593$, $p = <.001$. Also, distance-long was found to be significantly (but not highly) correlated, $r(97) = .201$, $p = .047$. Although seven variables of interest were found to be significant using chi-square analysis, only two were found to be significantly correlated using Pearson's r. This could be the misleading result of curvilinear relationships due to dummy coding of nominal variables.

A forward step-wise entry method was used to enter the variables, which utilized the Wald statistic as a measure for significant contribution to the prediction of the dependent variable. This method was utilized over the 'forced-entry' method due to its exploratory nature, and to ensure a significant relationship between the independent variables and the dependent variable. Both the forward and backward Wald-entry method is utilized to explore these relationships. If a variable was found to be significant at .05, then it was included in the model as the maximum likelihood estimation makes iterations of the model for best fit. The binary logistic regression analysis (of the 99 cases) and corresponding tables are below.

Table 22 shows an evaluation of the null iteration of the model. The 35% sample of 99 agencies was representative of the larger sample of data in that approximately two-thirds of the agencies did not report an injury or fatality.

Table 22

Classification Table

	Observed		Predicted injury/fatality: No Injury/Fatality	Predicted injury/fatality: Injury/Fatality	Percentage Correct
Step 0	injury/fatality	No Injury/Fatality	67	0	100.0
		Injury/Fatality	32	0	.0
					67.7

Here, the SPSS program would predict every case of the analysis to be a non-event (0) and place them into the model based on chance alone with the prediction. In predicting events, each case at this iteration is predicted as one. Therefore, the cut value is at .500 of 50% of the 99 cases predicted. The correct predictions are found on the diagonal, and incorrect predictions are found on the off-diagonal. The analyst expects the model increases the hit ratio above .500 (or 67.7% in this analysis) at subsequent iterations of the model.

From Table 23, the null model does not include independent variables at this iteration, but does include the constant at this iteration of the model is (.739). The Wald statistic essentially takes the value of the constant and divides that value by the standard error. The Wald statistic is chi-squared distributed, and a value of 11.826 is significant. Therefore, the constant can be used, to some degree, prior to the inclusion of variables in predicting if an event will occur.

Table 23

Variables in the Null Model

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.739	.215	11.826	1	.001	.478

The maximum likelihood estimation process uses an iterative process that begins with a first approximation of model fit at values similar in parameters to the initial sample. The computation makes a more accurate model in steps by adjusting the coefficients of the independent variables in an effort to reduce error. This iteration procedure continues until the point of convergence -- which occurs when adjustments become trivial (less than .001). In Table 24, the variable distance-short was entered into the model using the forward stepwise method. At the first step of the maximum likelihood estimation (the initial fit of the model), the model had a -2LL value of 89.181 and parameter estimates for the constant (-.707) and distance-short (.428). Four more adjustments were made to the model until the point of convergence improved to 82.307, and final parameter estimates are made of the constant (-.724) and distance-short (.846).

Table 24

Block 1: Enter Method/Iteration History

Iteration		-2 Log likelihood	Coefficients	
			Constant	DISTANCE-SHORT
Step 1	1	89.181	-.707	.428
	2	82.965	-.750	.703
	3	82.316	-.729	.828
	4	82.307	-.724	.845
	5	82.307	-.724	.846

Note. a. Method: Forward Stepwise (Wald)
b. Constant is included in the model.
c. Initial -2 Log Likelihood: 124.598
d. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

The change in -2LL of the initial model to the first block can be assessed by the table of critical values in the chi-square distribution with appropriate degrees of freedom. The value of 42.291 at 1 degree of freedom was significant at .000. Therefore, one can conclude that the change in the model at Step 1 is statistically significant (due to the inclusion of distance-short) and not due to chance or sampling error.

Table 25 represents three values that are measures of fit for the model at step 1. The overall fit of the model can be assessed by the improvement in the -2LL at 82.307. The Cox and Snell R^2 and the Nagelkerke R^2 are known as ‘pseudo R^2’ measurements, which slightly measure an account for variance in logistic regression analogous to the R^2 in linear regression. However, despite computationally measuring the newer model compared to the baseline model, Cox and Snell R^2 cannot achieve a maximum value of one. The Nagelkerke R^2 is a variation of Cox and Snell R^2, and can overcome the limits of approaching a value of one (Field, 2005). Both of these measures allow one to gauge the significance of the model's impact on the variance in the dependent variable.

Table 25

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	82.307[a]	.348	.486

Note. a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 26 reports those correctly predicted cases as well as incorrectly predicted cases after the variable distance-short was entered into the model.

Table 26

Classification Table – Distance-Short

	Observed		Predicted injury/fatality: No Injury/Fatality	Predicted injury/fatality: Injury/Fatality	Percentage Correct
Step 1	injury/fatality	No Injury/Fatality	62	5	92.5
		Injury/Fatality	15	17	59.4
	Overall Percentage				79.8

Note. a. The cut value is .500

With distance-short included, the model was able to correctly predict 62 cases and incorrectly predict five cases for agencies reporting no injury/fatality (coded 0). Conversely, the model correctly predicted 15 cases for agencies that reported injury/fatality (coded 1), but incorrectly predicted 17 cases. The overall hit ratio for Step 1 was 79.8% correct, which is an improvement from the null model of 67.7%.

Table 27 reports the significance of the empirically estimated weights assigned to the constant and the independent variable (distance-short) that were included in the model. The Wald statistic for the independent variable (20.950) was compared to the table of critical values in the chi-squared distribution at 1 degree of freedom, resulting in a significance level of .000. Therefore, one can assume that the coefficient for the independent variable at .846 is not due to chance or sampling error. For the constant, the coefficient of -.724 also indicated a significant Wald statistic (6.654) in the model. Distance-long was excluded in the model because it was determined to be insignificant.

Table 27

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	DISTANCESHORT	.846	.185	20.950	1	.000	2.330
	Constant	-.724	.281	6.654	1	.010	.485

Note. a. Variable(s) entered on step 1: DISTANCESHORT.

Also (see Table 27), the Exp (B) value represents a change in log-odds ratio resulting from a unit change in the independent variable. Therefore, one can interpret the Exp(B) value of the independent variable to be that the odds of an agency reporting an injury/fatality are 2.330 times greater when there is an increase across the ranges of short distance pursuits relative to agencies who do not report an injury or fatality for the year.

Figure 1 evaluates the post-hoc assumption that errors generated by the model are normally distributed. The straight line represents the cumulative probability of the binomial distribution, while the dotted line is the cumulative probability of the observed distribution of errors. For the assumption, one would want to see errors fall along the straight line. Here, the analyst observes an S-shape distribution with some cases falling above the line and some cases falling below the line. From approximately 0.1 to 0.4 and 0.4 to 0.8, one can observe the predictive inaccuracy of ranges of the independent variables in this model. Binary logistic regression allows for non-linear distributions, which makes this finding acceptable. Therefore, short-distance is the only variable that explains the dependent variable agencies that reported pursuits with negative outcomes.

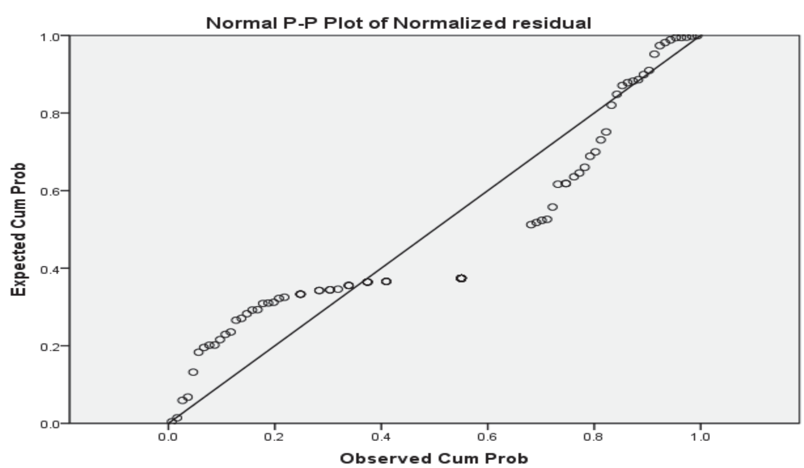

Figure 1. Standardized Residuals of Model

Qualitative Component of Research

> Qualitative techniques allow researchers to share in the understandings and perceptions of other and to explore how people structure and give meaning to their daily lives. Researchers using qualitative techniques examine how people learn about and make sense of themselves and others. (Berg, 2009, p. 8)

As mentioned in Chapter III, a qualitative component can be utilized as both a means of verification and to provide detailed comparison of quantitative data. The use of triangulation has been suggested in the literature to provide verification, especially in dealing with secondary data collection (Wells & Falcone, 1997). To refine the typology of high-risk pursuits, a qualitative assessment was conducted for the time period in which the quantitative data was collected (2007 to 2009). *NewsBank Inc*. is utilized by many universities as a comprehensive archival system of over 2,000 newspapers worldwide (Newsbank, 2011). *Google News* archive is also a comprehensive archival system of both newspaper and online news articles. A search of both systems using the following keywords in variation yielded the most results: police, pursuit, chase, fatality, death, and Georgia. A content analysis was conducted of the salient variables associated with the pursuit incident as it was recorded by the archived news article. Initially, the ten significant variables that were revealed in the quantitative analysis were searched for in the news articles. However, news reporting of police incidents in Georgia did not capture all of the variables of interest. However, the following categories were created to capture the variables that were consistently reported across all news articles: Date of pursuit, reason for pursuit (violation if reported), number of vehicles in pursuit, speed (if mentioned), agency/number of vehicles involved in pursuit, identity and number of fatalities reported, and how the pursuit was terminated.

Despite the known fatalities (n = 42) from the quantitative sample of data provided by GACP, there were only 16 news articles from the archival search that indicated a fatality from a police pursuit in the state of Georgia from 2007 to 2009. Table 28 depicts a content analysis of these news articles for those variables that correlate with the quantitative analysis conducted in this research project. From this news media content, certain variables emerge that help verify quantitative findings. First, the reasons for pursuit reported most frequently were speeding, stolen vehicle, and crimes against persons. Second, the termination results of these pursuits showed that suspects lost control of their vehicle, struck a third party vehicle, or some use of force (termination techniques) were utilized. Third, fatality indicated most often that either the suspect driver was killed, or that a passenger/third party member was killed from a crash. Finally, most of the articles indicated that only one agency was involved in the pursuit. From the article search, suspect age surfaced only three times, and other variables found to be significant in the quantitative analysis (length in time of pursuit and road conditions) were not reported by the media. Despite the number of officers also killed in pursuit-related incidents, none were found in this media search. The results of this qualitative approach were limited, but salient variables did emerge -- which correspond with those variables found to be significant in chi-square analyses. Variables that were found to be non-significant in the quantitative approach were not reported in this content analysis.

Table 28

Content Analysis

Police Agencies	Reason For Pursuit	Speed	Pursuit Termination
(1 agency)	N/A	N/A	Troopers bumped the suspect vehicle, wreck
(1 agency)	Stolen vehicle	80 mph	Suspect vehicle fishtailed and hit a tree
(1 agency)	Suspicious vehicle	65 mph	Suspect vehicle struck another vehicle
(2 agencies)	Speeding	>100 mph	Suspect vehicle crashed into a wooded area
(1 agency)	Traffic violation	N/A	Officer terminated pursuit for public safety reasons
(1 agency)	Stolen vehicle	N/A	Officer terminated pursuit for public safety reasons
(1 agency)	Traffic violation	>100 mph	Suspect vehicle ran off the road
(1 agency)	Officer assault	N/A	Suspect was shot and killed in suspect vehicle
N/A	Reckless driving	N/A	Suspect vehicle collided with a motorcycle
(1 agency)	Officer assault	N/A	Suspect was shot and killed in suspect vehicle
(2 agencies)	Speeding	N/A	Suspect crashed
(1 agency)	Vehicle involved-Robbery	N/A	Suspect lost control of his vehicle and crashed
(1 agency)	Vehicle involved-Homicide	N/A	Suspect vehicle stopped
(1 agency)	Stolen vehicle	N/A	Suspect vehicle collided with 3rd party vehicle
(2 agencies)	Speeding	N/A	Suspect vehicle hit spike strips;hit vehicle
(1 agency)	Stolen vehicle	N/A	Suspect lost control of his vehicle and hit a tree

Although this verification procedure confirmed the importance of key variables for this research project, the limited results weaken the strength of triangulation.

Typology of High-Risk Pursuits

Research Question 2: *Is there a high risk typology associated with pursuit variables?*

Research Hypothesis #2

A combination of variables can create a risk typology that would more likely result in pursuits with negative outcomes.

From both quantitative and qualitative research components, the following typology of high-risk pursuits emerged:

1. L*ower speeds (20mph to 30mph over the limit) and extreme higher speeds (61mph or more over the speed limit).*

2. More than one vehicle from one agency.

3. Variation in road conditions; specifically with pursuits outside of city limits and during night-time conditions.

4. Increase in violations related to forcible felonies.

5. Length of pursuit in time, specifically pursuits lasting 9 to 15 minutes.

6. Variation in how the pursuit was terminated; specifically when agencies use stop sticks, the PIT maneuver, and the vehicle wrecked.

7. *Short-distance pursuits for an agency during a reporting cycle.*

Chi-square analysis (coupled with content analysis of news media reports) on fatal police pursuits points toward these variables as a type of pursuit that resulted in negative outcomes. Agencies that reported no negative pursuit outcomes had a less marked increase in frequency of pursuits with respect to these variables. The extreme negative outcome of 'fatality associated with pursuit' as reported by the content analysis indicated the most extreme values recorded from the quantitative data (e.g. speed in excess of 100 mph, use of force in termination techniques).

Termination Techniques

Research Question 3: *Have termination techniques changed since Scott v. Harris (2007)?*

For termination techniques, the collection of this data by the GACP originated with litigation concerned with the interpretation of *Scott v. Harris* before the year 2007. The termination technique utilized in the *Scott case* (summarized in Chapter I) was the key legal issue. In preparation for a review of the specific technique (P.I.T. maneuver) and efficiency of other termination techniques, GACP's original focus was on how these techniques are employed in pursuits with ancillary goals of collecting other important variables. Data collection started prior to the decision in early 2007, and the decision was announced later in the year. GACP directives concerning the final decision from the U.S. Supreme Court were later re-evaluated during training in August of 2007. For police departments to enact any changes concerning this landmark decision, the timeline for re-training in termination techniques could have occurred on the date of the decision, after GACP directives/changes were announced, and up to the end of the year 2007.

Research Hypothesis #3

It is hypothesized that there has been an increase in the frequency of termination techniques since *Scott v. Harris* (2007). Due to the court decision imparting more decision-making power for the officer to utilize a wide-range of termination techniques, one would infer a significant relationship between its use and negative pursuit outcomes between the decision year 2007 and years 2008 and 2009 for this sample. To test this hypothesis, Pearson's chi-square test of independence was used to determine if there was a significant relationship. The values for the 2008/2009 group were approximately double that of the 2007 group. Chi-square analysis did not indicate a significant relationship between the years (2008, 2009) and pursuit termination techniques [χ^2 (8, 2,262) = 6.685, p = .517]. Table 29 shows frequencies between years for each termination technique.

Table 29

Frequency of Termination Techniques

Technique	**2007**	**2008**	**2009**
Pursuit discontinued	205	204	186
Suspect Stopped	297	315	262
Vehicle Wrecked	173	170	167
Stop-sticks	24	28	21
PIT	12	18	13
Station Roadblock	3	3	4
Rolling Roadblock	5	4	7
Suspect Shot	0	2	1
Other	35	50	53

The PIT maneuver and other procedures for terminating pursuits were, however, variables found to be significant. After 2007, there does not seem to be much variation across techniques, but there was a slight increase in the proportion of pursuits discontinued from 2008 (25.7%) to 2009 (26.0%). Furthermore, there was a drop in the proportion of suspects stopping the pursuit on their own (2008 = 39.7%; 2009 = 36.7%). From Table 29, the use of stop-sticks increased in 2008 (from 3.2% to 3.5%), but decreased in 2009 (3.5% to 2.9%). The PIT maneuver -- the technique of interest in *Scott v. Harris* (2007) -- also increased in 2008 (from 1.6% to 2.3%) but then decreased in 2009 (from 2.3% to 1.8%). Also of note, incidents where the suspect was shot increased from zero to two in 2008, and there was one incident in 2009. From chi-square and frequency analyses, the data does not support hypothesis #3. For practitioner inference, the use of termination techniques was consistent throughout this data collection period, and as such, GACP and other agency led training initiatives can utilized these findings despite no support in the hypothesis.

Summary of Findings

This chapter focused on research questions pertaining to developing a typology of high-risk police pursuits in the state of Georgia. The analysis of a large sample over a three-year period (2007 to 2009) included over 2,000 pursuits. A random sample of approximately one-third was taken from the larger sample, and most variables that emerged as significant in the analysis were also found to be significant in the random sample analysis. Pearson’s chi-square test of independence between categorical variables was used to indicate significant relationships between pursuit variables of interest and the dependent variable “pursuits with negative outcomes”. Groups were assigned by agencies that reported pursuits that involved damage/injury/fatalities and those agencies that reported pursuits with no negative outcomes. Each variable had certain categories associated with the overall main factors of pursuits – officer variables, pursuit variables, and suspect variables. The research project also included a qualitative component in an attempt to triangulate the variables that emerged from the quantitative component. In a content analysis of newspaper media coverage of fatal police pursuits, variables emerged through articles published during the same time period as the collected quantitative data. The categories reported by the media corresponded with variables found to be significant from chi-square analyses of pursuit reports collected by the GACP. These variables of interest included an increase in frequency of: (1) pursuits with variation of speed, (2) number of vehicles utilized during pursuit, (3) variation of road conditions during the pursuit, (4) variation of termination techniques used to end the pursuit, and (5) violation that initiated pursuit. Finally, analyses of how termination techniques are utilized after the *Scott v. Harris* (2007) decision indicated no significant variation by agencies regarding pursuit outcomes. These findings can contribute to existing research, policy formulation and police training, and will be further discussed in Chapter V: Observations and Conclusion.

CHAPTER V

OBSERVATIONS AND CONCLUSION

This project found that pursuit variables significantly related to negative outcomes were associated with a high-risk pursuit typology. This typology could contribute to the existing (but brief) literature concerning police pursuits, but more importantly, evidence-based pursuit research. Furthermore, these results could be utilized for pursuit policy evaluation for GACP and its associated agencies in the state of Georgia.

Observations of Data

Data from GACP accredited agencies provided the researcher with categorical data displayed in frequency form. From 2007 to 2009, the GACP collected information in spreadsheet format to collect overall numbers of pursuit data from their participating agencies. The format of this data collection process started with certain variables of interest to GACP. Preliminary preparation of the data was problematic as the data was not separated by the dependent variable of interest, pursuits with negative outcomes. The researcher created numerous tables between independent variables and the dependent variable for chi-square analysis.

Findings

Concerning agencies that reported pursuits with negative outcomes, the researcher noted higher frequency rates across all independent variables. However, some agencies that reported no negative pursuit outcomes did have higher frequency values across categorical variables. The proportion of agencies with negative pursuit outcomes to agencies with no negative pursuit outcomes was similar to research studies conducted with large samples of police pursuits (Alpert & Dunham, 1989; Hoffman & Mazerolle, 2005; Lum & Fachner, 2008; Madden & Alpert, 1999).

From this project's analysis, certain variables emerged that contributed to a typology of high-risk pursuits for the sample of Georgia pursuits. Speed, as a variable associated with negative outcomes in pursuit report analysis, has been found to be significant (Lum & Fachner, 2008; Madden & Alpert, 1999). Speed also was a variable of concern in *Scott v. Harris* (2007). In the case, the legal interpretation of 'imminent threat' to a third party was associated with increasing speeds by both the suspect and the pursuing officers. Surprisingly, a large number of values in the category of speed indicated pursuits 60 mph or more over the posted speed limit. For training and policy requirements, police departments have had restrictions on top speeds to indicate high-risk pursuits (Alpert, 1998). The importance of the supervisor regulating speed during pursuits has been a relevant theme throughout pursuit literature, legal issues concerning liability, and practitioner experiences. An officer's decision to follow suspects at high speeds creates an unpredictable environment. Supervisor and officer decision-making are critical for this one dimension of pursuits (Alpert, 1998; Crew et al., 1995).

Road conditions also were significant in this project, as previously noted in select literature (Alpert, 1998; Lum & Fachner, 2008; Madden & Alpert, 1999). Road conditions have been considered in pursuit policy restrictions as an important variable for discretion in pursuit continuation (Hicks, 2006; Lum & Fachner, 2008). Few pursuits in this sample included incidents with heavy traffic or inclement weather. A typical pursuit from this sample occurred on dry roads, at night-time, and on a two-lane road. Practitioner experiences have pointed toward an increasing danger concerning road conditions. The amount of traffic encountered during pursuits can be problematic and increase the danger associated with the driving public. This was yet another issue weighed by the Supreme Court in *Scott v. Harris* (2007). Road conditions as part of the decision-making process during pursuits have been part of many departmental policies and included in high-speed pursuit training (Alpert 1998; Crew et al., 1995; Hicks, 2006).

Another variable found to be significant was short lengths of pursuits. A univariate analysis indicated a significant Pearson correlation between the dependent variable and the categories of distance travelled in pursuits. Therefore, binary logistic regression was utilized to explore this relationship with a forward stepwise method. As a re-computed variable, short-distance was found to be a significant predictor of the classification of agency that reported injury/fatality in pursuits. Furthermore, the odds ratio for an agency reporting injury/fatality is 2.3 times more likely for increases across the range of short distances in pursuits. The police adage, “Chase them until the wheels falls off,” has been used as an informal policy in many departments -- but related to un-restricted pursuit policies utilized by various police agencies (Alpert, 1997; Crew et al., 1995; Hicks, 2006). Consistent with pursuit report samples from other research, pursuits from this study were predominantly short in distance (with a minority lasting longer than 2 miles). For discretion in continuing the pursuit, many officers report willingness to continue is balanced by violation and severity of offense (Alpert, 1997).

Length of pursuit in time was found to have a significant relationship with negative outcomes of pursuits. The duration of pursuits is one of the salient variables indicated in previous research (Alpert & Dunham, 1989; Madden & Alpert, 1999), and one also considered for training. From a practitioner viewpoint, supervisors have to keep a mindful clock on the duration of pursuits for which they are monitoring, and this is also paramount in the calculus for the pursuing officer. The longer pursuits in this analysis indicated a relationship with agencies that reported negative outcomes. Furthermore, research has also indicated that longer pursuits factor into a suspect's discretion to abscond from law enforcement (Alpert, 1997).

Concerning reasons to pursue a criminal, this study found that violation of law was related with pursuits with negative outcomes. The categorical value of violation in the data does not represent an ordinal level of measurement, but a nominal level for analysis. Therefore, severity of offense as a dimension is not captured in this study. However, increases in variation of violations as the reason for pursuit was found to be significant. Violation for severe offenses was also reported in a majority of pursuits that resulted in fatalities, which was captured by content analysis of news articles. Violation and its effect on both officer and suspect decisions to continue pursuit or flee can increase risks to parties involved and the driving public. Consistent with other research assessing this variable, violation -- narrowly captured by only seven categories -- was found to be significant in this project. Violation was a significant variable related to negative pursuit outcomes in other studies as well (Alpert, 1997; Hoffman & Mazerolle, 2005; Madden & Alpert, 1999). As such, many police policies consider 'violation' in the decision making process and/or use violation as the primary factor in making pursuits more restrictive across a spectrum of policies (Alpert 1997; Hicks, 2006). From a practitioner standpoint, the policy can restrict officers from initiating a pursuit unless the original violation is a felony. A number of the accredited agencies reported no pursuits during their reporting cycle, which implies a restrictive policy.

Traditionally, agencies utilize a ‘mutual aid’ policy to assist with law enforcement emergencies across jurisdictions. Furthermore, police pursuits within one jurisdiction often require more than one police vehicle. In pursuit policies, much of the directives require more than one officer (e.g. pursuit and/or supervising officer) to work together in an effort to capture the fleeing suspect or assess the risk of the pursuit. Therefore, many agencies often utilize more than one police vehicle during pursuits. For this project, number of vehicles and number of agencies involved in pursuits were found to be significantly related with pursuits with negative outcomes. In fact, this variable was found to be more significant than other variables of interest in the project, and has also significant in other projects in the literature body (see Table 30). As part of the typology of high-risk pursuits, an increase in the number of vehicles-- though required -- is associated with negative outcomes of pursuits. Supervisor discretion and officer calculus involving numerous vehicles duplicating risky driving behaviors is an important factor for policy evaluation in the midst of a pursuit (Alpert, 1997).

An important variable of interest found in this project was termination techniques utilized by the pursuing police officer. Lum and Fachner (2008) found termination techniques were rarely used in their study but significantly associated with negative pursuit outcomes. As mentioned in Chapters I and IV, the genesis of the GACP’s decision to collect data on pursuits was concerned with the termination technique at issue in the landmark Supreme Court case *Scott v. Harris* (2007). In an effort to capture a suspect, where pursuit discontinuation is not considered, police officers and police supervisors have few choices regarding how to end a pursuit. Various termination techniques have emerged with technological advances, but have resulted in negative as well as safe pursuit outcomes.

There were ancillary variables of interest (not associated with research hypotheses) that were found to be significant: age of officer, suspect's age, and suspect demographics. Alpert and Dunham (1989) established three-categories of variables associated with research in police pursuits – which consisted of officer variables, suspect variables, and pursuit characteristics. For policy and training implications, suspect variables may not contribute widely, but age of officer was found to be significant in the authors study as well as in this research project. The literature indicates the maturity level of officers can affect discretion, and this may be of importance in regard to future research and agency directives for this variable. This project has found the preceding variables to be significantly associated with pursuits with negative outcomes. The connection of these variables with preceding research, as well as that gleaned from news media depictions, presents a typology of high-risk pursuits in the state of Georgia. A typical high-risk pursuit would contain the variables: high speed, a non-traffic violation, adverse road conditions, lengthy pursuit in time, more than one pursuit vehicle, and utilizing a termination technique in an effort to capture a suspect.

Implications

This project adds to the existing but minute body of literature on police pursuit research where variables are assessed. Overall, research concerning police pursuits is relatively new with most of the initial works beginning in the 1980s. Furthermore, most research on police pursuits has focused narrowly on policy reform and/or types. Table 30 displays the body of literature concerning this sub-set of research that captured actual pursuit data to evaluate decision-making variables and pursuit variables.

Table 30

Literature Summary

Author(s)	Year	Sample	Method	Findings
Alpert & Dunham	1989	300 Pursuit Reports	Discriminant Analysis	Road conditions, # of vehicles, Age of Officer, Length-time
Alpert	1997	436 Agencies/1,200 Pursuit Reports	Case Studies/Frequencies	Speed, # of vehicles, Violation
Alpert	1998	1,055 Officers	Interviews/Factor Analysis	Officer Decision-making variables
Madden & Alpert	1999	1,200 Pursuit Reports	Log-linear Analysis	Speed, # of vehicles, time, and violation
Hoffman & Mazerolle	2005	640 Pursuit Reports	Frequencies	Violations resulting in negative outcomes
Lum & Fachner	2008	56 Agencies/ 7,737 Pursuits	Chi-square/Frequencies	Speed, time of day, road conditions

Comparable to the methods and variables obtained from previous research on police pursuits, frequency data revealed certain trends. In both this project and that of Madden and Alpert's (1999) initial Miami-Dade study, road conditions, violations, officer age, and number of vehicles were found to be significantly related to pursuits with negative outcomes. In Alpert's (1997) additional study of 1,200 pursuit reports, violation, speed, and number of vehicles were found to be related to negative pursuit outcomes. From Table 30, there have been other studies which utilized interview/survey methods to capture decision-making variables of both police officers and suspects. Comparing decision-making variables with categorical data (much like the data from this project), time of travel in pursuit, number of vehicles, and violation were found to be associated with pursuits with negative outcomes.

Hoffman and Mazerolle (2005) focused on violations relating to negative outcomes in their sample of 640 pursuit reports. Lum and Fachner (2008) examined 7,737 pursuits from a National Pursuit database, and utilized frequencies and chi-square (similar to this project). By adding to the literature body concerning pursuit variables summarized in Table 30, this project is very similar in characteristics to the goals, findings, and implications of the summarized works. Much of the implications from the preceding works lends toward a decision-making process where policymakers, practitioners, and other researchers can be informed of the salient variables related to high-risk pursuits. Administrators in law enforcement have consulted and worked with groups of professional organizations and/or academic researchers toward policy evaluation concerning use of force (Alpert, 1997; Alpert et al., 1999).

Secondly, there is opportunity to inform both the administrator and practitioner presently. GACP has been open to data analysis and initiated data collection as part of its accreditation process. To be informed of the results of this project could possibly lead toward effective communication, network information, and training reform. Although GACP establishes rules for accreditation for training in high liability areas, these directives do not precisely specify how training is to be conducted. In fact, most administrators in law enforcement enjoy discretion regarding the manner in which training is conducted within their organization. Furthermore, this project's findings can inform and contribute to the learning process that is ongoing in understanding the dynamics of police pursuits in the state of Georgia.

Thirdly, this project can contribute directly to the GACP in two ways. One way is through providing an executive summary which describes the nature of pursuits from the sample of pursuit data; such a summary can inform directly and efficiently toward assessing pursuits for participating agencies in the accreditation program. Also, the nature of the results and its limitations can yield reform regarding how pursuit data is collected. This project utilized chi-square analyses as part of its methodology, which was due to the nature of the data recorded. GACP accepts final reports in spreadsheet format from participating agencies. Agencies have wide discretion in how they format pursuit incident reports. Therefore, GACP currently has no directive on how agencies report the data, except to report number of frequencies. A more detailed analysis can occur if pursuit data were entered by individual report. In this way, each negative outcome of a pursuit would have specific variables associated with it. Multivariate analysis finds relationships between variables more efficiently than categorical data analysis and frequency reports. The existing method utilized by GACP is probably due to the agency segueing this data collection directive to agencies that might be reluctant to report or provide actual copies of incident reports for pursuits. Future directives could provide for a standard reporting system to help inform GACP of the nature of specific pursuits both abroad and in the state of Georgia, but could also provide better analysis for research endeavors.

A second contribution to GACP and its associated agencies is the emergence of high-risk pursuits in agency-level policies which detail the procedure or protocol through which individual officers carry out duties (Hess & Orthmann, 2012). From GACP, the regulatory authority and training requirements as part of their accreditation can affect individual policy evaluation and modification. After the *Scott v. Harris* (2007) decision and the implementation of this new data collection procedure, many departments changed their policies to coincide with the case law and GACP guidance. According to GACP accreditation coordinator Mike Edwards, many agencies held immediate re-training classes on the impact of the Supreme Court decision and corresponding variables of interest in the case history (personal communication, Dec 1, 2010). Many of those variables coincide with this research project and the three core dimensions of pursuit variables – officer variables, suspect variables and pursuit characteristics. Despite the broad decision in utilizing the PIT maneuver and other termination techniques, GACP and agency administrators urged training to focus on liability and maintaining strict policy guidance. GACP felt this new endeavor to capture statistics and re-training officers on high-risk pursuits was paramount after the decision.

For maximum impact on practitioner 'buy-in' to GACP policy recommendations, many agencies may have challenges, and many departments may keep with organizational or department cultural practices. Peer group influences are the "connecting bridge" between organizational influences on use of force policy and citizen-police encounters. Research indicated that officers with low, cultural identifications focused on legal factors in critical decisions, whereas officers with higher cultural identifications focused on extra-legal factors including aggression. The GACP promulgate standards and publish policy recommendations, but it is up to administrators to monitor peer group effects on officers in reviewing the decision-making process of police pursuits (McCluskey, Terrill, & Paoline, 2007). Research that helps administrators effectively monitor these issues as they affect pursuit driving decisions is beneficial.

One concern of the GACP during this data collection process was the use of PIT and other termination techniques. Would officers utilize PIT more often after the implications in the *Harris* decision? This was the underlying principle for why an agency started to collect pursuit data. Should practitioners be concerned with utilizing pursuit termination technology? The s-curve learning process of police officers regarding technology involves low rates of use, but officers comfortable with a new use-of-force policy or technique usually see rapid increases in the use of technology (Adams & Jennison, 2007). The potential problem GACP officials' contemplated was overuse in the range and frequency of techniques that would lead to unpredictable pursuit outcomes (Edwards, personal communication, Dec 1, 2010). A dynamic environment is one that is subject to unpredictable change. A criminal justice practitioner has to understand and predict the static environment while being cognizant of the dynamic environments.

According to Stojkovic, Kalinich, and Klofas (2008), goals in the decision making process are specific to each decision, and they refer to what a decision maker would like to achieve. Decision makers also need three kinds of information. First, they must be aware of alternatives available in the decision-making process. For pursuits, culture and training directly affect the available alternatives during the incident. Second, officers must also be aware of the possible consequences of the decision. Again, training focused on the dynamics of the pursuit, which can be unpredictable, is important to inform in the decision-making process. Furthermore, liabilities concerning violations of policies, training procedures, and constitutional protections are paramount in the decision-making process. Third, the processing of information according to decision rules produces ‘outcomes’ that inform on individual or agency feedback. This information could provide feedback in the decision-making process by review of pursuit statistics, associated risks, and agency-level probabilities of negative pursuit outcomes. To bolster data-driven decision-making by practitioners, a data analysis that relates the in-pursuit variables associated with high risk are of interest to executives, trainers, supervisors and individual officers. In making and/or following policy, all levels of practitioners need information to properly guide actions, especially in high-risk procedures like police pursuits. Perhaps a new paradigm should emerge that includes agency policy restrictions during a pursuit-reporting cycle, or a focus on changing police culture that eliminates the basic idea that pursuits are races that must start and finish.

Limitations and Future Research

Administrators know their resources, personnel, and the trends of how their police departments utilize police pursuit in daily operations. Prior to any implications inferred toward complete policy reformation or specification, it should be noted there are several limitations to this research project. There are 535 law enforcement agencies in the state of Georgia. The sample of data collected by GACP originated from approximately 100 agencies per year, a smaller sample of the entire population. Furthermore, this smaller sample provided data for this analysis that informs on accredited agencies only. Accredited agencies and non-accredited agencies can have similar characteristics, but be different in many operational aspects depending on administrator discretion and policies. Therefore, generalizations made from this research project's findings should be limited to accredited law enforcement agencies in the state of Georgia only.

This research project utilized only descriptive and non-parametric statistics. Therefore, the assumptions associated with non-parametric statistics are limited and not inferential to a larger population. Caution is advised in generalizing this project's findings as typical pursuits in the state of Georgia. Furthermore, administrators and practitioners should only recognize the typology presented as informative. Policy changes should be based upon projects that utilize multivariate analysis, and administrators can rely on the nature of pursuits within their own department to effect positive policy reform. This project's scope of limitation should be viewed as a descriptive or characterization of police agencies which experienced negative outcomes in police pursuits, and the associated, typical high-risk pursuit.

Future research concerning police pursuits should focus on the variables involved in the dynamics of incident. As stated previously, there is minute research focusing on capturing the variables involved in police pursuits in America. This is largely due to the trend of police agencies to not keep their own statistics, despite the suggestion of professional organizations and researchers (Alpert, 1997). Future research projects that utilize data both before and after policy changes can also contribute to policy reform effectiveness. Crew et al. (1995) examined injury/fatality rates for agencies that changed from non-restricted to restricted pursuit policies. To build upon this type of project, policies that have changed by restricting pursuits based upon certain variables (e.g. discontinue if more than two vehicles or over a certain speed) would be influential in policy reformation. Finally, future research projects should also focus on inferential statistics to enhance analysts' findings and implications toward policy reform. If future research utilizes such techniques, important findings could lead to a scientific calculus in decision-making processes.

The decision making process in police pursuits are key, and currently driven by individual officer training, experience, and pursuit policy restrictions. This project's scope was intended to inform on the type of high-risk pursuits that occur in the state of Georgia. Police pursuits are complicated and dynamic incidents that can result in dangerous and fatal outcomes. Police officers and supervisors can observe and record trends within their own department or shifts to assist in this complicated decision-making process. Knowing traffic and road condition patterns and monitoring speed variances in the midst of a pursuit can affect the decision to continue or discontinue the pursuit. Training officers can update officers on effective termination measures and proper management of pursuits between jurisdictions. Finally, administrators can adjust their agency pursuit policies dependent on the number of pursuits reported during the year. If anything can be gleaned from this project's findings it is that agencies that have higher frequencies of pursuits -- which involved variables associated with negative outcomes --

reported an injury or fatality for that year. Administrators concerned with public safety, officer safety, and liability, can do well to monitor their officers' pursuits and maintain a fluid policy of restrictiveness based upon safety and law enforcement objectives.

APPENDIX A

REQUEST FOR DATA

To: dm.edZards@gachiefs.com

Mr. Edwards,

I am currently working on a dissertation topic involving management strategies and proper policy\guidelines as they relate to police pursuits. I used to be an assessor and certification manager for Carrollton PD, and I remember collecting the data to be sent in accordance with certification standards from 2007. The data you have would be invaluable to my research project. I have attached my proposal for my dissertation committee, who will guide me in this research effort. I would like to request the data and summary findings you have from 2007 to 2009 (3 years) if it is available.
Please let me know if you have any questions, and I will not hesitate to answer them.

Thank you so much for \our assistance,

Lee Wade, M.P.A.
Doctoral Teaching Assistant,
School of Criminal Justice
The University of Southern Mississippi

Mike Edwards <dm.edZards@gachiefs.com> Wed, Dec 1, 2010 at 10:57 AM
Reply-To: dm.edZaUdV@gachiefV.com
To: Lee Wade <leeZade254@gmail.com>

Lee,
I have your e mail address on my computer. I will get your info to you soon.

Mike

APPENDIX B

IRB EXEMPTION

Lee Wade lee.wade@eagles.usm.edu via gmail.com

10/12/11

To: betty.morgan@usm.edu

Ms. Morgan,

I am a doctoral student at USM working on a dissertation. I have read the IRB website, and as a graduate student have submitted to IRB two or three times before. I have the cover page, and I have a narrative in MS Word describing the project. I am working with publicly available data on police reports, and there are neither human subjects involved nor names/information. I didn't know if I needed to complete something else because I am not dealing with human subjects? I have my two copies ready to send via my major professor and chair, and since this is for my dissertation, I wanted to make sure everything was perfect and correct.

Lee Wade, M.P.A.
Ph.D. Candidate

Betty Morgan Betty.Morgan@usm.edu
10/12/11

Hello Lee,
If your project does not involve human subjects you will not need IRB approval.

Good luck to you on your study.

Please feel free to contact me if I can be of further assistance.

Thank you,

Betty Ann Morgan
The University of Southern Mississippi
Institutional Review Board
118 College Drive #5147
Hattiesburg, MS 39406-0001
Phone: 601-266-6820
Fax: 601-266-5509

Betty.Morgan@usm.edu

Betty Morgan Betty.Morgan@usm.edu via eagles.usm.edu

10/12/11

to Lee
IRB approval is not required for research that does not involve human subjects.

Is your committee aware of the study and has it been approved?

Betty Ann Morgan
The University of Southern Mississippi
Institutional Review Board
118 College Drive #5147
Hattiesburg, MS 39406-0001
Phone: 601-266-6820
Fax: 601-266-5509

Betty.Morgan@usm.edu

APPENDIX C

NEWSPAPER ARTICLES

Date	Title	Newspaper
Feb. 26, 2007	"Two Teens Dead in Clayton Chase; Four Others Injured in Police Pursuit"	Atlanta Journal-Constitution
Feb. 27, 2007	"Police Rules of Pursuit Scrutinized in Two Cases"	Atlanta Journal-Constitution
May 18, 2007	"Police Chase Ends in Woman's Death; Cobb Investigates to See if Pursuit Broke Any Rules"	Atlanta Journal-Constitution
May 19,2007	"Two Face Murder Charges After Police Chase; Cobb to Investigate Whether Officers Followed Procedures"	Marietta Daily Journal
May 20,2007	"Suspects Charged in Woodstock woman's death; Police Investigate Adherence to Procedures During High-speed Chase"	Cherokee Tribune
July 20, 2007	"Across the Area"	The Augusta Chronicle
Oct. 29, 2007	"Police Pursuit Policy Followed"	The Times-Herald
Feb. 8, 2008	"Soldier Hit by Stolen Truck Dies - Wreck Occurred After Police Pursuit of Teen Robbery Suspect Was Called Off"	Columbus Ledger-Enquirer
April 3, 2008	"Effingham Co. Sheriff Comments on Fatal Chase"	NBC-3 WSAV
Aug. 16, 2008	"Police Chase Traffic Violator; Cyclist Dies Amid Pursuit"	Clayton News Daily
Sept. 17, 2008	"Man Dies in Meth Arrest Outside of Restaurant"	Clayton News Daily
Dec. 19, 2008	"Unidentified Man Killed by Police After Alleged Car-jacking Attempt"	Henry Daily Herald
Jan. 16, 2009	"Community News Alleged Teen Purse Snatchers Flee, Crash; One Dies"	Atlanta Journal-Constitution
June 30, 2009	19-Year-Old Gets 20 Years for Voluntary Manslaughter - Led Police on High-speed Chase That Led to Soldier's Death"	Columbus Ledger-Enquirer
July 12, 2009	"Shootings, Chase, Car Fire, Claim Three"	Atlanta Journal-Constitution
Sept. 11, 2009	"Grief, Anger, and Probes Follow Fatal Police Chase"	Atlanta Journal-Constitution
Sept. 18, 2009	"Deadly Police Chase Sent to Grand Jury"	Atlanta Journal-Constitution
Oct. 12, 2009	"Two Killed in Police Pursuit - High-speed Chase by Highway Patrol Ends in Crash, Killing Suspects and Injuring One Motorist"	Savannah Morning News
Oct. 13, 2009	"Passenger Killed in High-speed Pursuit ID'd"	Savannah Morning News
Nov. 13, 2009	"Community News"	Atlanta Journal-Constitution

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