Local Police Protection Options for Pennsylvania Municipalities: A Quantitative Analysis of Determinants

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By

Andrew J. Nolan, MS, MBA, CPA

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John J. Callahan, Ph.D.
Executive in Residence
School of Health and Human Services
University of Baltimore
Committee Chair

_____

P. Ann Cotten, D.P.A., C.P.A.
Director
Schaefer Center for Public Policy
University of Baltimore
Committee Member

_____

Beverly A. Cigler, Ph.D.
Professor
School of Public Affairs
PennState Harrisburg
Committee Member

College of Public Affairs
University of Baltimore
Baltimore, Maryland
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Abstract

Pennsylvania is divided into 2,562 separate municipalities which provide local services to their residents. With the exception of the 56 cities within the State, municipalities have the option to either provide police protection to their residents or rely on the State for police protection. For the municipalities that choose to provide police protection to their residents, they can do so through a traditional police force serving a single municipality or in collaboration with neighboring jurisdictions.

Through an analysis of existing literature it has been determined that the provision of police services is most economically and programmatically efficient when forces serve between 22,350 and 36,000 residents. Below this level, increasing the population served by a police force results in savings per resident served. Above this level, increasing the population served results in increase in the cost per resident served. The average traditional police force in Pennsylvania serves 3,932 residents while the average regional force serving multiple municipalities serves an average of 10,549 residents. The vast majority of the 1,180 police forces in Pennsylvania serve far fewer residents than is optimal while nearly 2.5 million Pennsylvanians or twenty percent of the State's 12.7 million residents rely solely on the state police for local protection which is significantly larger than the optimal range.

The purpose of this research is to determine the extent that the decision to provide protection to residents, as opposed to relying on the State, is consistent with an empirical model based on factors derived from the literature. The extent that municipalities that provide protection to their residents independently versus doing so in collaboration with other jurisdictions will then be compared to separate empirical mode.

The first empirical model, focusing on reliance on the State versus offering protection to residents, is based on two assumptions: first, municipalities with a high need for police protection would be more likely to provide protection to their residents and second, municipalities that are more able to absorb the cost of police protection would provide the protection.

The second empirical model, focusing on the differences between municipalities that provide protection independently versus doing so in collaboration, is based on three assumptions: first, smaller municipalities would be more likely to collaborate if they provided protection, second, municipalities with a greater number of nearby municipalities would be more likely to collaborate, and third, municipalities that have greater demographic similarity with their neighboring municipalities would be more likely to collaborate and would likely have the most to gain from a collaboration.

Both models were tested utilizing binary logistic analysis utilizing seven predictor independent variables obtained from the US Census, the American Community Survey and State published information regarding crime rates and municipal spending. After the development and testing of the initial empirical models derived from the literature, the first model was expanded to reflect 26 variables identified to have statistically significant differences and the second model was expanded to reflect 14 variables.

The analysis of the first model confirmed the association between a municipality's ability to afford police protection and the municipality's likelihood of providing protection to residents. It did not confirm the anticipated link between the need for police protection and the likelihood that a municipality would provide protection.

The analysis of the second model confirmed the association between a municipality's size and the likelihood that a smaller municipality would be more likely to provide protection in collaboration as opposed to providing protection independently. It did not confirm the anticipated link between a higher number of nearby municipalities and the likelihood of collaboration and a higher level of demographic similarity and the likelihood of collaboration.

The inability to confirm the link between the need for police protection and the likelihood that a given municipality would provide protection identifies an opportunity to focus education and incentives on encouraging the municipalities with the greatest need for police protection to establish or join existing forces. The inability to confirm the link between a higher number of nearby municipalities and a higher level of demographic similarity and the likelihood that a given municipality would collaborate in providing police protection identifies an opportunity to focus education and incentives to encourage the municipalities with the greatest opportunity for success in collaboration to explore opportunities to collaborate.

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Chapter 1 - Introduction

Municipalities in Pennsylvania, other than those classified as cities, have the option to either provide police protection to their residents or rely on the State police for this service. Municipalities can provide protection independently or in collaboration with neighboring jurisdictions by forming a regional police force or by contracting to obtain the services from a neighboring jurisdiction. Further, municipalities are not required to provide a specific level of service and can rely on the state police to augment the local services (Krot 2010).

Clear advantages and disadvantages exist for each type of service delivery. The reliance on the state police for protection eliminates all administrative responsibilities and costs from the municipal operations. No-cost, minimal protection is often seen as an ideal solution to local taxpayers and elected officials. From a macro-economic perspective, the management of local police protection serving millions of residents across the State, even when divided into county-based stations exceeds the efficient organizational size. As a result, the state police are not able to provide quick response times to the areas they serve. As an example, in a telephone conversation with Jodi Grove, the Municipal Secretary for Shrewsbury Township and a follow-up call to the Loganville station serving York County, it was learned there is little call from local citizens or township leaders for increased services beyond the level provided by the state police. On the day of the calls, April 21, 2011, there were four officers on duty serving York County covering 905 square miles including 352 square miles not covered by any other form of local police protection. The estimated response time is one half hour from the time the call is received.

The reason most often cited for the high level of satisfaction with the reliance on the State for protection is the lack of a cost associated with the option (Grove 2011). The effectiveness of the state police is also diminishing as the crime rates in the less populous areas of the State are increasing at a time when the crime rates for the State as a whole are decreasing (Bucklen 2012).

Traditional forces, where individual municipalities have dedicated police force, are operated completely within the authority of the single municipality represent the opposite extreme of the police protection spectrum from reliance on the State. In a small municipality, a traditional force may serve the community in a capacity that far exceeds providing police protection. These services may include delivering mail for municipal officers, running errands, issuing permits and performing other municipal tasks. In many smaller municipalities, traditional police forces are often part-time, lack specialized services such as investigators, crime labs, detention facilities and so on. Many small municipalities with traditional forces rely on the state police for the services that the municipal police force is not able to provide (Regional Police Services in Pennsylvania 2010). Traditional police forces for small municipalities are typically more expensive to operate per resident served than regional police forces where costs can be spread across a wider population base.

Providing police protection in collaboration with neighboring jurisdictions, either by forming regional forces or by contracting with another municipality for services results in uniform policing across a wider area, facilitates the ability to solve crimes that span several jurisdictions and distributes the costs across a larger population base. By spreading the cost across a larger population base, services and resources can be specialized resulting in improved training, the ability to have access to specialized equipment and dedicated personal for various

types of policing. Additionally, through a collaborative force, career enhancement opportunities exist for officers (Regional Police Services in Pennsylvania 2010).

While collaborative police forces provide significant benefits, the cost of maintaining a police force, even one where the cost is spread across multiple municipalities consumes a significant percentage of any municipality's budget. Police forces shared across multiple jurisdictions cannot be as responsive to the needs of individual jurisdictions as they can in in a traditional police force, as a result, the ability to control the resources of the municipality by the elected officials diminishes. Additionally, as police forces grow and serve multiple jurisdictions, the ability to provide non-enforcement services diminishes. Police officers tend to focus on policing in a larger force and less on the ancillary services often provided by traditional forces. While cost per citizen should decrease in the development of a regional police force, individual costs are likely to increase as a result of consolidation. As an example, state law requires that compensation of officers in a consolidated force be set at the highest rate from the existing forces. Additionally, newly created police forces must follow the current police force pension requirements where individual forces, which were created prior to the enactment of the law, were not required to do so (Regional Police Services in Pennsylvania 2010).

Collaboration occurs within Pennsylvania at many levels including municipal shared services, school system collaborations, fire department mergers and so on (Cigler 2013). Additionally, at the time of this publication, there is talk of consolidating the State's 500 school districts into 100 larger districts. There are also numerous studies being conducted at any given time within the state examining potential police force consolidations. While there are studies related to collaboration in the provision of police services, the lack of an understanding of the

benefits of collaboration remains a major barrier to collaboration (Honadle, Costa and Cigler 2004).

Statement of Problem

The operation of small police forces is economically inefficient when the population base is less than an optimal level. Southwick (2005) calculated the optimal point to be between 22,350 and 36,000 residents. Based on the 2010 US Census and the list of municipal police forces provided by Governor's Center for Local Government Services, the median Pennsylvania non-city traditional police force serving a single municipality has a population of 3,932. The median population served by regional police force is 10,549. A total of 2,489,383 Pennsylvania residents rely exclusively on the state police for protection. The majority of traditional police forces and to a lesser extent, current regional police forces operate below the optimal level of efficiency while the size of the state police force significantly exceeds the optimal level for efficiency.

Statement of Research Purpose

The purpose of this research is to determine the extent that the decision to provide protection to residents, as opposed to relying on the State, is consistent with an empirical model based on factors derived from the literature. The extent that municipalities that provide protection to their residents independently versus doing so in collaboration with other jurisdictions will then be compared to a separate empirical mode.

After determining the extent that the decision to provide protection and the decision to provide protection in collaboration are based on the empirical models, other potential determinants will be examined to identify other factors that are correlated with the type of protection provided. By determining the prominent characteristics of the municipalities in each

group, future efforts to encourage collaboration can be redirected to more effectively encourage collaboration.

Scope of the Research

In assessing collaboration between municipalities in the provision of police protection, this research limits the forms of collaboration considered to the establishment of regional police forces and outsourcing police protection services to another jurisdiction. In the case of outsourcing protection to another jurisdiction, both the municipalities that provide service and those that have others provide service on their behalf are counted as collaborating. No effort was made in this research to quantify the extent that municipalities collaborate on a smaller scale such as in the joint utilization of a crime lab, combined investigations into related crimes and so on. Additionally, the collaboration between municipal forces and the state police force are not explored. Police forces which do not have twenty-four hour coverage rely on the State for coverage in off hours are considered as having a police force for this research.

Background

Pennsylvania has a fragmented service delivery system. The State is divided into 67 counties that are further divided into 57 cities, 968 boroughs, 1,547 townships and 1 town. Many services such as local road repair, police protection, fire protection, building codes enforcement, public water, public sewer and solid waste removal are the responsibility of the local government. Nearly 90 percent of the municipalities have fewer than 10,000 residents and 40 percent of the State's population resides in municipalities with fewer than 10,000 residents. Additionally, the State also has 1,180 police departments (Pennsylvania Local Government Fact Sheet). The median Pennsylvania municipal population is 1,905 according to the 2010 US

Census while the median police force serves 4,914 residents with seven officers (Pennsylvania Full-time Law Enforcement Employees by City, 2010).

Pennsylvania may be unique among the States in that the residents have a strong attachment to their local community. While the Texans will say they are from Texas and the people within 20 miles of Baltimore will say they are from Baltimore, Pennsylvanians are strongly identified with their borough or township. They would be more likely to say they are from Pottsville, Pequa or Paradise than Pennsylvania. The local focus has its foundation in the unique characteristics of the State that allowed small towns to develop through the generations. Additionally, families tend to stay in town for generations. In fact, eighty percent of the State's residents were born in the State representing the highest rate in the nation (Miller and Pencak 2002). This strong local identification was also a factor in two of the major post-revolutionary war rebellions against the new national government. Both the Whisky Rebellion in 1794 and Fries's Rebellion in 1799 resulted from Pennsylvanian's objections to centralized governance (Miller and Pencak 2002).

One consequence of the decentralization is that the local municipal governments primarily act independently of each other and tend to avoid collaborative efforts with their neighbors. The government leaders often will state that there is no proof that providing services in collaboration with other jurisdictions results in lower costs to the taxpayers. According to Harry Krot (2010), Local Government Policy Manager with the Pennsylvania Governor's Center for Local Government Services, this statement is correct in that no large scale study has been completed to date that calculates the savings associated with providing services in collaboration with other municipalities. While no large scale study has been completed, the literature review in

this research explains the potential savings and includes two case studies conducted within Pennsylvania that confirms the significant savings available through collaboration.

The primary barrier to collaborative efforts appears to be the rivalry between the various jurisdictions that is similar to the traditional competitive rivalry between neighboring high school football teams. Other barriers are likely to include a lack of understanding of the savings possible through collaboration and a misinterpretation of the laws supporting collaborative efforts.

To encourage collaborative efforts, Pennsylvania's former Governor, Ed Rendell, established the Shared Municipal Services Program through the Department of Community and Economic Development to assist municipalities interested in working collaboratively by providing grants to promote cooperation as well as training and technical assistance (Economics and Business Week 2009). The economic changes that occurred in 2008 to 2012 have brought to light the fact that governments at all levels must operate as efficiently as possible. Tax revenues have decreased with no reduction in demand for services. By providing services in collaboration with other jurisdictions, costs can be reduced and the Pennsylvania structure of local government can be maintained. While the impact of the ongoing economic challenges facing all levels of government in Pennsylvania would be lessened by the consolidation of smaller inefficient police forces into regional forces where costs can be shared by a larger population base, the State resources dedicated to encouraging collaboration have been greatly reduced. Currently the State has a single employee dedicated to supporting police consolidation as the majority of State funds supporting local governments have been focused on economically distressed municipalities (Krot 2010).

While it could be argued that the complete elimination of the municipality-based structure in Pennsylvania could result in a more efficient system to provide local services, this

extreme option is outside the scope of this paper. The decentralized structure of Pennsylvania government is a core principle that dates back to the founding of the Commonwealth by William Penn in 1682 and earlier. Penn's intention was to form a nation where the citizens participated in their own governance and shaped the law and services to match their unique needs. This was carried out from the beginning with representative local governments with limited centralized control (Soderlund 1983). The structure of local government within the Commonwealth is a critical component of the culture of the Commonwealth.

To call attention to the lack of efficiency at the local level, State Representative Thomas Caltagirone, a Democrat from Reading, introduced House Bill 2431 with eleven co-sponsors in April 2010 to amend the Pennsylvania constitution to reassign much of the services provided by municipalities to the counties. While Caltagirone, himself, did not believe the bill would be successful, his purpose was to bring to the attention of the legislature the inefficiencies of the current system (Duarte 2010). The literature related to the economies of scale of police services contradict the assumption that police forces the size necessary for many of the Pennsylvania counties would be more efficient than smaller forces (Southwick 2005, Walzer 1972, Gabler 1969 and Finney 1997). The literature also indicates that the consolidation of police forces the size of the vast majority of those found in Pennsylvania would result in economic efficiencies.

Relevant History of Pennsylvania

While the history of Pennsylvania is typically traced to William Penn and the royal charter granted by King Charles II in 1681, many of the characteristics of the current structure of local government can be traced to the Duke of York. The Duke possessed the territory that later became the States of New York, Pennsylvania, Delaware and portions of New Jersey beginning in 1664 (Gould 1882). Under the administration of the Duke of York, the territory was divided

similarly to England into towns and parishes. Each town was governed by officers chosen by the people and had their own constitution and by-laws. Parishes were governed by the local overseers and a constable of their choosing. The constables acted as the guardians of the parishes and enforced the moral code. Town taxes were collected solely to support the local government. Separate taxes were assessed to cover general civil and military authority. Under the Duke of York, county governments did not exist in the territory.

When William Penn was awarded the charter to Pennsylvania, he was granted the power to "divide the said country and islands into towns, hundreds and counties and to erect and incorporate towns into boroughs and boroughs into cities and to make and constitute fairs and markets therein…" (Soderlund 1983, 44). Penn established the county as the primary structure in local government and established county courts to which was made responsible for local governance in areas without a town or village center. The towns and villages were incorporated into cities and boroughs. While the charter for Maryland also empowered Lord Baltimore to develop towns and boroughs, Maryland's local government was primarily county focused with fewer and less important towns. The towns that did develop in Maryland were classified as towns or cities (Holcomb 1886).

After independence was declared in the 18th century, the State government continued to encourage the incorporation of municipalities by surveying land and selling lots with the requirement that houses be built within two years from the date of purchase. State encouragement of the development of boroughs was done to create commerce centers for the primarily agricultural state. In the early 19th century, when it was no longer necessary for the State to encourage municipal development, private speculators took over. The privately developed boroughs were often located close enough that rivalries developed. In the late 19th

century, manufacturing became the primary driving force encouraging the incorporation and expansion of boroughs (Holcomb 1886).

While the trend from the beginning was to have areas with no significant population concentration be formed as townships, smaller villages incorporated as boroughs and the largest municipalities be incorporated as cities, there was no requirement that they be incorporated as such. Villages, when incorporated as boroughs, are better able to provide services such as paved and lit roads, and responsive police protection to residents in concentrated centers than townships where the population is broadly disbursed. In the late 19th century, Holcomb (1886) identified townships such as Hegel in Luzerne County with a population of over 10,000 and thirteen unincorporated villages. Holcomb (1886) also identified York with a population of 13,940 in the 1880 census as being classified as a borough and not a city as would be expected based on the size. Additionally, Holcomb identified several boroughs comprising only few households.

The present day townships, boroughs and cities are similarly not constrained by size limits. Based on the 2000 census, as reported in the 2008 Statewide Municipal Financial Information data file, first class townships range from a population of 351 in South Versailles Township to 81,821 in Upper Darby Township. Second class townships range in population from East Keating Township with a population of 24 to Bensalem having a population of 58,434. Boroughs range in population from the borough of S.N.P.J with a population of zero (according to the March 17, 2001 Sharon, PA Herald, the 14 residents were not home when the census counter visited the borough) to 38,420 in State College Borough. Cities range in population from 799 in Parker City to 1.5 million in Philadelphia.

Theoretical Perspective

This research is approached from a pragmatic perspective. Economies of scale can be achieved through providing police protection in collaboration for municipalities the size of the vast majority of the municipalities within Pennsylvania (Southwick (2005). Based on existing studies of independent and collaborative police forces documented in the literature, economies of scale result from spreading the cost of police protection across multiple municipalities can result in savings determined to be 28 percent in one study (Krimmel 1997) and 24 percent in a second independent study (Yablonsky, Redding and Gamble 2006). Additionally, as municipalities work together collaboratively, they will have the opportunity to learn from their peers and thereby avoid making similar costly mistakes. By providing services in collaboration with other municipalities, the values of local government remaining close to the citizens as intended by William Penn will remain possible. Despite the apparent benefits of collaboration, the high number of small independent police forces within the State indicates that forces beyond economic efficiency impact the method of providing local police protection. If improvements are not made to the current system, the pressures to replace the system with countywide services may become too great to defeat in the future.

Research Methods

This research will be comprised of an extensive quantitative analysis of existing data sources to identify the characteristics of Pennsylvania municipalities in each of the three groups. Pennsylvania cities will be excluded from the analysis since cities are required to provide local police protection, and therefore, the service is not provided as a result of a choice. The research will utilize existing data sources such as financial data filed annually with the Pennsylvania Department of Community and Economic Development Office on form DCED-CLGS-30, crime

statistics compiled by the Pennsylvania Uniform Crime Reporting and National Incident Based Reporting (PA UCR/NIBRS) system, the 2010 US Census and the 5-Year American Community Survey (for the period 2006-2010) conducted by the US Census Bureau.

Empirical models will be developed utilizing binary logistic analysis to assess the likelihood of a given municipality offering protection to their residents or offering protection in collaboration with neighboring jurisdictions. After the empirical models are tested, they will be expanded in a descriptive analysis phase to incorporate variables not related to the literature derived assumptions to determine the extent that the outcome can be predicted by the preconceived variables versus those identified independently of the literature based assumptions. Finally, the expanded models will be refined to reflect only the most influential variables utilizing backward stepwise likelihood analysis.

Limitations

The research will be conducted solely within the State of Pennsylvania and the conclusions will reflect the unique characteristics of Pennsylvania's culture, government structure, history and legal environment. Therefore, the conclusions from the research may not be applicable to municipalities in other states with different circumstances.

The research will focus on police services provided by the local municipalities. While it is likely that the barriers to and benefits from collaborative efforts in providing police protection are similar to the benefits and barriers related to other municipality services, no effort will be made in this study to confirm the relationship. Additionally, kindergarten through high school education is provided through 500 school districts independent from the local municipalities. As a result, the educational system Pennsylvania appears to face the same challenges of inefficient service delivery as municipal services. While the school districts face many of the same issues as

the municipalities, no effort will be made to determine if the lessons learned in this research are applicable to the school districts.

The variables utilized in this research were selected from existing data sources including the 2010 US Census, the 2006 to 2010 American Community Survey and information published by the State of Pennsylvania. As a result of the dependence on existing data for the research and the nature of the data utilized, the variables do not reflect measurements at the same point in time. Additionally some variables represent either the averaging of results over a two year period or the inclusion of reported data from prior years when no current report was filed. The utilization of measurements across multiple periods was done to identify the most statistically significant measurements; however, the risk exists that changes over time may impact the results. Further discussion of the time period utilized for specific variables can be found in chapter three where the variables are defined.

The models developed in this research do not address the current economic condition of individual municipalities except where measured by the variables selected. Additionally, no effort was made to measure the impact of the recession of the second half of the first decade of the twenty first century or the change in the economic condition of the State as a whole or the individual municipalities. While the recession has sparked significant discussions in both the legislature and the local press regarding the inequity of local protection for some municipalities being borne by the taxpayers of the state as a whole and the inefficiencies of small police forces, the number of municipalities relying on the State for protection, the number of municipalities providing protection independently and the number of municipalities providing protection in collaboration have all remained relatively consistent throughout the decade.

Significance of the Research

It is anticipated that this study will generate a foundation of information that can be utilized in conjunction with other existing and future research to facilitate an increase in collaboration between the smaller Pennsylvania municipalities in service provision. It is anticipated that this could occur in a three-part process coordinated primarily through the Pennsylvania Department of Community and Economic Development's Center for Local Government Services. First, the results of the study could be utilized to augment the trainings offered to local governments in collaboration. Second, the resources the Center offers to the local governments through their website could be augmented with analysis derived from the study. Third, the results of the study could be utilized in the development of local newspaper articles throughout the State. These articles could be focused to spread the information to local governments, elected officials and voters to support collaborative efforts between municipalities.

Chapter 2 - Review of Literature

The review of literature for this research will be divided into two sections. A foundation of public administration literature will be developed to identify the principles which will later be applied to the specific examples of police force formation and consolidation as it relates to the research questions.

The foundation literature section includes the development of rational choice theory, organizational theory and economies of scale. The rational choice perspective is utilized to develop the most efficient method of providing police service without consideration of personal preferences. Public choice theory will be explored to obtain an understanding of why a municipality might rationally make decisions that appear to be contrary to pure economic efficiency but are necessary to match service delivery to the needs of local citizens.

The applied literature will begin with literature related to the formation of police forces and the application economies of scale concepts to determine the optimal size range for a police force. The literature related to municipal collaboration will be explored as well as the barriers to collaboration. Literature that examines examples of collaboration between police forces and the benefits achieved will also be explored. Writings specifically related to police force collaborations within Pennsylvania will be emphasized in the applied literature section.

Foundation Literature Review

Rational choice theory is explored as the starting point. Individuals and groups make decisions for rational reasons. Organizational theory is then explored to develop a framework of how services could be provided most efficiently from a rational perspective. The concepts of economies and diseconomies of scale are added to the analysis to explore the impact of

economic factors that further shape the optimal service delivery method. Public choice theory will be explored to obtain an understanding of why a municipality might rationally make decisions that appear to be contrary to pure economic efficiency but which are necessary to match service delivery to the needs of local citizens.

Rational Choice Theory

Rational choice, also referred to as optimal choice theory is a fundamental economic and behavioral science principle (Herrnstein 1990). Based on the rational choice theory, a person will make choices that maximize their total utility. It is assumed that individuals want more of goods and that they want to pay less for them. As a result, individuals will make choices that balance the benefits of a decision and the cost of the decision to maximize the individual preferences. Rational choice theory in economics and behavioral sciences can be compared to Newton's theory of matter in motion in the physical sciences. In this perspective, rational choice theory would determine choices if there were no outside forces similar to wind, friction and measurement error that must be taken into consideration in Newton's theory (Herrnstein 1990). Rational choice has its roots in the economic man who is at the foundation of economic theories. Economic man had three properties: he was completely informed, he was infinitely sensitive and he was completely rational (Edwards 1954). Economic man was assumed to have the ability to know all of the choices available as well as what the outcome will be. He could differentiate the countless opportunities in his decision-making. Rationality was a critical factor for economic man; all of his choices maximized his personal interests.

Rational choice incorporates risk and uncertainty in the decision making process. Risk and uncertainty are factored into the equation by depending on the probability adjusted expected

results when known results are not available (Herrnstein 1990). Additionally, rational choice accounts for the seemingly irrational decisions people make. When individuals make decisions that are not in their best long-term self-interest, they are still maximizing their personal utility as they define it at the time. In this case, the long-term impact is not the utility that the individual is trying to maximize but rather they are maximizing their short-term preference (Stigler and Becker 1977).

Organizational Theory

The principles of organization theory are presented to develop the optimal method to deliver police protection in a rational choice perspective.

The foundations of organizational theory can be traced to Adam Smith (1776) in "On the Division of Labour", which described the impact of labor specialization by workers in a pin factory. Smith explained that if the manufacturing process of pins were divided into separate operations, the production per employee would be greater than if single workers were responsible for completing the entire manufacturing process. Smith associated the production improvements to specialization of labor and credited three causes. First, the repetitive nature of individual tasks allows the individual to become an expert in individual functions allowing the worker to be more proficient. Second, specialization reduces the time lost as a result of transitioning from one task to another. Third, the use of machinery becomes economically feasible and assists the individual employee to produce more.

Georg Wilhelm Friderich Hegel (1821) expanded upon Smith's concepts by applying the theory to include the executive functions within the organization as well. At all organizational levels, work should be divided to allow all employees to specialize in specific functions.

Henry Fayol (1916) added the importance of unity of command to the developing organizational theory. Fayol believed that employees should have only one supervisor. Multiple supervisors undermine authority and workplace discipline is jeopardized without unity of command. Luther Gulick (1937) acknowledged that there are often attempts to justify having several masters for employees; however, the drawbacks of having employees receiving direction from multiple supervisors will always outweigh the benefits of a strict adherence to unity of command.

Gulick (1937) also advocated for a limited span of control where a supervisor has responsibility for only a limited number of employees. The limitation is a result of limitations in the supervisor's knowledge as well as the limitations on time and energy. Gulick indicated that the ideal span is dependent on both how spread-out the workers are and the type of work. Lyntall Urwick (1956) continued Gulick's research over the next twenty years. He studied the efforts to increase the span of control to attempt to reduce the number of organizational levels. Urwick advocated for a balance between the advantages of maintaining a limited span of control and pressures to increase the span to limit organizational levels.

By combining the lessons learned from Smith, Hegel, Fayol, Gulick and Urwick, and applying them to the issue of police protection services in Pennsylvania, it would be reasonable to anticipate that the most economically advantageous method of providing service would be a few police forces for the State with specialists focusing on a limited scope of service. An equilibrium point could be calculated to determine for each function the extent of specialization and the span of control.

Economies of Scale and Diseconomies of Scale

The concept of economics of scale was developed by Alfred Marshall in his Principles of Economics published in 1890. Marshall concluded that increases in the volume of production will increase the internal economies of the firm and the external economies of the firm will also increase. As a result, increases in production volume will result in lower proportionate cost in both labor and other resources. Marshall contrasted the effect of nature, which tends to create a diminishing return on output to the efforts of man, which has a tendency to increase return. The forces of nature and man are counter to each other and in different applications one force is likely dominate over the other. In the production of wool or wheat, the forces of nature predominate resulting in diminishing returns with increasing volume. In the processing of wool into blankets or wheat into fabric, the forces of man predominate resulting in increasing returns with increasing volume (Marshal 1890).

The division of labor concepts developed by Adam Smith is directly related to the concept of economies of scale (Young 1928). As complex processes are divided into a succession of simpler processes, the opportunity to utilize machinery to increase the efficiency of the individual tasks becomes more feasible. Increasing volume justifies the increased investment necessary to cover the cost of developing task specific machinery. Young pointed to Henry Ford's use of automation in the production of automobiles and concluded that the automation of the Ford factories has resulted in low unit cost of production but the level of automation would not be justified with a lower volume of production. Young also points to simplification and standardization as well as the removal of deeply rooted competitive waste from the production process as critical factors in increasing efficiency.

The concept of economies of scale was developed prior to the industrial revolution where optimal production levels were seldom met and were not known to exist. The early example of Ford's production of the Model T seemed to confirm the limitless potential of maximizing profits by increasing production volume. It was initially assumed that marginal cost per unit would continue to decline for all man-based inputs through the use of new technologies and machines which would continuously increase the benefits of specialization. The concept of diseconomies of scale is based on the principle that there is an optimal volume point. Beyond the optimal point, marginal cost per unit increases. The resulting cost curve is U-shaped where increased production initially has a significant effect in reducing the cost per unit. The savings per unit minimizes as the optimal volume is achieved. Beyond the optimal volume, cost per unit increases gradually and as volume increases further the marginal cost of production continues to increase more significantly (Viner 1932).

While economies of scale are primarily achieved through the specialization of labor, diseconomies of scale primarily result from the inefficiencies inherent in the growing hierarchical structure of larger organizations (McAfee and McMillan 1995). Due to the limitations of span of control, as an organization grows, additional organizational layers must be added to insure that individual supervisors are able to support the individuals reporting to them. Knowledge is dispersed among the various individuals within an organization (Hayek 1945). This knowledge, in the form of scientific expertise as well as circumstances related to how the organization carries out its function, is pervasive throughout the organization. As an organizational hierarchy grows, the distance between the individuals with necessary knowledge and the individual who makes the strategic decisions increases, and as a result, strategic decisions reflect less of the necessary information in larger organizations. McAfee and

McMillan (1995) propose the utilization of the Japanese style production as a method to reduce the negative impact of a large hierarchy. In the Japanese method, production occurs through a chain of subcontractors who interact directly without reporting up a chain of command.

Public Choice Theory Literature

The decisions made by individuals on behalf of larger groups are the focus of public choice theory. While economics begins with the assumption that individuals make decisions solely in their own best interest, traditional political theory is based on an assumption that politicians act based on the needs of the voters they represent. Public choice economists begin with an assumption that the main motivation of all decision makers is their own personal self-interest (Shaw 2008).

Duncan Black (1948), who is often credited as the father of public choice theory, first raised the issue of the gap in current political theory. Decisions that are made in a group setting are done so by individuals who are not in complete agreement. He began with the assumption that members of a voting committee have preferences between options proposed and that the preferences can be ranked. Each member can be expected to vote for the option that he/she is most interested in. In the end, resolutions will pass that are favored by the majority of the deciding committee and are not in conflict with other resolutions that the committee members value more highly.

The initial concepts of Black assumed single preferences. A is preferred over B therefore A is chosen. Pierre Lemieux (2004) describes a concept called cycling as a natural progression from Black's concepts. While A may be preferred over B, C may be preferred over A and yet B may be preferred over C. In group decisions deciding between multiple factors, the preference for not having a given outcome may be the deciding factor in which is chosen.

When issues become too complex for Black's theories or cycling to be utilized in decision making, the median voter theory takes effect where the interests of the median voter are utilized as the guiding factor in decision making. Voters select politicians to represent them that are closest to representing their interests. They do not hold out waiting for a politician that perfectly matches their opinions. Therefore, politicians tend to present their opinions such that they represent a sufficient percentage of the population. Eventually all politicians would "move towards the center" and represent the median voter. The end result is that only the median voter has their interests represented. All other voters have a moderate level of dissatisfaction (Lemieux 2004).

Charles Tiebout (1956) focused on the choices that individuals have with regards to local governments as compared to national government. Tiebout postulated that local governments are able to provide specific services that are more reflective of the interests of the population served than is possible for the national government. Local governments have the ability to provide a range of services. Residents and potential residents, in their role as a "consumer-voter" have the ability to select the community most closely matching their preference for level of service as well as level of taxation.

Tiebout (1956) based his theory on seven assumptions. First, consumer-voters are able to move to the community where their preferences are most closely matched. Second, consumer-voters have full knowledge of the differences among the available communities. Third, there are a large number of communities available for consumer-voters to choose. Fourth, employment restrictions are not considered. Fifth, no economies of scale can be maximized through collaboration between neighboring communities. Sixth, there is an optimal community size for providing the services preferred by the existing residents. Seventh, communities with a

population below the optimal size seek to lower the cost of providing services by attracting new residents.

Arguments against the Tiebout model begin with questioning the initial assumptions. According to Lowery and Lyons (1989) the assumptions that individuals are aware of the level of services available and that they consider these factors when making community selection decisions. The Tiebout model is further based on the assumption that citizens will leave a community as a result of their dissatisfaction with the mismatch of the service and tax level and their personal preference. The decision to move to another community is based on many factors including the significant cost of relocation, which could exceed the financial impact of the level of taxes imposed for undesired services.

Gordon Tullock (1969) presents the treatment of mosquitos in the 1950's and the 1960's as examples of public choice theory in practice. In the 1950's example, the negative effects of DDT were not known, therefore, the decision of treatment for mosquitos was simplified to the question of: should an individual treat their own property at a cost of $1.00 or should the town hire a plane to treat the entire town with household cost of $0.05? When most of the residents in the town agreed that the value of treatment exceeded $0.05, the plane-distributed method was clearly the more cost effective option. The contract to have the treatment applied to the entire town must be initiated by the town government since each individual in the town would logically opt out of participating in the cost if they were confident that others would pay for the treatment and they would still receive the value of treatment.

In the 1960's the situation changed. As a result of the problems that became apparent with aerial spraying, the cost of consolidated treatment increased significantly. While the cost per household for consolidated treatment remained below the average amount that an individual

would be willing to spend on treatment, it exceeded the amount that some would find acceptable and did not provide as much treatment as others would be willing to purchase. Tullock stated that many welfare economists would conclude that as long as the value to society exceeds the cost as a whole, the consolidated treatment should be undertaken.

Vincent and Elinor Ostrom (1971) sum up the then developing new branch of public administration officially named public choice which is based on four basic assumptions. First, individuals are self-interested in that the decisions they make are based on their own unique preferences. Second, individuals are rational and they rank alternatives as described by Black. Third, individuals adopt maximizing strategies where the maximum net benefit from multiple opportunities is sought. Fourth, individuals factor in uncertainty and risk into the decision making process and choose options that result in the best alternative after adjusting for the probability of the various outcomes.

Public goods are, by definition, goods where the benefit cannot be limited to those who pay for them. Rational individuals would always avoid paying for public goods if given the choice since they would be able to realize the benefit without cost (Tullock 1969). Public goods, therefore, must be funded collectively with decisions made by individuals on behalf of the broader group. Individuals participate in voluntary associations in pursuit of the public interest when the individual expects to achieve sufficient personal benefit beyond the amount that would have received had they not participated. As a result, each individual will maximize his net welfare at the minimum personal cost. There is no incentive to maximize the benefit/cost ratio for others (Ostrom and Ostrom 1971).

Individuals who receive public goods without paying for them are referred to as free riders and form the primary challenge in providing public goods. The decision to pay for public

goods is independent from the decision to utilize and consume the goods. As a result, when free riding becomes the dominant strategy of individuals and public goods will only be provided when the paying for the provision of the goods can be mandated by a coercive state apparatus (Runge 1984). Runge also identifies examples where individuals voluntarily contribute resources to the provision of public goods for reasons.

Applied Literature Review

In the previous section, the principles of rational choice theory, public choice theory and economies of scale were developed in a broad perspective. In this section, existing literature directly related to the formation of police forces and the collaboration of forces is examined. The applied literature will begin with literature related to the formation of police forces and the application economies of scale concepts to determine the optimal size range for a police force. The literature related to municipal collaboration will be explored as well as the barriers to collaboration. Examples of collaboration between police forces and the benefits achieved will also be explored. Literature specifically related to police force collaborations within Pennsylvania will be emphasized in the applied literature section.

Police Force Formation

The decision to implement a new police force should be based on three factors according to the Guidelines for Starting and Operating a New Police Department published by the U.S. Department of Justice (Spence, Webster and Connors 2006). These factors include the rational and cost-effectiveness of operating a force, the level of citizen and political support for operating a force and the range of available options for satisfying the community's need.

Based on a survey by Spence, Webster and Connors (2006), the factors that are associated with the decision to implement a police force typically include dissatisfaction with current services including slow response times, lack of police visibility, unacceptable style of policing, lack of desired services and lack of control by local government and community. Recent and anticipated population growth is also typically a factor in the decision to implement a new force, as is the nature of the growth increase in population density versus annexation of a neighboring area as an example.

The wrong reasons to implement a police force include personality conflicts between the elected leadership and the current sheriff, the mishandling of an individual event and the public concern resulting from a single significant crime. Additionally, police forces should not be implemented when the concept is the pet project of a single individual or a small group of citizens or elected officials. The implementation of a police force is a long-term commitment requiring the resources of the entire community and as such should not be done as a response to a temporary situation or to a situation that does not impact the community as a whole (Spence, Webster and Connors (2006).

Disadvantaged neighborhoods, as defined as those with high poverty rates and structural disadvantages typically have high crime rates, which results in an increased need for policing (Krivo and Peterson 1996). The need for increased policing is better served with a local force where the needs of a specific community can be addressed. Structural disadvantages include the absence of local middle class role models, the absence of local employers and a high prevalence of vacant properties.

Police Force Economies of Scale Literature and Minimal Optimal Force Size

Like other industries and services, the provision of police protection is most cost effective when provided in a jurisdiction at a certain level of population. Below this optimal point, economies of scale can be maximized by expanding the jurisdiction. Above the optimal point, increases in the jurisdiction size result in a greater than proportionate cost per resident protected.

Economies of scale are dependent on the type of service provided according to Holzer and Fry (2011). Capital-intensive services such as water supply require a substantial infrastructure that when allocated across a large population base can be provided at a lower cost per resident. Labor-intensive services, such as neighborhood police patrol, do not benefit from economies of scale beyond a comparatively low optimal point since two police officers are not likely to produce a greater quantity of service than a single officer. Diseconomies of scale occur as the size of a police force grows beyond the optimal point resulting in an increasing demand for management and other support functions which is not offset by an increase in individual officer efficiency. Economies of scale do exist in police forces when excess capacity can be consumed by a larger population base thereby spreading existing costs (Holzer and Fry 2011).

In a study conducted by Southwick (2005), of New York police forces, the optimal point is 22,350. Below a population of 22,350, crime rates and cost of protection is greater than it is had the police force served a population over 22,350. Between a population of 22,350 and 36,000, increases in population served results in increasing crime rates while the cost of protection continues to decrease. Above a population of 36,000 both crime and cost increase with population growth. Southwick recommends that police forces that serve less than 22,350 individuals should attempt to incorporate others not currently served into their jurisdiction or consider merging with other police forces. At population levels above 36,000, consideration

should be given to dividing the police force jurisdiction into separate forces to optimize both the cost and effectiveness of the service.

Numerous other studies have concluded that cost of police protection increases as population increases indicating that there are diseconomies of scale in the provision of police protection. The studies where diseconomies of scale were identified were based on a population base that significantly exceeds the average Pennsylvania municipality size. As an example, a study of municipal police services conducted in the 1960s in Illinois determined that based on the sample of 31 cities with populations ranging from 22,000 to 143,000; there are no economies of scale in police protection, contrary to the research hypothesis (Walzer 1972). A study conducted in the 1960s in Ohio, Texas and New Jersey in cities ranging in size from 25,000 to 250,000 analyzing the cost per capita for general control, highways, sanitation, parks, fire and police. In this study, it was concluded that there are diseconomies of scale in the provision of each of the areas with the exception of highways and general control where economies of scale were identified (Gabler 1969). A study to determine if the police force consolidations within Los Angeles County, which were implemented to maximize economies of scale actually realized the intended costs savings. The study concluded that diseconomies of scale were identified as cost per capita increased as a result of consolidation. The mean population of the fourteen police force examined was 96,474 (Finney 1997).

The Governor's Center for Local Government Services cites the 1973 National Advisory Commission on Criminal Justice Standards and Goals that concludes that police forces with less than ten full-time officers should consolidate with neighboring forces (Regional Police Services in Pennsylvania, 2010). The 1973 report quantified the size of a police force that has too few officers to provide full patrol service. Previous to this report, other federal reports failed to

identify the minimal size of a force and simply stated that forces should consolidate that are too small to operate efficiently. The National Advisory Commission (NAC) quantified the minimal size of a police force to counter the growing body of literature that concluded that consolidation of police forces did not result in economic savings. The NAC quantified the minimal size of a police force to establish a clear point where below which consolidations do produce economic benefits (Skoler 1977).

The minimum size of a police department is calculated by the Local Unit Alignment, Reorganization and Consolidation Commission (LUARCC) (2010) as a police force that has eleven officers. LUARCC was formed to support local governments in New Jersey. The commission determined that police forces should always have two officers on duty to provide a backup in the event of a threat to the responding officer. The commission's calculation is based on the number of officers necessary to have two officers on duty at all times and accounts for necessary vacation, sick, holiday and training time.

The LUARCC commission then took the average number of officers per 1,000 residents in the northeast as cited by the Federal Bureau of Investigation (FBI) of 2.7 officers per 1,000 residents and determined that municipalities with a population of less than 3,700 should consider the possibility of consolidating their police force with other communities.

In Pennsylvania, according to the FBI Full Time Law Enforcement Employees report for Pennsylvania, there are 1.95 officers per 1,000 residents in the State as a whole. When excluding Philadelphia and Pittsburgh, the ratio is reduced to 1.44 officers per 1,000 residents. Based on the officer to resident ratios, the minimum number of residents served by a police force should be 5,600 or 7,600 residents.

With the median population of Pennsylvania's municipalities at 1,905 according to the 2010 US Census, the vast majority of the municipalities are below the efficient point to support an independent police force as determined by Southwick and the majority of municipalities are below the size calculated by the LUARCC commission. Additionally, according to the data reflected in the Municipal Police Service Report (2012) published by the Governor's Center, of the 1,005 non-regional police forces in the State, 626 (62.6 percent) have fewer than ten full time equivalent officers and an additional 57 (5.7 percent) have ten to eleven officers. Only 322 (32.2 percent) have greater than eleven officers.

Police Force Collaboration within Pennsylvania

Two case studies have been published that have examined consolidated of police forces within Pennsylvania. The Pennsylvania Governor's Center for Local Government Services published a Police Peer Project (Yablonsky, Reddig and Gamble, 2006) which analyzed the West Hills Regional Police Department and Krimmel (1997) analyzed Northern York Regional Police Department, which was the first Pennsylvania consolidated police force. Both Pennsylvania based studies concluded that through collaboration, the level of service provided could be enhanced at the same time the cost of protection can be significantly reduced. The cost savings was calculated to be 28 percent in the West Hills case study (Krimmel 1997) and 24 percent in the Northern York case study (Yablonsky, Reddig and Gamble, 2006).

Krimmel (1997) identified the advantages of consolidated police force as providing smaller municipalities the opportunity to take advantage of the benefits available to larger areas without the cost of supporting a large force. As an example, Krimmel indicates that crime labs and specialized police services in particular are not available resources for the smaller forces. He further indicated that the supporting cost such as centralized record keeping and administrative

support of police protection can be more cost effective when spread across a broader population base. As a result of consolidation, the West Hills Regional Police Department has specialists on staff including a Special Emergency Response Team Training Officer, Crime Prevention Officer, Certified Firearms Instructor and a Certified PennDOT Truck Inspector. Each of these specialties would not be available had the individual municipalities not work in collaboration (Yablonsky, Reddig and Gamble, 2006). The Northern York force has also been able to specialize and now provides a canine unit, an investigations unit as well as a juvenile specialist that would not have been possible had the municipalities not provided services in collaboration (Krimmel 1997).

The consolidation of police forces does not mean that the local services that make small town life unique are eliminated. The West Hills Regional Police Department continues to provide school crossing assistance, delivery of mail to councilors/supervisors and provide a police presence at festivals, school functions and sporting events (Yablonsky, Reddig and Gamble, 2006).

The most challenging aspect of determining the financial benefits of collaboration is identifying the counterfactual comparison; the cost of providing the exact same services for the specific municipalities had they not collaborated. No two municipalities provide the same services and one of the greatest benefits of consolidation is the expanded services available to municipalities through collaboration. As a result, it is difficult to separate the cost savings from increased services through collaboration. While acknowledging the difficulty of the proposition, both studies identified similar municipalities that provide as similar level of service and in the same general area as possible to the subject of their studies. The West Hills force was compared to four similar municipalities that the study did not identify (Yablonsky, Reddig and Gamble,

2006) while the Northern York force was compared to eight similar municipalities in Lancaster, the neighboring county with similar demographics and services (Krimmel 1997).

Krimmel (1997) calculates the cost of police protection to be 28 percent less per resident in the municipalities covered by the Northern York consolidated force than in the comparison group of municipalities with the same geographic area, population density and other factors. While the total cost of service is lower, the cost per police officer is 13 percent higher in the consolidated force. The higher cost per officer is most likely a result of a combination of factors including better accounting for costs in the consolidated forces, higher wages and benefits paid to officers and shared resources that are not present in the single municipal forces. The consolidated force operates with 37 percent fewer police officers (33 versus 52) and 56 percent fewer police cars (14 versus 32).

Yablonsky, Reddig and Gamble (2006) calculate the cost of police protection to be 24 percent less per resident in the municipalities covered by the West Hills consolidated force than the comparison group of independent municipalities. The cost per police officer in the consolidated force is 18 percent higher than in the average cost in the independent forces. The West Hills consolidated force operates with 39 percent fewer police officers (15 versus 21) and 30 percent fewer police cars (9 versus 6).

A third research study was published in August 2012 by the Police Executive Research Forum. In this report, the potential cost savings associated with the potential consolidation of various combinations of nine municipalities within York County Pennsylvania. This study selected the municipalities for analysis based on jurisdictions that were willing to participate in the study within the county. As a result, the municipalities reflected in the study were demographically dissimilar. They ranged from York City with a population of 59,000, a 49

percent minority rate and a median household income of $26,475 to Mt. Wolf Borough with a population of 1,389, a 5 percent minority rate and a $42,135 median household income. The study found that the municipalities had varying policing needs as a result of the varying demographics.

The Police Executive Research Forum (2012) study concluded that a savings of 9.05 percent could be achieved by consolidating all police forces in the study; alternately, a 10.73 percent savings could be achieved by consolidating all but the two most urban municipalities. The potential savings, the study concluded, could be achieved by reducing personnel within a consolidated force. The reduction is primarily a result of the elimination of a police chief in each force.

Collaboration between Local Governments

The Tiebout model, which concluded that municipalities would cater services to attract consumer-voters, presents an excellent argument for municipal independence to the extent that the assumptions inherent in the model are true. Specifically the fifth assumption, which requires that no economies of scale can be maximized through collaboration between neighboring communities, is seldom accurate.

There is a significant body of research into interlocal cooperation where municipal governments collaborate to provide services at a lower cost than can be achieved by providing services independently. While the arrangement may be either voluntary or involuntary, involuntary arrangements are excluded from the majority of the literature since they exclude the process of the decision to collaborate. Collaboration can be formal or informal and either short or long term. They can be in the form of a purchase of service agreement where one municipality

simply purchases the services of another with no joint control or it can result in the transfer of authority to a newly created entity (Andrew 2009).

Voluntary interlocal agreements present unique challenges to local governments since they require cost sharing which often results in the cost of one municipality being covered by the taxpayers of another municipality (Feiock 2008). In addition to cost sharing, interlocal agreements require municipal leaders to share control. While control is shared between municipalities, agreements to provide services cooperatively maintain the autonomy of the individual jurisdictions (Andrew 2009).

Collaboration between municipalities including interlocal agreements and partnerships reduce per unit costs and increase the level of service available to residents by providing services in voluntarily created governance mechanisms (Feiock 2008). Economies of scale are often the primary motivation for establishing interlocal agreements (Bish 2000). Collaboration can also be an effective mechanism to address regional issues where many jurisdictions are impacted and a solution is not possible without a consistent regional solution (Feiock 2008).

While collaboration can reduce the cost of providing services and has the potential to increase the quality of service delivery, local officials often perceive the cost of collaboration to exceed the benefits obtained (Feiock 2008).

The self-interest of the participants in the negotiation process creates a significant non-financial cost to the process of collaboration. Administrative employees are likely to oppose collaboration that reduces their autonomy while managers may seek opportunities for efficiencies to advance their own careers (Kwon and Feiock 2010). Elected officials, on the other hand, have no incentive to advocate for the interests of voters outside their district (Zeemering 2008).

Collaboration may increase the potential for an agency problem as services are designed to serve the needs of a wider population. The possibility that the decision implemented does not match the majority of the residents' interests increases as a result. The pursuit of agreements for collaborative service may impose a political cost for those that advocate for collaboration when the benefits sought do not match the interests of the residents (Kwon and Feiock 2010). Additional agency problems exist when individual decision makers base their decisions on their personal interests and not on the interests and needs of the residents that they have been elected or appointed to represent (Feiock 2008).

A significant component of the negotiation process centers on identifying the joint benefits and costs to be obtained through the collaboration and determining how the benefits and costs will be allocated. Stronger negotiating partners may attempt to push the benefits to their municipality and reject the costs. Weaker participants may push to receive a disproportionate share of the benefits relative to costs under the assumption that their participation is necessary for the collaboration to be possible. Greater similarity between the partner municipalities and individual participants increases the chance of a successful collaboration (Bingham and O'Leary 2008).

An imbalance in the level of information known to the potential municipal participants may also act as a barrier to establishing a collaborative agreement. An imbalance in information may result in some participants not understanding the potential benefits of collaboration. The imbalance may also lead to distrust between potential participants as those with a limited understanding of the benefits may assume that the other party is acting solely in their own self-interest. The potential imbalance of information is likely to increase with an increasing number of potential participants, geographic dispersion and demographic composition (Feiock 2008).

Ongoing monitoring and enforcement costs are typically identified and estimated in the negotiation process. The possibility that participants in the process may withdraw from the collaboration after the cost of implementation has occurred but before the offsetting benefits have been achieved necessitates a process of monitoring and enforcement. The perceived potential of participants to not honor their commitments and the estimated cost of monitoring and enforcement can be a significant barrier to the collaboration process (Bingham and O'Leary 2008).

To minimize the impact of the challenges to collaboration, Kwon and Feiock (2010) propose a two-stage approach for communities to address the question of collaboration. The first stage is to decide whether to consider collaboration and the second stage is to address the barriers to developing an interlocal agreements. By separating the process into two stages, quantification of the benefits occurs first and the valuation of the benefits is not tainted by the difficulty of achieving the benefits.

The first Kwon and Feiock stage focuses on the demand for collaboration. The demand is centered on the limitations of service delivery effectiveness and efficiencies caused by governmental defragmentation and the need to address the impact of external factors from a broader perspective.

The second Kwon and Feiock stage focuses on the development of the mechanism to satisfy the demand. This stage focuses on agency, negotiation, monitoring and enforcement costs that must be addressed in the development of a collaborative agreement.

Barriers to Collaboration

The barriers to collaboration come from many sources including political perspectives, a tradition of autonomy, the fear of loss of control and the fear of change. Significant barrier to

collaboration are also based on a lack of knowledge by the stakeholders regarding the benefits available through collaboration and a lack of knowledge of the resources available to assist in the process.

Dr. Beverly Cigler conducted a survey in the summer of 2000 which was published in Honadle, Costa and Cigler (2004) examining the perceived barriers to cooperation in Pennsylvania municipalities by interviewing the leaders of 45 local governments. Her analysis focused on the opinions regarding collaborative efforts related to police protection, emergency management, fire protection and libraries. The barrier most often listed is the lack of information regarding the benefits and the alternatives available. Of the forty-five municipalities included in the 2000 survey, sixteen indicated that they had direct experience with inter-municipal agreements. Fourteen of the sixteen municipalities experienced problems in the collaboration process. The problems were categorized as politics, funding and negotiations.

Many of the objections identified by Krimmel are based on misunderstandings or are legitimate concerns that can be controlled in an effective consolidation. Based on the responses from the Pennsylvania survey, Beverly Cigler in Honadle, Costa and Cigler (2004) identified several factors consistent with successful efforts to provide services collaboratively including: 1) Information regarding the process needs to be more readily available. 2) Model agreements should be developed and made available. 3) State financial assistance should be made available to fund the initial start-up costs of inter-municipal agreements. 4) Municipalities need to know their own cost of service to calculate cost advantages. 5) Local unions, citizens and volunteers should be informed and involved in the process.

Complexity of the potential consolidation is a significant barrier to a successful consolidation (Holzer and Fry 2011). Complexity adds to the cost of consolidation and if ignored

could result in the development of an inappropriate structure that does not meet the needs of the community. Addressing the complexity of a consolidation adds to the research and development cost of developing the business case for the consolidation. Complexity can be based on the demographic dissimilarity of municipalities considering collaboration and the increase in the spectrum of services to be provided which are not required for individual participants.

Krimmel (1997) identifies the barriers to collaboration in creating the Northern York Regional Police Department as stemming from a strong history of autonomy. Members of the community, the elected and staff officials as well as the police officers, value the unique characteristics of the community and want to avoid changes that would result from providing consistent services throughout a broader area. In the smaller municipalities, the police officers are seen as providing a community service where making arrests is only a small part of the responsibility. It is feared that the community service component would not be possible through a multijurisdictional force.

Police protection is often the largest part of the budget of smaller municipalities and the elected officials often are reluctant to give up their greatest area of control. Police officers are concerned about the possibility of the loss of their jobs when they are likely to work for a new chief. The citizens often fear that the cost of larger force will be passed on to them as taxpayers. In general, there is a fear of big government and a consolidated police force is a clear step towards big government (Krimmel 1997).

The Police Executive Research Forum (2012) study identified seven barriers to consolidation in their study of York County municipalities. 1) A concern that police coverage in areas with less crime would be reduced as officers respond to crimes that occur in the more urban areas within the consolidation. 2) Community members would lose the relationship they

have with the officers that currently serve the community. 3) The community identity would be diminished as officers from other areas patrol their municipality. 4) The culture of the local police department and the style of policing would be jeopardized through consolidation. 5) Officers, especially the senior officers fear for the potential loss of their jobs through consolidation. 6) Officers are concerned that they will suffer reduction in wages, benefits or advantages of seniority as a result of consolidation. 7) Officers are concerned about changes in working conditions resulting from changes in coverage area, supervision and so on.

Literature Review Summation

Through exploration of rational choice theory it is learned that individuals and groups will make choices that are in their best interest. From organizational theory it is learned that the cost of providing a service such as police protection can be decreased and the quality of service can be increased by having individual employees specialize in specific aspects and have others specialize in other aspects. As the number of individuals served by a police force increases, specialized equipment can be purchased further enhancing the quality of service provided and making the individual officers more efficient. From the discussions of economies and diseconomies of scale it was learned that the optimal service delivery level for police protection is lower than for many other products and services. This is due to the heavy reliance on individual officers and the fact that expansion results in additional administrative structure, the cost of which is not offset by increased utilization of shared fixed costs such as equipment. The optimal service delivery level by one estimate is between 22,350 and 36,000. Additionally, it is learned that the minimal optimal police force size is one that includes ten or eleven officers.

Police protection in Pennsylvania is provided through over 1,000 separate police forces, most of which are significantly smaller than the size necessary for economic efficiency. The purpose of this research is examine the differences between the municipalities that rely on the State for protection as contrasted to those that provide protection to their residents and the differences between the municipalities that provide protection independently as contrasted to those that do so in some form of collaboration.

Chapter 3 – Research Methods and Procedures

This research will determine the extent that the decision to provide protection to residents, as opposed to relying on the State, is consistent with an empirical model based on factors derived from the literature. The extent that municipalities that provide protection to their residents independently versus doing so in collaboration with other jurisdictions will then be compared in separate empirical mode.

After determining the extent that the decision to provide protection and the decision to provide protection in collaboration are based on the empirical models, other potential determinants will be examined from available federal and state published information to identify other factors that are correlated with the type of protection provided. By determining the prominent characteristics of the municipalities in each group, future efforts to encourage collaboration can be redirected to more effectively encourage collaboration.

Research Questions:

Research Question 1: To what extent is the decision of Pennsylvania municipalities to provide police protection to residents versus relying on the State for protection consistent with an empirical model based on factors derived from the literature?

The first research question will test the predictive value of variable derived from the literature in predicting whether a municipality will provide protection to their residents or rely on the State for protection in a logistic regression analysis. The dependent variable will be whether a municipality provides police protection to residents or not. The independent variables can be grouped into two assumption groups. The first assumption of the empirical model is that municipalities that have the greatest need for police protection will provide protection to their

residents. The second assumption is that municipalities that can afford to provide protection will be more likely to do so.

The need for police protection will be quantified, in part, by the property and violent crime rates. The rate of crime is reflected as an important factor related to the establishment of a police force according to the Guidelines for Starting and Operating a New Police Department (Spence, Webster and Connors 2006). Additionally, the rate of poverty and the percentage of vacant homes in a given community are associated with the need for policing (Krivo and Peterson 1996), and therefore, are reflected in the model as predictor variables in the need for police protection assumption of the empirical model.

Population density, number of residents and the amount of government spending per resident on other services is utilized to measure a municipality's ability to absorb the cost of police protection. These factors are included in the empirical model based primarily on the Guidelines for Starting and Operating a New Police Department (Spence, Webster and Connors 2006), where it can be inferred that these factors should be taken into consideration in the decision to start a police force. It is assumed that municipalities with higher number of residents will be able to spread the cost across a broader population base and therefore be able to absorb the cost. A higher population density would indicate that the cost of providing protection would be lower per resident than if the population was widely dispersed for municipalities that are smaller than the optimal size to support an independent police force. The level of government spending on other services per resident is used as evidence of a willingness and ability to provide a range of government services. Other factors, identified by Spence, Webster and Connors, such as community dissatisfaction with current services, are not quantifiable using the existing data and will not be evaluated in this research.

Table 1 - Research Question 1: Empirical Model

Research Question 1: Empirical Model							
	The Decision to Provide Police Protection to Residents						
Research Question	To what extent is the decision of Pennsylvania municipalities to provide police protection to residents versus relying on the state for protection consistent with an empirical model based on factors derived from the literature?						
Dependent Variable	Provide Local Police Protection						
Dependent Variable Name	HAVE_PF						
Dependent Variable Values	Rely on the State for Protection = 0 Provide Local Police Protection = 1						
Predictor Variable	Violent Crime Rate	Property Crime Rate	Other Government Spending per Resident	Poverty Rate	Vacancy Rate	Population Density	Number of Residents
Variable Name	CRIME_VIO	CRIME_PROP	O_SPEND	POVERTY	VACANCY	POP_DEN	NO_RES
Predicted Relationship	+	+	+	+	+	+	+

Research Question 2: For the Pennsylvania municipalities that provide protection to their residents, to what extent is the decisions to provide police protection independently versus providing protection in collaboration with neighboring jurisdictions consistent with an empirical model based on factors derived from the literature?

The second research question will test the predictive value of the variables derived from the literature in predicting whether a municipality that provides protection to their residents does so independently or in collaboration with neighboring jurisdictions. The dependent variable will be whether a municipality provides police protection to residents independently or in some form of collaboration. The independent variables are grouped in three assumption groups. First, smaller municipalities that provide police protection will be more likely to collaborate in the provision of the service. Second, Municipalities with a greater number of municipalities in which to collaborate will be more likely to collaborate. Third, municipalities that are demographically similar to their neighbors are more likely to collaborate.

Smaller municipalities will be measured by the number of residents, which should be inversely related to the decision to collaborate. Municipalities with a lower number of residents have the most to gain from providing protection in collaboration in both financial savings and increased ability to provide a more comprehensive spectrum of services. Based on the literature, the benefits and probability of success for collaborations increases as the municipalities are both geographically close and demographically similar. Therefore, the number of nearby municipalities and the number of nearby municipalities with police forces (independent or collaborative) will be considered predictor variables in the second assumption group. To quantify the municipalities that are demographically similar to their neighbors for the third assumption group, the variation in household income, percentage of rental properties, population density and minority percentage will be utilized as predictor variables.

Table 2 - Research Question 2: Empirical Model

	Research Question 2: Empirical Model						
	The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions						
Research Question	For the Pennsylvania municipalities that provide protection to their residents, to what extent is the decisions to provide police protection independently versus providing protection in collaboration with neighboring jurisdictions consistent with an empirical model based on factors derived from the literature?						
Dependent Variable	Provide Protection in Collaboration						
Dependent Variable Name	SHARE						
Dependent Variable Values	Provide Protection Independently = 0 Provide Protection in Collaboration = 1						
Predictor Variable	Number of Residents	Number of Nearby Municipalities	Number of Nearby Municipalities with Force	Variation in Household Income	Variation in Property Rental Percentage	Variation in Population Density	Variation in Minority Percentage
Variable Name	NO_RES	NO_NEAR	NO_NEAR_PF	HOUSE_INC_VAR	RENT_VAR	POP_DEN_VAR	MIN_VAR
Predicted Relationship	-	+	+	-	-	-	-

Calculation of Mean Difference and Statistical Significance

The first step in testing each empirical model will be the calculation of the mean and standard deviation of the independent variables when separated by the possible dependent variable outcomes. The difference in the means is calculated and the statistical significance of the mean difference as calculated using the t-Test of Significance. Initially the models will be tested with all variables determined to have a statistically significant mean difference. A second model will be developed excluding those variables that, while statistically significant, the direction of the difference is contrary to the model assumptions. The second model, when compared to the first, will assist in the determination of the importance of these contrary variables in predicting the outcome.

Logistic Regression Analysis

Each empirical model will be tested utilizing binary logistic regression analysis. Logistic regression is based on the logit or the natural logarithm of an odds ratio between two dichotomous outcomes (Peng, Lee and Ingersoll 2002). Logistic regression calculates the probability of achieving an outcome based on independent variables acting as predictors. It can also be utilized to determine the strength of the relationship between the predictor variables and the outcome. Logistic regression does not assume a linear relationship between the dependent variable and the predictor, independent variables. A linear relationship is not possible for a dichotomous variable. A critical assumption of logistic regression is that the dichotomous dependent variable must be exclusive and exhaustive. Unlike a linear regression, where the formula predicts a given value of an expected dependent variable, logistic regression returns the probability of the outcome being in one of the two outcome groups (Burns and Burns 2008).

The logit probability formula shown in table 3 below utilizes the maximum likelihood method to determine the expected outcome based on the predictor variables. The formula is based on the exponential function (exp) which is the opposite of the natural logarithm (Burns and Burns 2008).

Table 3 - Logistic Regression - Logit Probability Formula

Logit Probability Formula

$$p = \frac{exp^{(a + b_1x_1 + b_2x_2 + b_3x_3\ldots)}}{1 + exp^{(a + b_1x_1 + b_2x_2 + b_3x_3\ldots)}}$$

Where:

p =	the probability that a case is in a given category
exp =	the base of natural logarithms 2.718281828459
a =	the constant of the equation
b =	the coefficient of the predictor variables
x =	the predictor variable

Source: Burns and Burns 2008

For each research question, a logistic regression analyses will be calculated based on the variables from the empirical model that are determined to have a statistically significant mean difference in the direction projected by the model.

The logistic regression analysis conducted as part of this study was preformed utilizing IBM SPSS Statistics, Versions 20, Release 20.0.0, Copyright 2011 in the Windows 7 professional 32-bit environment. The calculation of variables will be conducted in Microsoft Excel 2010.

The first step in analyzing the results generated by SPSS will be to calculate the expected outcome based on the percentage of each of the two possible dichotomous outcomes independent of the impact of any predicting variables. This model will later be compared to the logistic regression model reflecting the impact of the predictors (Burns and Burns 2008).

The model developed will be tested to determine the fit of the model and its significance in predicting the outcome based on the existence of the predictor variables. Cox & Snell R square as well as Nagelkerke R square will be calculated to determine the percentage of the variation in results that is predicted by the logistic model. Cox & Snell and Nagelkerke are approximations of R square (Burns and Burns 2008).

A classification table will be generated of the logistic regression model. The classification table will be a cross-tabulation between the actual observed outcome and the model-calculated outcome. From this table, it can be determined the overall percentage of outcomes correctly predicted as well as the rates of false positive and false negative predictions. Each independent predictor variable will be evaluated for significance. The variables determined to be statistically significant will be reflected in the logit probability formula.

Collinearity of Predictor Variables

Collinearity is the correlation between independent variables. Multicollinearity refers to perfectly correlated variables. When there is a significant correlation between independent variables in a model, it is difficult to determine the impact of the individual variables while there is no impact on the output or reliability of the model as a whole. In the extreme example of multicollinearity, an infinite number of combinations of coefficients are possible (Menard 2002).

Collinearity becomes an issue when one of the variables in the equation is a risk factor and another correlated variable is not. Since it is difficult to separate the impact of two correlated variables on a predicted outcome, the model may attribute incorrect percentages of the outcome variance to the individual predictor variables. While the outcome is accurately projected, the impact of the individual variables on the outcome is not (Peng and So 2002). This is not a factor in this research since the intent of the research is to identify correlation and not causation.

Menard (2002) determined that the variables with an r square of greater than 0.80 have a high level of collinearity may pose a problem while variables with an a square of greater than 0.90 have a very high level of collinearity and are almost certain to result in inaccurate coefficients in the logistic regression model.

When the final models are developed for each research question, the degree of collinearity between each combination of independent variables remaining in the formula will be examined and the impact of collinearity will be discussed. Beyond discussing the impact of variables with a high degree of collinearity, there is no solution to eliminate the problem. When it is determined that collinearity has an impact on the model, the variables affected should be considered together and independent conclusions should not be drawn (Menard 2002).

Data Utilized for this Study

This study will be based exclusively on existing data published by either the federal government in the US Census or the American Community Survey (ACS) or State government made available through the Pennsylvania State Police and the Pennsylvania Governor's Center for Local Government Services within the Pennsylvania Department of Community and Economic Development.

Census Data

The US government takes a count of every individual living in the Unites States every ten years and has done so since 1790. The primary purposes for the census counts are to distribute congressional seats and determine legislative boundaries (2012 Census Data Workshop). The count is also utilized for the distribution of federal and state funding and other governmental resources. In addition to determining the number of individuals residing in a specific location, the census asks questions which are of a broad public interest of every resident (2012 Census Data Workshop). The count of 2010 will be utilized to for this study to determine current population and demographic information for all variables reflected in the 2010 Census. The 2000 Census count will be utilized to calculate population growth.

American Community Survey

The American Community Survey (ACS) replaces the long form of the Census, which was included in census counts prior to the 2010 census. The long form was sent to one of every six households in the United States and compiled information related to the individuals residing in the country on sampling basis. The long form reflected questions that, while important, were not required by legislation to be asked of every individual in the country. Like the Census, the long form sampling was obtained each decade and as a result could be as much as ten years old at the time of use. The federal government replaced the long form with a continuous sampling survey beginning in 2006. Each month, the ACS is mailed to 250,000 addresses nationwide. No address will be selected for the survey more often than once every five-year period. Additional steps are taken to obtain responses from households that fail to respond to the survey. Response

to the survey is mandatory under federal law and respondents are required to answer all questions (2012 Census Data Workshop).

While the American Community Survey is compiled annually, the annual estimated results are only published for communities with a population over 65,000. Three-year estimates are published for communities with populations over 20,000 and five-year estimates are published for all communities. As a result, neither the one nor three-year estimates are adequate for utilization in this study since the vast majority of the municipalities in Pennsylvania have a population below both 65,000 and 20,000. Five-year data is published in December of the following year (2012 Census Data Workshop). Therefore, all ACS data utilized in this study will be based on the ACS 5-Year Estimates based on the survey results from the period 2006 to 2010.

The ACS is useful to identify the social, economic, housing and demographic characteristics of the population. Since the data is from a survey and not a census, the results are estimates and not exact amounts and are often reflect the percentage of a given population matching specific criteria. When information is available in both the census and the survey, census data will be utilized since it reflects all individuals and households and not a sampling of individuals and households.

Crime Data

The Pennsylvania State Police maintains the Pennsylvania Uniform Crime Reporting and National Incident Based Reporting System (PA UCR/NIBRS) for the State. The system is web based and facilitates both automated data entry from police departments within the State as well as a comprehensive source of crime information for various end users. The reports available to the public are in table format where all data for the selected summary level is reflected in a single

table. Data is available for individual police forces, summarized by county or for the State as a whole (Pennsylvania Uniform Crime Reporting System).

The data captured by the PA UCR/NIBRS system by police force and not individual municipality (Duckman 2012). As a result, the crime rates for individual municipalities without independent forces are not available. Additionally, the crime rates for municipalities that participate in regional police forces are reflected as the crime rate for the regional police force. The crime rates for areas covered by the State Police are reported by individual station. Each station is contained within a single county. All counties have at least one State Police station and many have several. In 2011, there were 144 State Police stations reporting crime statistics. Crimes that occur in municipalities that do not have independent or regional police coverage have been calculated in the crime rate for the State Police stations within the county. Crimes are also reported by the State Police that occur in municipalities where the State Police acts as back-up to the local police and for crimes that occur beyond the operating hours of the local police force. This is particularly apparent in the reporting of violent crimes where the local force may not have the expertise to investigate and solve some types of violent crimes due to limited resources.

Also reflected in the PA UCR/NIBRS database are crimes reported by police forces that are countywide services or provide protection to non-municipal entities. These forces, categorized as other in Table 4 below, include 800 reporting entities within the State and include state and county services such as Liquor Enforcement, Forestry, Organized Crime, Computer Crime, Narcotics and Sheriff Offices. Also included in other are police forces for colleges and universities, railroads and larger public school systems.

For this study, crime rates are calculated by county excluding cities, the countywide forces will be allocated to the county as a whole and forces not related to local protections will be ignored. The total number of crimes of each type in a given county is divided by the number of residents and multiplied by 10,000 to calculate the number of crimes per 10,000 residents.

Items captured from the PA UCR/NIBRS database include violent crimes, property offenses, arson, drug violations and other crimes. Violent crimes include homicide, sex related offenses, robbery and assaults. It is important to note that the database is a live data source and is subject to revision by the various reporting police forces. The data utilized in this study was captured on March 8, 2012; therefore, any later corrections made to the data related to the years included in the study are not reflected in the study.

Many of the reporting police forces cover a small population base, therefore, there is a significant possibility that the crime rates for individual police forces may fluctuate significantly from year to year. To minimize the impact of these fluctuations, the crime rates from 2010 and 2011 will be combined and the average of the two years will be used.

Table 4 below summarizes the rate of both violent crimes and property crimes within Pennsylvania for 2010 and 2011 and is broken out by the population served by the force. From the table it is apparent that the rate of both violent and property crimes is greatest for police forces in cities and is lower boroughs and townships. As anticipated, the rates for regional forces are consistent with the rates for boroughs and townships. The table shows the other forces as adding reported crimes without adding additional population. The violent crime rates for the State police stations exceeds the rates for boroughs and townships which is consistent with the assumption that the state police report crimes in municipalities with another form local police coverage. The property crime rate for state police stations is lower than the rates for boroughs

and townships, which is consistent with the assumption that the state police are less likely to be involved in the property crimes in boroughs and townships with another form of local police coverage. While the PA UCR/NIBRS database is the official source of crime statistics within Pennsylvania and is reported to the FBI for inclusion in national statistics, it is not the official source for population data. The 2010 census is the official source of population data. Total population for the State reflected in the PA UCR/NIBRS database is 12,628,858 in 2010 while the total population in the state according to the 2010 Census is 12,702,379, a difference of 0.6 percent. The 2010 Census will utilized for population and the PA UCR/NIBRS database will be utilized for crime information. Likely causes of the differences may include the use of estimates before the official count was available, the possible absence of reported population from some reporting forces and potential double counting for overlapping local and state coverage.

Table 4 - Crime Rate by Police Force Type

Pennsylvania Crime Rates by Police Force Type for 2010 and 2011

		Population	Violent Crimes		Property Crimes	
			Total	Per 10,000 residents	Total	Per 10,000 residents
2010						
	City	3,089,032	78,498	254.1	170,332	551.4
	Borough	2,126,520	17,730	83.4	70,904	333.4
	Township	4,188,227	16,846	40.2	110,135	263.0
	Town	12,873	46	35.7	524	407.1
	Regional	560,010	2,808	50.1	14,818	264.6
	State Police	2,652,196	24,905	93.9	57,127	215.4
	Other	-	2,323		13,248	
	State Total	12,628,858	143,156	113.4	437,088	346.1
2011						
	City	3,075,890	78,405	254.9	167,593	544.9
	Borough	2,165,378	16,708	77.2	68,866	318.0
	Township	4,191,357	16,677	39.8	108,009	257.7
	Town	14,855	55	37.0	418	281.4
	Regional	554,649	2,822	50.9	13,569	244.6
	State Police	2,629,346	23,978	91.2	58,122	221.1
	Other	-	2,050		13,513	
	State Total	12,631,475	140,695	111.4	430,090	340.5

Source: Pennsylvania Uniform Crime Reporting System

Municipal Statistical Information

The Pennsylvania Governor's Center for Local Government Services, established within the Pennsylvania Department of Community and Economic Development was established as a one-stop shop for the local governments within the Commonwealth. The Center's programs are designed to provide efficient access for local governments to the resources available throughout

the executive branch of the State (Annual Report: Governor's Center for Local Government Services 2010).

The Center also works with the local governments to facilitate business and community growth throughout Pennsylvania. To encourage local government operational efficiency, the center provides technical resources including publications related to best practices, trainings, publications. A major initiative of the center is the encouragement of collaborative efforts between municipalities including the collaboration in the provision of police forces. The center reports that there are more police forces in Pennsylvania than any other State and as a result, the majority of the forces are too small to operate efficiently or to be able to provide a full range of necessary police services.

The Center has been designated as the central repository for local government data including tax, financial and demographic. The data collected from the municipalities is made available through the department's website.

The statewide financial data sheet is compiled by the Governor's Center utilizing the annual DCED-CLGS-30 filed by all counties, cities, boroughs, townships and towns within the state. Despite the mandatory requirement to submit the report, the 2009 data sheet does not reflect the reports of 121 of the 2,496 municipalities reflected in the target population for the first research question. To minimize the impact of the missing data, 99 reports from 2008, eleven from 2007 and six from 2006 were added to the data set utilized for this study.

The municipal financial information for the remaining five municipalities with a combined population of 5,607 will be considered missing data in the study. The five include Fallston Borough, Beaver County; Orangeville Borough, Columbia County; Lower Chickester

Township, Delaware County; Carbon Township, Huntingdon County and Sugar Notch Borough, Luzerene County.

Additionally, the Governor's Center has made available the list of municipalities that rely on the State for protection, those that have independent forces as well as those that provide protection in collaboration.

Target Population and Dependent Variables

Target Population and Dependent Variable for Research Question 1

> **Research Question 1: To what extent is the decision of Pennsylvania municipalities to provide police protection to residents versus relying on the state for protection consistent with an empirical model based on factors derived from the literature?**

The target population for the first research question will be all municipalities in Pennsylvania that have the option to provide police protection to residents. The 2010 US Census includes 2,575 municipalities in Pennsylvania including 57 cities, 969 boroughs, 1,547 townships, 1 town and 1 "County subdivision not defined". The 2010 Local Government Fact Sheet includes 2,562 municipalities including 56 cities, 958 boroughs, 1,547 townships and 1 town. The "county subdivision not defined" has no recorded population and is therefore excluded as an error in the Census data. The difference of one city and eleven boroughs represent municipalities that are split between counties, and therefore, are reflected twice in the census count and once on the Local Government Fact Sheet. The list of specific cross boarder municipalities was confirmed with John Maurer of the PA State Data Center.

Cities have been excluded from the study since they are required to provide protection to residents, and therefore, do not do so by choice. Ten of the eleven boroughs that cross county boarders have also been excluded from the target population since several variables are calculated based on the municipality's county, and therefore, the inclusion of these

municipalities would result in inconsistencies. Ashland Borough, which is reflected in the Census data as being in both Columbia and Schuylkill Counties, has not been excluded from the analysis since the Census reflects zero population in Columbia County and therefore the borough population is reflected entirely in Schuylkill County. After excluding cities and the ten boroughs that have Census reported population in multiple counties, there are 2,496 municipalities in the net target population for the first research question. Table 5 below reflects the reconciliation between the number of municipalities reflected in the US Census and the target population for this research.

Table 5 - Reconciliation of the Number of PA Municipalities

Reconciliation between the number of municipalities reflected on the 2010 Local Government Fact Sheet and the 2010 US Census and Calculation of Target Population for Research Question 1

	Cities	Boroughs	Townships	Town	Other	Total
Number of Municipalities from the 2010 Local Government Fact Sheet	56	958	1,547	1		2,562
County Subdivisions as reported in the 2010 US Census	57	969	1,547	1	1	2,575
Errors in Census Data					-1	-1
Municipalities listed in Census twice that reside in two counties	-1	-11				-12
Adjusted Census	56	958	1,547	1	0	2,562
Calculation of RQ1 Target Population						
Number of Municipalities per Fact Sheet	56	958	1,547	1	0	2,562
Cities Excluded	-56					-56
Boroughs that are located in 2 counties (See list below)		-10				-10
Target Population for RQ1	0	948	1,547	1	0	2,496

Error in Census Data

Municipality with a population of zero listed as "County subdivisions not defined, Erie County, Pennsylvania"

Municipalities in two counties	Counties	
Bethlehem City	Northampton	Lehigh
Ellwood Borough	Beaver	Lawrence
Emlenton Borough	Clarion	Venango
Falls Creek	Jefferson	Clearfield
McDonald Borough	Allegheny	Washington
Seven Springs Borough	Somerset	Fayette
Shippensburg Borough	Franklin	Cumberland
Telford Borough	Bucks	Montgomery
Trafford Borough	Allegheny	Westmoreland
Tunnelhill Borough	Blair	Cambria
Adamstown Borough	Berks	Lancaster

Municipality split between two counties with census count of zero reported in one county

Ashland Borough	Columbia	Schuylkill

Table 6 - Have Police Force Dependent Variable for Research Question 1

Dependent Variables

Research Question: **1 - The Decision to Provide Police Protection to Residents**
Variable: **Provide Police Protection to Residents**
Variable Name: **HAVE_PF**
Source: **US 2010 Census and Pennsylvania Police Service Report**

	Total Number of Municipalities	Number that Provide Protection to Residents	Number that do not Provide Protection
Borough	948	697	251
Township	1,547	549	998
Town	1	1	0
Total	**2,496**	**1,247**	**1,249**

Target Population and Dependent Variable for Research Question 2

Research Question 2: For the Pennsylvania municipalities that provide protection to their residents, to what extent is the decisions to provide police protection independently versus providing protection in collaboration with neighboring jurisdictions consistent with an empirical model based on factors derived from the literature?

The target population for the second research question will be the 1,247 municipalities in Pennsylvania that provide police protection to residents and are not cities and are also not split between counties as calculated in the first research question. Based on the Pennsylvania Police Service Report, 429 non-city municipalities provide protection to their residents in some form of collaboration with other municipalities and 818 provide the service independently.

Table 7 – Share Police Force Dependent Variable for Research Question 2

Dependent Variables

Research Question:	**2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions**
Variable:	**Provide Police Protection in Collaboration with Other Municipalities**
Variable Name:	**SHARE**
Source:	**Pennsylvania Police Service Report**

	Number that Provide Protection to Residents	Number that Provide Protection in Collaboration	Number that have Independent Police Forces
Borough	697	242	455
Township	549	187	362
Town	1	-	1
Total	**1,247**	**429**	**818**

Independent Variables

Independent Variables for Research Question 1

Research Question 1: To what extent is the decision of Pennsylvania municipalities to provide police protection to residents versus relying on the state for protection consistent with an empirical model based on factors derived from the literature?

The independent variables for the first empirical model are based on the premise that municipalities should implement and maintain a police force for their jurisdiction when the crime rates and other factors associated with an increased need for policing warrant the added cost of providing the service in combination with the ability of the municipality to afford the service.

Crime Rates (Violent and Property Crime)

Crimes are tracked by police force within the commonwealth by the Pennsylvania State Police and maintained in the Pennsylvania Uniform Crime Reporting and National Incident Based Reporting System (PA UCR/NIBRS). These data are captured by police force and not by municipality. As a result, individual crime rates are not available for each of the non-city municipalities. Additionally, if the data were captured by individual municipalities, the small size of the municipal population and the much smaller number of crimes committed relative to population size would result in substantial reported variation in crime rate, which would not be reflective of the true risk of crime in a given area. Additionally, the State police provide back-up protection in areas where the local coverage is not provided 24 hours per day and supplement the local police lacking specialty services. If the crime rates per police force were utilized without adjustment, municipalities with part-time police forces would have artificially low apparent crime rates. Crime data reported by the State police are broken out by county and by type of state police unit. Crime data are also reported by university, airport and other non-municipal police forces within the State will be excluded from this study.

For the purpose of this research, crimes reported within each county for all non-city municipal police forces and state barracks within the county will be combined. The crimes reported per county were divided by the 2010 total census population for the county excluding cities to determine the crime rate for all non-city municipalities within the county. The crimes reported by city police forces and the city population have been excluded from the calculation to derive a single rate per county outside of city boundaries. Actual crimes reported in 2010 and 2011 will be averaged to reduce the impact variation caused by the small population base in some Pennsylvania counties.

Rates for violent crime and property crime will be calculated separately and each will be analyzed as separate independent variables.

While Pennsylvania has 67 counties, Philadelphia County is comprised of Philadelphia City as its only municipality. Therefore, 66 separate values for violent crime and 66 separate values for property crime will be utilized in the research. Appendix 3 of this report lists each county and the number of non-city municipalities by type in each county and the crime statistics utilized for the counties. By combining the crime statistics from all of the non-city municipalities within the county the same statistic is utilized for between 7 and 124 municipalities. This approach assumes consistency between the levels of crime relevant to each non-city municipality within the county. To the extent that this is a faulty assumption, particularly in the geographically larger counties, the crime rates for the county have reduced value in representing the crime rate relevant to a given municipality.

Violent Crime and Property Crime are reflected in the first empirical model based on the link between a higher crime rate and the need for a level of policing that can better be achieved with a local police presence as defined in the Guidelines for Starting and Operating a New Police Department (Spence, Webster and Connors 2006). A correlation between higher crime rates and municipalities that provide police protection to residents would support the empirical model.

Table 8 – Violent Crime Rate and Property Crime Rate Independent Variables

Independent Variables - Coefficient of Variation

Research Question:	**1 - The Decision to Provide Police Protection to Residents**
Variable:	**Violent and Property Crimes Per 10,000 Residents**
Variable Names:	**CRIME_VIO and CRIME_PROP**
Source:	**Violent and Property Crimes Per County from PA UCRC/NIBRS excluding those reported by Cities for 2010 and 2011 (averaged) divided by the 2010 US Census Population per Municipality times 10,000.**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
Violent Crimes	66	78	35	72	162	26	0.341
Property Crimes	66	240	142	232	404	62	0.257

Other Government Spending per Resident

Other government spending per resident is calculated by taking the most recently available total expenditures on all municipal services excluding police as reported by the Pennsylvania Governor's Center for Local Government Services divided by the municipal population per the 2010 US Census. Other government spending per resident is reflected in the empirical model based on the assumption that municipalities are more likely to provide protection to their residents if they can afford to provide the protection. The amount spent on other government services is used to indicate the ability to pay for police protection. Combined with the need for a police force as determined by a higher area crime rate, the ability to provide the service to residents is also critical to the decision to implement and maintain a force (Spence, Webster and Connors 2006). A positive correlation between other government spending per resident and municipalities that provide police protection to residents would support the empirical model.

Table 9 - Other Government Spending per Resident Independent Variable

Independent Variables - Coefficient of Variation

Research Question: **1 - The Decision to Provide Police Protection to Residents**
Variable: **Other Government Spending Per Resident**
Variable Name: **OTHER_G_SPND**
Source: **Government Spending for all services other than police protection per Statewide Financial Datasheet divided by Municipal Population per the 2010 US Census**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	923	701	8	473	66,819	2,295	3.274
Township	1,535	419	36	306	7,105	458	1.093
Town	1	283	283	283	283		
All Municipalities	**2,459**	**525**	**8**	**346**	**66,819**	**1,458**	**2.777**

Poverty Rate

Poverty rate, obtained from the most recently available 5-year ACS Survey, is utilized to identify the need for policing in a given community and therefore the increased likelihood that the need cannot be satisfied through the limited resources provided by the State. The link between poverty rate and the need for increased policing is drawn from Krivo and Peterson (1996). A positive correlation between the poverty rate and municipalities that provide police protection to residents would support the empirical model.

Table 10 - Poverty Rate

Independent Variables - Coefficient of Variation

Research Question: **1 - The Decision to Provide Police Protection to Residents**
Variable: **Poverty Rate**
Variable Name: **POVERTY**
Source: **5-Year ACS Survey from 2006 to 2010**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	946	12.3	0	10.7	51.3	8.0	0.654
Township	1,547	9.3	0	8.1	52.2	6.0	0.650
Town	1	33.8	33.8	33.8	33.8		
All Municipalities	**2,494**	**10.4**	**0**	**8.9**	**52.2**	**7.0**	**0.674**

Property Vacancy Rate

Property vacancy rate, also obtained from the most recently available 5-year ACS Survey, is utilized to identify the need for policing in a given community and therefore the increased likelihood that the need cannot be satisfied through the limited resources provided by the State. Property vacancy rate is a secondary defining characteristic of a disadvantaged neighborhood which is correlated with an increased need for policing (Krivo and Peterson 1996). A positive correlation between the property vacancy rate and municipalities that provide police protection to residents would support the empirical model.

Table 11 - Property Vacancy Rate Independent Variable

Independent Variables - Coefficient of Variation

Research Question: **1 - The Decision to Provide Police Protection to Residents**
Variable: **Property Vacancy Rate**
Variable Name: **VACANCY**
Source: **5-Year ACS Survey from 2006 to 2010**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	948	10.0	0	8.5	93.2	7.6	0.765
Township	1,547	15.6	1.8	8.7	96.1	16.8	1.076
Town	1	7.3	7.3	7.3	7.3		
All Municipalities	**2,495**	**13.5**	**0**	**8.6**	**96.1**	**14.3**	**1.062**

Population Density

Population density is calculated as the municipal population per the 2010 US Census divided by the square miles per municipality as reported by Pennsylvania Governor's Center for Local Government Services.

Population density is reflected in the empirical model based on the assumption that greater population density increases the need for police protection and makes the cost of providing the service more affordable for the residents within the jurisdiction. Population density is reflective of a need for increased policing as defined by Krivo and Peterson (1996) and as a factor in the decision to start a new police force (Spence, Webster and Connors 2006). A positive correlation between higher population density and municipalities that provide police protection to residents would support the empirical model.

Table 12 - Population Density Independent Variable

Independent Variables - Coefficient of Variation

Research Question: **1 - The Decision to Provide Police Protection to Residents**

Variable: **Population Density**

Variable Name: **POP_DEN**

Source: **Municipal Population per the 2010 US Census divided by the number of Square Miles within each municipality**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	948	2,415.7	9.1	1,955.7	13,358.8	2,098.7	0.869
Township	1,547	305.8	0.2	88.6	10,480.4	654.8	2.141
Town	1	3,376.1	3,376.1	3,376.1	3,376.1		
All Municipalities	**2,496**	**1,108.4**	**0.2**	**262.8**	**13,358.8**	**1,728.7**	**1.560**

Number of Residents

The number of residents has been obtained from 2010 US Census per municipality. Number of residents is a factor in the empirical model based on the assumption that greater population increases the need for police protection and makes the cost of providing the service more affordable for the residents as the cost is spread across many residents realizing economies of scale (Spence, Webster and Connors 2006). A correlation between higher number of residents and municipalities that provide police protection to residents would support the first empirical model.

Table 13 - Number of Residents Independent Variable (RQ1)

Independent Variables - Coefficient of Variation

Research Question: **1 - The Decision to Provide Police Protection to Residents**
Variable: **Number of Residents (RQ1)**
Variable Name: **NO_RES**
Source: **US 2010 Census**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	948	2,619	10	1,316	42,034	3,771	1.44
Township	1,547	4,588	11	2,122	82,795	7,060	1.54
Town	1	14,855	14,855	14,855	14,855		
All Municipalities	**2,496**	**3,845**	**10**	**1,841**	**82,795**	**6,103**	**1.59**

Independent Variables for Research Question 2

> **Research Question 2: For the Pennsylvania municipalities that provide protection to their residents, to what extent is the decisions to provide police protection independently versus providing protection in collaboration with neighboring jurisdictions consistent with an empirical model based on factors derived from the literature?**

The independent variables for the second empirical model are based on the premise that municipalities should provide police protection in collaboration with neighbors when it is economically and programmatically beneficial to provide protection in collaboration. Additionally, the independent variables in the model are utilized to quantify the link between the existence of municipalities in the surrounding area in which to collaborate as well as the

demographics similarity of neighboring municipalities and the likelihood of a given municipality providing protection in collaboration.

The successful collaborations resulting in the creation of the West Hills Regional Police Department which achieved a 28 percent cost savings (Krimmel 1997) and Northern York Regional Police Department which achieved a 24 percent cost savings (Yablonsky, Reddig and Gamble, 2006) contrasts to the possible savings of up to 10.7 percent in the Police Executive Research Forum (2012) study. Additionally, the studies of the two successful consolidations resulted in significant enhancements in services provided that far exceeds the potential benefits discussed in the Police Executive Research Forum study. The first two consolidation studies identified the benefits that can be achieved by forming consolidations between demographically similar municipalities with similar policing needs. Additionally, the first two studies focused on municipalities significantly below the optimal service delivery level where the consolidations result in economies of scale. The third study was based on municipalities that were not demographically similar and many of which exceeded the optimal service delivery level where consolidation will result in economies of scale.

Number of Residents

The number of residents has been obtained from 2010 US Census per municipality. Number of residents is a factor in the second empirical model based on the assumption that collaboration will result in the greatest economic benefit for the smallest municipalities. This assumption is supported by the Holzer and Fry (2011) and Southwick (2005) research. Appendix 4 of this research reflects a table of the minimum, maximum as well as each quartile of population for Pennsylvania municipalities by county. A correlation between low number of

residents and municipalities that provide police protection in collaboration would support the second empirical model.

Table 14 - Number of Residents Independent Variable (RQ2)

Independent Variables - Coefficient of Variation

Research Question:	**2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions**
Variable:	**Number of Residents (RQ2)**
Variable Name:	**NO_RES**
Source:	**US 2010 Census**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	697	3,378	19	2,156	42,034	4,132	1.22
Township	549	8,629	250	4,938	82,795	9,922	1.15
Town	1	14,855	14,855	14,855	14,855		
All Municipalities	**1,247**	**5,699**	**19**	**3,062**	**82,795**	**7,726**	**1.36**

Number of Nearby Municipalities

The number of nearby municipalities is calculated by determining the number of non-city municipalities within the same county that are less than three miles north, south, east or west of the given municipality. The calculation is based on latitude and longitude of the center point of each municipality as reported in the 2010 US Census. A change of one degree in latitude equates to 69 miles for all degrees of latitude and a change of one degree of longitude equates to 53 miles at the longitude within the State of Pennsylvania (NOAA Latitude/Longitude Distance Calculator).

The distance of three miles utilized to identify the nearby municipalities was arbitrarily chosen to approximate the municipalities that are likely to be close enough to be likely candidates for collaboration. This measurement incorporates both the relative compactness of the municipality as well as the compactness of the neighboring municipalities. A limitation of this calculation is the lack of consideration for geographic features such as mountains, rivers, streams and roads. Municipalities that are within the three mile distance may require a greater travel time than would be anticipated based solely on the distance between the municipalities center point. A better variable would reflect the travel time between municipalities. Appendix 5 of this research reflects a table of the minimum, maximum as well as each quartile of the size in square miles for Pennsylvania municipalities by county.

The number of nearby municipalities is reflected in the second empirical model based on the assumption that collaboration will be more beneficial if there are other municipalities that are geographically close in which to collaborate.

Table 15 - Number of Nearby Municipalities Independent Variable

Independent Variables - Coefficient of Variation

Research Question:	**2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions**
Variable:	**Number of Nearby Municipalities**
Variable Name:	**NO_NEAR**
Source:	**The number of municipalities within 3 miles based on each non-city municipality's latitude and longitude within the same county** **Based on the 2010 US Census**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	697	3.9	-	3.0	19.0	3.8	0.973
Township	549	2.2	-	2.0	16.0	2.5	1.147
Town	1	2.0	2.0	2.0	2.0		
All Municipalities	**1,247**	**3.1**	**-**	**2.0**	**19.0**	**3.4**	**1.081**

Number of Nearby Municipalities with a Police Force

The number of nearby municipalities with a police force is calculated utilizing the same logic as the number of nearby municipalities; however the calculation reflects only the municipalities that offer protection to their residents either in collaboration or independently.

The number of nearby municipalities with a police force is reflected in the second empirical model based on the assumption that collaboration is more feasible if there are other nearby municipalities which also provide protection to residents in which to collaborate.

Table 16 - Number of Municipalities with a Police Force

Independent Variables - Coefficient of Variation

Research Question:	**2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions**
Variable:	**Number of Nearby Municipalities with a Police Force**
Variable Name:	**NO_NEAR _PF**
Source:	**The number of municipalities with a Police Force within 3 miles based on each non-city municipality's latitude and longitude within the same county** **Based on the 2010 US Census**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	697	3.9	-	3.0	19.0	3.8	0.973
Township	549	2.2	-	2.0	16.0	2.5	1.147
Town	1	2.0	2.0	2.0	2.0		
All Municipalities	**1,247**	**3.1**	**-**	**2.0**	**19.0**	**3.4**	**1.081**

Independent Variables to Calculate the Variation in Demographic Characteristics

The four variations in demographic characteristic independent variables are based on the percentage variance in a given statistic for a municipality and the statistic for the five nearest non-city municipalities within the same county. The five nearest non-city municipalities were identified based on latitude and longitude of the center point of each municipality as reported in the 2010 US Census. Based on the fact that one degree change in latitude equates to 69 miles for all degrees of latitude and one degree of longitude equates to 53 miles at the longitude within the State of Pennsylvania (NOAA Latitude/Longitude Distance Calculator) municipalities were identified within an area a given distance north, south, east and west of the municipality. The distance necessary to identify the five closest municipalities varies for each municipality to

insure that exactly five nearby municipalities is different for each municipality. The same distance factor was used for each east-west and north-south calculation for a given municipality.

As with the number of nearby municipalities variables, the variables based on the demographic similarity variables, the identification of five municipalities was arbitrarily selected to identify a pool of municipalities that a given municipality could collaborate with. Also, as with the number of nearby municipalities variables, there may be municipalities that have a center point that is further, however, may be closer when measured by travel time.

The variation in demographics between nearby municipalities is utilized in the second empirical model based on the literature, which indicates that the success of a consolidation will increase when complexity is reduced. Demographically similar municipalities are more likely to have common policing needs resulting in service delivery efficiency. Additionally, demographic similarity is likely to result in an increased willingness of the stakeholders to cooperate.

Variation in Household Income

Household income for each municipality is obtained from the 5-year American Community Survey for the period 2006 to 2010. Household income for the nearest five non-city municipalities within the county is calculated by averaging the household income of the five municipalities. The variation in household income is calculated as the percentage difference between the median household income for a municipality and the median household income for the five nearest non-city municipalities within the same county. The absolute value of the percentage difference is utilized to focus on the variance regardless of whether the municipal rate is greater or less than the rate of the nearby municipalities.

Variation in household income is a variable in the second empirical model based on the assumption that lower variation in household income would be associated with a higher likelihood of collaboration in providing police protection to residents. A strong correlation between lower variation in household income and municipalities that provide police protection in collaboration with neighboring municipalities would support the empirical model.

Table 17 - Variation in Household Income Independent Variable

Independent Variables - Coefficient of Variation

Research Question:	**2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions**
Variable:	**Variation in Household Income**
Variable Name:	**HOUSE_INC_VAR**
Source:	**The absolute value of the percentage difference between the average household income for each municipality and the average household income of the nearest 5 non-city municipalities within the same county** **Based on Household Income from the 5-Year ACS Survey from 2006 to 2010**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	697	21.3%	0.0%	18.4%	263.0%	18.3%	0.861
Township	549	17.1%	0.1%	12.5%	115.4%	15.3%	0.893
Town	1	43.2%	43.2%	43.2%	43.2%		
All Municipalities	**1,247**	**19.5%**	**0.0%**	**15.8%**	**263.0%**	**17.2%**	**0.883**

Variation in Property Rental Rate

Property rental rate for each municipality is obtained from the 5-year American Community Survey for the period 2006 to 2010. Property rental rate for the nearest five non-city

municipalities within the county is calculated by averaging the property rental rate of the five municipalities. The variation in property rental rate is calculated as the percentage difference between the property rental rate for each municipality and the property rental rate for the five nearby municipalities. The absolute value of the percentage difference is utilized to focus on the variance regardless of whether the municipal rate is greater or less than the rate of the nearby municipalities.

Variation in property rental rate is a factor in the second empirical model based on the assumption that lower variation in property rental rate would be associated with a higher likelihood of collaboration in providing police protection to residents. A strong correlation between lower variation in household income and municipalities that provide police protection in collaboration with neighboring municipalities would support the empirical model.

Table 18 - Variation in Property Rental Rate Independent Variable

Independent Variables - Coefficient of Variation

Research Question:	**2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions**
Variable:	**Variation in Property Rental Rate**
Variable Name:	**RENT_VAR**
Source:	**The absolute value of the percentage difference between the percent of properties that are renter occupied for each municipality and the percent of properties that are renter occupied for the nearest 5 non-city municipalities within the same county.**

Based on 5-Year ACS Survey from 2006 to 2010

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	697	67.6%	0.1%	51.2%	443.9%	59.2%	0.876
Township	549	35.0%	0.1%	33.8%	145.8%	22.8%	0.651
Town	1	220.2%	220.2%	220.2%	220.2%		
All Municipalities	**1,247**	**53.3%**	**0.1%**	**41.4%**	**443.9%**	**49.7%**	**0.932**

Variation in Population Density

Population density for each municipality was calculated for the population density variable for the first empirical model. Population density for the nearest five non-city municipalities within the county is calculated by averaging the population density for the five municipalities. The variation in population density is calculated as the percentage difference between the population density for each municipality and the population density for the five nearby municipalities. The absolute value of the percentage is utilized.

Variation in population density is a factor in the second empirical model based on the assumption that lower variation in population density would be associated with a higher

likelihood of collaboration in providing police protection to residents. A strong correlation between lower variation in population density and municipalities that provide police protection in collaboration with neighboring municipalities would support the empirical model.

Table 19 - Variation in Population Density Independent Variable

Independent Variables - Coefficient of Variation

Research Question:	**2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions**
Variable:	**Variation in Population Density**
Variable Name:	**POP_DEN_VAR**
Source:	**The absolute value of the percentage difference between the population density for each municipality and the population density for the nearest 5 non-city municipalities within the same county** **Based on the POP_DEN variable utilized for the first research question**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	697	407.6%	0.4%	94.0%	22539.0%	1375.1%	3.374
Township	549	67.0%	0.0%	74.6%	197.6%	27.0%	0.403
Town	1	305.5%	305.5%	305.5%	305.5%		
All Municipalities	**1,247**	**257.5%**	**0.0%**	**78.7%**	**22539.0%**	**1041.7%**	**4.045**

Variation in Percentage of Minority Population

Minority percentage for each municipality was calculated by taking the difference between the municipal population and the number of individuals in the municipality who are not white and of one race divided by the municipal population. Both population figures utilized to calculate the minority percentage are from the 2010 US Census. Minority percentage for the nearest five non-city municipalities within the county is calculated by averaging the minority

percentage of the five nearby municipalities. The variation in percentage of minority population is calculated as the percentage difference between the minority percentage for a given municipality and the minority percentage for the nearby municipalities. The absolute value of the percentage is utilized.

Variation in percentage of minority population is a factor in the second empirical model based on the assumption that lower variation in percentage of minority population would be associated with a higher likelihood of collaboration in providing police protection to residents. A strong correlation between lower variation in percentage of minority population and municipalities that provide police protection in collaboration with neighboring municipalities would support the empirical model.

Table 20 - Variation in Minority Rate Independent Variable

Independent Variables - Coefficient of Variation

Research Question:	**2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions**
Variable:	**Variation in Minority Rate**
Variable Name:	**MIN_VAR**
Source:	**The absolute value of the percentage difference between the percent non-white population for each municipality and the percent non-white population for the nearest 5 non-city municipalities within the same county** **Based on 2010 US Census**

	N	Mean	Minimum	Median	Maximum	Standard Deviation	Coefficient of Variation
City							
Borough	697	64.0%	0.1%	41.3%	1122.5%	96.2%	1.504
Township	549	54.9%	0.0%	37.1%	2559.9%	138.5%	2.523
Town	1	241.3%	241.3%	241.3%	241.3%		
All Municipalities	**1,247**	**60.1%**	**0.0%**	**39.6%**	**2559.9%**	**116.9%**	**1.944**

Reliability and Validity

Reliability, as defined by Carmines and Zeller (1979), is the extent that a measuring procedure will produce consistent results with repeated trials. Reliability errors are the result of random results not related to true fluctuations in the true results. In this research, reliability will be tested by calculating the internal consistency. Multiple measurements will be obtained to support the quantitative hypotheses. The correlation of the responses to related variables will be calculated to confirm that there is a strong internal consistency between variables where there is a strong anticipated correlation.

Variables based solely on the data obtained from the census have the greatest reliability since there is no inherent sampling error. To the extent that variables are based on the American Community Survey, reliability errors may exist as a result of the projection of the characteristics of a small number of individuals to the greater population. Variables based on municipal information face reliability concerns resulting from accounting and reporting errors. While the municipal reports are required by state law, the missing reports from some municipalities indicate that the penalties for not reporting, if any, do not insure compliance.

All data utilized in the study have a reliability benefit of the requirement to report the data by federal or state law. A response to both the Census and the American Community Survey are required by federal law and is published by the Federal government. The criminal statistics are required by federal law and published by the state government and the municipal information is required by the State and published by the State.

To confirm reliability of the data in this research, the split-halves method will be utilized. In this method, the population will be divided into two randomly chosen halves. The calculations of significance and correlation will be made based on the two independent populations.

Consistency between the results obtained from the two randomly chosen groups will confirm the reliability of the test (Carmines and Zeller 1979).

Validity, as defined by Carmines and Zeller (1979), is the extent that a measurement device actually measures what it intends to measure. While reliability errors are typically the result of faulty measurement tools, validity errors are the result of using a measurement tool for an inappropriate purpose. Validity has several components. Face validity is a common sense perspective analysis: does it make sense that if a study measures what it intends to measure, the conclusions will support the research question. Content validity relates to the extent that the measurement encompasses the scope of the research question. Construct validity measures the extent that the conclusions are consistent with the theory.

Validity from face, construct and content perspectives is addressed by the development of the empirical model. The model was developed based on the literature as well interviews with individuals at the Governor's Center, and therefore, the variables chosen are believed to be an accurate representation of the factors defining the rational factors that should correlate to the two research questions. To the extent that the variables chosen accurately represent the perspectives, the validity of the research will be assured.

Descriptive Analysis of Collaborating, Non-Collaborating and State Dependent Municipalities:

The intent of the descriptive analysis phase of the research is to provide an understanding of the measurable differences between the three distinct groups, those that depend on the State for police protection, those that provide police protection independently and those that provide police protection in collaboration with other municipalities. Beyond the research questions stated above, no preconceived beliefs shape the expectations of the results. Additionally, without, a

traditional approach of research question followed by testing, little effort will be made to explain why the differences occur. The intent is solely to calculate the differences so that efforts to encourage collaboration can be shaped by the differences that exist.

The descriptive analysis will search for factors that are significantly more or less common in one of the three groups. Potential independent variables will be identified from the federal and state sources utilized in the first phase of the research.

Chapter 4 – Analysis

The analysis for each research questions begins by calculating the mean and standard deviation of the independent variables when separated by the possible dependent variable outcomes. The difference in the means is calculated and the statistical significance of the mean difference is calculated using the t-Test of Significance. The variables that are determined to have a statistically significant mean variance will be incorporated in the model. Those variables that are determined to have a statistically significant mean variance where the direction of the difference is contrary to the model expectation will be excluded from a second model to be compared to the initial model to identify the impact on the predictive value of the contrary variables in predicting the outcome. The model developed in the secondary phase will incorporate all identified characteristics without regard for the theoretical justification for the inclusion of specific variables in an empirical model.

After identification of the variables which will remain in each empirical model, the models will be tested utilizing binary logistic regression analysis. Logistic regression is based on the logit or the natural logarithm of an odds ratio between two dichotomous outcomes (Peng, Lee and Ingersoll 2002). Logistic regression calculates the probability of achieving an outcome based on variables acting as predictors. It can also be utilized to determine the strength of the relationship between the predictor variables and the outcome.

The logit probability formula shown in the table below utilizes the maximum likelihood method to determine the expected outcome based on the predictor variables. The formula is based on the exponential function (exp) which is the opposite of the natural logarithm (Burns and Burns 2008).

Table 21 - Logistic Regression - Logit Probability Formula

Logit Probability Formula

$$p = \frac{exp^{(a + b_1x_1 + b_2x_2 + b_3x_3\ldots)}}{1 + exp^{(a + b_1x_1 + b_2x_2 + b_3x_3\ldots)}}$$

Where:

p =	the probability that a case is in a given category
exp =	the base of natural logarithms 2.718281828459
a =	the constant of the equation
b =	the coefficient of the predictor variables
x =	the predictor variable

Source: Burns and Burns 2008

For each research question, a logistic regression analysis will be calculated based on the variables from the empirical model that are determined to have a statistically significant mean difference in the direction projected by the model.

The models will be expanded in the descriptive analysis phase of the research to include the analysis of a wide spectrum of variables available through the 2010 US Census, the 2006 to 2011 American Community Survey as well as the data available through the Pennsylvania Governor's Center for Local Government Services. All variables determined to have a statistically significant mean variance from the initial phase of research, regardless of the direction of the difference, will be incorporated in new models to incorporate all identified predicting variables.

The final stage of testing the models developed for each reach question will be the elimination of the variables which, while determined to have a statistically significant mean

difference relevant to the model, do not make a significant contribution to the model in predicting the probability of a given municipality either offering protection or doing so in collaboration. Independent variables will be eliminated from the final models utilizing backward stepwise likelihood analysis. In the backward stepwise method, all possible variables are incorporated and those that are determined to not provide a significant contribution to the formula are eliminated in a multistep process. Backward analysis is preferred over forward analysis, where individual variables are added to the model in steps, to minimize the possibility of incorrectly excluding variables which may have its benefit to the equation suppressed by another variable (Menard 2002).

Testing of Research Question 1

The empirical model for the first research question to identify the predicting variables for the decision to provide police protection to residents as opposed to reliance on the State for protection are violent and property crime rates, the rate of other government spending per resident, poverty rate, vacancy rate, population density and the number of residents. Each of the predictor variables are projected to have a higher mean for municipalities that provide protection than the municipalities that rely on the State for protection.

Table 22 - Research Question 1: Empirical Model

Research Question 1: Empirical Model							
	The Decision to Provide Police Protection to Residents						
Research Question	To what extent is the decision of Pennsylvania municipalities to provide police protection to residents versus relying on the state for protection consistent with an empirical model based on factors derived from the literature?						
Dependent Variable	Provide Local Police Protection						
Dependent Variable Name	HAVE_PF						
Dependent Variable Values	Rely on the State for Protection = 0 Provide Local Police Protection = 1						
Predictor Variable	Violent Crime Rate	Property Crime Rate	Other Government Spending per Resident	Poverty Rate	Vacancy Rate	Population Density	Number of Residents
Variable Name	CRIME_VIO	CRIME_PROP	O_SPEND	POVERTY	VACANCY	POP_DEN	NO_RES
Predicted Relationship	+	+	+	+	+	+	+

In calculating the mean value for each variable for the 1,247 municipalities in the first target population that provide protection to their residents separate from the mean value for the 1,249 municipalities that rely on the State for protection it is determined that all seven predicting variables have a statistically significant mean difference, however only four of the seven variables display the predicted relationship. The mean difference and significance for each of the independent variables in the first empirical model is reflected in table 23 below.

Property Crime Rate (CRIME_PROP), Other Government Spending per Resident (O_SPEND), Population Density (POP_DEN), and Number of Residents (NO_RES) are all statistically significant and has the predicted relationship.

Property Crime Rate (CRIME_PROP). As predicted in the empirical model, there is a statistically significant positive correlation between the rate of countywide property crimes per 10,000 residents and the municipalities that offer police protection to their residents. The mean number of countywide property crimes per 10,000 residents for municipalities that provide

protection is 251.1 as compared to 231.5 in the municipalities that rely on the State for protection. While the mean difference of 16.3 is determined to be statistically significant, the mean difference is small in comparison to the mean values and standard deviation indicating that the property crime rate is likely to have limited predictive value in the empirical model.

Other Government Spending per Resident (O_SPEND). The mean per-capita amount municipalities spend on other government services is $664 in municipalities that provide protection to their residents as compared to $386 in municipalities that rely on the State. The mean difference of $277 is statically significant and likely represents a large enough variance to have strong predictive value in the empirical model.

Population Density (POP_DEN). The number of residents per square mile is 1,925 in municipalities that provide protection to their residents as compared to 293 in municipalities that rely on the State. The mean difference of 1,632 is statically significant and is also likely represents a large enough variance to have strong predictive value in the empirical model.

Number of Residents (NO_RES). The total number of residents per municipality is 5,699 in municipalities that provide protection to their residents as compared to 1,993 in municipalities that rely on the State. The mean difference of 3,706 is statically significant, and as with population density and other government spending, is likely represents a large enough variance to have strong predictive value in the empirical model.

Violent Crime Rate (CRIME_VIO), Poverty Rate (POVERTY) and Vacancy Rate (VACANCY) are all statistically significant, however the relationship observed is opposite the predicted relationship.

Violent Crime Rate (CRIME_VIO). While the countywide property crime is higher in municipalities that provide protection to their residents, the countywide rate of violent crimes per

10,000 residents is lower in municipalities that provide police protection to their residents. The mean number of countywide violent crime rate for municipalities that provide protection is 64.9 as compared to 81.3 in the municipalities that rely on the State for protection. As with the property crime rate, the mean difference of 19.6, while statistically significant, is small in comparison to the mean values and standard deviation indicating that the property crime rate is likely to have limited predictive value in the empirical model.

Poverty Rate (POVERTY). The poverty rate in municipalities that offer police protection to their residents is 10.1 percent as compared to 10.7 percent in municipalities that rely on the State for protection. While the mean difference of 0.6 percent is determined to be statistically significant, the mean difference is small in comparison to the mean values and standard deviation indicating that the poverty rate is likely to have limited predictive value in the empirical model.

Vacancy Rate (VACANCY). The property vacancy rate in municipalities that offer police protection to their residents is 8.7 percent in municipalities that provide protection to their residents as compared to 18.3 percent in municipalities that rely on the State for protection. The mean difference of 9.6 percent is statistically significant and the magnitude of the difference large in comparison to both the mean values and standard deviations. As a result, contrary to the conclusions drawn from the literature, there appears to be a strong correlation between property vacancy rate and municipalities that rely on the State for protection.

Table 23 - Calculation of Mean, Standard Deviation, Mean Difference and Significance for RQ1 Independent Variables

Calculation of Mean, Standard Deviation, Mean Difference and Significance for RQ1 Independent Variables

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
CRIME_VIO	81.2	27.4	64.9	21.1	16.3	0.00000	*
CRIME_PROP	231.5	57.9	251.1	56.0	19.6	0.00000	*
O_SPEND	386.2	502.4	663.6	1,989.6	277.4	0.00000	*
POVERTY	10.7%	7.1%	10.1%	6.9%	0.6%	0.03263	*
VACANCY	18.3%	17.8%	8.7%	6.8%	9.6%	0.00000	*
POP_DEN	293.1	596.5	1,925.0	2,072.2	1,631.9	0.00000	*
NO_RES	1,993	2,826	5,699	7,726	3,706	0.00000	*
N	1,249		1,247				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Empirical Model for Research Question 1

The initial empirical model for research question 1 reflects all variables which have statistically significant mean difference regardless of the relationship between the direction of the difference anticipated based on the literature based theory and the direction observed in the data. Therefore, the model reflects all variables, Property Crime Rate (CRIME_PROP), Other Government Spending per Resident (O_SPEND), Population Density (POP_DEN), and Number of Residents (NO_RES) which have a relationship consistent with the literature based theory as well as Violent Crime Rate (CRIME_VIO), Property Vacancy Rate (VACANCY) and the Poverty Rate (POVERTY) which have a relationship that is opposite the direction anticipated in the literature based theory.

The net target population is the 2,496 municipalities that are not cities and are also not split between municipal borders is further reduced by seven municipalities where complete information was not available. As a result, the logistic regression analysis for the first research question with all variables is based on 2,489 municipalities.

Table 24 - RQ1A Cases Reflected in Logistic Regression Analysis

RQ1A - Cases Reflected in Logistic Regression Analysis

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	2489	99.7
	Missing Cases	7	0.3
	Total	2496	100.0
Unselected Cases		0	0.0
Total		2496	100.0

a. If weight is in effect, see classification table for the total number of cases.

Source: IBM SPSS Statistics Version 20

The first step in the logistic regression analysis of the first research question is the calculation of the probability of any single non-city municipality offering police protection to their residents is reflected in table 25 below. Without reflecting the impact of any predictor variables, the overall probability of any given municipality offering police protection is slightly greater than 50 percent. In using the model without predictor variables, all municipalities would be assumed to have police forces resulting in 1,242 false positive results and no false negative results.

Table 25 - RQ1A Classification Table before Adding Variables

RQ1A - Predicted Outcome with no Variables

Classification Table[a,b]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 0	HAVE_PF	0	1247	0	100.0
		1	1242	0	0.0
	Overall Percentage				50.1

a. Constant is included in the model.

b. The cut value is .500

Source: IBM SPSS Statistics Version 20

In utilizing SPSS to calculate a logistic regression based on the predictor variables, it is confirmed that all seven variables are significantly related to the outcome with a significance factor below 0.05 as shown in table 26 below.

Table 26 - RQ1A Analysis of Predictor Variables

RQ1A - Analysis of Variables

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-0.004	.040	0.010	1	0.920	0.996

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	CRIME_VIO	249.590	1	.000
		CRIME_PROP	70.248	1	.000
		O_SPEND	22.990	1	.000
		POVERTY	4.717	1	.030
		VACANCY	286.096	1	.000
		POP_DEN	555.532	1	.000
		NO_RES	231.080	1	.000
	Overall Statistics		833.131	7	.000

Source: IBM SPSS Statistics Version 20

The SPSS program calculates two estimations of the percentage of variation predicted by the logistic regression model. The Cox & Snell R Square value reported by the program is an attempt to emulate R-Square based on the likelihood of the dichotomous outcome. The Nagelkerke R Square is a more commonly reported measurement of the strength of estimation and typically results in a higher result than the Cox & Snell value (Burns and Burns 2008). The Cox & Snell value of .397 and the Nagelkerke value of .529 indicate that the independent predictor variables predict 39.7 percent and 52.9 percent of the variation in the decision of a given municipality to offer police protection to their residents.

Table 27 - RQ1A Determination of Model Significance

RQ1A - Model Significance

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2193.088a	.397	.529

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Source: IBM SPSS Statistics Version 20

The Classification table generated by SPSS quantifies the accuracy of the logistic regression model. Overall the model for the first research question with all variables predicts the choice of offering police protection to residents with 78.9 percent accuracy as compared to 50.1 percent accuracy if no predictor variables were taken into consideration. The model would falsely predict that 192 municipalities would rely on the State for protection (the false negative rate). Additionally the model would falsely predict that 332 municipalities would provide protection to their residents (the false negative rate).

Table 28 - Predicted Outcome Based on Logistic Regression Model

RQ1A - Predicted Outcome with Variables

Classification Table[a]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 1	HAVE_PF	0	1055	192	84.6
		1	332	910	73.3
	Overall Percentage				78.9

a. The cut value is .500

Source: IBM SPSS Statistics Version 20

The Logistic Regression model for the first Research Question has a constant of -0.536214 and coefficients of -0.015170 for CRIME_VIO, 0.002000 for CRIME_PROP, 0.000781 for O_SPEND, 0.005878 for POVERTY, -0.044128 for VACANCY, 0.001085 for POP_DEN and 0.000132 for NO_RES. While POVERTY was determined to be significantly related to the decision to offer protection to residents in both the calculation of the mean difference, the significance factor for the variable in the logistic regression model is 0.479 which exceeds the 0.05 level necessary to indicate that the variable has a significant impact on the equation.

Table 29 - RQ1A Variables in the Model

RQ1A - Variables in the Model

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	CRIME_VIO	-0.015170	.002	38.946	1	0.000000	.985
	CRIME_PROP	0.002000	.001	4.108	1	0.042692	1.002
	O_SPEND	0.000781	.000	37.379	1	0.000000	1.001
	POVERTY	0.005878	.008	0.500	1	0.479342	1.006
	VACANCY	-0.044128	.007	43.094	1	0.000000	0.957
	POP_DEN	0.001085	.000	231.386	1	0.000000	1.001
	NO_RES	0.000132	.000	54.401	1	0.000000	1.000
	Constant	-0.536214	.274	3.840	1	0.050055	.585

a. Variable(s) entered on step 1: CRIME_VIO, CRIME_PROP, O_SPEND, POVERTY, VACANCY, POP_DEN, NO_RES.

Source: IBM SPSS Statistics Version 20

The Logit probability formula is calculated by entering the constant, coefficients and variables into the Logit formula as reflected in table 30 below. This formula predicts the probability of a given municipality providing police protection to their residents and not relying on the State for protection.

Table 30 - RQ1A Logit Probability Formula

RQ1A - Logit Probability Formula

$$p = \frac{\exp(-0.536214 - 0.015170 \times CRIME\_VIO + 0.002000 \times CRIME\_PROP + 0.000781 \times O\_SPEND + 0.005878 \times POVERTY - 0.044128 \times VACANCY + 0.001085 \times POP\_DEN + 0.000132 \times NO\_RES)}{1 + \exp(-0.536214 - 0.015170 \times CRIME\_VIO + 0.002000 \times CRIME\_PROP + 0.000781 \times O\_SPEND + 0.005878 \times POVERTY - 0.044128 \times VACANCY + 0.001085 \times POP\_DEN + 0.000132 \times NO\_RES)}$$

Where:

p= the probability that a case is in a given category

exp= the base of natural logarithms 2.71828182845904

Revised Empirical Model for Research Question 1

The revised empirical model reflects only the variables which have statistically significant mean difference and a relationship consistent with the literature based theory. Therefore, the revised model reflects only Property Crime Rate (CRIME_PROP), Other Government Spending per Resident (O_SPEND), Population Density (POP_DEN), and Number of Residents (NO_RES).

Table 31 - Research Question 1: Revised Empirical Model

Research Question 1: Revised Empirical Model				
	The Decision to Provide Police Protection to Residents			
Research Question	To what extent is the decision of Pennsylvania municipalities to provide police protection to residents versus relying on the state for protection consistent with an empirical model based on factors derived from the literature?			
Dependent Variable	Provide Local Police Protection			
Dependent Variable Name	HAVE_PF			
Dependent Variable Values	Rely on the State for Protection = 0 Provide Local Police Protection = 1			
Predictor Variable	Property Crime Rate	Other Government Spending per Resident	Population Density	Number of Residents
Variable Name	CRIME_PROP	O_SPEND	POP_DEN	NO_RES
Predicted Relationship	+	+	+	+

The net target population of 2,496 municipalities that are not cities and are also not split between municipal borders is further reduced by the five municipalities that did not complete the required DCED-CLGS-30 financial report for any of the most recent 5 year period. As a result, the logistic regression analysis for the first research question is based on 2,491 municipalities.

Table 32 - RQ1 Cases Reflected in Logistic Regression Analysis

RQ1 - Cases Reflected in Logistic Regression Analysis

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	2491	99.8
	Missing Cases	5	0.2
	Total	2496	100.0
Unselected Cases		0	0.0
Total		2496	100.0

a. If weight is in effect, see classification table for the total number of cases.

Source: IBM SPSS Statistics Version 20

The first step in the logistic regression analysis of the first research question is the calculation of the probability of any single non-city municipality offering police protection to their residents is reflected in table 33 below. Without reflecting the impact of any predictor variables, the overall probability of any given municipality offering police protection is again slightly greater than 50 percent. In using the model without predictor variables, all municipalities would be assumed to have police forces resulting in 1,243 false positive results and no false negative results.

Table 33 - RQ1 Classification Table before Adding Variables

RQ1 - Predicted Outcome with no Variables

Classification Table[a,b]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 0	HAVE_PF	0	1248	0	100.0
		1	1243	0	0.0
	Overall Percentage				50.1

a. Constant is included in the model.

b. The cut value is .500

Source: IBM SPSS Statistics Version 20

In utilizing SPSS to calculate a logistic regression based on the predictor variables, it is confirmed that all four variables are significantly related to the outcome with a significance factor below 0.05 as shown in table 34 below.

Table 34 - RQ1 Analysis of Predictor Variables

RQ1 - Analysis of Variables

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-0.004	.040	0.010	1	0.920	0.996

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	CRIME_PROP	69.953	1	.000
		O_SPEND	22.762	1	.000
		POP_DEN	555.346	1	.000
		NO_RES	231.006	1	.000
	Overall Statistics		669.927	4	.000

Source: IBM SPSS Statistics Version 20

The Cox & Snell value of .361 and the Nagelkerke value of .481 indicate that the independent predictor variables predict 36.1 percent and 48.1 percent of the variation in the decision of a given municipality to offer police protection to their residents.

Table 35 - RQ1 Determination of Model Significance

RQ1 - Model Significance

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2338.379a	.361	.481

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Source: IBM SPSS Statistics Version 20

The Classification table generated by SPSS quantifies the accuracy of the logistic regression model. Overall the model for the first research question predicts the choice of offering police protection to residents with 78.4 percent accuracy as compared to an accuracy rate of 50.1 percent if no predictor variables were taken into consideration. The model predicts municipalities that rely on the State with 87.1 percent accuracy and those that provide protection with 69.8 percent accuracy. The model would falsely predict that 161 municipalities would rely on the State for protection (the false negative rate). Additionally the model would falsely predict that 376 municipalities would provide protection to their residents (the false negative rate).

Table 36- Predicted Outcome based on Logistic Regression Model

RQ1 - Predicted Outcome with Variables

Classification Table[a]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 1	HAVE_PF	0	1087	161	87.1
		1	376	867	69.8
	Overall Percentage				78.4

a. The cut value is .500

Source: IBM SPSS Statistics Version 20

The Logistic Regression model for the first Research Question has a constant of -1.972210 and coefficients of 0.000745 for CRIME_PROP, 0.000469 for O_SPEND, 0.001270 for POP_DEN and 0.000201 for NO_RES. While CRIME_PROP was determined to be significantly related to the decision to offer protection to residents in both the calculation of the

mean difference and the initial analysis of variables for the logistic analysis, it is not determined to have a significant impact on the ultimate equation which resulted from the analysis.

Table 37 RQ1 Variables in the Model

RQ1 - Variables in the Model

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	CRIME_PROP	0.000745	.001	0.692	1	0.405485	1.001
	O_SPEND	0.000469	.000	20.493	1	0.000006	1.000
	POP_DEN	0.001270	.000	319.393	1	0.000000	1.001
	NO_RES	0.000201	.000	121.286	1	0.000000	1.000
	Constant	-1.972210	.219	80.876	1	0.000000	.139

a. Variable(s) entered on step 1: CRIME_PROP, O_SPEND, POP_DEN, NO_RES.

Source: IBM SPSS Statistics Version 20

The Logit probability formula is calculated by entering the constant, coefficients and variables into the Logit formula as reflected in table 38 below. This formula predicts the probability of a given municipality providing police protection to their residents and not relying on the State for protection.

Table 38 - RQ1 Logit Probability Formula

RQ1 - Logit Probability Formula

$$p = \frac{\exp^{(-1.972210 + .000745 \times CRIME\_PROP + .000469 \times O\_SPEND + .001270 \times POP\_DEN \times .000201 \times NO\_RES)}}{1 + \exp^{(-1.972210 + .000745 \times CRIME\_PROP + .000469 \times O\_SPEND + .001270 \times POP\_DEN \times .000201 \times NO\_RES)}}$$

Where:

p= the probability that a case is in a given category

exp= the base of natural logarithms 2.71828182845904

While the empirical model reflecting only the variables where the mean difference is consistent with the theory predicts the outcome with 78.4 percent accuracy, the mode accuracy is only slightly less than the 78.9 percent which resulted when the model included the three variables which were contrary to the assumptions of the literature based model. This indicates that the three contrary variables (CRIME_VIO, VACANCY and POVERTY) did not represent a significant factor in the predictive value of the model.

The first assumption of the first research question, that municipalities with the greatest need for protection will be more likely to provide protection to their residents, was not supported by the data as evidenced by the direction of the difference being contrary to the anticipated direction for three of the four variables. Since the testing of the model with the contrary variables resulted in a predictive value of only slightly higher than the revised model which excluded the contrary variables, it was determined that the contrary variables did not represent a significant impact in the predictive value of the model.

The second assumption of the first research question that municipalities that can afford to provide protection will be more likely to do so was confirmed by the testing of the model.

Testing of Research Question 2

The empirical model for the second research question is designed to identify the predicting variables for the decision to provide protection in collaboration with neighboring municipalities as opposed to providing the service independently for those municipalities that provide protection to their residents. Based on conclusions drawn from the literature, it is assumed that there will be a positive correlation between the number of nearby municipalities as well as the number of nearby municipalities with a police force. It is assumed that there will be a

negative correlation between the number of residents, and variations in household income, property rental percentage, population density and minority percentage with the closest five municipalities within the same county.

Table 39 - Research Question 2: Empirical Model

	Research Question 2: Empirical Model						
	The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions						
Research Question	For the Pennsylvania municipalities that provide protection to their residents, to what extent is the decisions to provide police protection independently versus providing protection in collaboration with neighboring jurisdictions consistent with an empirical model based on factors derived from the literature?						
Dependent Variable	Provide Protection in Collaboration						
Dependent Variable Name	SHARE						
Dependent Variable Values	Provide Protection Independently = 0 Provide Protection in Collaboration = 1						
Predictor Variable	Number of Residents	Number of Nearby Municipalities	Number of Nearby Municipalities with Force	Variation in Household Income	Variation in Property Rental Percentage	Variation in Population Density	Variation in Minority Percentage
Variable Name	NO_RES	NO_NEAR	NO_NEAR_PF	HOUSE_INC_VAR	RENT_VAR	POP_DEN_VAR	MIN_VAR
Predicted Relationship	-	+	+	-	-	-	-

In calculating the mean value for each of independent variables for the 818 municipalities in the first segment of the target population that provides protection to their residents independently separate from the mean value for the 429 municipalities that provide protection in some form of collaboration it is determined that only one variable has a statistically significant mean difference. The mean difference and significance for each of the independent variables in the second empirical model is reflected in table 40 below.

Number of Residents (NO_RES). The number of residents is the only independent variable in the second empirical model shown to have a statistically significant mean difference between the municipalities that provide protection independently versus those that provide

protection in collaboration with their neighbors as predicted in the empirical model. The mean number of residents in municipalities that provide protection independently is 6,777 as compared to 3,644 in municipalities that provide protection in collaboration. The mean difference of 3,134 residents is statistically significant and will remain in the empirical model.

Number of Nearby Municipalities (NO_NEAR). The mean number of municipalities within an area that is three miles north, south, east and west from a given municipality that provides protection independently is 3.13 while the mean for those that provide protection in collaboration is 3.18. Contrary to the assumptions drawn from the literature, the group of municipalities that provide protection in collaboration with neighboring municipalities has a slightly greater mean number of nearby municipalities. The t-test of significance indicates that there is a 79 percent probability that the mean difference is caused by random variations and is not the result of a true difference in the data.

Number of Nearby Municipalities with a Police Force (NO_NEAR_PF). As with the previous variable, the number of nearby municipalities that have a police force was assumed to be greater for municipalities that provide protection in collaboration. The calculation of the mean difference, however, indicates that there is no such relationship. While the mean number of nearby municipalities that have a police force is greater for municipalities that provide protection to their residents, the difference is extremely small and statistically insignificant.

Variation in Demographic Measurements (Household Income (HOUSE_INC_VAR), Property Rental Rate (RENT_VAR), Population Density (POP_DEN_VAR) and Minority Population (MIN_VAR)). Based on the literature, it was assumed that there would be correlation between lower variations in demographic factors and municipalities that provide protection in collaboration. While the direction of the mean difference in the variation for three

of the four measurements of demographic variation is consistent with the assumed direction in the model, none of the mean differences are statistically significant. The variation in household income of 19.0 percent for municipalities that provide protection is slightly less than the 19.7 percent for municipalities that provide protection independently. The variation in the property rental rate of 51.4 percent for municipalities that provide protection is slightly less than the 54.4 percent for municipalities that provide protection independently. The variation in the population density rate of 233.4 percent for municipalities that provide protection is slightly less than the 270.2 percent for municipalities that provide protection independently. The variation in the percentage of minority population of 65.7 percent for municipalities that provide protection is unexpectedly greater than the 57.2 percent for municipalities that provide protection independently.

Table 40 - Calculation of Mean, Standard Deviation, Mean Difference and Significance for RQ2 Independent Variables

Calculation of Mean, Standard Deviation, Mean Difference and Significance for RQ2 Independent Variables

RQ2- The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
NO_RES	6,777	8,437	3,644	5,609	3,134	0.00000	*
NO_NEAR	3.13	3.45	3.18	3.31	0.05	0.79494	
NO_NEAR_PF	2.73	3.56	2.79	3.27	0.06	0.76494	
HOUSE_INC_VAR	19.7%	17.7%	19.0%	16.2%	0.7%	0.45542	
RENT_VAR	54.4%	49.7%	51.4%	49.7%	3.0%	0.30883	
POP_DEN_VAR	270.2%	1211.9%	233.4%	595.6%	36.9%	0.47189	
MIN_VAR	57.2%	87.9%	65.7%	157.9%	8.5%	0.30360	
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Revised Empirical Model for Research Question 2

The revised empirical model reflects only the variables which have statistically significant mean difference and a relationship consistent with the literature based theory. Therefore, the revised model reflects only Property Crime Rate (CRIME_PROP), Other Government Spending per Resident (O_SPEND), Population Density (POP_DEN), and Number of Residents (NO_RES).

Table 41 - Research Question 2: Revised Empirical Model

	Research Question 2: Revised Empirical Model
	The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions
Research Question	For the Pennsylvania municipalities that provide protection to their residents, to what extent is the decisions to provide police protection independently versus providing protection in collaboration with neighboring jurisdictions consistent with an empirical model based on factors derived from the literature?
Dependent Variable	Provide Protection in Collaboration
Dependent Variable Name	SHARE
Dependent Variable Values	Provide Protection Independently = 0 Provide Protection in Collaboration = 1
Predictor Variable	Number of Residents
Variable Name	NO_RES
Predicted Relationship	-

The net target population for the second research question includes the 1,247 municipalities that are not cities, not split between municipal borders that offer police protection to residents identified in the first research question. There are no missing cases in the population for the second research question.

The first step in the logistic regression analysis of the second research question is the calculation of the probability of any single non-city municipality offering police protection to their residents in collaboration as opposed to independently is reflected in table 42 below. Without reflecting the impact of the predictor variable that remains in the model, the overall probability of any given municipality offering police protection independently is 65.6 percent. In using the model without predictor variables, all municipalities would be assumed to have a traditional non-shared police forces resulting in 429 false negative results and no false positive results.

Table 42 - RQ2 Classification Table before Adding Variables

RQ2 - Predicted Outcome with no Variables

Classification Table[a,b]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 0	SHARE	0	818	0	100.0
		1	429	0	0.0
	Overall Percentage				65.6

a. Constant is included in the model.

b. The cut value is .500

Source: IBM SPSS Statistics Version 20

In utilizing SPSS to calculate a logistic regression based on the sole remaining predictor variable, it is confirmed that the variable is significantly related to the outcome with a significance factor below 0.05 as shown in table 43 below.

Table 43 - RQ2 Analysis of Predictor Variable

RQ2 - Analysis of Variables

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-0.645	.060	117.222	1	0.000	0.524

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	NO_RES	46.332	1	.000
		0	46.332	1	.000
	Overall Statistics		0.000	0	.000

Source: IBM SPSS Statistics Version 20

The calculation of the Cox & Snell R Square value of .049 and the Nagelkerke value of .068 indicate that the independent predictor variables predict 4.9 percent and 6.8 percent of the variation in the decision of a given municipality to offer police protection in collaboration to their residents.

The extremely low values provided by both the Cox & Snell and the Nagelkerke calculations indicates that there is limited predictive value of our sole remaining independent variable in predicting the probability that a given municipality will provide police protection in collaboration as opposed to providing the service independently.

Table 44 - RQ2 Determination of Model Significance

RQ2 - Model Significance

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1542.269a	.049	.068

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

Source: IBM SPSS Statistics Version 20

The Classification table generated by SPSS quantifies the accuracy of the logistic regression model. Overall the model for the second research question predicts the choice of offering police protection to residents with the same 65.6 percent accuracy as the base model without including the predictor variable.

Table 45 - Predicted Outcome based on the RQ2 Logistic Regression Model

RQ2 - Predicted Outcome with Variables

Classification Table[a]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 1	SHARE	0	818	0	100.0
		1	429	0	0.0
	Overall Percentage				65.6

a. The cut value is .500

Source: IBM SPSS Statistics Version 20

The Logistic Regression model for the second research question has a constant of 0.219874 and coefficients of -0.000089 for NO_RES.

Table 46 - RQ2 Variables in the Model

RQ2 - Variables in the Model

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	NO_RES	-0.000089	.000	42.574	1	0.000000	1.000
	Constant	-0.219874	.082	7.137	1	0.007550	.803

a. Variable(s) entered on step 1: NO_RES.

Source: IBM SPSS Statistics Version 20

The Logit probability formula is calculated by entering the constant, coefficients and variables into the Logit formula as reflected in table 47 below. This formula predicts the probability of a given municipality providing police protection in collaboration with neighboring jurisdictions instead of providing the protection independently.

Table 47 - RQ1 Logit Probability Formula

RQ2 - Logit Probability Formula

$$p = \frac{\exp^{(-0.219874 - 0.000089 \times NO\_RES)}}{1 + \exp^{(-0.219874 + .000089 \times NO\_RES)}}$$

Where:

p= the probability that a case is in a given category

exp= the base of natural logarithms 2.71828182845904

As noted in the development of the logistic regression model for the second research question, the sole remaining independent variable had no predictive value in determining which municipalities will offer police protection in collaboration as compared to providing protection independently. While it had no predictive value in the logistic regression model, it was noted earlier that there was a strong mean difference which implied that it would have been a significant predictor variable. In analyzing the variable further, it is shown in table 48 below that municipalities with a population below 1,500 have a greater likelihood of sharing a municipal police force than the municipalities equal to or larger than 1,500 residents. To measure the impact of the number of residents in a given municipality in light of the identified dividing point, a new variable UNDER_1500 was created to separate municipalities with a population below 1,500 from those over 1,500. It is likely that the large number of municipalities with a population significantly greater than the 1,500 dividing point may have cancelled out the predictive value of the number of residents where a dichotomous variable may not be similarly impacted.

Table 48 - Breakdown of Municipal Population by type of Force Provided

Breakdown of Municipal Population by type of Force Provided

Population	Number of Municipalities	Traditional Force		Share	
0 - 499	73	22	30.1%	51	69.9%
500 - 999	142	50	35.2%	92	64.8%
1,000 - 1,499	120	65	54.2%	55	45.8%
1,500 - 1,999	109	73	67.0%	36	33.0%
2,000 - 3,999	287	204	71.1%	83	28.9%
4,000 - 9,999	325	246	75.7%	79	24.3%
10,000 - 19,999	126	101	80.2%	25	19.8%
20,000 and over	65	57	87.7%	8	12.3%
	1247	818	65.6%	429	34.4%

In recalculating the logistic regression model for the second research question with the new UNDER_1500 variable to replacing the NO_RES variable, the initial calculation remains unchanged, without reflecting the impact of the predictor variable, the overall probability of any given municipality offering police protection independently is 65.6 percent.

Again the base model confirms that the variable is significantly related to the outcome with a significance factor below 0.05 as shown in table 49 below.

Table 49 - RQ2a Analysis of Predictor Variable

RQ2a - Analysis of Variables

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-0.645	.060	117.222	1	0.000	0.524

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	UNDER_1500	123.851	1	.000
		0	123.851	1	.000
	Overall Statistics		0.000	0	.000

Source: IBM SPSS Statistics Version 20

The calculation of the Cox & Snell R Square value of .092 and the Nagelkerke value of .127 indicate that the independent predictor variables predict 9.2 percent and 12.7 percent of the variation in the decision of a given municipality to offer police protection in collaboration to their residents.

While both the Cox & Snell and the Nagelkerke calculations remain low, the predictive value of the model has increased from the prior calculation.

Table 50 - RQ2 Determination of Model Significance

RQ2a - Model Significance

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1485.477a	.092	.127

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

Source: IBM SPSS Statistics Version 20

The Classification table generated by SPSS quantifies the accuracy of the logistic regression model. Overall the model for the second research question with the new UNDER_1500 variable predicts the choice of offering police protection to residents with 70.5 percent accuracy as compared to the 65.6 percent accuracy in the base model without including the predictor variable.

Table 51 - Predicted Outcome based on the RQ2 Logistic Regression Model

RQ2a - Predicted Outcome with Variables

Classification Table[a]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 1	HAVE_PF	0	681	137	83.3
		1	231	198	46.2
	Overall Percentage				70.5

a. The cut value is .500

Source: IBM SPSS Statistics Version 20

The Logistic Regression model for the second research question has a coefficient of 1.449431 for UNDER_1500 and a constant of -1.081145.

Table 52 - RQ2a Variables in the Model

RQ2a - Variables in the Model

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	UNDER_1500	1.449431	.135	115.767	1	0.000000	4.261
	Constant	-1.081145	.076	201.619	1	0.000000	.339

a. Variable(s) entered on step 1: UNDER_1500.

Source: IBM SPSS Statistics Version 20

The Logit probability formula is again calculated by entering the constant, coefficients and variables into the Logit formula as reflected in table 53 below. This formula predicts the probability of a given municipality providing police protection in collaboration with neighboring jurisdictions instead of providing the protection independently.

Table 53 – RQ2 Logit Probability Formula

RQ2a - Logit Probability Formula

$$p = \frac{\exp^{(-1.081145 + 1.449431 \times \text{UNDER\_1500})}}{1 + \exp^{(-1.081145 + 1.449431 \times \text{UNDER\_1500})}}$$

Where:

p= the probability that a case is in a given category

exp= the base of natural logarithms 2.71828182845904

Empirical Model Summation

The first empirical model to identify the predicting variables for municipalities that provide police protection to residents as opposed to reliance on the State was initially based on seven independent predicting variables. The model assumed that all seven independent variables would have a positive correlation with the decision to offer protection to residents. Based on the literature, it was assumed that there would be a particularly strong correlation between crime rates in an area and the municipalities that provide protection to their residents.

After adjusting the model to eliminate the variables where the direction of the association was opposite the direction assumed in the model only four of the seven variables remained. Most notably, property crime was eliminated when it was determined that municipalities in counties that have a lower non-city property crime rate have a higher likelihood of providing police protection to residents. If the crime rate utilized for the study was the municipality specific crime rate, it could be inferred that the existence of a local police force resulted in the lower crime rate. Since the crime rate utilized in the study is based on the county excluding cities, the inference is not likely a valid conclusion. Further, the association between the property crime rate and the dependent variable is a weak association.

Two variables, poverty rate and property vacancy rate had a negative association with the decision to provide protection to residents. The association for the poverty rate was not strong with a mean average of 10.7 percent for municipalities that rely on the State for protection as compared to 10.1 percent for municipalities that provide protection to residents. The property vacancy rate, however, had a strong inverse association with the decision to provide local police protection with the vacancy rate of 18.7 percent for municipalities that rely on the State as compared to 8.7 percent for the municipalities that provide protection to residents.

For the first research question, without utilizing logistic analysis, the likelihood of predicting if a given municipality offering protection to their residents or relying on the State is 50.1 percent. When logistic analysis is utilized with the variables that remaining in the model the predictive value of the model increases to 78.4 percent. The descriptive analysis section to follow will incorporate the variables previously included as well as those discarded for as well as other potential predicting variables to develop a model with greater accuracy on predicting the likelihood of a given municipality offering police protection to residents.

The second empirical model to identify the predicting variables for municipalities that provide police protection in collaboration as opposed to providing the service independently was also initially based on seven variables. The model assumed that two independent variables would have a positive association with the dependent variable while the remaining five would have a negative association.

The calculation of the mean difference between the municipalities and the t-Test of the significance of the mean difference determined that only one independent variable, the number of residents, had a statistically significant mean difference. The mean number of residents in municipalities that provide protection to residents in collaboration is 3,644 where the mean number of residents in municipalities that provide protection independently is 6,777. The mean difference of 3,134 was determined to be statistically significant and the direction of the association was consistent with the assumed direction in the model. When the model was developed utilizing only this remaining independent variable, the coefficient set by the model for the variable was so low that the independent variable had no impact on the predictive value of the model.

In analyzing the number of residents independent variable further, it was determined that municipalities with fewer than 1,500 residents had a greater than average probability of providing protection in collaboration while those with 1,500 or more residents had a less than average probability of providing protection in collaboration. When the original number of residents variable was replaced with a dichotomous variable of less than 1,500 residents or 1,500 or more residents, the new variable was determined to have a positive impact on the predictive value of the model.

For the second research question, without utilizing logistic analysis, the likelihood of predicting if a given municipality will offer protection in collaboration or independently is 65.6 percent. When logistic analysis is utilized with the modified independent variable the predictive value of the model increased to 70.5 percent. The descriptive analysis section to follow will incorporate the modified independent variable as well as other potential predicting variables to develop a model with greater accuracy on predicting the likelihood of a given municipality offering police protection in collaboration or independently.

Descriptive Analysis

The descriptive analysis phase of this research is intended to investigate potential variables from the 2010 US Census, the 2006 to 2010 American Community Survey and State published data. The variables reflected in this section have been chosen based on identified mean differences in one or both of the research questions of the research. The models developed in the previous section will be expanded to reflect the new variables identified in this section which may have predictive value for either research question.

Crime Rates

Property and violent crime rates were previously considered in the empirical model for the first research question. While municipalities that were in counties with higher property crime rates were more likely to provide protection to their residents, the inverse relationship was determined to exist for violent crime. Municipalities in counties with higher violent crime rates were less likely to provide protection to their residents. Both property and violent crime rates will be included in the final model for the first research question.

For the second research question, the difference in the rate of violent crimes for municipalities that provide protection to residents independently versus providing the service in collaboration is not statistically significant. The mean difference in the rate of property crimes is statistically significant yet the difference is small, 255.0 property crimes per 10,000 residents in municipalities that have independent forces as compared to 243.8 for municipalities that provide protection in collaboration.

The violent crime rate will be included as a variable in the first model and the property crime rate will be included as a variable in the second model.

Table 54 - Crime Rates

Descriptive Analysis
Variable: Violent and Property Crime Rates

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Violent Crimes per 10,000 People	81.0	27	65.0	21.0	16.0	0.00000	*
Property Crimes per 10,000 People	231.5	57.9	251.1	56.0	19.6	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Violent Crimes per 10,000 People	65.0	21.0	65.0	20.0	1.0	0.51924	
Property Crimes per 10,000 People	255.0	56.6	243.8	54.1	11.2	0.00067	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: Pennsylvania Uniform Crime Reporting System

Rate of Males to 100 Females

The average municipality that relies on the State for police protection has 105.4 males for every 100 females while the average municipality that provides protection to their residents has 96.6 males for every 100 females. The mean difference of 8.8 in the male to female ratio is statistically significant.

The average municipality that provides protection independently has 95.4 males for every 100 females while the average municipality that provides protection in collaboration has 98.8 males for every 100 females. The mean difference of 3.4 is not statistically significant.

The rate of males to 100 females will be included as a variable in the first model.

Table 55 - Population and Males per 100 Females

Descriptive Analysis
Variables: Population and Males per 100 Females

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total population	1,993	2,826	5,699	7,726	3,706	0.00000	*
Males per 100 females	105.4	37.0	96.6	38.7	8.8	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total population	6,777	8,437	3,644	5,609	3,134	0.00000	*
Males per 100 females	95.4	19.9	98.8	60.0	3.4	0.25552	
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2010 US Census File: DEC_10_SF1_QTP1_with_ann - Age Groups and Sex:2010 obtained through American Fact Finder

Median Age

The median age for municipalities that relies on the State for police protection is 43.6 compared to 42.0 in the average municipality that provides protection to its residents. The median age for males shows a greater variation than for females.

Median age for the population as a whole as well as the median age for both males and females independently is not significantly different between municipalities that provide protection independently as compared to those that provide protection in collaboration.

The median age for males and the median age for females will both be included as variables in the first model.

Table 56 - Median Age

Descriptive Analysis
Variable: Median Age

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total population	1,993	2,826	5,699	7,726	3,706	0.00000	*
Median age in years for both sexes	43.6	5.0	42.0	5.3	1.5	0.00000	*
Median age in years for males	42.8	5.3	40.6	5.1	2.2	0.00000	*
Median age in years for females	44.4	4.9	43.4	5.5	0.9	0.00001	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total population	6,777	8,437	3,644	5,609	3,134	0.00000	*
Median age in years for both sexes	41.9	4.9	42.2	5.9	0.3	0.39876	
Median age in years for males	40.5	4.9	40.9	5.6	0.5	0.14558	
Median age in years for females	43.4	5.1	4..5	6.1	0.1	0.80208	
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2010 US Census File: DEC_10_SF1_QTP1_with_ann - Age Groups and Sex:2010 obtained through American Fact Finder

Age Groups

While the median age is statistically higher in municipalities that rely on the State for protection than for those that provide protection to their residents, the difference by age group is not statistically different. For municipalities that provide protection to their residents, those that do so independently have a slightly lower percentage of residents under the age of eighteen (21.3 versus 21.9) while the difference is considered statistically significant, the small difference in the mean of 0.6 percent indicates that the association is weak.

Age group will not be added as a variable to either model.

Table 57 - Age Groups

Descriptive Analysis
Variable: Age Group

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total Population	1,993	2,826	5,699	7,726	3,706	0.00000	*
Under 18 years	21.7%	4.60%	21.5%	4.20%	0.2%	0.30097	
18 to 64 years	61.3%	4.50%	61.6%	4.60%	0.3%	0.16342	
65 years and over	17.0%	4.90%	16.9%	4.80%	0.1%	0.71218	
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total Population	6,777	8,437	3,644	5,609	3,134	0.00000	*
Under 18 years	21.3%	3.70%	21.9%	4.9%	0.6%	0.02789	*
18 to 64 years	61.8%	4.30%	61.2%	5.2%	0.5%	0.06584	
65 years and over	17.0%	4.10%	16.9%	5.8%	0.1%	0.87336	
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2010 US Census File: DEC_10_SF1_QTP1_with_ann - Age Groups and Sex:2010 obtained through American Fact Finder

Median Income

Median household income in municipalities that provide protection to their residents is $53,050 for all households versus $48,413 in municipalities that rely on the State for protection. The variance is greater for householders between the ages of 45 and 64 where the median household income is 64,760 in municipalities that provide protection to their residents as compared to 57,540 in municipalities that rely on the State for protection.

The difference in the median household income in the groups for the second research question is smaller and the difference is not statistically significant.

Median household income for all households and the median household income for householders between the age of 45 and 64 will be reflected as variables in the first model.

Table 58 - Median Income

Descriptive Analysis
Variable: Median Income in the Past 12 Months (in 2010 inflation-adjusted dollars)

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Estimated Households	740	1,045	2,238	2,971	1,498	0.00000	*
Median income (dollars)	48,413	14,129	53,050	19,815	4,637	0.00000	*
Median income for 15 to 24 year old householders	36,732	21,530	35,520	22,465	1,211	0.30151	
Median income for 25 to 44 year old householders	56,615	19,357	61,291	21,793	4,676	0.00000	*
Median Income for 45 to 64 year old householders	57,540	16,984	64,760	23,847	7,221	0.00000	*
Median income for 65 years and over householders	30,881	9,860	32,390	11,851	1,509	0.00057	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Estimated Households	2,675	3,259	1,406	2,087	1,268	0.00000	*
Median income (dollars)	53,249	20,450	52,669	18,558	580	0.61332	
Median income for 15 to 24 year old householders	34,836	23,527	37,078	19,791	2,241	0.14959	
Median income for 25 to 44 year old householders	61,722	22,747	60,466	19,838	1,257	0.31385	
Median Income for 45 to 64 year old householders	65,102	24,377	64,107	22,812	995	0.47589	
Median income for 65 years and over householders	32,233	11,573	32,691	12,376	458	0.52675	
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_S1903_with_ann - Median Income in the Past 12 Months (in 2010 inflation-adjusted dollars) obtained through American Fact Finder

Educational Attainment

Educational attainment is divided below in tables 59 and 60 into two categories, residents over 25 and those from the ages of 18 to 24. In comparing the data for the first research question, it is apparent that the mean percentage of residents in all categories of educational attainment below and including high school graduation are higher on average in municipalities that rely on the State for police protection than they are in municipalities that provide protection to their residents. Similarly the mean percentage of residents in all categories of educational attainment above the high school level is higher, on average, in municipalities that provide protection to their residents. When the categories below and including high school graduation are combined and those above high school graduation level are combined, the variance is 9.9 percent when analyzing the data for residents 25 and older and 9.2 percent when analyzing the data for residents 18 to 24.

In comparing the data for the second research question, a similar breakdown is apparent. The mean percentage of residents in categories of educational attainment below and including high school graduation are higher on average in municipalities that provide police protection collaboratively than those that provide protection independently. Similarly the mean percentage of residents in all categories of educational attainment above the high school level is higher, on average, in municipalities that provide protection independently. When the categories below and including high school graduation are combined and those above high school graduation level are combined, the variance is 3.3 percent when analyzing the data for residents 25 and older and 3.4 percent when analyzing the data for residents 18 to 24.

The percentage of residents 25 and older who have more than a high school education will be utilized as an independent variable in both models.

Table 59 - Educational Attainment for Residents 25 and Over

Descriptive Analysis
Variable: Educational Attainment for Residents 25 and Over

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Estimated Population 25 years and over	685	963	1,849	2,476	1,165	0.00000	*
Less than 9th grade	4.5%	4.0%	3.5%	3.0%	1.0%	0.00000	*
9th to 12th grade, no diploma	9.8%	4.4%	8.1%	4.1%	1.7%	0.00000	*
High school graduate (includes equivalency)	48.8%	9.5%	41.7%	11.2%	7.1%	0.00000	*
Some college, no degree	14.2%	5.0%	15.8%	3.8%	1.6%	0.00000	*
Associate's degree	7.4%	3.6%	7.6%	2.6%	0.2%	0.08295	
Bachelor's degree	10.2%	6.8%	14.8%	8.0%	4.6%	0.00000	*
Graduate or professional degree	5.1%	4.1%	8.5%	7.2%	3.4%	0.00000	*
High school or less	63.1%	11.8%	53.3%	14.7%	9.9%	0.00000	*
More than High school	36.9%	11.8%	46.7%	14.7%	9.9%	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Estimated Population 25 years and over	2,212	2,742	1,158	1,666	1,054	0.00000	*
Less than 9th grade	3.3%	2.3%	3.9%	3.9%	0.6%	0.00280	*
9th to 12th grade, no diploma	8.0%	3.9%	8.4%	4.4%	0.5%	0.06079	
High school graduate (includes equivalency)	40.9%	10.9%	43.1%	11.6%	2.2%	0.00120	*
Some college, no degree	16.0%	3.7%	15.4%	4.1%	0.6%	0.00905	*
Associate's degree	7.8%	2.5%	7.4%	2.8%	0.4%	0.00589	*
Bachelor's degree	15.3%	7.9%	13.9%	8.1%	1.4%	0.00251	*
Graduate or professional degree	8.8%	7.1%	8.0%	7.3%	0.8%	0.06721	
High school or less	52.1%	14.3%	55.4%	15.1%	3.3%	0.00021	*
More than High school	47.9%	14.3%	44.6%	15.1%	3.3%	0.00020	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_S1501_with_ann - Educational Attainment obtained through American Fact Finder

Table 60 - Educational Attainment for Residents 18 to 24

Descriptive Analysis
Variable: Educational Attainment for Residents 18 to 24

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Population 18 to 24 years	153	277	513	1,170	360	0.00000	*
Less than high school graduate	18.7%	16.00%	15.0%	11.3%	3.7%	0.00000	*
High school graduate	42.5%	19.40%	37.0%	15.6%	5.6%	0.00000	*
Some college or associate's degree	31.1%	18.00%	37.0%	16.2%	5.9%	0.00000	*
Bachelor's degree or higher	7.7%	9.50%	11.0%	9.9%	3.4%	0.00000	*
High school or less	61.2%	19.60%	52.0%	18.1%	9.2%	0.00000	*
More than High school	38.8%	19.60%	48.0%	18.1%	9.2%	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Population 18 to 24 years	587	899	370	1,553	217	0.00779	*
Less than high school graduate	14.9%	10.5%	15.1%	12.8%	0.2%	0.80152	
High school graduate	35.9%	14.4%	39.1%	17.5%	3.3%	0.00098	*
Some college or associate's degree	37.7%	15.9%	35.6%	16.7%	2.1%	0.03630	*
Bachelor's degree or higher	11.5%	9.6%	10.1%	10.2%	1.4%	0.02114	*
High school or less	50.8%	17.4%	54.2%	19.0%	3.4%	0.00193	*
More than High school	49.2%	17.4%	45.8%	19.0%	3.4%	0.00191	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_S1501_with_ann - Educational Attainment obtained through American Fact Finder

Race

The racial diversity in Pennsylvania is lowest in municipalities that rely on the State for police protection followed by those that provide protection in collaboration and finally by the municipalities that provide protection independently. The mean percentage of residents

classifying themselves white and of a single race is 97.1 percent in municipalities that rely on the state for protection compared to 92.7 percent in municipalities that provide protection to their residents. In municipalities that provide protection in collaboration, the mean percentage of white and of a single race is 94.3 percent which compares to 91.8 percent municipalities that provide protection independently.

The percentage of residents classifying themselves white and of a single race will be utilized as a variable in both models.

Table 61 - Race

Descriptive Analysis
Variable: Race

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total population	1,993	2,826	5,699	7,726	3,706	0.00000	*
White	97.1%	4.7%	92.7%	10.4%	4.4%	0.00000	*
Black or African American	1.1%	3.5%	3.6%	8.4%	2.5%	0.00000	*
American Indian and Alaska Native	0.2%	0.3%	0.1%	0.2%	0.0%	0.18228	
Asian	0.4%	0.7%	1.3%	2.6%	1.0%	0.00000	*
Native Hawaiian and Other Pacific Islander	0.0%	0.1%	0.0%	0.1%	0.0%	0.88416	
Some Other Race	0.4%	1.2%	0.9%	1.9%	0.5%	0.00000	*
Two or More Races	0.9%	0.7%	1.4%	0.9%	0.5%	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total population	6,777	8,437	3,644	5,609	3,134	0.00000	*
White	91.8%	11.6%	94.3%	7.3%	2.5%	0.00001	*
Black or African American	4.2%	9.8%	2.3%	4.6%	1.9%	0.00001	*
American Indian and Alaska Native	0.1%	0.1%	0.1%	0.2%	0.0%	0.88737	
Asian	1.5%	2.9%	1.0%	2.1%	0.5%	0.00136	*
Native Hawaiian and Other Pacific Islander	0.0%	0.1%	0.0%	0.0%	0.0%	0.34187	
Some Other Race	0.9%	1.9%	0.9%	2.0%	0.0%	0.95688	
Two or More Races	1.4%	0.9%	1.3%	1.0%	0.1%	0.01969	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2010 US Census File: DEC_10_SF1_QTP3_with_ann - Race and Hispanic or Latino Origin: 2010 obtained through American Fact Finder

Household Types

In the average municipality that relies on the State for protection, 84.6 percent of the population lives in family households compared to 80.8 percent for the municipalities that provide protection to their residents. Females living alone represent 4.7 percent of the

population in the municipalities that rely on the State for protection compared to 6.7 percent of the population in the municipalities that provide police protection to their residents. The percentage of the population that live in non-institutionalized group quarters, college dormitories as an example, represent 1.1 percent of the population in the municipalities that provide protection to their residents as compared to 0.4 percent in the municipalities that rely on the State for protection.

As with most demographic variables, the variation in household type is much smaller between municipalities that provide protection collaboratively and those that provide protection independently. The largest variation reported is the percentage of the population living in family households with 81.6 percent of the population in municipalities that provide protection collaboratively as compared to 80.3 percent in municipalities that provide the service independently.

The percentage of residents living in family households will be utilized as a variable in both models.

Table 62 - Household Type

Descriptive Analysis
Variable: Household Type

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total Population	1,993	2,826	5,699	7,726	3,706	0.00000	*
Living in family households	84.6%	7.7%	80.8%	9.1%	3.8%	0.00000	*
Male living alone	4.8%	2.0%	5.0%	1.8%	0.2%	0.00453	*
Male householder non-family	1.2%	0.7%	1.3%	0.7%	0.1%	0.00030	*
Female living alone	4.7%	1.9%	6.7%	2.7%	2.0%	0.00000	*
Female householder non-family	0.7%	0.5%	1.0%	0.6%	0.3%	0.00000	*
Nonrelative non-householders	2.4%	1.3%	2.9%	2.0%	0.5%	0.00000	*
Institutionalized population in group quarters	1.3%	6.5%	1.2%	4.7%	0.1%	0.73132	
Non-institutionalized population in group quarters	0.4%	2.5%	1.1%	5.0%	0.8%	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total Population	6,777	8,437	3,644	5,609	3,134	0.00000	*
Living in family households	80.3%	9.0%	81.6%	9.4%	1.3%	0.02280	*
Male living alone	5.1%	1.7%	4.9%	1.8%	0.2%	0.03034	*
Male householder non-family	1.3%	0.6%	1.3%	0.8%	0.0%	0.81909	
Female living alone	6.9%	2.5%	6.4%	3.1%	0.5%	0.00536	*
Female householder non-family	1.0%	0.6%	0.9%	0.6%	0.1%	0.14321	
Nonrelative non-householders	2.9%	1.9%	2.9%	2.0%	0.1%	0.63828	
Institutionalized population in group quarters	1.2%	4.4%	1.1%	5.2%	0.1%	0.78200	
Non-institutionalized population in group quarters	1.2%	5.3%	0.9%	4.4%	0.4%	0.20558	
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2010 US Census File: DEC_10_SF1_P29_with_ann - Household Type by Relationship obtained through American Fact Finder

Number of Housing Units and Occupancy / Vacancy Rates

The average number of housing units in municipalities that rely on the State for protection is 897 as compared to 2,444 for municipalities that provide protection to their residents. The mean difference of 1,547 is statistically significant. Of the municipalities that provide protection to their residents, the municipalities that provide it independently have an average of 2,914 housing units compared to 1,548 for municipalities that provide protection in collaboration.

The mean percentage of vacant homes in municipalities that rely on the State is significantly higher than in municipalities that provide protection to their residents. In municipalities relying on the state, 18.3 percent of homes are vacant as compared to 8.7 percent in municipalities that provide protection. The difference in the mean values is statistically significant. The property vacancy rate was included in the initial model for the first research question; the variable was eliminated since the direction of the difference was contrary to the model assumptions. It was assumed that an increased property vacancy rate would be correlated with an increased need for local protection.

The difference in the mean property vacancy rate between the municipalities that provide protection in collaboration and those that provide protection independently is much smaller and the difference has been determined to not be statistically significant.

The number of housing units will be added as a variable in both models and the mean property vacancy rate will be added back to the first model.

Table 63 - Occupancy and Vacancy Rates

Descriptive Analysis
Variable: Occupancy and Vacancy Rates

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total housing units	897	1,179	2,444	3,194	1,547	0.00000	*
Occupied housing units	81.7%	17.8%	91.3%	6.8%	9.6%	0.00000	*
Vacant housing units	18.3%	17.8%	8.7%	6.8%	9.6%	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total housing units	2,914	3,491	1,548	2,281	1,367	0.00000	*
Occupied housing units	91.5%	6.2%	90.9%	7.8%	0.6%	0.16234	
Vacant housing units	8.5%	6.2%	9.1%	7.8%	0.6%	0.16242	
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2010 US Census File: DES_10_SF1_QTH1_with_ann - General Housing Characteristics obtained through American Fact Finder

Home Ownership Status

The average percentage of the occupied homes that have a mortgage or loan in the four groups is between 45.4 and 46.4 percent. Additionally, the small difference in this category is not statically significant. There is, however, a strong association between a higher percentage of homes that are owned without a mortgage and the municipalities that rely on the State for protection as compared to those that provide some form or protection to residents (36.0 versus 27.1 percent). Additionally there is an offsetting strong association between a higher rate of renter occupied homes and municipalities that provide protection in some form to residents (27.2 versus 17.6 percent).

The mean difference in the percentage of homes owned free and clear as well as the percentage of renter occupied homes is smaller; however it is statistically significant between the municipalities that provide protection independently versus those that provide protection in collaboration.

The percentage of homes that are renter occupied will be included as a variable in both models.

Table 64 - Home Ownership Status

Descriptive Analysis
Variable: Home Ownership Status

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total occupied housing units	758	1,074	2,268	3,016	1,510	0.00000	*
Owned with a mortgage or loan	46.4%	9.3%	45.6%	11.2%	0.8%	0.05690	
Owned free and clear	36.0%	8.2%	27.1%	8.8%	8.9%	0.00000	*
Renter occupied	17.6%	8.2%	27.2%	13.8%	9.6%	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total occupied housing units	2,711	3,309	1,423	2,118	1,288	0.00000	*
Owned with a mortgage or loan	45.4%	11.0%	46.0%	11.6%	0.6%	0.34319	
Owned free and clear	26.7%	8.3%	28.1%	9.5%	1.4%	0.01068	*
Renter occupied	27.9%	13.6%	25.9%	14.1%	2.0%	0.01430	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2010 US Census File: DEC_10_SF1_QTH2_with_ann - General Housing Characteristics obtained through American Fact Finder

Median Property Value

The median property value in municipalities that provide protection to residents is lowest in municipalities that rely on the state for protection with a mean median rate of $132,736 as

compared to $155,296 in municipalities that rely on the State for protection. The $22,561 mean difference is statistically significant. The variation is lower with a mean difference of $16,095 for the upper quartile of property values. The difference in median property value as well as the upper and lower quartile is not statistically significant between municipalities that provide protection in collaboration as compared to those that provide protection independently.

The median property value will be included as a variable in the first model.

Table 65 - Median Property Value

Descriptive Analysis
Variable: Median Value, Lower Quartile and Upper Quartile of Owner Occupied Housing Units

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Lower value quartile (dollars)	88,826	48,868	111,710	68,467	22,884	0.00000	*
Median value (dollars)	132,736	64,331	155,296	95,606	22,561	0.00000	*
Upper value quartile	197,056	93,995	213,151	127,467	16,095	0.00034	*
N	1,245		1,244				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration			
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance
Lower value quartile (dollars)	114,040	71,979	107,252	61,023	6,788	0.08061
Median value (dollars)	158,180	101,163	149,773	83,776	8,406	0.11850
Upper value quartile	215,312	131,611	209,022	119,189	6,290	0.39441
N	817		427			

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_B25077_with_ann, B25076 and B25078 - Median Value (Dollars), Lower Value Quartile and Upper Value Quartile obtained through American Fact Finder

Household Size

There is a greater percentage of one-person households in municipalities that provide protection to their residents than those that rely on the State (28.2 versus 23.5 percent). The 4.7 percent variance is offset in each of the multiple person household categories with the exception

of three-person households where there is no discernible difference. The majority of the variance is offset by two-person households.

The difference in the percentage of one-person households for municipalities that provide protection independently versus in collaboration reflects a much smaller variance (28.7 versus 27.1 percent). This variance is also primarily offset by the variance in two-person households.

The percentage of 1-person households will be included as a variable in both models.

Table 66 - Household Size

Descriptive Analysis
Variable: Household Size

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total Occupied Housing Units	758	1,074	2,268	3,016	1,510	0.00000	*
1-person household	23.5%	5.8%	28.2%	7.4%	4.7%	0.00000	*
2-person household	38.8%	4.7%	35.2%	4.3%	3.6%	0.00000	*
3-person household	16.1%	2.8%	16.1%	2.2%	0.0%	0.67150	
4-person household	12.8%	3.3%	12.6%	3.0%	0.3%	0.03445	*
5-person household	5.4%	1.9%	5.2%	1.7%	0.2%	0.01081	*
6-person household	1.9%	1.1%	1.7%	0.8%	0.1%	0.00019	*
7-or-more-person household	1.4%	1.7%	1.0%	1.0%	0.4%	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total Occupied Housing Units	2,711	3,309	1,423	2,118	1,288	0.00000	*
1-person household	28.7%	7.1%	27.1%	7.9%	1.7%	0.00025	*
2-person household	34.8%	4.0%	36.1%	4.8%	1.3%	0.00000	*
3-person household	16.1%	2.1%	16.0%	2.6%	0.1%	0.39672	
4-person household	12.5%	2.8%	12.6%	3.4%	0.1%	0.76329	
5-person household	5.2%	1.6%	5.4%	1.9%	0.2%	0.08257	
6-person household	1.7%	0.7%	1.8%	0.9%	0.1%	0.05297	
7-or-more-person household	0.9%	0.7%	1.1%	1.4%	0.1%	0.04264	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2010 US Census File: DEC_10_SF1_H13_with_ann - Household Size obtained through American Fact Finder

Median Length of Residency

The median length of residency is 16.1 years in municipalities that rely on the State for protection as compared to 13.6 years in municipalities that provide protection to their residents. The difference is much smaller between municipalities that provide protection in collaboration with a mean median length of residency of 14.0 years as compared to 13.4 years in municipalities that provide protection independently.

The length of residency in years will be included as a variable in both models.

Table 67 - Median Length of Residency

Descriptive Analysis
Variable: Median Length of Residency

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Median length of residency in years	16.1	4.0	13.6	4.2	2.5	0.00000	*
Median length of residency in years, owner occupied units	18.6	4.2	18.0	4.5	0.6	0.00035	*
Median length of residency in years, renter occupied units	6.9	5.7	5.0	3.1	1.9	0.00000	*
N	1,247		1,246				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Median length of residency in years	13.4	4.0	14.0	4.6	0.5	0.04197	*
Median length of residency in years, owner occupied units	18.1	4.3	17.8	4.9	0.3	0.25447	
Median length of residency in years, renter occupied units	4.8	2.5	5.4	4.0	0.7	0.00199	*
N	818		428				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_B25039_with_ann - Median Year Householder Moved into Unit by Tenure obtained through American Fact Finder

Ancestry

Ancestry reported as American, Dutch, English, German and Pennsylvania Dutch represents 52 percent of the population in municipalities that rely on the State for protection as compared to 41.3 percent in municipalities that provide protection to their residents. In each of these categories the reported ancestry is higher in the municipalities that rely on the State for protection. Similarly, in each of these categories the reported ancestry is higher in the municipalities that provide protection in collaboration (a combined 45.1 percent) than in the municipalities that provide protection independently (39.3 percent). The mean difference of 10.7 percent in the first group and 5.7 percent in the second group is statistically significant.

The percentage of the population that reported their ancestry as American, Dutch, English, German or Pennsylvania Dutch will be included as a variable in both models.

Table 68 - Ancestry (RQ1)

Descriptive Analysis
Variable: Total Ancestry Reported

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total Reported	2,401	3,592	7,335	9,975	4,934	0.00000	*
American	6.1%	4.4%	3.9%	2.8%	2.2%	0.00000	*
Dutch	3.4%	2.7%	2.3%	2.1%	1.1%	0.00000	*
English	8.8%	4.4%	7.6%	3.4%	1.2%	0.00000	*
French	2.0%	1.8%	1.6%	1.2%	0.3%	0.00000	*
German	31.8%	10.2%	26.1%	9.9%	5.7%	0.00000	*
Irish	13.6%	5.1%	14.5%	4.8%	0.9%	0.00001	*
Italian	6.2%	4.2%	10.0%	5.2%	3.8%	0.00000	*
Pennsylvania Dutch	1.9%	3.0%	1.4%	2.1%	0.5%	0.00000	*
Polish	4.6%	3.8%	6.3%	4.8%	1.8%	0.00000	*
Scotch-Irish	2.2%	2.1%	1.8%	1.5%	0.4%	0.00000	*
Slovak	1.3%	2.2%	2.1%	2.6%	0.8%	0.00000	*
All Other Groups	18.2%	6.5%	22.3%	8.8%	4.1%	0.00000	*
American, Dutch, English, German & Pennsylvania Dutch	52.0%	11.5%	41.3%	13.0%	10.7%	0.00000	*
N	1,248		1,246				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_B04003_with_ann - Total Ancestry Reported obtained through American Fact Finder

Table 69 - Ancestry (RQ2)

Descriptive Analysis
Variable: Total Ancestry Reported

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Total Reported	8,808	11,018	4,519	6,762	4,288	0.00000	*
American	3.7%	2.7%	4.4%	3.0%	0.7%	0.00018	*
Dutch	2.2%	2.0%	2.5%	2.2%	0.3%	0.04802	*
English	7.4%	3.2%	8.0%	3.8%	0.6%	0.00276	*
French	1.6%	1.0%	1.8%	1.4%	0.2%	0.00329	*
German	24.7%	9.5%	28.7%	10.1%	4.0%	0.00000	*
Irish	14.9%	4.9%	13.7%	4.6%	1.2%	0.00004	*
Italian	10.6%	5.1%	8.9%	5.1%	1.6%	0.00000	*
Pennsylvania Dutch	1.3%	1.9%	1.5%	2.3%	0.2%	0.15146	
Polish	6.8%	5.0%	5.5%	4.4%	1.3%	0.00000	*
Scotch-Irish	1.7%	1.4%	1.9%	1.7%	0.2%	0.10892	
Slovak	2.2%	2.6%	1.9%	2.7%	0.3%	0.07612	
All Other Groups	22.9%	9.4%	21.2%	7.4%	1.7%	0.00037	*
American, Dutch, English, German & Pennsylvania Dutch	39.3%	12.6%	45.1%	12.8%	5.7%	0.00000	*
N	818		428				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_B04003_with_ann - Total Ancestry Reported obtained through American Fact Finder

Poverty Status in the Previous 12 Months

The mean poverty rate in municipalities that rely on the State is slightly higher than in municipalities that provide protection to their residents. In municipalities relying on the state, 10.7 percent of the population is below the poverty level as compared to 10.1 percent in municipalities that provide protection. The difference in the mean poverty level is statistically significant. The rate of poverty was included in the initial model for the first research question; the variable was eliminated since the direction of the difference was contrary to the model

assumptions. It was assumed that an increase in the poverty rate would be correlated with an increased need for local protection.

The difference in the mean poverty rate between the municipalities that provide protection in collaboration and those that provide protection independently is larger (9.5 percent versus 10.4 percent) and the difference is also statistically significant.

The poverty rate will be included as a variable in both models.

Table 70 - Poverty Status in the Previous 12 Months

Descriptive Analysis
Variable: Poverty Status in the Previous 12 Months

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Population for whom poverty status is determined	1,905	2,647	5,496	7,457	3,590	0.00000	*
Percent below poverty level	10.7%	7.1%	10.1%	6.9%	0.6%	0.03263	*
Percent not below poverty level	89.3%	7.1%	89.9%	6.9%	0.6%	0.03263	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Population for whom poverty status is determined	6,550	8,221	3,486	5,166	3,065	0.00000	*
Percent below poverty level	10.4%	6.9%	9.5%	6.8%	0.9%	0.02772	*
Percent not below poverty level	89.6%	6.9%	90.5%	6.8%	0.9%	0.02772	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_S1701_with_ann - Poverty Status in the Past 12 Months obtained through American Fact Finder

Place of Birth by Citizenship Status

The majority of the population within the State was born in the State. Of municipalities that rely on the State for protection, 81.1 percent were born in Pennsylvania as compared to 79.2 percent in municipalities that provide protection to their residents. The difference in the percentage born in the State between municipalities that provide protection in collaboration is not statistically different from that of the municipalities that provide protection independently. No other significant differences in place of birth by citizenship status are reflected in the ACS data.

The percentage of residents born in the State of residence will be included as a variable in the first model.

Table 71 - Place of Birth by Citizenship Status

Descriptive Analysis
Variable: Place of Birth by Citizenship Status

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Projected Population	2,081	2,817	5,686	7,668	3,605	0.00000	*
Born in State of residence	81.1%	14.1%	79.2%	12.9%	1.9%	0.00052	*
Born in other State in the United States	17.1%	13.1%	16.9%	11.1%	0.1%	0.80353	
Born in Puerto Rico	0.1%	0.4%	0.3%	0.7%	0.2%	0.00000	*
Born in U.S. Island Areas	0.0%	0.1%	0.0%	0.1%	0.0%	0.93712	
Born abroad of American parent(s)	0.3%	0.5%	0.4%	0.6%	0.1%	0.00000	*
Foreign born, naturalized U.S. citizen	0.8%	1.1%	1.6%	1.9%	0.9%	0.00000	*
Foreign born, not a U.S. citizen	0.6%	1.5%	1.5%	2.7%	0.9%	0.00000	*
N	1,178		1,242				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Projected Population	6,740	8,372	3,653	5,550	3,087	0.00000	*
Born in State of residence	79.6%	11.8%	78.5%	14.9%	1.1%	0.17505	
Born in other State in the United States	16.3%	9.7%	18.0%	13.4%	1.7%	0.02044	*
Born in Puerto Rico	0.3%	0.7%	0.3%	0.8%	0.0%	0.65786	
Born in U.S. Island Areas	0.0%	0.1%	0.0%	0.1%	0.0%	0.88066	
Born abroad of American parent(s)	0.4%	0.5%	0.5%	0.7%	0.1%	0.16431	
Foreign born, naturalized U.S. citizen	1.7%	2.0%	1.4%	1.7%	0.3%	0.00269	*
Foreign born, not a U.S. citizen	1.6%	2.7%	1.3%	2.6%	0.3%	0.04288	*
N	818		424				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_SF4_B05002_with_ann - Place of Birth by Citizenship Status obtained through American Fact Finder

Employment by Industry

The rate of employment in agriculture, mining, construction and manufacturing is greater in municipalities that rely on the State for police protection which is offset in a wider variety of other industries. These industries make up 30.8 percent of the population in municipalities that rely on the State for protection as compared to 22.9 percent in the municipalities that provide protection to their residents. The same industries represent 24.9 percent of the population in the municipalities that provide protection in collaboration as compared to 21.9 percent of the population in the municipalities that provide protection independently.

The percentage of employees in the Agriculture, forestry, fishing, hunting, mining, construction and manufacturing will be included as variables in both models.

Table 72 - Employment by Industry (RQ1)

Descriptive Analysis
Variable: Employment by Industry

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Civilian employed population 16 years and over	1,993	2,826	5,699	7,726	3,706	0.00000	*
Agriculture, forestry, fishing and hunting, and mining	4.5%	5.0%	1.4%	2.3%	3.1%	0.00000	*
Construction	9.1%	5.1%	6.7%	3.3%	2.3%	0.00000	*
Manufacturing	17.2%	8.2%	14.8%	6.5%	2.4%	0.00000	*
Wholesale trade	2.7%	2.3%	3.1%	2.1%	0.5%	0.00000	*
Retail trade	11.7%	5.3%	12.2%	3.9%	0.5%	0.00584	*
Transportation and warehousing, and utilities	6.7%	5.0%	5.6%	3.0%	1.1%	0.00000	*
Information	1.4%	2.0%	1.9%	1.5%	0.5%	0.00000	*
Finance and insurance, and real estate and rental and leasing	3.9%	4.0%	5.7%	3.4%	1.8%	0.00000	*
Professional, scientific, and management, and administrative and waste management services	6.0%	4.1%	8.3%	4.2%	2.2%	0.00000	*
Educational services, and health care and social assistance	21.1%	6.8%	24.0%	6.4%	2.9%	0.00000	*
Arts, entertainment, and recreation, and accommodation and food services	6.3%	4.5%	7.5%	3.6%	1.2%	0.00000	*
Other services, except public administration	4.8%	3.2%	4.8%	2.3%	0.0%	0.75614	
Public administration	4.5%	3.8%	3.9%	2.8%	0.6%	0.00004	*
Agriculture, forestry, fishing, hunting, mining, construction and manufacturing	30.8%	9.7%	22.9%	8.3%	7.9%	0.00000	*
N	1,249		1,247				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_S2403_with_ann - Industry by Sex and Median Earnings in the Past 12 Months obtained through American Fact Finder

Table 73 - Employment by Industry (RQ2)

Descriptive Analysis
Variable: Employment by Industry

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Civilian employed population 16 years and over	6,777	8,437	3,644	5,609	3,134	0.00000	*
Agriculture, forestry, fishing and hunting, and mining	1.2%	1.9%	1.8%	2.9%	0.6%	0.00013	*
Construction	6.5%	2.8%	7.2%	4.0%	0.7%	0.00071	*
Manufacturing	14.2%	6.3%	15.9%	6.9%	1.7%	0.00002	*
Wholesale trade	3.1%	1.8%	3.2%	2.7%	0.1%	0.54134	
Retail trade	12.3%	3.7%	12.1%	4.4%	0.2%	0.36605	
Transportation and warehousing, and utilities	5.7%	2.9%	5.5%	3.1%	0.3%	0.13553	
Information	2.0%	1.5%	1.8%	1.6%	0.2%	0.03158	*
Finance and insurance, and real estate and rental and leasing	6.0%	3.4%	5.3%	3.4%	0.7%	0.00058	*
Professional, scientific, and management, and administrative and waste management services	8.4%	4.0%	8.0%	4.5%	0.4%	0.08605	
Educational services, and health care and social assistance	24.3%	6.2%	23.4%	6.8%	1.0%	0.01606	*
Arts, entertainment, and recreation, and accommodation and food services	7.7%	3.6%	7.2%	3.8%	0.5%	0.02757	*
Other services, except public administration	4.7%	2.1%	4.8%	2.7%	0.1%	0.35923	
Public administration	3.9%	2.7%	4.0%	2.9%	0.0%	0.94792	
Agriculture, forestry, fishing, hunting, mining, construction and manufacturing	21.9%	7.6%	24.9%	9.1%	3.0%	0.00000	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_S2403_with_ann - Industry by Sex and Median Earnings in the Past 12 Months obtained through American Fact Finder

Travel Time to Work

The average travel time to work is greater in the municipalities that rely on the State for protection when compared to the municipalities that provide protection to their residents. In

municipalities that provide protection to their residents, 31.6 percent of the population has a commute to work that is less than 15 minutes where 25.6 percent of the population has a similar commute in the municipalities that rely on the State for protection. The difference in the mean commute time is not statistically significant between the municipalities that provide protection in collaboration and those that do so independently.

The percentage of the population that has a commute time of less than 15 minutes will be included as a variable in the first model.

Table 74 - Travel Time to Work

Descriptive Analysis
Variable: Travel Time to Work

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
ACS Mean Commuting Population	908	1,247	2,650	3,688	1,742	0.00000	*
Less than 15 minutes	25.6%	11.6%	31.6%	11.6%	6.0%	0.00000	*
15 to 29 minutes	35.4%	11.7%	35.5%	9.8%	0.1%	0.81939	
30 to 59 minutes	30.0%	11.7%	25.8%	9.7%	4.2%	0.00000	*
Greater than 60 minutes	9.1%	6.3%	7.2%	4.6%	1.9%	0.00000	*
N	1,178		1,242				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
ACS Mean Commuting Population	3,148	4,079	1,689	2,523	1,459	0.00000	*
Less than 15 minutes	31.5%	11.8%	31.6%	11.1%	0.1%	0.92867	
15 to 29 minutes	35.3%	9.2%	35.9%	10.8%	0.6%	0.30271	
30 to 59 minutes	26.1%	9.9%	25.3%	9.3%	0.8%	0.15950	
Greater than 60 minutes	7.1%	4.3%	7.2%	5.1%	0.1%	0.71942	
N	818		424				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_SF4_B08303_with_ann - Travel Time to Work obtained through American Fact Finder

Means of Transportation to Work

Slightly greater than 90 percent of the population in all groups commutes to work by car, truck or van regardless of the category of their grouping in this research. While some of the categories show a statistically significant difference, the difference in percentage of the population that commutes in one form versus another is small.

As a result, no means of transportation categories will be included as variables in either model.

Table 75 - Travel Time to Work

Descriptive Analysis
Variable: Means of Transportation to Work

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
ACS Mean Commuting Population	950	1,299	2,748	3,824	1,798	0.00000	*
Car, truck, or van (drove alone)	80.5%	7.8%	80.9%	7.7%	0.4%	0.24197	
Car, truck, or van, (Carpooled)	10.8%	5.4%	9.6%	4.2%	1.2%	0.00000	*
Public transportation	0.3%	0.9%	1.8%	3.6%	1.4%	0.00000	*
Taxicab	0.1%	0.4%	0.0%	0.2%	0.0%	0.29159	
Motorcycle	0.2%	0.5%	0.2%	0.4%	0.0%	0.19735	
Bicycle	0.1%	0.6%	0.2%	0.6%	0.1%	0.00167	*
Walked	2.7%	2.9%	3.4%	4.2%	0.7%	0.00000	*
Other means	0.8%	1.4%	0.6%	1.0%	0.2%	0.00004	*
Worked at home	4.5%	3.4%	3.3%	2.6%	1.2%	0.00000	*
N	1,178		1,242				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
ACS Mean Commuting Population	3,260	4,217	1,761	2,660	1,499	0.00000	*
Car, truck, or van (drove alone)	80.6%	7.7%	81.5%	7.9%	1.0%	0.03886	*
Car, truck, or van, (Carpooled)	9.6%	4.0%	9.7%	4.6%	0.1%	0.70184	
Public transportation	2.1%	4.2%	1.1%	2.1%	1.1%	0.00000	*
Taxicab	0.0%	0.2%	0.0%	0.2%	0.0%	0.33197	
Motorcycle	0.1%	0.3%	0.2%	0.4%	0.0%	0.06372	
Bicycle	0.2%	0.5%	0.2%	0.6%	0.0%	0.72897	
Walked	3.6%	4.1%	3.1%	4.3%	0.5%	0.06804	
Other means	0.6%	0.9%	0.7%	1.3%	0.1%	0.16523	
Worked at home	3.2%	2.4%	3.5%	2.8%	0.3%	0.05503	
N	818		424				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_SF4_B05002_with_ann - Place of Birth by Citizenship Status obtained through American Fact Finder

Population Density

Perhaps the most significant difference between the municipalities that rely on the State for protection and those that provide protection is population density. Population density, as calculated as the municipality population from the 2010 census and the number of square miles

per municipality obtained from the municipal demographic data published by the Pennsylvania Department of Community and Economic Development shows that there are 1,923.6 people per mile in municipalities that provide protection to their residents as compared to 289.4 for the municipalities that rely on the State. Population density is also statistically different between municipalities that provide protection in collaboration as compared to those that do so independently. Municipalities that provide protection in collaboration have 1,565.8 residents per square mile as compared to 2,110.6 residents in the average municipality that provides protection independently.

Population density will continue to be a variable in the first model and will be included as a variable in the second model.

Table 76 - Population Density

Descriptive Analysis
Variable: Population Density

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Number of Residents	1,993.10	2,826.00	5,699.20	7,726.30	3,706.10	0.00000	*
Square Miles	25.8	20.7	9.5	12.5	16.3	0.00000	*
Population Density	293.1	596.5	1,925.00	2,072.20	1,631.90	0.00000	*
N	1,249		1,247				

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Number of Residents	6,777.30	8,436.70	3,643.50	5,609.10	3,133.80	0.00000	*
Square Miles	9.9	12.5	8.8	12.3	1.2	0.11041	
Population Density	2,109.60	2,213.90	1,573.00	1,719.00	536.7	0.00000	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: 2006 to 2010 American Community Survey File: ACS_10_5YR_B04003_with_ann - Total Ancestry Reported obtained through American Fact Finder

Government Spending

Other government spending per resident was reflected as a variable in the first empirical model to represent the assumption that there is a correlation between the amount a municipality spends per resident on non-police services and the likelihood that a municipality would offer police protection to its residents. Table 77 below breaks out several categories of government spending for the first research question while table 78 does so for the second research question. Both tables also breakout the municipal employees per 1,000 residents.

Municipalities that provide protection to their residents spend on average $655.61 per resident for services other than police protection as compared to an average of $379.51 per resident in the municipalities that rely on the State for protection. Components of the variance include the expenditure on Water and Sewer where those providing police protection spend $101.01 per resident compared to $27.27 in the municipalities protected by the State and Cultural, Recreational, Libraries and Community Development where those providing police protection spend $42.41 per resident compared to $16.46 in the municipalities protected by the State.

There is no significant variance in the number of employees per 1,000 residents. Municipalities that provide protection to their residents have 5.5 employees per 1,000 residents as compared to 5.6 for municipalities that rely on the State for protection.

For municipalities that provide protection to their residents, the amount of government spending on all services excluding police protection is not statistically different between the municipalities that provide protection in collaboration as compared to those that do so independently. The amount spent on cultural, recreational, libraries and community development is statistically higher per resident in municipalities that provide police protection

independently as compared to municipalities that provide the service in collaboration ($47.55 as compared to $32.60).

Consistent with the literature, the cost of police protection is 38 percent higher per resident ($122.95 as compared to $88.84) for municipalities that provide the service independently than the municipalities that provide protection in collaboration with their neighbors.

Other government spending per resident will remain as a variable for the first research question and the amount of government spending on cultural, recreation, libraries, and community development per resident will be included as a variable in both models.

Table 77 - Government Spending (RQ1)

Descriptive Analysis
Variable: Government Spending

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Number of Residents	1,993.1	2,826.0	5,699.2	7,726.3	3,706.1	0.00000	*
Total Government Spending	682,055	1,217,275	4,594,252	8,179,513	3,912,197	0.00000	*
Police	1,004	7,826	858,255	1,685,690	857,251	0.00000	*
Government Spending on All but Police	681,050	1,217,108	3,735,997	6,710,087	3,054,947	0.00000	*
Fire	35,421	69,498	171,484	403,255	136,063	0.00000	*
Public Works Highways and Streets	257,656	347,434	665,091	1,027,548	407,435	0.00000	*
Water and Sewer Expenditures	41,175	184,587	525,620	1,197,336	484,445	0.00000	*
Cultural, Recreation, Libraries and Community Development	48,964	275,798	342,318	997,336	293,354	0.00000	*
Other Government Spending	297,833	611,789	2,031,484	4,185,348	1,733,651	0.00000	*
Total Government Spending Per Resident	387.05	502.29	776.20	2001.99	389.14	0.00000	*
Police Per Resident	0.81	5.84	112.59	91.40	111.78	0.00000	*
Government Spending on All but Police Per Resident	386.24	502.41	663.61	1989.62	277.36	0.00000	*
Fire Per Resident	17.05	15.99	23.69	27.24	6.64	0.00000	*
Public Works Highways and Streets Per Resident	168.83	279.09	126.85	241.21	41.98	0.00007	*
Water and Sewer Expenditures Per Resident	27.71	185.02	102.24	331.26	74.53	0.00000	*
Cultural, Recreation, Libraries and Community Development Per Resident	16.74	123.62	42.93	144.36	26.20	0.00000	*
Other Government Spending Per Resident	155.92	184.42	367.89	1579.63	211.98	0.00000	*
Municipal Employees	5.5	4.4	25.6	39.2	20.1	0.00000	*
Municipal Employees Per 1,000 Residents	5.6	9.0	5.4	4.1	0.2	0.53145	
N	1,249		1,247				

Source: Municipal Statistical Reports, Pennsylvania Department of Community and Economic Development

Table 78 - Government Spending (RQ2)

Descriptive Analysis
Variable: Government Spending

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
Number of Residents	6,777	8,437	3,644	5,609	3,134	0.00000	*
Total Government Spending	5,591,796	8,662,619	2,688,778	6,779,274	2,903,017	0.00000	*
Police	1,048,409	1,851,287	495,030	1,235,609	553,379	0.00000	*
Government Spending on All but Police	4,543,387	7,092,695	2,193,749	5,603,619	2,349,638	0.00000	*
Fire	206,785	443,674	104,054	300,986	102,730	0.00000	*
Public Works Highways and Streets	800,177	1,129,058	407,053	733,508	393,124	0.00000	*
Water and Sewer Expenditures	645,359	1,317,753	296,898	882,017	348,460	0.00000	*
Cultural, Recreation, Libraries and Community Development	413,641	1,024,072	206,080	930,238	207,561	0.00035	*
Other Government Spending	2,477,425	4,447,661	1,179,663	3,481,380	1,297,762	0.00000	*
Total Government Spending Per Resident	776.24	699.13	776.11	3278.30	0.13	0.99935	
Police Per Resident	124.47	98.09	89.89	71.85	34.58	0.00000	*
Government Spending on All but Police Per Resident	651.77	642.17	686.22	3278.52	34.45	0.83065	
Fire Per Resident	24.34	25.40	22.46	30.44	1.88	0.27757	
Public Works Highways and Streets Per Resident	122.31	102.02	135.51	386.73	13.20	0.49077	
Water and Sewer Expenditures Per Resident	100.84	239.79	104.93	458.12	4.10	0.86356	
Cultural, Recreation, Libraries and Community Development Per Resident	48.14	161.82	32.99	102.56	15.15	0.04556	*
Other Government Spending Per Resident	356.15	441.94	390.33	2626.51	34.18	0.79060	
Municipal Employees	31.5	41.8	14.2	30.6	17.3	0.00000	*
Municipal Employees Per 1,000 Residents	5.6	3.9	5.2	4.5	0.3	0.23024	
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

Source: Municipal Statistical Reports, Pennsylvania Department of Community and Economic Development

Expanded Models

The empirical models accounted for only a portion of the variance in the populations for the two research questions. In this section of the research, the models are expanded to include all variables determined to have a significant mean difference which may increase the predictive value of the models. It is important to note that no effort has been made to link individual variables to specific theories. By expanding the models in this manner, a greater understanding of the differences between the groups can be developed and the original models can be compared to the final model to determine if the empirical models previously developed represent the majority of the variation or only a small portion of the identifiable variation.

Variables

Table 79 below reflects the variables from the initial models that were determined to be statistically significant regardless of the direction of the difference as well as the variables identified in descriptive analysis phase of the research. Additionally, the variable UNDER_1500 which was created in the development of the revised empirical model for the second research question will be included as a variable for the expanded model for the first research question as well.

Table 79 - Variables for Expanded Models

Expanded Model for Research Question 1 and 2			
Variable Name	Description	First Model	Second Model
CRIME_VIO	Violent Crime Rate	X	
CRIME_PROP	Property Crime Rate	X	X
O_SPEND	Other Government Spending per Resident	X	
POVERTY	Poverty Rate	X	X
VACANCY	Property Vacancy Rate	X	
POP_DEN	Population Density	X	X
NO_RES	Number of Residents	X	
UNDER_1500	Less than 1,500 Residents	X	X
MALE_FEM	Males per 100 Females	X	
MED_AGE_M	Median Age in Years for Males	X	
MED_AGE_F	Median Age in Years for Females	X	
MED_INC	Median Household Income	X	
MED_INC_4564	Median Household Income for Householders Between the age of 45 and 64	X	
HS_PLUS	Percentage of Residents 25 and Older Who Have More Than a High School Education	X	X
NON_MIN	Percentage of the Population Classifying Themselves as White and of a Single Race	X	X
IN_HH	Percentage of Residents Living in Family Households	X	X
HOMES	Total Number of Housing Units	X	X
RENTALS	Percentage of Homes that are Renter Occupied	X	X
PROP_VAL	Median Property Value	X	
HH_1P	Percentage of 1-Person Households	X	X
H_YRS	Median Length of Residency in Years	X	X
A_D_E_G_PD	Percentage of the Population that Reported their Ancestry as American, Dutch, English, German or Pennsylvania Dutch	X	X
PA_BORN	Percent of Residents Born in the State of Residence	X	
AG_CONST	Percent of employees in the Agriculture, Forestry, Fishing, Hunting, Mining, Construction and Manufacturing	X	X
C_15M	Percent of the Population that has a Commute Time of Less Than 15 Minutes	X	
CULT_SPEND	Government Spending on Cultural, Recreation, Libraries and Community Development per Resident	X	X

Expanded Model for Research Question 1

The expanded model for research question 1 begins with the 26 variables either carried over from the first revised empirical model or identified in the descriptive analysis section of this research. The variables included in the expanded model are reflected in table 80 below. After creating a formula predicting the outcome based on all 26 variables, variables will be eliminated through the use of the backward stepwise likelihood analysis conducted through SPSS.

Table 80 - Variables in the First Expanded Model

Calculation of Mean, Standard Deviation, Mean Difference and Significance for Independent Variables in the Expanded First Model

RQ1 - The Decision to Provide Police Protection to Residents	Rely on State for Protection		Provide Protection				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
CRIME_VIO	**81.2**	27.4	64.9	21.1	16.3	0.00000	*
CRIME_PROP	**231.5**	57.9	251.1	56.0	19.6	0.00000	*
O_SPEND	**386.24**	502.41	663.61	1989.62	277.36	0.00000	*
POVERTY	**10.7%**	7.1%	10.1%	6.9%	0.6%	0.03263	*
VACANCY	**18.3%**	17.8%	8.7%	6.8%	9.6%	0.00000	*
POP_DEN	**293.1**	596.5	1925.0	2072.2	1631.9	0.00000	*
NO_RES	**1,993**	2,826	5,699	7,726	3,706	0.00000	*
UNDER_1500	**58.9%**	49.2%	26.9%	44.3%	32.1%	0.00000	*
MALE_FEM	**105.4**	37.0	96.6	38.7	8.8	0.00000	*
MED_AGE_M	**42.8**	5.3	40.6	5.1	2.2	0.00000	*
MED_AGE_F	**44.4**	4.9	43.4	5.5	0.9	0.00001	*
MED_INC	**48,413**	14,129	53,050	19,815	4,637	0.00000	*
MED_INC_4564	**57,540**	16,984	64,760	23,847	7,221	0.00000	*
HS_PLUS	**36.9%**	11.8%	46.7%	14.7%	9.9%	0.00000	*
NON_MIN	**97.1%**	4.7%	92.7%	10.4%	4.4%	0.00000	*
IN_HH	**84.6%**	7.7%	80.8%	9.1%	3.8%	0.00000	*
HOMES	**897**	1,179	2,444	3,194	1,547	0.00000	*
RENTALS	**17.6%**	8.2%	27.2%	13.8%	9.6%	0.00000	*
PROP_VAL	**132,736**	64,331	155,296	95,606	22,561	0.00000	*
HH_1P	**23.5%**	5.8%	28.2%	7.4%	4.7%	0.00000	*
H_YRS	**16.1**	4.0	13.6	4.2	2.5	0.00000	*
A_D_E_G_PD	**52.0%**	11.5%	41.3%	13.0%	10.7%	0.00000	*
PA_BORN	**81.1%**	14.1%	79.2%	12.9%	1.9%	0.00052	*
AG_CONST	**30.8%**	9.7%	22.9%	8.3%	7.9%	0.00000	*
C_15M	**25.6%**	11.6%	31.6%	11.6%	6.0%	0.00000	*
CULT_SPEND	**16.74**	123.67	42.97	144.42	26.23	0.00000	*
N	1,249		1,247				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

The net target population of 2,496 municipalities that are not cities and are also not split between municipal borders has been reduced by 77 municipalities which either did not complete the required DCED-CLGS-30 financial report for any of the most recent 5 year period or where

there is missing information reported in the ACS survey. As a result, the logistic regression analysis for the model is based on 2,419 municipalities.

Table 81 – Expanded RQ1 Cases Reflected in Logistic Regression Analysis

ERQ1 - Cases Reflected in Logistic Regression Analysis

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	2419	96.9
	Missing Cases	77	3.1
	Total	2496	100.0
Unselected Cases		0	0.0
Total		2496	100.0

a. If weight is in effect, see classification table for the total number of cases.

Source: IBM SPSS Statistics Version 20

The first step in the logistic regression analysis, the calculation of the probability of any single non-city municipality offering police protection to their residents, is reflected in table 82 below. Without reflecting the impact of any predictor variables, the overall probability of any given municipality offering police protection is slightly greater than 51.3 percent in this model. In the initial empirical model, the predicted outcome was 50.5 percent. The difference between the two models is a result of the increased missing variables in the expanded model. Without predictor variables, all municipalities would be assumed to have police forces resulting in 1,177 false positive results and no false negative results.

Table 82 – Expanded RQ1 Classification Table before Adding Variables

ERQ1 - Predicted Outcome with no Variables

Classification Table[a,b]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 0	HAVE_PF	0	0	1177	0.0
		1	0	1242	100.0
	Overall Percentage				51.3

a. Constant is included in the model.

b. The cut value is .500

Source: IBM SPSS Statistics Version 20

In utilizing SPSS to calculate a logistic regression based on the predictor variables, it is confirmed that all 26 variables are significantly related to the outcome with a significance factor below 0.05 as shown in table 83 below.

Table 83 – Expanded RQ1 Analysis of Predictor Variables

ERQ1 - Analysis of Variables

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	0.054	.041	1.746	1	0.186	1.055

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	CRIME_VIO	227.807	1	.000
		CRIME_PROP	73.222	1	.000
		O_SPEND	145.523	1	.000
		POVERTY	3.836	1	.050
		VACANCY	276.061	1	.000
		POP_DEN	533.495	1	.000
		NO_RES	208.632	1	.000
		UNDER_1500	223.563	1	.000
		MALE_FEM	63.513	1	.000
		MED_AGE_M	93.718	1	.000
		MED_AGE_F	12.088	1	.001
		MED_INC	34.373	1	.000
		MED_INC_4564	61.942	1	.000
		HS_PLUS	299.363	1	.000
		NON_MIN	167.157	1	.000
		IN_HH	131.343	1	.000
		HOMES	212.427	1	.000
		RENTALS	379.828	1	.000
		PROP_VAL	38.402	1	.000
		HH_1P	299.436	1	.000
		H_YRS	205.159	1	.000
		A_D_E_G_PD	404.278	1	.000
		PA_BORN	12.441	1	.000
		AG_CONST	414.798	1	.000
		C_15M	152.048	1	.000
		CULT_SPEND	24.063	1	.000

a. Residual Chi-Squares are not computed because of redundancies.

Source: IBM SPSS Statistics Version 20

The SPSS program calculates two estimations of the percentage of variation predicted by the logistic regression model. The Cox & Snell value of .451 and the Nagelkerke value of .602 indicate that the independent predictor variables predict 45.1 percent and 60.2 percent of the variation in the decision of a given municipality to offer police protection to their residents. The Cox & Snell and Nagelkerke values were .361 and .481 respectively in the previous model for the first research question.

Table 84 – Expanded RQ1 - Determination of Model Significance

ERQ1 - Model Significance

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1900.379a	.451	.602

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Source: IBM SPSS Statistics Version 20

The Classification table generated by SPSS quantifies the accuracy of the logistic regression model. Overall the model for the first research question predicts the choice of offering police protection to residents with 82.1 percent accuracy as compared to an accuracy rate of 78.4 percent from the prior model for the first research question. The model predicts municipalities that rely on the State with 83.7 percent accuracy and those that provide protection with 80.6 percent accuracy. The model would falsely predict that 192 municipalities would rely on the State for protection (the false negative rate). Additionally the model would falsely predict that 241 municipalities would provide protection to their residents (the false negative rate).

Table 85 – Expanded RQ1 Predicted Outcome based on Logistic Regression Model

ERQ1 - Predicted Outcome with Variables

Classification Table[a]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 1	HAVE_PF	0	985	192	83.7
		1	241	1001	80.6
	Overall Percentage				82.1

a. The cut value is .500

Source: IBM SPSS Statistics Version 20

Table 86 below shows the calculation of the constant as well as the coefficient for each variable. The table also shows the calculation of the significance of each variable in the equation. It is important to note that many of the variables have a significance of greater than 0.05 which indicates that although the variables have previously been determined to be significantly related to the likelihood of the outcome of the model, they do not represent a significant factor in the model developed.

Table 86 – Expanded RQ1 Variables in the Model

ERQ1 - Variables in the Model

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	CRIME_VIO	-0.017682	.003	37.368	1	0.000000	.982
	CRIME_PROP	0.002390	.001	4.481	1	0.034280	1.002
	O_SPEND	0.001101	.000	21.404	1	0.000004	1.001
	POVERTY	-0.013296	.012	1.258	1	0.262098	0.987
	VACANCY	-0.046376	.009	24.703	1	0.000001	0.955
	POP_DEN	0.000840	.000	77.259	1	0.000000	1.001
	NO_RES	-0.000010	.000	0.008	1	0.928621	1.000
	UNDER_1500	-0.546167	.151	13.136	1	0.000290	0.579
	MALE_FEM	-0.004870	.003	1.939	1	0.163729	0.995
	MED_AGE_M	0.020941	.029	0.517	1	0.472151	1.021
	MED_AGE_F	0.021725	.027	0.633	1	0.426384	1.022
	MED_INC	-0.000009	.000	0.698	1	0.403459	1.000
	MED_INC_4564	0.000011	.000	2.271	1	0.131835	1.000
	HS_PLUS	0.006749	.009	0.601	1	0.438101	1.007
	NON_MIN	-0.028005	.019	2.072	1	0.149978	0.972
	IN_HH	0.020978	.013	2.557	1	0.109784	1.021
	HOMES	0.000161	.000	0.326	1	0.567895	1.000
	RENTALS	0.021272	.012	3.254	1	0.071248	1.021
	PROP_VAL	-0.000004	.000	5.902	1	0.015124	1.000
	HH_1P	0.025862	.021	1.551	1	0.212970	1.026
	H_YRS	0.032794	.020	2.590	1	0.107562	1.033
	A_D_E_G_PD	-0.036189	.006	33.107	1	0.000000	0.964
	PA_BORN	-0.002915	.005	0.294	1	0.587930	0.997
	AG_CONST	-0.018459	.009	4.291	1	0.038324	0.982
	C_15M	0.027782	.006	22.745	1	0.000002	1.028
	CULT_SPEND	-0.000842	.001	2.154	1	0.142163	0.999
	Constant	0.055790	2.291	0.001	1	0.980572	1.057

a. Variable(s) entered on step 1: CRIME_VIO, CRIME_PROP, O_SPEND, POVERTY, VACANCY, POP_DEN, NO_RES, UNDER_1500, MALE_FEM, MED_AGE_M, MED_AGE_F, MED_INC, MED_INC_4564, HS_PLUS, NON_MIN, IN_HH, HOMES, RENTALS, PROP_VAL, HH_1P, H_YRS, A_D_E_G_PD, PA_BORN, AG_CONST, C_15M, CULT_SPEND.

Source: IBM SPSS Statistics Version 20

Refined Expanded Model for Research Question 1

The model for the first research question can be further refined to eliminate the variables from the equation that do not significantly contribute to the outcome of the model by utilizing the backward stepwise functionality incorporated in the SPSS software. After recalculating the model in twelve steps to eliminate unnecessary variables, a model was created including fifteen variables and maintained 81.6 percent accuracy rate in predicting which municipalities would provide protection to their residents. The details of each of the twelve steps are included as appendix 6.

The Cox & Snell value of .451 and the Nagelkerke value of .602 indicate that the independent predictor variables predict 45.1 percent and 60.2 percent of the variation in the decision of a given municipality to offer police protection to their residents. The Cox & Snell and Nagelkerke values were .361 and .481 respectively in the previous model for the first research question.

Table 87 – Refined Expanded RQ1 - Determination of Model Significance

RERQ1 - Model Significance

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
12	1913.217a	.448	.598

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Source: IBM SPSS Statistics Version 20

The Classification table generated by SPSS quantifies the accuracy of the logistic regression model. Overall the model for the first research question predicts the choice of offering

police protection to residents with 81.6 percent accuracy which is identical to the rate from the expanded model and compares to 78.4 percent from the initial model for the first research question. The model predicts municipalities that rely on the State with 83.9 percent accuracy and those that provide protection with 79.5 percent accuracy. The model would falsely predict that 189 municipalities would rely on the State for protection (the false negative rate). Additionally the model would falsely predict that 255 municipalities would provide protection to their residents (the false negative rate).

Table 88 – Refined Expanded RQ1 Predicted Outcome based on Logic Regression Model

RERQ1 - Predicted Outcome with Variables

Classification Table[a]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 12	HAVE_PF	0	988	189	83.9
		1	255	987	79.5
	Overall Percentage				81.6

a. The cut value is .500

Source: IBM SPSS Statistics Version 20

Table 89 below shows the calculation of the constant as well as the coefficient for each variable. The table also shows the calculation of the significance of each variable in the equation. Only the variable CULT_SPEND and the constant have a significance greater than 0.05 which indicates that the remaining variables represent a significant factor in the model developed.

The Logistic Regression model for the first Refined Expanded Research Question has a constant of -0.067947 and coefficients of -0.017503 for CRIME_VIO, 0.002439 for CRIME_PROP, 0.001188 for O_SPEND, -0.046441 for VACANCY, 0.000873 for POP_DEN, -0.518227 for UNDER_1500, -0.005456 for MALE_FEM, 0.053644 for MED_AGE_F, 0.053644 for HOMES, 0.015750 for RENTALS, -0.000002 for PROP_VAL, -0.040886 for A_D_E_G_PD, -0.020826 for AG_CONST, 0.025699 for C_15M, -0.001061 for CULT_SPEND.

Table 89 – Refined Expanded RQ1 Variables in the Model

RERQ1 - Variables in the Model

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 12[a]	CRIME_VIO	-0.017503	.003	38.586	1	0.000000	.983
	CRIME_PROP	0.002439	.001	4.780	1	0.028796	1.002
	O_SPEND	0.001188	.000	24.573	1	0.000001	1.001
	VACANCY	-0.046441	.007	39.174	1	0.000000	0.955
	POP_DEN	0.000873	.000	91.500	1	0.000000	1.001
	UNDER_1500	-0.518227	.147	12.403	1	0.000429	0.596
	MALE_FEM	-0.005456	.003	4.034	1	0.044584	0.995
	MED_AGE_F	0.053644	.014	14.882	1	0.000114	1.055
	HOMES	0.000155	.000	10.586	1	0.001140	1.000
	RENTALS	0.015750	.008	3.979	1	0.046072	1.016
	PROP_VAL	-0.000002	.000	8.700	1	0.003182	1.000
	A_D_E_G_PD	-0.040886	.005	55.475	1	0.000000	0.960
	AG_CONST	-0.020826	.008	6.576	1	0.010338	0.979
	C_15M	0.025699	.006	21.358	1	0.000004	1.026
	CULT_SPEND	-0.001061	.001	3.572	1	0.058770	0.999
	Constant	0.067947	.887	0.006	1	0.938918	1.070

a. Variable(s) entered on step 1: CRIME_VIO, CRIME_PROP, O_SPEND, POVERTY, VACANCY, POP_DEN, NO_RES, UNDER_1500, MALE_FEM, MED_AGE_M, MED_AGE_F, MED_INC, MED_INC_4564, HS_PLUS, NON_MIN, IN_HH, HOMES, RENTALS, PROP_VAL, HH_1P, H_YRS, A_D_E_G_PD, PA_BORN, AG_CONST, C_15M, CULT_SPEND.

Source: IBM SPSS Statistics Version 20

Table 90 below shows the variables that have been excluded from the revised expanded model.

Table 90 – Refined Expanded RQ1 Variables not in the Model

RERQ1 - Variables not in the Model

Variables not in the Equation

		Score	df	Sig.
Step 12	POVERTY	2.479	1	.115
	NO_RES	.463	1	.496
	MED_AGE_M	.842	1	.359
	MED_INC	.314	1	.575
	MED_INC_4564	2.373	1	.123
	HS_PLUS	.758	1	.384
	NON_MIN	.771	1	.380
	IN_HH	.983	1	.321
	HH_1P	.387	1	.534
	H_YRS	2.265	1	.132
	PA_BORN	.087	1	.769
	Overall Statistics	12.692	11	.314

Source: IBM SPSS Statistics Version 20

The Logit probability formula is calculated by entering the constant, coefficients and variables into the Logit formula as reflected in table 91 below. This formula predicts the probability of a given municipality providing police protection to their residents and not relying on the State for protection.

Table 91 – Refined Expanded RQ1 Logit Probability Formula

RQ1 - Logit Probability Formula

$$p = \frac{\exp^{(-0.067947 - 0.017503 X CRIME\_VIO + 0.002439 x CRIME\_PROP + 0.001188 x O\_SPEND - 0.046441 x VACANCY + 0.000873 x POP\_DEN - 0.518227 for UNDER\_1500 - 0.005456 x MALE\_FEM + 0.053644 x MED\_AGE\_F + 0.053644 x HOMES + 0.015750 x RENTALS - 0.000002 x PROP\_VAL - 0.040886 x A\_D\_E\_G\_PD - 0.020826 x AG\_CONST + 0.025699 x C\_15M - 0.001061 x CULT\_SPEND)}}{1 + \exp^{(-0.067947 - 0.017503 X CRIME\_VIO + 0.002439 x CRIME\_PROP + 0.001188 x O\_SPEND - 0.046441 x VACANCY + 0.000873 x POP\_DEN - 0.518227 for UNDER\_1500 - 0.005456 x MALE\_FEM + 0.053644 x MED\_AGE\_F + 0.053644 x HOMES + 0.015750 x RENTALS - 0.000002 x PROP\_VAL - 0.040886 x A\_D\_E\_G\_PD - 0.020826 x AG\_CONST + 0.025699 x C\_15M - 0.001061 x CULT\_SPEND)}}$$

Where:

p= the probability that a case is in a given category

exp= the base of natural logarithms 2.71828182845904

The impact of individual independent variables as predictors of the probability may be misstated in the logit probability formula if there is a high level of collinearity between the variables. Menard (2002) determined that the variables with an r square of greater than 0.80 have a high level of collinearity which may pose a problem while variables with an a square of greater than 0.90 have a very high level of collinearity and are almost certain to result in inaccurate coefficients in the logistic regression model. Table 92 below reflects the r square for each possible combination of variables. In the refined expanded model for the first research model, there are no r square values in excess of 0.800 indicating that collinearity between variables is not an issue with the model. If the number of residents was not removed as a variable in the backward stepwise likelihood analysis phase, the coefficients for the number of residents and the number of homes variables could not have been depended upon to indicate the relevance of the two variables in the formula since the r square value between these two variables is 0.979.

Table 92 - Test of Collinearity for Refined Expanded RQ1 Model

Testing for Collinearity - Calculation of R Square Between Variables in Refined Expanded RQ1 Model

	CRIME_VIO	CRIME_PROP	O_SPEND	VACANCY	POP_DEN	UNDER_1500	MALE_FEM	MED_AGE_F	HOMES	RENTALS	PROP_VAL	A_D_E_G_PD	AG_CONST	C_15M	CULT_SPEND
CRIME_VIO	1.000	0.023	0.002	0.115	0.038	0.068	0.003	0.007	0.045	0.005	0.134	0.058	0.024	0.001	0.006
CRIME_PROP		1.000	0.003	0.018	0.038	0.034	0.001	0.005	0.042	0.004	0.047	0.041	0.037	0.007	0.002
O_SPEND			1.000	0.001	0.003	0.000	0.333	0.000	0.001	0.034	0.011	0.004	0.007	0.003	0.022
VACANCY				1.000	0.049	0.131	0.011	0.095	0.035	0.039	0.046	0.009	0.060	0.021	0.000
POP_DEN					1.000	0.043	0.016	0.087	0.060	0.399	0.000	0.120	0.135	0.028	0.005
UNDER_1500						1.000	0.001	0.016	0.196	0.012	0.094	0.053	0.076	0.021	0.003
MALE_FEM							1.000	0.002	0.005	0.001	0.001	0.000	0.003	0.002	0.001
MED_AGE_F								1.000	0.004	0.109	0.004	0.001	0.001	0.003	0.000
HOMES									1.000	0.013	0.119	0.092	0.100	0.004	0.009
RENTALS										1.000	0.028	0.041	0.076	0.150	0.002
PROP_VAL											1.000	0.025	0.045	0.019	0.030
A_D_E_G_PD												1.000	0.238	0.003	0.012
AG_CONST													1.000	0.023	0.016
C_15M														1.000	0.000
CULT_SPEND															1.000

No R Square values greater than 0.800 indicates that there are no variables with a high level of collinearity.

Relative Influence of Variables in the Refined Expanded RQ1 Model Variables

It is difficult to determine the influence of individual variables on the final equation simply by looking at the coefficient of the variable. Population density (POP_DEN) as an example has a coefficient of 0.000873 may be construed as having less impact on the results of the equation than the property vacancy rate (VACANCY) with a coefficient of -0.046441. However, the formula is based on the product coefficient and the value of the variable. The mean population density for the municipalities in the target population for the first research question is 1,108 while the mean property vacancy rate is 0.135. As a result, conclusions of the importance of individual variables cannot be drawn simply by a comparison of the coefficients. To determine some measure of the significance of individual variables in the final equation, all

variables were recalculated as the percentage of the maximum value for the variable. As a result, all variables range in value from zero or near zero to one. A logistic regression analysis was calculated and the predicted outcomes table that resulted was identical to the table reported for the refined, expanded RQ1 printed above. The variables in the equation table below reflect new coefficients which more closely represent the impact of the individual variables on the prediction of outcome.

Based on the percentage of the maximum value substitute variables, population density (POP_DEN) and the amount spent on other government services (O_SPEND) have the most significant predictive value followed by the number of homes (HOMES) and the ratio of males to females (MALE_FEM). The test of reliability reflected in appendix 8 of this research confirms the impact of the POP_DEN and O_SPEND variables, but failed to confirm the impact of the HOMES and MED_AGE_F variables.

Table 93 - Refined Expanded RQ1 Variables in the Model with the Variable Value Adjusted to Reflect the Percentage of the Maximum Value

RERQ1 - Variables in the Model With All Variables adjusted to reflect the percentage of the maximum value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	P_CRIME_VIO	-2.838	.457	38.586	1	0.000000	.059
	P_CRIME_PROP	0.985	.451	4.780	1	0.028796	2.678
	P_O_SPEND	11.345	2.289	24.572	1	0.000001	84574.801
	P_VACANCY	-3.985	.637	39.174	1	0.000000	0.019
	P_POP_DEN	11.661	1.219	91.500	1	0.000000	115993.453
	P_UNDER_1500	-0.518	.147	12.403	1	0.000429	0.596
	P_MALE_FEM	-4.327	2.154	4.034	1	0.044587	0.013
	P_MED_AGE_F	4.174	1.082	14.883	1	0.000114	64.955
	P_HOMES	5.301	1.629	10.586	1	0.001140	200.535
	P_RENTALS	1.255	.629	3.979	1	0.046067	3.509
	P_PROP_VAL	-2.381	.807	8.700	1	0.003183	0.092
	P_A_D_E_G_PD	-3.629	.487	55.474	1	0.000000	0.027
	P_AG_CONST	-1.323	.516	6.576	1	0.010339	0.266
	P_C_15M	1.938	.419	21.358	1	0.000004	6.947
	P_CULT_SPEND	-4.070	2.154	3.571	1	0.058784	0.017
	Constant	0.068	.887	0.006	1	0.939039	1.070

a. Variable(s) entered on step 1: P_CRIME_VIO, P_CRIME_PROP, P_O_SPEND, P_POVERTY, P_VACANCY, P_POP_DEN, P_NO_RES, P_UNDER_1500, P_MALE_FEM, P_MED_AGE_M, P_MED_AGE_F, P_MED_INC, P_MED_INC_4564, P_HS_PLUS, P_NON_MIN, P_IN_HH, P_HOMES, P_RENTALS, P_PROP_VAL, P_HH_1P, P_H_YRS, P_A_D_E_G_PD, P_PA_BORN, P_AG_CONST, P_C_15M, P_CULT_SPEND.

Source: IBM SPSS Statistics Version 20

Expanded Model for Research Question 2

The expanded model for research question 2 begins with the 14 variables either carried over from the first revised empirical model or identified in the descriptive analysis section of this research. The variables included in the expanded model are reflected in table 94 below. After

creating a formula predicting the outcome based on all 14 variables, variables will be eliminated through the use of the backward stepwise likelihood analysis conducted through SPSS.

Table 94 - Variables for the Expanded Second Model

Calculation of Mean, Standard Deviation, Mean Difference and Significance for Independent Variables in the Expanded Second Model

RQ2 - The Decision to Provide Police Protection in Collaboration with Neighboring Jurisdictions	Provide Protection Independently		Provide Protection in Collaboration				
	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	t-Test Significance	
CRIME_PROP	255.0	56.6	243.8	54.1	11.2	0.00067	*
POVERTY	10.4%	6.9%	9.5%	6.8%	0.9%	0.02772	*
POP_DEN	2,109.6	2,213.9	1,573.0	1,719.0	536.7	0.00000	*
UNDER_1500	16.7%	37.4%	46.2%	49.9%	29.4%	0.00000	*
HS_PLUS	47.9%	14.3%	44.6%	15.1%	3.3%	0.00020	*
NON_MIN	91.8%	11.6%	94.3%	7.3%	2.5%	0.00001	*
IN_HH	80.3%	9.0%	81.6%	9.4%	1.3%	0.02280	*
HOMES	2,914	3,491	1,548	2,281	1,367	0.00000	*
RENTALS	27.9%	13.6%	25.9%	14.1%	2.0%	0.01430	*
HH_1P	28.7%	7.1%	27.1%	7.9%	1.7%	0.00025	*
H_YRS	13.4	4.0	14.0	4.6	0.5	0.04197	*
A_D_E_G_PD	39.3%	12.6%	45.1%	12.8%	5.7%	0.00000	*
AG_CONST	21.9%	7.6%	24.9%	9.1%	3.0%	0.00000	*
CULT_SPEND	48.14	161.82	33.07	102.67	15.07	0.04690	*
N	818		429				

* - A t-Test significance of less than 0.05 indicates that the likelihood that mean difference is attributable to chance is less than 5%.

The net target population of 1,247 municipalities that are not cities and are also not split between municipal borders has been reduced by one municipality with missing information reported in the ACS survey. As a result, the logistic regression analysis for the model is based on 1,246 municipalities.

Table 95 – Expanded RQ2 Cases Reflected in Logistic Regression Analysis

ERQ2 - Cases Reflected in Logistic Regression Analysis

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	1246	99.9
	Missing Cases	1	0.1
	Total	1247	100.0
Unselected Cases		0	0.0
Total		1247	100.0

a. If weight is in effect, see classification table for the total number of cases.

Source: IBM SPSS Statistics Version 20

The first step in the logistic regression analysis, the calculation of the probability of any single non-city municipality offering police protection in collaboration, is reflected in table 96 below. Without reflecting the impact of any predictor variables, the overall probability of any given municipality offering police protection is 34.3 percent in this model. 65.7 percent of municipalities provide protection independently. In the initial empirical model, the predicted outcome was 65.6 percent. The difference between the two models is a result of the missing variables in the expanded model. Without predictor variables, all municipalities would be assumed to have police forces resulting in 428 false negative results and no false positive results.

Table 96 – Expanded RQ2 Classification Table before Adding Variables

ERQ2 - Predicted Outcome with no Variables

Classification Table[a,b]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 0	HAVE_PF	0	818	0	100.0
		1	428	0	0.0
	Overall Percentage				65.7

a. Constant is included in the model.

b. The cut value is .500

Source: IBM SPSS Statistics Version 20

In utilizing SPSS to calculate a logistic regression based on the predictor variables, it is confirmed that 13 of the 14 variables are significantly related to the outcome with a significance factor below 0.05 as shown in table 97 below. The variable CULT_SPEND has a significance of 0.081 indicating that there is an 8.1 percent probability that the variation in this variable is a random variation and does not reflect a true difference in the two populations.

Table 97 – Expanded RQ2 Analysis of Predictor Variables

ERQ2 - Analysis of Variables

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-0.648	.060	117.891	1	0.000	0.523

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	CRIME_PROP	11.241	1	.001
		POVERTY	4.588	1	.032
		POP_DEN	18.606	1	.000
		UNDER_1500	122.776	1	.000
		HS_PLUS	14.271	1	.000
		NON_MIN	15.300	1	.000
		IN_HH	5.130	1	.024
		HOMES	51.209	1	.000
		RENTALS	5.978	1	.014
		HH_1P	14.513	1	.000
		H_YRS	4.501	1	.034
		A_D_E_G_PD	55.308	1	.000
		AG_CONST	37.388	1	.000
		CULT_SPEND	3.043	1	.081
		0	189.496	14	.000

0

Source: IBM SPSS Statistics Version 20

The Cox & Snell value of .147 and the Nagelkerke value of .203 indicate that the independent predictor variables predict 14.7 percent and 20.3 percent of the variation in the decision of a given municipality to offer police protection to their residents. The Cox & Snell and Nagelkerke values were .049 and .068 respectively in the previous model for the second research question.

Table 98 - Expanded RQ2 - Determination of Model Significance

ERQ2 - Model Significance

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1404.829a	.147	.203

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

Source: IBM SPSS Statistics Version 20

The Classification table generated by SPSS quantifies the accuracy of the logistic regression model. Overall the model for the first research question predicts the choice of offering police protection to residents with 70.5 percent accuracy which is identical to the accuracy rate from the prior model for the second research question. The model predicts municipalities that will provide police protection independently with 83.3 percent accuracy and those that provide protection in collaboration with 46.2 percent accuracy. The model would falsely predict that 100 municipalities would provide protection independently (the false negative rate). Additionally the model would falsely predict that 268 municipalities would provide protection in collaboration (the false negative rate).

Table 99 - Expanded RQ2 Predicted Outcome Based on Logistic Regression Model

ERQ2 - Predicted Outcome with Variables

Classification Table[a]

Observed			Predicted		
			HAVE_PF		Percentage Correct
			0	1	
Step 1	HAVE_PF	0	718	100	87.8
		1	268	160	37.4
	Overall Percentage				70.5

a. The cut value is .500

Source: IBM SPSS Statistics Version 20

Table 100 below shows the calculation of the constant as well as the coefficient for each variable. The table also shows the calculation of the significance of each variable in the equation. It is important to note that, as with the expanded model for the first research question, many of the variables have a significance of greater than 0.05 indicating that although the variables have previously been determined to be significantly related to the likelihood of the outcome of the model, they do not represent a significant factor in the model developed.

Table 100 Expanded RQ2 Variables in the Model

ERQ2 - Variables in the Model

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	CRIME_PROP	-0.000987	.001	0.621	1	0.430654	.999
	POVERTY	-0.034957	.013	6.839	1	0.008920	0.966
	POP_DEN	-0.000050	.000	1.143	1	0.285042	1.000
	UNDER_1500	1.355341	.166	67.007	1	0.000000	3.878
	HS_PLUS	0.006393	.007	0.797	1	0.372047	1.006
	NON_MIN	-0.012947	.010	1.819	1	0.177477	0.987
	IN_HH	-0.013557	.010	1.766	1	0.183911	0.987
	HOMES	-0.000107	.000	9.517	1	0.002035	1.000
	RENTALS	0.000137	.010	0.000	1	0.989261	1.000
	HH_1P	-0.020912	.016	1.749	1	0.185982	0.979
	H_YRS	-0.033594	.023	2.176	1	0.140214	0.967
	A_D_E_G_PD	0.024985	.007	12.657	1	0.000374	1.025
	AG_CONST	0.014789	.011	1.901	1	0.168011	1.015
	CULT_SPEND	-0.000653	.001	1.600	1	0.205899	0.999
	Constant	1.532571	1.558	0.968	1	0.325194	4.630

a. Variable(s) entered on step 1: CRIME_PROP, POVERTY, POP_DEN, UNDER_1500, HS_PLUS, NON_MIN, IN_HH, HOMES, RENTALS, HH_1P, H_YRS, A_D_E_G_PD, AG_CONST, CULT_SPEND.

Source: IBM SPSS Statistics Version 20

Refined Expanded Model for Research Question 2

The model for the second research question can be further refined to eliminate the variables from the equation that do not significantly contribute to the outcome of the model as was done for the model for the first research question by utilizing the backward stepwise functionality incorporated in the SPSS software. After recalculating the model in nine steps to eliminate unnecessary variables, a model was created including six variables and maintained

70.5 percent accuracy rate in predicting which municipalities would provide protection in collaboration to their residents. The details of each of the nine steps are included as appendix 7.

The Cox & Snell value of .141 and the Nagelkerke value of .195 indicate that the independent predictor variables predict 14.1 percent and 19.5 percent of the variation in the decision of a given municipality to offer police protection to their residents. The Cox & Snell and Nagelkerke values were .147 and .203 respectively in the previous model for the second research question.

Table 101 - Refined Extended RQ2 Determination of Model Significance

RERQ2 - Model Significance

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
9	1413.797a	.141	.195

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

Source: IBM SPSS Statistics Version 20

The Classification table generated by SPSS quantifies the accuracy of the logistic regression model. Overall the model for the first research question predicts the choice of offering police protection to residents with 70.5 percent accuracy which is identical to the accuracy obtained in the expanded model and the initial model for the first research question. The model predicts municipalities that rely on the State with 87.5 percent accuracy and those that provide protection with 37.9 percent accuracy. The model would falsely predict that 102 municipalities would provide protection independently (the false negative rate). Additionally, the model would

falsely predict that 266 municipalities would provide protection to their residents collaboratively (the false negative rate).

Table 102 - Refined Expanded RQ2 Predicted Outcomes Based on Logic Regression Model

RERQ2 - Predicted Outcome with Variables

Classification Table[a]

Observed			Predicted		
			SHARE		Percentage Correct
			0	1	
Step 9	SHARE	0	716	102	87.5
		1	266	162	37.9
	Overall Percentage				70.5

a. The cut value is .500

Source: IBM SPSS Statistics Version 20

Table 103 below shows the calculation of the constant as well as the coefficient for each variable. The table also shows the calculation of the significance of each variable in the equation. All of the variables that remain in the model have a significance of less than 0.05 which indicates that all of the variables represent a significant factor in the model developed.

The Logistic Regression model for the second Refined Expanded Research Question has a constant of -0.388345 and coefficients of -0.031829 for POVERTY, 1.342694 for UNDER_1500, -0.000104 for HOMES, -0.022161 for HH_1P, -0.039595 for H_YEARS, 0.024528 for A_D_E_G_PD.

Table 103 - Refined Expanded RQ2 Variables in the Model

RERQ2 - Variables in the Model

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 9[a]	POVERTY	-0.031829	.011	8.040	1	0.004577	.969
	UNDER_1500	1.342694	.163	68.004	1	0.000000	3.829
	HOMES	-0.000104	.000	9.689	1	0.001854	1.000
	HH_1P	-0.022161	.010	5.117	1	0.023689	0.978
	H_YRS	-0.039595	.017	5.453	1	0.019533	0.961
	A_D_E_G_PD	0.024528	.005	20.857	1	0.000005	1.025
	Constant	-0.388345	.521	0.555	1	0.456317	0.678

a. Variable(s) entered on step 1: CRIME_PROP, POVERTY, POP_DEN, UNDER_1500, HS_PLUS, NON_MIN, IN_HH, HOMES, RENTALS, HH_1P, H_YRS, A_D_E_G_PD, AG_CONST, CULT_SPEND.

Source: IBM SPSS Statistics Version 20

Table 104 below shows the variables that have been excluded from the revised expanded model.

Table 104 - Refined Expanded RQ2 Variables not in the Model

RERQ2 - Variables not in the Model

Variables not in the Equation

		Score	df	Sig.
Step 9	CRIME_PROP	0.764	1	.382
	POP_DEN	1.136	1	.287
	HS_PLUS	.069	1	.792
	NON_MIN	.971	1	.324
	IN_HH	1.846	1	.174
	RENTALS	.001	1	.975
	AG_CONST	1.153	1	.283
	CULT_SPEND	1.510	1	.219
	Overall Statistics	12.692	11	.314

Source: IBM SPSS Statistics Version 20

The Logit probability formula is calculated by entering the constant, coefficients and variables into the Logit formula as reflected in table 105 below. This formula predicts the probability of a given municipality providing police protection in collaboration to their residents.

(-0.388345 - 0.031829 x POVERTY + 1.342694 x UNDER_1500 - 0.000104 x HOMES - 0.022161 x HH_1P - 0.039595 x H_YEARS + 0.024528 x A_D_E_G_PD)

Table 105 – Refined Expanded RQ2 Logit Probability Formula

RQ2 - Logit Probability Formula

$$p = \frac{\exp^{(-0.388345 - 0.031829 \times POVERTY + 1.342694 \times UNDER\_1500 - 0.000104 \times HOMES - 0.022161 \times HH\_1P - 0.039595 \times H\_YEARS + 0.024528 \times A\_D\_E\_G\_PD)}}{1 + \exp^{(-0.388345 - 0.031829 \times POVERTY + 1.342694 \times UNDER\_1500 - 0.000104 \times HOMES - 0.022161 \times HH\_1P - 0.039595 \times H\_YEARS + 0.024528 \times A\_D\_E\_G\_PD)}}$$

Where:

p= the probability that a case is in a given category

exp= the base of natural logarithms 2.71828182845904

The impact of individual independent variables as predictors of the probability may be misstated in the logit probability formula if there is a high level of collinearity between the variables. Menard (2002) determined that the variables with an r square of greater than 0.80 have a high level of collinearity may pose a problem while variables with an a square of greater than 0.90 have a very high level of collinearity and are almost certain to result in inaccurate coefficients in the logistic regression model. Table 106 below reflects the r square for each possible combination of variables. In the refined expanded model for the first research model, there are no r square values in excess of 0.800 indicating that collinearity between variables is not an issue with the model.

Table 106 - Test of Collinearity for Refined Expanded RQ2 Model

Testing for Collinearity - Calculation of R Square Between Variables in Refined Expanded RQ2 Model

	POVERTY	UNDER_1500	HOMES	HH_1P	H_YRS	A_D_E_G_PD
POVERTY	1.000	0.012	0.026	0.173	0.031	0.014
UNDER_1500		1.000	0.153	0.000	0.077	0.013
HOMES			1.000	0.002	0.052	0.049
HH_1P				1.000	0.051	0.046
H_YRS					1.000	0.000
A_D_E_G_PD						1.000

No R Square values greater than 0.800 indicating that there are no variables with a high level of collinearity.

Relative Influence of Variables in the Refined Expanded RQ1 Model Variables

Similar to the recalculation of the logistic regression model to determine a measure of the significance of individual variables in the final equation, all variables were recalculated as the percentage of the maximum value for the variable. The variables in the equation table below reflect new coefficients which more closely represent the impact of the individual variables on the prediction of outcome.

Based on the percentage of the maximum value substitute variables, the number of homes (HOMES) followed by the percentage of the population that reported their ancestry as American, Dutch, English, German or Pennsylvania Dutch (A_D_E_G_PD) represent the most significant factors in the equation. The test of reliability reflected in appendix 9 of this research confirms the impact of both the HOMES and A_D_E_G_PD variables.

Table 107- Refined Expanded RQ2 Variables in the Model with the Variable Values Adjusted to Reflect the Percentage of the Maximum Value

RERQ2 - Variables in the Model With All Variables adjusted to reflect the percentage of the maximum value

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 9[a]	P_POVERTY	-1.572442	.546	8.308	1	0.003948	.208
	P_UNDER_1500	1.343855	.163	68.109	1	0.000000	3.834
	P_HOMES	-3.558108	1.140	9.742	1	0.001801	0.028
	P_HH_1P	-1.472813	.666	4.894	1	0.026954	0.229
	P_H_YRS	-1.273561	.542	5.522	1	0.018783	0.280
	P_A_D_E_G_PD	2.042801	.448	20.755	1	0.000005	7.712
	Constant	-0.389473	.521	0.558	1	0.454993	0.677

a. Variable(s) entered on step 1: P_CRIME_PROP, P_POVERTY, P_POP_DEN, P_UNDER_1500, P_HS_PLUS, P_NON_MIN, P_IN_HH, P_HOMES, P_RENTALS, P_HH_1P, P_H_YRS, P_A_D_E_G_PD, P_AG_CONST, P_CULT_SPEND.

Source: IBM SPSS Statistics Version 20

Analysis Summation

The analysis of the first research question began by testing an empirical model which intended to determine which municipalities would provide police protection to their residents and which would rely on the State for protection based on variables determined from a review of the relevant literature. The model was based on two assumptions: first, municipalities with a high need for police protection would be more likely to provide protection to their residents and second, municipalities that are more able to absorb the cost of police protection would provide the protection.

The need for police protection was measured by the property and violent crime rates within the county excluding cities as well as the poverty rate and property vacancy rate. The ability to absorb the cost of protection was measured by the amount of local government

spending on other services, the number of residents and the population density. A higher level of all seven variables was anticipated to be correlated with municipalities that provide protection directly.

In testing the four variables associated with the need for protection, three of the four were determined to have a direction of difference that was contrary to the direction anticipated in the literature based model. The violent crime rate and the rate of poverty are greater in municipalities that rely on the State for protection. The property vacancy rate, which was assumed to be higher in municipalities that provided protection, was more than double (18.3 percent versus 8.7 percent) in municipalities that rely on the State. Of the four variables for the first assumption of the first research question, that municipalities with the greatest need for protection will be more likely to provide protection to their residents, only property crime rate supported the assumption.

The three variables associated with the second assumption that municipalities that can afford protection would be more likely to provide protection, were confirmed by the initial testing of the model. The rate of spending on other government services, property density and the number of residents are all positively correlated with municipalities that provide protection to their residents.

The empirical model based on the assumptions from the literature explained 57.6 percent of the variance not attributable to the estimation that would have been possible had no predicting variables been incorporated. The model, when excluding the impact of the contrary variables, had 78.4 percent accuracy as compared to 50.1 percent achieved with no predicting variables.

When the model was expanded to include all identified differences in the population, the model prediction increased from 78.4 to 81.6 percent. The increase in the accuracy of the model was achieved by incorporating the number of homes, the ratio of males to females and the

median age of females while excluding the number of residents. While the accuracy of the model increased with the incorporation of a total of 15 variables, the improved accuracy was not sufficient to discredit the conclusions of the initial model to the extent that it confirmed that there is a strong positive correlation between municipalities that are more able to absorb the cost of police protection and municipalities providing the protection.

The analysis of the second research question began by testing an empirical model which intended to determine which municipalities that provide protection to their residents would do so in collaboration with neighboring municipalities based on variables determined from a review of relevant literature. This model had three assumptions: first, smaller municipalities would be more likely to collaborate, second, municipalities that have more municipalities nearby would be more likely to provide protection in collaboration and third, municipalities that are demographically similar to their nearby municipalities would also be more likely to collaborate.

The number of residents within a municipality was utilized to quantify the connection between smaller municipalities and the providing protection in collaboration. It was assumed that the number of residents and the decision to collaborate would be negatively correlated. To measure the number of non-city municipalities that a given municipality could collaborate, the number of municipalities, within the same county, within three miles north, south, east and west was utilized. The number of municipalities with the same criteria further limited to include only those that offer police protection to their residents was also utilized as a variable. It was assumed that there would be a positive correlation between both calculations of the number of nearby municipalities and the likelihood of a given municipality providing protection in collaboration. The demographic similarity was measured by calculating the variation in four demographic measurements, household income, property vacancy rate, population density and the minority

percentage. The model assumed that the variation in the demographic measurements would be negatively correlated with the probability that a given municipality would provide protection in collaboration.

In testing the seven variables incorporated in the initial model for the second research question, it was determined that only one variable, the number of residents, had a statistically significant mean difference between the municipalities that provide protection independently and those that provide protection in collaboration. The direction of the correlation was also consistent with the model. Municipalities that provide protection independently are nearly twice as large as those that provide protection independently on average. The variables to determine the impact of the number of nearby municipalities and the demographic similarity to neighboring municipalities were all determined to not result in statistically significant differences between the municipalities that provide protection independently and those that do so in collaboration.

When the model was developed utilizing binary logistic analysis, to test the predictive nature of the sole remaining variable no improvement in the model was achieved. The failure of the model was attributed to the distribution of the variable which ranged from the smallest municipalities having populations below 500 and the largest having over 20,000. It appeared that municipalities were more likely to collaborate if their population was below 1,500 residents and therefore a dichotomous variable was created separating the municipalities below 1,500 residents from those at or above 1,500.

Utilizing only the newly created variable to differentiate the smaller from the larger municipalities, an empirical model was created which predicted 14.2 percent of the variance not attributable to the estimation that would have been possible had no predicting variable been

incorporated. The model had 70.5 percent accuracy as compared to 65.6 percent achieved with no predicting variables.

When the model was expanded to include all identified differences in the population, the model prediction remained at 70.5 percent despite the fact that the final model incorporated six variables. The most significant variable incorporated in the final model was the number of homes in the municipality followed by the percentage of the population of the population that reported their ancestry as American, Dutch, English, German or Pennsylvania Dutch.

The analysis of the second research question confirmed a link between the number of residents in a municipality and the likelihood that the municipality would provide police protection in collaboration as compared to providing protection independently. It did not however support the assumption that municipalities would be more likely to collaborate if there were more nearby municipalities or if the given municipality was more demographically similar to neighboring municipalities. The expanded analysis of the second research question did not identify other factors that were significantly correlated to the decision to provide protection in collaboration as compared to providing the service independently.

Chapter 5 – Conclusions

Local police protection in Pennsylvania is not being provided in an economically efficient manner. Half of the State's municipalities rely on the state police for protection which is too large to be efficient while the vast majority of the local forces are too small to be efficient. The municipalities in Pennsylvania that rely on the State for protection do so as a no-cost option since the cost of State provided service is absorbed by all Pennsylvania taxpayers with no charge to the individual municipality or increased charge to the municipal residents. While the State served municipalities avoid the direct financial cost of their police protection, they receive less responsive service in return. The rural areas of the State are experience rising crime rates while crime rates for the State as a whole is declining (Bucklen 2012) this discrepancy may be related to the type of police protection typically available in the rural as compared to the type of protection available in the more populated areas.

Police protection like other services and the production of all products are subject to economies and diseconomies of scale. By increasing the number of residents served by a force, officers can concentrate on policing while non-professional staff can be hired at a lower cost to provide administrative support. As the number of residents served increases, vehicles and specialty equipment can be purchased with the cost allocated across the population resulting in a lower cost per resident than would have been obtained with a lower population base. Cost per resident savings resulting from increasing the number of residents served results in economies of scale.

The benefit of spreading costs across an expanding population is offset by the additional administrative structure that is necessary to support the larger organization. When a police force

grows beyond the point where the additional administrative support costs exceeds the savings of spreading the cost across an expanding population base, diseconomies of scale results.

While much of the literature related to economies of scale for police forces concludes that cost per resident served increases with expansion, the sources that reach this conclusion are based on forces much larger than those typically found in Pennsylvania (examples include Walzer 1972, Gabler 1969 and Finney 1997) . One study by Southwick (2005) examined smaller forces and has identified an optimal police force size of roughly 22,350 to 36,000 residents. Below the optimal size range, cost per resident would decrease with an expansion of the population served and above the optimal size range cost per resident increases with an expansion of the population served. The median traditional police force serving a single municipality serves a population of 3,932 while the median regional police force serves a population of 10,549. The state police force serves nearly 2.5 million residents. The majority of both traditional and regional police forces in Pennsylvania are below the optimal range while the state police force exceeds the optimal range for maximum efficiency.

The 1973 National Advisory Commission on Criminal Justice Standards and Goals indicated that the minimal optimal size of a police force is ten full time officers. The commission recommended that forces below this size should consolidate with neighboring forces (Regional Police Services in Pennsylvania, 2010). The Local Unit Alignment, Reorganization and Consolidation Commission (LUARCC) (2010) developed a similar minimal size of a police force as having eleven officers. Their calculation is based on the number of officers necessary to have two officers on duty at all times and accounts for necessary vacation, sick, holiday and training time. Two officers on duty allows for all responding officers to have a backup on duty at all times. While the minimum efficient force has ten or eleven officers, sixty-two percent of the

1,005 traditional police forces in Pennsylvania have less than ten full time equivalent officers (Municipal Police Service Report 2012).

Two existing case studies of police force consolidations within Pennsylvania have confirmed the existence of economies of scale available through the creation of regional police forces. Yablonsky, Reddig and Gamble (2006) determined that West Hills Regional Police is able to realize a 28 percent cost of service advantage over similar independent forces while Krimmel (1997) determined that the Northern York Regional Police was able to realize a 24 percent cost advantage through a similar consolidation. In both of these case studies, the cost savings was achieved while also providing services to residents that would not have been possible without the consolidation of the forces. In analyzing the components of government spending for this research, it was learned that municipalities that provide protection to their residents incur, on average, 38 percent more cost per resident than municipalities that provide protection independently.

The intent of this research was to determine the extent that the municipalities that provide local protection and those that provide protection in collaboration do so consistent with empirical models derived from the literature. Secondarily, the research identified the demographic characteristics of the municipalities in each group. The goal of the research is to contribute to the general understanding of the differences between the groups to facilitate efforts to encourage more efficient service delivery and to encourage collaboration between municipalities.

The models developed to address the research questions were tested utilizing binary logistic regression analysis based on the logit probability formula. Logistic regression calculates the probability of achieving a dichotomous outcome based on variables acting as predictors. After calculating the probability formula for each empirical model based on the variables derived

from the research questions the models were expanded to incorporate numerous variables derived from the US Census, the American Community Survey and published municipal statistics. The expanded models were then refined to reflect only the variables that have the greatest impact utilizing backward stepwise likelihood analysis.

The first research question, to what extent is the decision of Pennsylvania municipalities to provide police protection to residents versus relying on the State for protection consistent with an empirical model based on factors derived from the literature, was addressed with an empirical model based on two assumptions tested through seven variables. The first assumption of the first model was that municipalities with a high need for police protection, as measured by crime rates, poverty rates and population density, would be more likely to provide protection to their residents. The second assumption was that those municipalities with a greater ability to afford to provide the service, as measured by the number of residents, population density and amount spent on other government services per residents, would be more likely to do so.

The logistic regression analysis of the first model confirmed the association between the assumption that municipalities with a greater ability to afford to provide police protection were more likely to provide protection. The analysis determined that there was limited connection between the need for police protection and the municipalities that provide protection. The empirical model predicted, with 78.4 percent accuracy, the municipalities which would provide protection to their residents as compared to 50.1 percent if no predicting variables were incorporated in the model.

When the first model was expanded to include all identified differences from the US Census, the American Community Survey and published information from the State, the model's accuracy increased to 81.6 percent. The limited increase, which resulted from the significant

expansion of the number of variables in the model, confirms that the variables related to the ability of a municipality to afford to provide protection to their residents has the greatest predictive value in identifying the municipalities which provide protection to their residents.

In the expanded model, population density and the amount spent on other government services have the most significant predictive value followed by the number of homes and the ratio of males to females.

The second research question, for the Pennsylvania municipalities that provide protection to their residents, to what extent is the decisions to provide police protection independently versus providing protection in collaboration with neighboring jurisdictions consistent with an empirical model based on factors derived from the literature, was addressed with an empirical model based on three assumptions tested through seven variables. The first assumption of the second model was that smaller municipalities, as measured by the number of residents, would be more likely to collaborate. The second assumption was that municipalities that have more municipalities nearby, as measured by the number of non-city municipalities within the same county and the number with an existing police force, would be more likely to provide protection in collaboration. The third assumption was that municipalities that are demographically similar to their nearby municipalities, as measured by the variance in four demographic measurements, would also be more likely to collaborate.

The logistic regression analysis of the second model failed to confirm a connection between the number of nearby municipalities or the demographic similarity to neighboring and the municipalities that provide protection collaboratively. Additionally, the number of residents, although statistically significant, was not reflected in the logistic regression formula until the variable was modified to reflect the dichotomous separation of municipalities below 1,500

residents. The empirical model and the expanded model predicted the municipalities that would provide protection in collaboration with only 70.5 percent accuracy as compared to 65.6 percent if no predicting variables were incorporated in the model.

The most significant variable incorporated in the final model was the number of homes in the municipality followed by the percentage of the population of the population that reported their ancestry as American, Dutch, English, German or Pennsylvania Dutch.

Beyond the conclusion that smaller municipalities are slightly more likely to provide protection in collaboration if they provide protection to their residents, limited differences in the two groups have been identified.

The conclusions drawn from the first research question are that municipalities offer police protection to their residents based on their ability to afford to provide the service with no significant correlation between the need for increased police protection and the likelihood that a given municipality will provide protection.

The decision to rely on the State for police protection is not likely to change as long as the State government and taxpayers of the State are willing to cover the cost of protection for those not interested in paying for it themselves. If an assessment of a reasonable amount per person was assessed on all municipalities that did not provide protection to residents municipalities that could provide the service for less than the fee assessed would likely begin to offer protection.

The conclusions drawn from the second research question are that smaller municipalities are more likely to collaborate in the provision of police protection if they provide the service, however the factors from the literature indicating which collaborative efforts would be more successful appear not to be taken into consideration when collaborations are included.

Next Steps – Need for Future Research

Future research should be considered to reflect the recalculation of the crime variables as well as the variables that are based on the characteristics of nearby municipalities. For this research, the crime statistics for a given municipality were calculated based on the crime statistics for the county excluding cities. This definition resulted in an area crime rate that extends beyond the borders of the municipality itself. The benefits of utilizing a wider area for the crime rate include a larger pool of observations and it reflects the reality that crime is not constrained by municipal boundaries. The limitation of using crimes by county is that it measures crimes in far areas of the county equally to crimes closer to the given municipality. Additionally, the measurement method results in sixty-six values for variables assigned to the population with no fluctuation within a given county. Since crime rates are captured by police force and often crimes within a municipality that have a police force are investigated are reported by the state police, no more local measurement can be obtained from the data publically available. The value of the crime data for the research would be greatly enhanced if geocoded crime data could be utilized.

The variables based on the nearby municipalities including variance in demographics and the number of nearby municipalities could be refined to reflect the specific municipalities that border a given municipality. The identification of the nearby municipalities in this research based on the miles north, south, east and west of the center point of each municipality was an attempt to identify the municipalities that are close to a municipality and therefore a likely candidate for collaboration. This calculation does not take into consideration the impact of geography within the State. The layout of streams, rivers, mountains and roads may make the identified municipality more remote than others with easier access. Another approach would be to identify

nearby municipalities by driving miles between the center points or the municipalities that share a common border.

Additional future research could include a study of the characteristics of municipalities that have changed their status related to police protection. This research could include a case study that examine the causes of the change as well as the successes and challenges that were faced in the process. Additional research into the recent successful mergers as well as those that have not been successful could identify the municipality characteristics that could be beneficial in identifying candidates for future successful collaborations.

Next Steps – Putting the Lessons Learned From the Research into Practice

While this research was unable to confirm a correlation between the need for police protection and the likelihood that a given municipality would collaborate, the number of nearby municipalities and the demographic similarity and the likelihood that municipalities would provide protection in collaboration, the knowledge of the absence of these links may be a useful tool in improving the police protection services provided within the State.

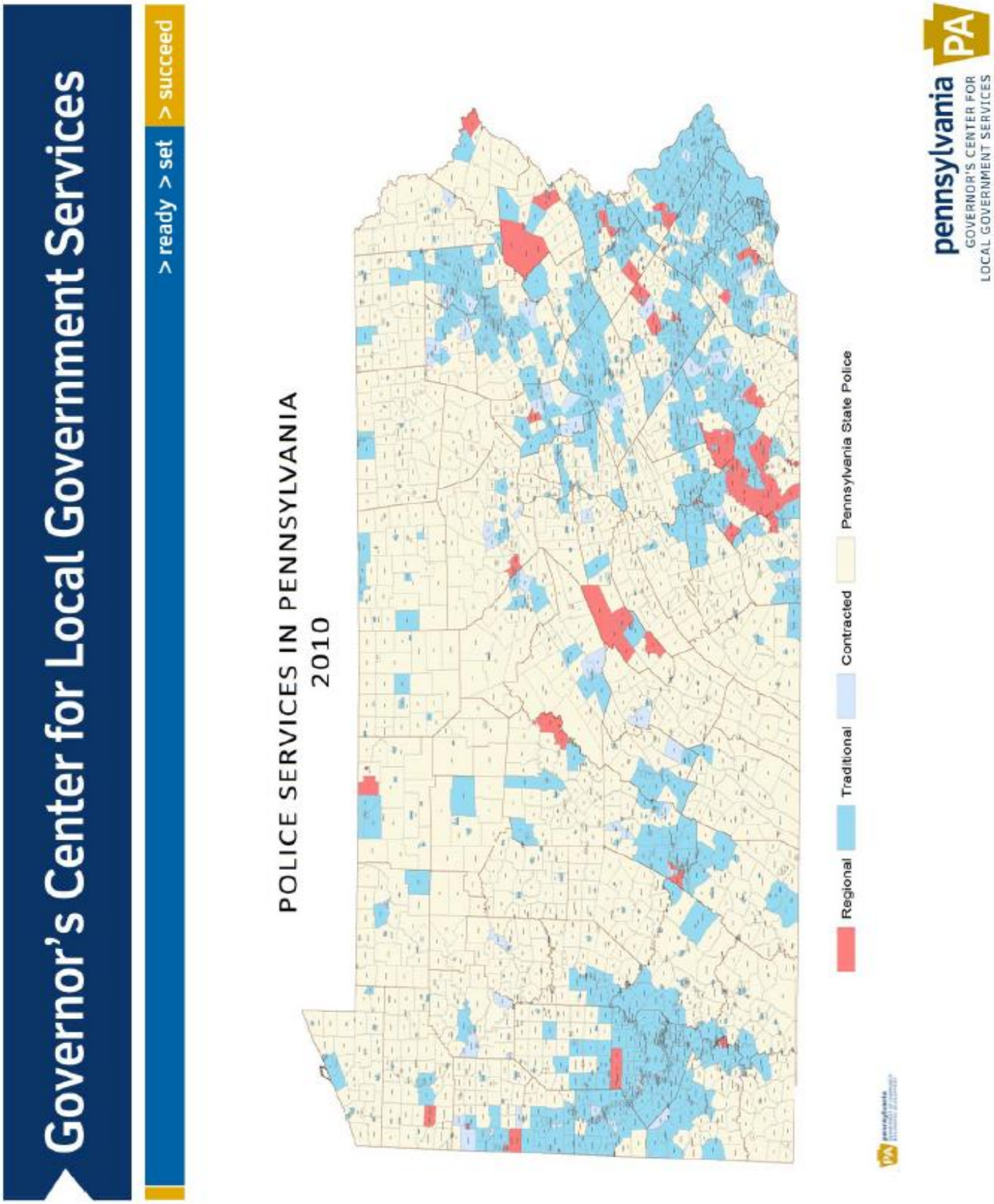
The knowledge of the absence of a link between the need for police protection and the existence of a local force as identified in the first empirical model could be utilized to target municipalities in areas with higher crime and provide both education of the advantages of establishing a police force and provide incentives to form regional forces to address the need.

The knowledge of the absence of a link between the existence of nearby municipalities and the demographic similarity of nearby municipalities and municipalities that provide protection in collaboration could be utilized to focus efforts to encourage collaboration on the municipalities that would be the most likely to benefit from collaboration. Collaboration in the provision of police service can provide significant cost savings and enhanced services over

traditional forces for smaller municipalities and efforts to encourage collaboration should be focused on the municipalities with the greatest probability of achieving successful collaborations.

Appendix 1: Map of Municipalities by type of Police Services

(Source: Police Services in Pennsylvania 2010)



Appendix 2: Pennsylvania Local Government Fact Sheet

PENNSYLVANIA LOCAL GOVERNMENT FACT SHEET

Governor's Center for Local Government Services
Department of Community and Economic Development
OCTOBER 2010

POPULATION OF THE STATE OF PENNSYLVANIA
Total Population - 12,281,054
Rural Municipalities – 1,652; **Rural Population** – 3,438,695 (28%)
Urban Municipalities – 910; **Urban Population** – 8,842,359 (72%)
48 of Pennsylvania's 67 Counties are considered Rural
(Source – Center For Rural Pennsylvania)

MUNICIPALITIES BY TYPE	
# 1st Class Cities	1
# 2nd Class Cities	1
# 2nd Class A Cities	1
# 3rd Class Cities	53
# Boroughs	958
# 1st Class Townships	93
# 2nd Class Townships	1,454
# Towns	1
TOTAL NUMBER OF MUNICIPALITIES	*2,562*
TOTAL NUMBER OF COUNTIES	*67*

MUNICIPALITIES BY POPULATION (excludes counties)	NUMBER	%
TOTAL NUMBER	*2,562*	*100.0*
Under 1,000	766	29.9
1,000 - 2,499	743	29.0
2,500 - 4,999	489	19.1
5,000 - 9,999	315	12.3
10,000 - 14,999	109	4.3
15,000 - 19,999	52	2.0
20,000 + ABOVE	88	3.4

78.0% ARE UNDER 5,000 POPULATION

PLANNING COMMISSIONS IN PENNSYLVANIA (As of 2010)	
TOTAL NUMBER	*1,528*
County	62
Multi-County	10
Municipal	1,456

FIRE DEPARTMENTS IN PENNSYLVANIA (As of 2010)	
TOTAL NUMBER	*1,878*
Paid	26
Paid/Volunteer	108
Volunteer	1,744

LOCAL PENSION PLANS (As of 1/1/2009)	
TOTAL NUMBER	*3,207*
# Police	963
# Fire	81
# Non-Uniformed	2,163

MISCELLANEOUS (As of 2010)	
# School Districts	500
# COGS	155
# Municipal Managers	666
# Home Rule Jurisdictions	71

COUNTY & MUNICIPAL OFFICIALS (As of 2010)	
TOTAL NUMBER MUNICIPAL	*48,462*
Elected	*20,168*
Appointed	*28,294*
TOTAL NUMBER COUNTY	*1,672*
Elected	*996*
Appointed	*676*

COUNTY & MUNICIPAL EMPLOYES (As of 2010)			
TOTAL NUMBER-Full Time		*Part Time*	*160,182*
County	56,043	9,638	65,681
City	41,325	2,475	43,800
Borough	10,129	9,443	19,572
1st Class Twps.	6,036	2,785	8,821
2nd Class Twps.	11,273	11,035	22,308

LOCAL AUTHORITIES IN PENNSYLVANIA (As of 2010)	
TOTAL AUTHORITIES: Active & Inactive	*2,006*
TOTAL INACTIVE AUTHORITIES	*472*
Active Authorities By Type:	*1,534*
Airport	42
Business District Transit	24
Community Facility	25
Economic Development	9
Local Government Facilities	86
Multi-Purpose (Water & Sewer)	270
Non-Profit Institutions	62
Parking	33
Recreation	59
School	31
Sewer	598
Solid Waste	25
Transit	35
Water	235

POLICE DEPARTMENTS IN PENNSYLVANIA (As of 2010)	
TOTAL MUNICIPALITIES	*2,562*
TOTAL POLICE DEPARTMENTS	1,180
Traditional	1,017
Consolidated	39
Contractual	124
State Police Exclusive	1,258
Full-Time Officers	19,477
Part-Time Officers	4,538
Full-Time Departments	881
Part-Time Departments	136

Appendix 3: Pennsylvania Crime Rates and Number of Municipalities by County

Pennsylvania Crime Rates By County and Number of Municipalities by Type

County	Violent Crime Rate	Property Crime Rate	Borough	Town	Township	Total
Adams	84.6	184.4	13		21	34
Allegheny	57.0	244.5	82		42	124
Armstrong	68.9	142.0	16		28	44
Beaver	87.6	370.1	29		22	51
Bedford	88.4	153.4	13		25	38
Berks	46.8	278.2	28		44	72
Blair	64.9	228.7	8		15	23
Bradford	76.5	247.1	14		37	51
Bucks	36.3	311.2	22		31	53
Butler	34.8	167.2	23		33	56
Cambria	69.1	213.8	31		30	61
Cameron	113.1	308.8	2		5	7
Carbon	86.1	334.6	12		11	23
Centre	51.9	229.4	10		25	35
Chester	40.4	221.6	15		57	72
Clarion	92.0	223.6	12		22	34
Clearfield	162.2	339.1	19		30	49
Clinton	84.2	227.0	7		21	28
Columbia	39.2	309.3	8	1	24	33
Crawford	69.1	181.9	14		35	49
Cumberland	71.1	219.6	10		22	32
Dauphin	118.2	340.3	16		23	39
Delaware	64.0	343.9	27		21	48
Elk	93.5	404.0	2		9	11
Erie	66.4	283.2	14		22	36
Fayette	118.6	288.5	16		24	40
Forest	117.9	194.4	1		8	9
Franklin	96.7	230.4	6		15	21
Fulton	125.6	237.1	2		11	13
Greene	71.6	262.4	6		20	26
Huntingdon	105.1	209.1	18		30	48
Indiana	105.5	248.0	14		24	38
Jefferson	94.5	187.9	10		23	33
Juniata	98.6	155.3	4		13	17

Pennsylvania Crime Rates By County and Number of Municipalities by Type
(Continued)

County	Violent Crime Rate	Property Crime Rate	Borough	Town	Township	Total
Lackawanna	41.8	201.0	17		21	38
Lancaster	58.9	242.1	17		41	58
Lawrence	52.8	266.1	9		16	25
Lebanon	72.0	220.8	7		18	25
Lehigh	47.9	293.6	8		15	23
Luzerne	60.8	296.3	36		36	72
Lycoming	81.3	225.6	9		42	51
McKean	59.4	166.2	6		15	21
Mercer	71.4	215.5	14		31	45
Mifflin	38.5	237.4	6		10	16
Monroe	87.1	374.6	4		16	20
Montgomery	56.3	300.0	23		38	61
Montour	79.1	200.4	2		9	11
Northampton	36.2	293.2	19		17	36
Northumberland	67.6	184.7	11		23	34
Perry	128.7	342.9	9		21	30
Pike	86.7	239.4	2		11	13
Potter	111.4	178.4	6		24	30
Schuylkill	83.9	233.2	30		36	66
Snyder	81.6	261.7	6		15	21
Somerset	67.9	171.2	24		25	49
Sullivan	130.7	277.7	4		9	13
Susquehanna	98.1	190.1	13		27	40
Tioga	87.1	169.6	10		29	39
Union	59.2	142.1	4		10	14
Venango	62.2	174.0	8		20	28
Warren	86.1	243.6	5		21	26
Washington	61.4	214.7	31		32	63
Wayne	79.4	176.9	6		22	28
Westmoreland	46.6	181.7	37		21	58
Wyoming	90.0	158.8	5		18	23
York	61.2	277.9	36		35	71
Total			948	1	1547	2496

Appendix 4: Average Pennsylvania Municipality Population by County

Pennsylvania Municipality Population by County

County	Average	Minimum	1st Quartile	Median	3rd Quartile	Maximum
ADAMS	2,983	507	1,308	2,549	4,295	7,620
ALLEGHENY	7,138	70	1,772	3,771	8,691	42,329
ARMSTRONG	1,548	97	618	1,179	2,293	4,800
BEAVER	2,970	60	602	2,176	3,871	12,593
BEDFORD	1,310	78	360	1,217	1,808	5,395
BERKS	4,491	71	1,790	3,450	4,503	27,119
BLAIR	3,507	270	1,515	2,585	4,986	12,289
BRADFORD	1,228	156	684	1,058	1,329	5,587
BUCKS	11,756	868	2,248	6,574	15,029	60,427
BUTLER	3,038	66	709	1,612	3,558	28,098
CAMBRIA	1,981	147	748	1,464	2,595	12,814
CAMERON	726	67	168	183	1,134	2,232
CARBON	2,837	237	903	2,881	4,284	9,581
CENTRE	4,400	291	934	1,746	4,221	42,034
CHESTER	6,747	535	2,693	5,282	8,550	29,332
CLARION	1,176	55	502	970	1,460	5,276
CLEARFIELD	1,506	59	411	760	1,751	10,625
CLINTON	1,052	11	375	974	1,516	3,215
COLUMBIA	2,039	10	824	1,245	1,937	14,855
CRAWFORD	1,424	157	734	1,236	1,782	5,630
CUMBERLAND	7,166	179	2,005	5,429	8,981	28,044
DAUPHIN	5,604	231	1,010	2,268	5,477	47,360
DELAWARE	10,938	784	3,412	6,629	11,636	82,795
ELK	1,716	82	363	1,624	2,503	4,078
ERIE	4,783	218	1,517	3,068	4,415	53,515
FAYETTE	2,965	59	1,000	2,063	3,657	12,728
FOREST	857	361	405	522	666	3,629
FRANKLIN	7,073	262	2,151	5,541	10,788	20,268
FULTON	1,142	15	819	1,220	1,508	1,942
GREENE	1,488	219	373	734	1,559	7,280
HUNTINGDON	957	90	365	563	1,077	7,093
INDIANA	2,339	46	774	1,537	2,353	15,821
JEFFERSON	1,331	67	506	1,083	1,799	5,962

Pennsylvania Municipality Population by County (Continued)

County	Average	Minimum	1st Quartile	Median	3rd Quartile	Maximum
JUNIATA	1,449	617	830	981	2,088	3,478
LACKAWANNA	3,407	250	1,434	2,174	5,063	14,057
LANCASTER	7,799	1,168	3,784	6,308	9,637	38,133
LAWRENCE	2,633	19	873	2,143	3,233	9,609
LEBANON	4,324	52	2,080	3,892	6,991	11,429
LEHIGH	9,223	1,571	3,304	4,923	14,157	30,633
LUZERNE	3,276	98	1,256	2,750	4,490	13,182
LYCOMING	1,701	96	575	987	2,125	11,026
MCKEAN	1,651	141	694	1,556	2,157	4,805
MERCER	1,806	142	721	1,091	2,291	8,322
MIFFLIN	2,918	205	1,123	2,363	3,911	8,338
MONROE	8,492	746	4,062	7,195	10,146	20,564
MONTGOMERY	12,937	508	3,976	9,973	17,521	57,825
MONTOUR	1,661	250	718	1,130	1,871	4,699
NORTHAMPTON	5,980	199	2,495	5,198	7,967	23,730
NORTHUMBERLAND	2,272	279	747	1,839	2,850	10,383
PERRY	1,532	129	828	1,233	2,187	5,269
PIKE	4,413	485	2,323	3,312	4,994	11,926
POTTER	582	74	232	430	849	2,546
SCHUYLKILL	2,030	91	765	1,628	3,026	7,107
SNYDER	1,891	525	1,071	1,554	2,183	5,654
SOMERSET	1,555	26	365	828	2,084	12,122
SULLIVAN	494	120	316	358	577	1,705
SUSQUEHANNA	1,084	111	534	903	1,623	2,844
TIOGA	1,076	49	535	662	1,369	3,625
UNION	3,211	283	1,623	3,261	4,847	6,414
VENANGO	1,307	189	538	854	1,456	6,685
WARREN	1,235	164	468	1,056	1,845	3,594
WASHINGTON	2,973	29	825	1,572	3,574	21,213
WAYNE	1,887	173	822	1,407	2,571	5,269
WESTMORELAND	5,134	120	682	2,348	5,896	43,241
WYOMING	1,229	206	729	1,158	1,539	4,273
YORK	5,511	229	1,280	3,078	6,410	27,793

Appendix 5: Average Pennsylvania Municipality Size in Square Miles by County

Pennsylvania Municipality Size in Square Miles by County

County	Average	Minimum	1st Quartile	Median	3rd Quartile	Maximum
ADAMS	15.3	0.2	0.8	11.5	24.9	68.5
ALLEGHENY	5.3	0.1	0.6	1.6	7.2	32.6
ARMSTRONG	14.8	0.1	0.7	14.4	25.2	45.6
BEAVER	8.3	0.1	0.5	1.9	17.1	44.9
BEDFORD	26.7	0.1	0.4	24.8	41.1	88.0
BERKS	11.8	0.1	0.9	13.0	18.4	42.2
BLAIR	21.5	0.1	0.8	22.0	35.3	60.8
BRADFORD	22.6	0.5	1.9	25.6	34.6	47.0
BUCKS	11.3	0.3	1.2	9.6	20.1	33.1
BUTLER	14.0	0.1	1.0	21.4	23.7	25.9
CAMBRIA	11.0	0.1	0.5	2.7	19.2	49.3
CAMERON	56.7	0.7	10.0	51.4	84.0	157.2
CARBON	16.6	0.1	1.7	11.0	23.1	75.5
CENTRE	31.6	0.3	3.2	25.9	46.0	148.4
CHESTER	10.5	0.3	6.2	10.8	15.6	25.1
CLARION	17.7	0.2	0.9	17.7	29.4	62.0
CLEARFIELD	23.3	0.3	1.7	23.4	37.4	83.5
CLINTON	31.7	0.2	1.7	22.2	47.7	100.0
COLUMBIA	14.7	0.2	4.4	16.2	21.1	35.7
CRAWFORD	20.5	0.3	1.9	22.9	35.0	45.6
CUMBERLAND	16.7	0.3	2.2	15.0	26.0	52.5
DAUPHIN	13.3	0.3	0.8	11.4	23.3	54.6
DELAWARE	3.7	0.1	0.8	1.4	5.9	13.8
ELK	66.3	2.7	49.3	67.3	87.1	145.4
ERIE	21.5	0.3	1.8	29.0	36.5	50.1
FAYETTE	19.6	0.2	0.7	13.3	33.4	91.9
FOREST	47.6	1.3	34.3	42.2	61.4	87.8
FRANKLIN	35.1	0.1	4.3	38.5	55.1	70.3
FULTON	33.7	0.4	30.5	37.1	44.7	54.3
GREENE	22.2	0.1	4.7	23.3	31.6	56.0
HUNTINGDON	18.2	0.1	0.4	17.1	29.9	72.5
INDIANA	21.8	0.1	0.6	27.8	33.5	52.8
JEFFERSON	19.3	0.2	2.0	18.9	28.7	51.3

Pennsylvania Municipality Size in Square Miles by County (Continued)

County	Average	Minimum	1st Quartile	Median	3rd Quartile	Maximum
JUNIATA	23.0	0.1	16.4	21.7	32.1	56.9
LACKAWANNA	11.3	0.6	3.5	6.6	18.9	34.1
LANCASTER	16.0	0.5	2.4	18.1	23.1	47.5
LAWRENCE	13.5	0.1	1.3	16.1	19.9	43.1
LEBANON	14.3	0.2	1.6	16.9	21.8	34.7
LEHIGH	14.1	0.6	1.3	14.0	24.2	41.4
LUZERNE	12.1	0.1	1.2	5.4	18.2	68.7
LYCOMING	24.0	0.5	9.1	18.1	34.0	76.0
MCKEAN	46.6	0.9	2.4	46.4	73.2	98.1
MERCER	14.1	0.2	2.7	15.8	20.7	37.0
MIFFLIN	25.7	0.1	0.9	28.3	36.0	92.8
MONROE	30.4	1.7	22.4	29.6	38.4	85.7
MONTGOMERY	7.8	0.3	1.0	7.6	13.1	23.7
MONTOUR	11.9	0.1	7.0	8.6	16.2	27.1
NORTHAMPTON	9.8	0.3	0.7	2.2	15.5	43.5
NORTHUMBERLAND	13.4	0.1	3.4	12.8	21.5	31.0
PERRY	18.5	0.1	1.4	21.0	28.5	56.3
PIKE	42.1	0.5	30.4	44.7	58.6	78.6
POTTER	34.3	0.7	22.3	35.9	41.4	75.1
SCHUYLKILL	11.7	0.1	0.9	9.5	20.7	58.2
SNYDER	15.8	0.3	3.7	15.6	24.5	36.9
SOMERSET	21.5	0.2	0.7	9.7	38.1	67.2
SULLIVAN	34.6	0.9	2.1	38.5	53.3	78.3
SUSQUEHANNA	20.6	0.3	2.1	23.5	31.5	50.6
TIOGA	29.1	0.4	4.8	32.0	44.8	80.4
UNION	22.6	0.4	4.1	16.4	36.2	79.6
VENANGO	23.0	0.6	3.5	24.7	30.2	70.4
WARREN	33.9	0.4	30.3	35.6	42.5	78.5
WASHINGTON	13.3	0.1	0.8	10.3	22.4	47.6
WAYNE	26.0	0.5	13.8	24.8	38.5	79.0
WESTMORELAND	16.9	0.1	0.4	1.2	30.6	94.5
WYOMING	17.3	0.2	4.6	17.2	22.3	70.8
YORK	12.7	0.1	0.7	3.7	24.8	48.5

Appendix 6: Backward Stepwise Likelihood Analysis of Research Question 1

RQ1 Model Summary Step 1

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.
1	1900.379[a]	.451	.602	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 1	HAVE_PF	0	985	192	83.7	
		1	241	1001	80.6	
	Overall Percentage				82.1	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	CRIME_VIO	-.018	.003	37.368	1	.000	.982
	CRIME_PROP	.002	.001	4.481	1	.034	1.002
	O_SPEND	.001	.000	21.404	1	.000	1.001
	POVERTY	-.013	.012	1.258	1	.262	.987
	VACANCY	-.046	.009	24.703	1	.000	.955
	POP_DEN	.001	.000	77.259	1	.000	1.001
	NO_RES	.000	.000	.008	1	.929	1.000
	UNDER_1500	-.546	.151	13.136	1	.000	.579
	MALE_FEM	-.005	.003	1.939	1	.164	.995
	MED_AGE_M	.021	.029	.517	1	.472	1.021
	MED_AGE_F	.022	.027	.633	1	.426	1.022
	MED_INC	.000	.000	.698	1	.403	1.000
	MED_INC_4564	.000	.000	2.271	1	.132	1.000
	HS_PLUS	.007	.009	.601	1	.438	1.007
	NON_MIN	-.028	.019	2.072	1	.150	.972
	IN_HH	.021	.013	2.557	1	.110	1.021
	HOMES	.000	.000	.326	1	.568	1.000
	RENTALS	.021	.012	3.254	1	.071	1.021
	PROP_VAL	.000	.000	5.902	1	.015	1.000
	HH_1P	.026	.021	1.551	1	.213	1.026
	H_YRS	.033	.020	2.590	1	.108	1.033
	A_D_E_G_PD	-.036	.006	33.107	1	.000	.964
	PA_BORN	-.003	.005	.294	1	.588	.997
	AG_CONST	-.018	.009	4.291	1	.038	.982
	C_15M	.028	.006	22.745	1	.000	1.028
	CULT_SPEND	-.001	.001	2.154	1	.142	.999
	Constant	.056	2.291	.001	1	.981	1.057

Variables not in the Equation

	Score	df	Sig.
No variables excluded			

RQ1 Model Summary Step 2

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.
2	1900.387a	.451	.602	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 2	HAVE_PF	0	985	192	83.7	
		1	242	1000	80.5	
	Overall Percentage				82.1	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 2	CRIME_VIO	-.018	.003	37.446	1	.000	.982
	CRIME_PROP	.002	.001	4.516	1	.034	1.002
	O_SPEND	.001	.000	21.417	1	.000	1.001
	POVERTY	-.013	.012	1.276	1	.259	.987
	VACANCY	-.046	.008	31.903	1	.000	.955
	POP_DEN	.001	.000	77.328	1	.000	1.001
	UNDER_1500	-.548	.149	13.542	1	.000	.578
	MALE_FEM	-.005	.003	1.998	1	.158	.995
	MED_AGE_M	.021	.029	.531	1	.466	1.021
	MED_AGE_F	.022	.027	.645	1	.422	1.022
	MED_INC	.000	.000	.732	1	.392	1.000
	MED_INC_4564	.000	.000	2.278	1	.131	1.000
	HS_PLUS	.007	.009	.610	1	.435	1.007
	NON_MIN	-.028	.019	2.086	1	.149	.972
	IN_HH	.021	.013	2.892	1	.089	1.022
	HOMES	.000	.000	6.816	1	.009	1.000
	RENTALS	.021	.012	3.298	1	.069	1.022
	PROP_VAL	.000	.000	5.964	1	.015	1.000
	HH_1P	.026	.021	1.595	1	.207	1.026
	H_YRS	.033	.020	2.587	1	.108	1.033
	A_D_E_G_PD	-.036	.006	33.116	1	.000	.964
	PA_BORN	-.003	.005	.309	1	.578	.997
	AG_CONST	-.019	.009	4.378	1	.036	.982
	C_15M	.028	.006	22.753	1	.000	1.028
	CULT_SPEND	-.001	.001	2.160	1	.142	.999
	Constant	.025	2.265	.000	1	.991	1.025

Variables not in the Equation

			Score	df	Sig.	a. Variable(s) removed on step 2: NO_RES.
Step 2[a]	Variables	NO_RES	.008	1	.929	
	Overall Statistics		.008	1	.929	

RQ1 Model Summary Step 3

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.
3	1900.695[a]	.451	.602	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 3	HAVE_PF	0	986	191	83.8	
		1	241	1001	80.6	
	Overall Percentage				82.1	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 3	CRIME_VIO	-.017	.003	37.339	1	.000	.983
	CRIME_PROP	.002	.001	4.405	1	.036	1.002
	O_SPEND	.001	.000	21.532	1	.000	1.001
	POVERTY	-.013	.012	1.260	1	.262	.987
	VACANCY	-.045	.008	32.101	1	.000	.956
	POP_DEN	.001	.000	77.090	1	.000	1.001
	UNDER_1500	-.544	.149	13.374	1	.000	.580
	MALE_FEM	-.005	.003	2.090	1	.148	.995
	MED_AGE_M	.022	.029	.564	1	.453	1.022
	MED_AGE_F	.022	.027	.662	1	.416	1.022
	MED_INC	.000	.000	.755	1	.385	1.000
	MED_INC_4564	.000	.000	2.187	1	.139	1.000
	HS_PLUS	.007	.009	.703	1	.402	1.007
	NON_MIN	-.030	.019	2.480	1	.115	.970
	IN_HH	.021	.013	2.901	1	.089	1.022
	HOMES	.000	.000	6.796	1	.009	1.000
	RENTALS	.022	.012	3.465	1	.063	1.022
	PROP_VAL	.000	.000	5.674	1	.017	1.000
	HH_1P	.025	.021	1.474	1	.225	1.025
	H_YRS	.030	.020	2.334	1	.127	1.031
	A_D_E_G_PD	-.037	.006	34.116	1	.000	.964
	AG_CONST	-.018	.009	4.336	1	.037	.982
	C_15M	.027	.006	22.511	1	.000	1.028
	CULT_SPEND	-.001	.001	2.283	1	.131	.999
	Constant	-.007	2.272	.000	1	.998	.993

Variables not in the Equation

			Score	df	Sig.	b. Variable(s) removed on step 3: PA_BORN.
Step 3[b]	Variables	NO_RES	.024	1	.878	
		PA_BORN	.309	1	.578	
	Overall Statistics		.317	2	.853	

RQ1 Model Summary Step 4

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.
4	1901.259[a]	.451	.601	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 4	HAVE_PF	0	989	188	84.0	
		1	242	1000	80.5	
	Overall Percentage				82.2	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 4	CRIME_VIO	-.018	.003	37.702	1	.000	.983
	CRIME_PROP	.002	.001	4.386	1	.036	1.002
	O_SPEND	.001	.000	21.681	1	.000	1.001
	POVERTY	-.013	.012	1.265	1	.261	.987
	VACANCY	-.044	.008	31.677	1	.000	.957
	POP_DEN	.001	.000	76.850	1	.000	1.001
	UNDER_1500	-.547	.149	13.552	1	.000	.578
	MALE_FEM	-.005	.004	2.224	1	.136	.995
	MED_AGE_F	.038	.018	4.430	1	.035	1.038
	MED_INC	.000	.000	.781	1	.377	1.000
	MED_INC_4564	.000	.000	2.139	1	.144	1.000
	HS_PLUS	.008	.009	.817	1	.366	1.008
	NON_MIN	-.029	.019	2.275	1	.131	.972
	IN_HH	.022	.012	3.180	1	.075	1.022
	HOMES	.000	.000	6.634	1	.010	1.000
	RENTALS	.020	.012	3.081	1	.079	1.020
	PROP_VAL	.000	.000	5.513	1	.019	1.000
	HH_1P	.026	.020	1.572	1	.210	1.026
	H_YRS	.031	.020	2.502	1	.114	1.032
	A_D_E_G_PD	-.036	.006	34.001	1	.000	.964
	AG_CONST	-.019	.009	4.392	1	.036	.982
	C_15M	.027	.006	22.143	1	.000	1.028
	CULT_SPEND	-.001	.001	2.249	1	.134	.999
	Constant	.027	2.277	.000	1	.990	1.028

Variables not in the Equation

			Score	df	Sig.	c. Variable(s) removed on step 4: MED_AGE_M.
Step 4[c]	Variables	NO_RES	.048	1	.827	
		MED_AGE_M	.564	1	.453	
		PA_BORN	.342	1	.559	
	Overall Statistics		.882	3	.830	

RQ1 Model Summary Step 5

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	b. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.
5	1902.039[b]	.451	.601	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 5	HAVE_PF	0	987	190	83.9	
		1	245	997	80.3	
	Overall Percentage				82.0	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 5	CRIME_VIO	-.018	.003	37.609	1	.000	.983
	CRIME_PROP	.002	.001	4.389	1	.036	1.002
	O_SPEND	.001	.000	21.453	1	.000	1.001
	POVERTY	-.011	.012	.950	1	.330	.989
	VACANCY	-.043	.008	31.151	1	.000	.958
	POP_DEN	.001	.000	76.587	1	.000	1.001
	UNDER_1500	-.548	.149	13.594	1	.000	.578
	MALE_FEM	-.005	.004	2.287	1	.130	.995
	MED_AGE_F	.038	.018	4.510	1	.034	1.039
	MED_INC_4564	.000	.000	1.359	1	.244	1.000
	HS_PLUS	.006	.008	.555	1	.456	1.006
	NON_MIN	-.028	.019	2.159	1	.142	.973
	IN_HH	.022	.012	2.999	1	.083	1.022
	HOMES	.000	.000	6.814	1	.009	1.000
	RENTALS	.022	.011	3.651	1	.056	1.022
	PROP_VAL	.000	.000	8.139	1	.004	1.000
	HH_1P	.028	.020	1.862	1	.172	1.028
	H_YRS	.033	.020	2.851	1	.091	1.034
	A_D_E_G_PD	-.036	.006	33.833	1	.000	.964
	AG_CONST	-.019	.009	4.437	1	.035	.982
	C_15M	.027	.006	22.656	1	.000	1.028
	CULT_SPEND	-.001	.001	2.346	1	.126	.999
	Constant	-.251	2.255	.012	1	.911	.778

Variables not in the Equation

			Score	df	Sig.	d. Variable(s) removed on step 5: MED_INC.
Step 5[d]	Variables	NO_RES	.115	1	.734	
		MED_AGE_M	.590	1	.442	
		MED_INC	.781	1	.377	
		PA_BORN	.366	1	.545	
	Overall Statistics		1.660	4	.798	

RQ1 Model Summary Step 6

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	b. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.
6	1902.594[b]	.451	.601	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 6	HAVE_PF	0	987	190	83.9	
		1	245	997	80.3	
	Overall Percentage				82.0	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 6	CRIME_VIO	-.018	.003	38.113	1	.000	.983
	CRIME_PROP	.002	.001	4.280	1	.039	1.002
	O_SPEND	.001	.000	21.844	1	.000	1.001
	POVERTY	-.013	.011	1.230	1	.267	.987
	VACANCY	-.043	.008	31.154	1	.000	.958
	POP_DEN	.001	.000	77.086	1	.000	1.001
	UNDER_1500	-.549	.149	13.624	1	.000	.578
	MALE_FEM	-.006	.004	2.386	1	.122	.994
	MED_AGE_F	.038	.018	4.660	1	.031	1.039
	MED_INC_4564	.000	.000	2.083	1	.149	1.000
	NON_MIN	-.026	.019	1.974	1	.160	.974
	IN_HH	.021	.012	2.914	1	.088	1.021
	HOMES	.000	.000	7.075	1	.008	1.000
	RENTALS	.021	.011	3.478	1	.062	1.021
	PROP_VAL	.000	.000	7.644	1	.006	1.000
	HH_1P	.028	.020	1.872	1	.171	1.028
	H_YRS	.030	.019	2.406	1	.121	1.030
	A_D_E_G_PD	-.038	.006	40.004	1	.000	.963
	AG_CONST	-.021	.008	6.203	1	.013	.979
	C_15M	.028	.006	23.218	1	.000	1.028
	CULT_SPEND	-.001	.001	2.391	1	.122	.999
	Constant	-.010	2.232	.000	1	.996	.990

Variables not in the Equation

			Score	df	Sig.	e. Variable(s) removed on step 6: HS_PLUS.
Step 6[e]	Variables	NO_RES	.140	1	.709	
		MED_AGE_M	.683	1	.409	
		MED_INC	.518	1	.472	
		HS_PLUS	.555	1	.456	
		PA_BORN	.456	1	.499	
	Overall Statistics		2.211	5	.819	

RQ1 Model Summary Step 7

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	b. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.
7	1903.835[b]	.450	.601	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 7	HAVE_PF	0	985	192	83.7	
		1	246	996	80.2	
	Overall Percentage				81.9	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 7	CRIME_VIO	-.018	.003	39.955	1	.000	.982
	CRIME_PROP	.002	.001	4.352	1	.037	1.002
	O_SPEND	.001	.000	22.091	1	.000	1.001
	VACANCY	-.044	.008	32.176	1	.000	.957
	POP_DEN	.001	.000	79.829	1	.000	1.001
	UNDER_1500	-.555	.149	13.985	1	.000	.574
	MALE_FEM	-.005	.004	2.376	1	.123	.995
	MED_AGE_F	.041	.018	5.432	1	.020	1.042
	MED_INC_4564	.000	.000	2.693	1	.101	1.000
	NON_MIN	-.027	.019	2.124	1	.145	.973
	IN_HH	.022	.012	3.179	1	.075	1.022
	HOMES	.000	.000	7.396	1	.007	1.000
	RENTALS	.019	.011	2.945	1	.086	1.019
	PROP_VAL	.000	.000	7.259	1	.007	1.000
	HH_1P	.028	.020	1.860	1	.173	1.028
	H_YRS	.032	.019	2.763	1	.096	1.032
	A_D_E_G_PD	-.037	.006	38.935	1	.000	.964
	AG_CONST	-.021	.008	6.579	1	.010	.979
	C_15M	.028	.006	23.093	1	.000	1.028
	CULT_SPEND	-.001	.001	2.500	1	.114	.999
	Constant	-.321	2.213	.021	1	.884	.725

Variables not in the Equation

			Score	df	Sig.	f. Variable(s) removed on step 7: POVERTY.
Step 7[f]	Variables	POVERTY	1.231	1	.267	
		NO_RES	.180	1	.671	
		MED_AGE_M	.703	1	.402	
		MED_INC	.208	1	.648	
		HS_PLUS	.838	1	.360	
		PA_BORN	.451	1	.502	
	Overall Statistics		3.442	6	.752	

RQ1 Model Summary Step 8

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	b. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.
8	1905.693[b]	.450	.600	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 8	HAVE_PF	0	988	189	83.9	
		1	240	1002	80.7	
	Overall Percentage				82.3	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 8	CRIME_VIO	-.018	.003	39.595	1	.000	.982
	CRIME_PROP	.002	.001	4.196	1	.041	1.002
	O_SPEND	.001	.000	23.502	1	.000	1.001
	VACANCY	-.043	.008	30.873	1	.000	.958
	POP_DEN	.001	.000	86.855	1	.000	1.001
	UNDER_1500	-.548	.148	13.648	1	.000	.578
	MALE_FEM	-.006	.004	2.877	1	.090	.994
	MED_AGE_F	.054	.015	13.650	1	.000	1.056
	MED_INC_4564	.000	.000	2.395	1	.122	1.000
	NON_MIN	-.024	.019	1.706	1	.191	.976
	IN_HH	.015	.011	1.754	1	.185	1.015
	HOMES	.000	.000	7.908	1	.005	1.000
	RENTALS	.027	.010	8.098	1	.004	1.028
	PROP_VAL	.000	.000	8.745	1	.003	1.000
	H_YRS	.032	.019	2.820	1	.093	1.032
	A_D_E_G_PD	-.038	.006	44.431	1	.000	.963
	AG_CONST	-.022	.008	7.023	1	.008	.978
	C_15M	.027	.006	22.715	1	.000	1.028
	CULT_SPEND	-.001	.001	2.735	1	.098	.999
	Constant	.086	2.192	.002	1	.969	1.090

Variables not in the Equation

			Score	df	Sig.	g. Variable(s) removed on step 8: HH_1P.
Step 8[g]	Variables	POVERTY	1.220	1	.269	
		NO_RES	.337	1	.562	
		MED_AGE_M	.836	1	.361	
		MED_INC	.370	1	.543	
		HS_PLUS	.846	1	.358	
		HH_1P	1.862	1	.172	
		PA_BORN	.292	1	.589	
	Overall Statistics		5.294	7	.624	

RQ1 Model Summary Step 9

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.
9	1907.418[b]	.450	.600	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 9	HAVE_PF	0	991	186	84.2	
		1	242	1000	80.5	
	Overall Percentage				82.3	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 9	CRIME_VIO	-.018	.003	38.804	1	.000	.983
	CRIME_PROP	.002	.001	4.206	1	.040	1.002
	O_SPEND	.001	.000	23.587	1	.000	1.001
	VACANCY	-.043	.008	32.226	1	.000	.958
	POP_DEN	.001	.000	86.913	1	.000	1.001
	UNDER_1500	-.536	.148	13.121	1	.000	.585
	MALE_FEM	-.008	.003	4.832	1	.028	.992
	MED_AGE_F	.051	.015	11.972	1	.001	1.052
	MED_INC_4564	.000	.000	2.311	1	.128	1.000
	NON_MIN	-.019	.018	1.133	1	.287	.981
	HOMES	.000	.000	8.501	1	.004	1.000
	RENTALS	.022	.009	6.382	1	.012	1.022
	PROP_VAL	.000	.000	8.018	1	.005	1.000
	H_YRS	.031	.019	2.594	1	.107	1.031
	A_D_E_G_PD	-.038	.006	43.569	1	.000	.963
	AG_CONST	-.020	.008	6.087	1	.014	.980
	C_15M	.026	.006	21.038	1	.000	1.026
	CULT_SPEND	-.001	.001	3.038	1	.081	.999
	Constant	1.178	2.016	.342	1	.559	3.248

Variables not in the Equation

			Score	df	Sig.	h. Variable(s) removed on step 9: IN_HH.
Step 9[h]	Variables	POVERTY	1.424	1	.233	
		NO_RES	.825	1	.364	
		MED_AGE_M	1.020	1	.312	
		MED_INC	.198	1	.656	
		HS_PLUS	.776	1	.378	
		IN_HH	1.762	1	.184	
		HH_1P	.474	1	.491	
		PA_BORN	.358	1	.550	
	Overall Statistics		7.109	8	.525	

RQ1 Model Summary Step 10

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	
10	1908.605[b]	.449	.599	b. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	
Step 10	HAVE_PF	0	989	188	84.0	a. The cut value is .500
		1	242	1000	80.5	
	Overall Percentage				82.2	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 10	CRIME_VIO	-.018	.003	38.697	1	.000	.983
	CRIME_PROP	.002	.001	4.630	1	.031	1.002
	O_SPEND	.001	.000	24.001	1	.000	1.001
	VACANCY	-.043	.008	31.979	1	.000	.958
	POP_DEN	.001	.000	89.794	1	.000	1.001
	UNDER_1500	-.537	.148	13.136	1	.000	.585
	MALE_FEM	-.006	.003	4.092	1	.043	.994
	MED_AGE_F	.048	.014	10.988	1	.001	1.049
	MED_INC_4564	.000	.000	2.319	1	.128	1.000
	HOMES	.000	.000	11.164	1	.001	1.000
	RENTALS	.023	.009	7.105	1	.008	1.023
	PROP_VAL	.000	.000	7.427	1	.006	1.000
	H_YRS	.028	.019	2.210	1	.137	1.028
	A_D_E_G_PD	-.039	.006	50.795	1	.000	.961
	AG_CONST	-.020	.008	6.273	1	.012	.980
	C_15M	.026	.006	21.720	1	.000	1.026
	CULT_SPEND	-.001	.001	3.223	1	.073	.999
	Constant	-.692	.959	.521	1	.471	.501

Variables not in the Equation

			Score	df	Sig.	
Step 10[i]	Variables	POVERTY	1.499	1	.221	i. Variable(s) removed on step 10: NON_MIN.
		NO_RES	.769	1	.381	
		MED_AGE_M	.737	1	.391	
		MED_INC	.176	1	.675	
		HS_PLUS	.618	1	.432	
		NON_MIN	1.130	1	.288	
		IN_HH	1.124	1	.289	
		HH_1P	.432	1	.511	
		PA_BORN	.619	1	.432	
	Overall Statistics		8.124	9	.522	

RQ1 Model Summary Step 11

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	b. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.
11	1910.818[b]	.449	.599	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 11	HAVE_PF	0	984	193	83.6	
		1	248	994	80.0	
	Overall Percentage				81.8	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 11	CRIME_VIO	-.017	.003	37.870	1	.000	.983
	CRIME_PROP	.002	.001	4.916	1	.027	1.002
	O_SPEND	.001	.000	23.492	1	.000	1.001
	VACANCY	-.044	.008	34.400	1	.000	.957
	POP_DEN	.001	.000	88.838	1	.000	1.001
	UNDER_1500	-.520	.147	12.448	1	.000	.595
	MALE_FEM	-.005	.003	4.075	1	.044	.995
	MED_AGE_F	.053	.014	14.361	1	.000	1.054
	MED_INC_4564	.000	.000	2.369	1	.124	1.000
	HOMES	.000	.000	9.916	1	.002	1.000
	RENTALS	.019	.008	5.296	1	.021	1.019
	PROP_VAL	.000	.000	9.545	1	.002	1.000
	A_D_E_G_PD	-.040	.005	53.533	1	.000	.961
	AG_CONST	-.020	.008	5.814	1	.016	.981
	C_15M	.026	.006	21.491	1	.000	1.026
	CULT_SPEND	-.001	.001	3.101	1	.078	.999
	Constant	-.337	.927	.132	1	.716	.714

Variables not in the Equation

			Score	df	Sig.	
Step 11[j]	Variables	POVERTY	1.805	1	.179	
		NO_RES	.683	1	.409	
		MED_AGE_M	.920	1	.337	
		MED_INC	.407	1	.524	
		HS_PLUS	.178	1	.673	j. Variable(s) removed on step 11: H_YRS.
		NON_MIN	.771	1	.380	
		IN_HH	1.049	1	.306	
		HH_1P	.505	1	.477	
		H_YRS	2.213	1	.137	
		PA_BORN	.153	1	.696	
	Overall Statistics		10.333	10	.412	

RQ1 Model Summary Step 12

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	
12	1913.217[b]	.448	.598	b. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted			
			HAVE_PF		Percentage Correct	
			0	1		
Step 12	HAVE_PF	0	988	189	83.9	a. The cut value is .500
		1	255	987	79.5	
	Overall Percentage				81.6	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 12	CRIME_VIO	-.018	.003	38.586	1	.000	.983
	CRIME_PROP	.002	.001	4.780	1	.029	1.002
	O_SPEND	.001	.000	24.573	1	.000	1.001
	VACANCY	-.046	.007	39.174	1	.000	.955
	POP_DEN	.001	.000	91.500	1	.000	1.001
	UNDER_1500	-.518	.147	12.403	1	.000	.596
	MALE_FEM	-.005	.003	4.034	1	.045	.995
	MED_AGE_F	.054	.014	14.882	1	.000	1.055
	HOMES	.000	.000	10.586	1	.001	1.000
	RENTALS	.016	.008	3.979	1	.046	1.016
	PROP_VAL	.000	.000	8.700	1	.003	1.000
	A_D_E_G_PD	-.041	.005	55.475	1	.000	.960
	AG_CONST	-.021	.008	6.576	1	.010	.979
	C_15M	.026	.006	21.358	1	.000	1.026
	CULT_SPEND	-.001	.001	3.572	1	.059	.999
	Constant	.068	.887	.006	1	.939	1.070

Variables not in the Equation

			Score	df	Sig.	
Step 12[k]	Variables	POVERTY	2.479	1	.115	k. Variable(s) removed on step 12: MED_INC_4564.
		NO_RES	.463	1	.496	
		MED_AGE_M	.842	1	.359	
		MED_INC	.314	1	.575	
		MED_INC_4564	2.373	1	.123	
		HS_PLUS	.758	1	.384	
		NON_MIN	.771	1	.380	
		IN_HH	.983	1	.321	
		HH_1P	.387	1	.534	
		H_YRS	2.265	1	.132	
		PA_BORN	.087	1	.769	
	Overall Statistics		12.692	11	.314	

Appendix 7: Backward Stepwise Likelihood Analysis of Research Question 2

RQ2 Model Summary Step 1

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.
1	1404.829[a]	.147	.203	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 1	SHARE	0	718	100	87.8	
		1	268	160	37.4	
	Overall Percentage				70.5	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	CRIME_PROP	-.001	.001	.621	1	.431	.999
	POVERTY	-.035	.013	6.839	1	.009	.966
	POP_DEN	.000	.000	1.143	1	.285	1.000
	UNDER_1500	1.355	.166	67.007	1	.000	3.878
	HS_PLUS	.006	.007	.797	1	.372	1.006
	NON_MIN	-.013	.010	1.819	1	.177	.987
	IN_HH	-.014	.010	1.766	1	.184	.987
	HOMES	.000	.000	9.517	1	.002	1.000
	RENTALS	.000	.010	.000	1	.989	1.000
	HH_1P	-.021	.016	1.749	1	.186	.979
	H_YRS	-.034	.023	2.176	1	.140	.967
	A_D_E_G_PD	.025	.007	12.657	1	.000	1.025
	AG_CONST	.015	.011	1.901	1	.168	1.015
	CULT_SPEND	-.001	.001	1.600	1	.206	.999
	Constant	1.533	1.558	.968	1	.325	4.630

Variables not in the Equation

	Score	df	Sig.
No variables excluded			

RQ2 Model Summary Step 2

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.
2	1404.829[a]	.147	.203	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 2	SHARE	0	718	100	87.8	
		1	268	160	37.4	
	Overall Percentage				70.5	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 2	CRIME_PROP	-.001	.001	.621	1	.431	.999
	POVERTY	-.035	.013	7.237	1	.007	.966
	POP_DEN	.000	.000	1.245	1	.265	1.000
	UNDER_1500	1.356	.165	67.458	1	.000	3.879
	HS_PLUS	.006	.007	.809	1	.369	1.006
	NON_MIN	-.013	.009	1.886	1	.170	.987
	IN_HH	-.014	.010	1.807	1	.179	.987
	HOMES	.000	.000	9.527	1	.002	1.000
	HH_1P	-.021	.014	2.310	1	.129	.979
	H_YRS	-.034	.020	2.798	1	.094	.967
	A_D_E_G_PD	.025	.007	13.002	1	.000	1.025
	AG_CONST	.015	.011	1.901	1	.168	1.015
	CULT_SPEND	-.001	.001	1.601	1	.206	.999
	Constant	1.538	1.505	1.044	1	.307	4.655

Variables not in the Equation

			Score	df	Sig.	a. Variable(s) removed on step 2: RENTALS.
Step 2[a]	Variables	RENTALS	.000	1	.989	
	Overall Statistics		.000	1	.989	

RQ2 Model Summary Step 3

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.
3	1405.452[a]	.147	.203	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 3	SHARE	0	715	103	87.4	
		1	266	162	37.9	
	Overall Percentage				70.4	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 3	POVERTY	-.034	.013	6.948	1	.008	.967
	POP_DEN	.000	.000	1.503	1	.220	1.000
	UNDER_1500	1.364	.165	68.610	1	.000	3.914
	HS_PLUS	.007	.007	.898	1	.343	1.007
	NON_MIN	-.012	.009	1.642	1	.200	.988
	IN_HH	-.014	.010	1.825	1	.177	.986
	HOMES	.000	.000	9.873	1	.002	1.000
	HH_1P	-.020	.014	2.090	1	.148	.981
	H_YRS	-.034	.020	2.822	1	.093	.967
	A_D_E_G_PD	.025	.007	13.283	1	.000	1.026
	AG_CONST	.015	.011	2.044	1	.153	1.015
	CULT_SPEND	-.001	.001	1.587	1	.208	.999
	Constant	1.145	1.420	.650	1	.420	3.144

Variables not in the Equation

			Score	df	Sig.	b. Variable(s) removed on step 3: CRIME_PROP.
Step 3[b]	Variables	CRIME_PROP	.621	1	.431	
		RENTALS	.000	1	.997	
	Overall Statistics		.621	2	.733	

RQ2 Model Summary Step 4

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.
4	1406.350[a]	.146	.202	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 4	SHARE	0	715	103	87.4	
		1	265	163	38.1	
	Overall Percentage				70.5	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 4	POVERTY	-.039	.012	11.317	1	.001	.961
	POP_DEN	.000	.000	1.536	1	.215	1.000
	UNDER_1500	1.358	.164	68.283	1	.000	3.888
	NON_MIN	-.011	.009	1.310	1	.252	.989
	IN_HH	-.015	.010	2.067	1	.150	.986
	HOMES	.000	.000	9.272	1	.002	1.000
	HH_1P	-.023	.013	2.910	1	.088	.978
	H_YRS	-.041	.019	4.837	1	.028	.960
	A_D_E_G_PD	.023	.007	12.538	1	.000	1.023
	AG_CONST	.011	.010	1.296	1	.255	1.011
	CULT_SPEND	-.001	.001	1.418	1	.234	.999
	Constant	1.815	1.237	2.155	1	.142	6.143

Variables not in the Equation

			Score	df	Sig.	c. Variable(s) removed on step 4: HS_PLUS.
Step 4[c]	Variables	CRIME_PROP	.710	1	.399	
		HS_PLUS	.899	1	.343	
		RENTALS	.018	1	.893	
	Overall Statistics		1.520	3	.678	

RQ2 Model Summary Step 5

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	
5	1407.609[a]	.145	.201	a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted			
			HAVE_PF		Percentage Correct	
			0	1		a. The cut value is .500
Step 5	SHARE	0	715	103	87.4	
		1	261	167	39.0	
	Overall Percentage				70.8	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 5	POVERTY	-.038	.012	10.762	1	.001	.962
	POP_DEN	.000	.000	.876	1	.349	1.000
	UNDER_1500	1.352	.164	67.920	1	.000	3.863
	IN_HH	-.016	.010	2.660	1	.103	.984
	HOMES	.000	.000	8.577	1	.003	1.000
	HH_1P	-.026	.013	4.195	1	.041	.974
	H_YRS	-.046	.018	6.337	1	.012	.955
	A_D_E_G_PD	.020	.006	11.384	1	.001	1.021
	AG_CONST	.012	.010	1.425	1	.233	1.012
	CULT_SPEND	-.001	.001	1.443	1	.230	.999
	Constant	1.180	1.094	1.162	1	.281	3.253

Variables not in the Equation

			Score	df	Sig.	
Step 5[d]	Variables	CRIME_PROP	.468	1	.494	d. Variable(s) removed on step 5: NON_MIN.
		HS_PLUS	.587	1	.443	
		NON_MIN	1.316	1	.251	
		RENTALS	.010	1	.920	
	Overall Statistics		2.856	4	.582	

RQ2 Model Summary Step 6

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	
6	1408.501[a]	.145	.200	a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	
Step 6	SHARE	0	717	101	87.7	a. The cut value is .500
		1	264	164	38.3	
	Overall Percentage				70.7	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 6	POVERTY	-.038	.012	10.695	1	.001	.963
	UNDER_1500	1.360	.164	68.930	1	.000	3.896
	IN_HH	-.017	.010	2.914	1	.088	.983
	HOMES	.000	.000	8.449	1	.004	1.000
	HH_1P	-.031	.012	6.404	1	.011	.970
	H_YRS	-.040	.017	5.478	1	.019	.960
	A_D_E_G_PD	.021	.006	12.350	1	.000	1.021
	AG_CONST	.012	.010	1.628	1	.202	1.012
	CULT_SPEND	-.001	.001	1.364	1	.243	.999
	Constant	1.148	1.091	1.107	1	.293	3.153

Variables not in the Equation

			Score	df	Sig.	
Step 6[e]	Variables	CRIME_PROP	.707	1	.401	e. Variable(s) removed on step 6: POP_DEN.
		POP_DEN	.878	1	.349	
		HS_PLUS	.675	1	.411	
		NON_MIN	.604	1	.437	
		RENTALS	.061	1	.805	
	Overall Statistics		3.695	5	.594	

RQ2 Model Summary Step 7

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	
7	1410.130[a]	.144	.198	a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted			
			HAVE_PF		Percentage Correct	
			0	1		a. The cut value is .500
Step 7	SHARE	0	718	100	87.8	
		1	267	161	37.6	
	Overall Percentage				70.5	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 7	POVERTY	-.035	.011	9.501	1	.002	.966
	UNDER_1500	1.365	.164	69.376	1	.000	3.915
	IN_HH	-.015	.010	2.218	1	.136	.986
	HOMES	.000	.000	9.264	1	.002	1.000
	HH_1P	-.032	.012	7.268	1	.007	.968
	H_YRS	-.038	.017	4.927	1	.026	.963
	A_D_E_G_PD	.024	.005	20.420	1	.000	1.025
	CULT_SPEND	-.001	.001	1.515	1	.218	.999
	Constant	1.095	1.091	1.007	1	.316	2.989

Variables not in the Equation

			Score	df	Sig.	
Step 7[f]	Variables	CRIME_PROP	.811	1	.368	
		POP_DEN	1.075	1	.300	
		HS_PLUS	.048	1	.827	f. Variable(s) removed on step 7: AG_CONST.
		NON_MIN	.640	1	.424	
		RENTALS	.034	1	.854	
		AG_CONST	1.631	1	.202	
	Overall Statistics		5.309	6	.505	

RQ2 Model Summary Step 8

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	
8	1412.016[a]	.142	.197	a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted			
			HAVE_PF		Percentage Correct	a. The cut value is .500
			0	1		
Step 8	SHARE	0	716	102	87.5	
		1	270	158	36.9	
	Overall Percentage				70.1	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 8	POVERTY	-.034	.011	8.993	1	.003	.967
	UNDER_1500	1.355	.163	68.739	1	.000	3.878
	IN_HH	-.013	.010	1.825	1	.177	.987
	HOMES	.000	.000	9.622	1	.002	1.000
	HH_1P	-.031	.012	6.911	1	.009	.969
	H_YRS	-.036	.017	4.548	1	.033	.964
	A_D_E_G_PD	.025	.005	21.162	1	.000	1.025
	Constant	.899	1.086	.684	1	.408	2.457

Variables not in the Equation

			Score	df	Sig.	
Step 8[g]	Variables	CRIME_PROP	.771	1	.380	
		POP_DEN	.976	1	.323	
		HS_PLUS	.004	1	.951	g. Variable(s) removed on step 8: CULT_SPEND.
		NON_MIN	.710	1	.399	
		RENTALS	.021	1	.884	
		AG_CONST	1.840	1	.175	
		CULT_SPEND	1.873	1	.171	
	Overall Statistics		7.178	7	.411	

RQ2 Model Summary Step 9

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	
9	1413.797[a]	.141	.195	a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted			
			HAVE_PF		Percentage Correct	
			0	1		a. The cut value is .500
Step 9	SHARE	0	716	102	87.5	
		1	266	162	37.9	
	Overall Percentage				70.5	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 9	POVERTY	-.032	.011	8.040	1	.005	.969
	UNDER_1500	1.343	.163	68.004	1	.000	3.829
	HOMES	.000	.000	9.689	1	.002	1.000
	HH_1P	-.022	.010	5.117	1	.024	.978
	H_YRS	-.040	.017	5.453	1	.020	.961
	A_D_E_G_PD	.025	.005	20.857	1	.000	1.025
	Constant	-.388	.521	.555	1	.456	.678

Variables not in the Equation

			Score	df	Sig.	
Step 9[h]	Variables	CRIME_PROP	.764	1	.382	
		POP_DEN	1.136	1	.287	
		HS_PLUS	.069	1	.792	
		NON_MIN	.971	1	.324	h. Variable(s) removed on step 9: IN_HH.
		IN_HH	1.846	1	.174	
		RENTALS	.001	1	.975	
		AG_CONST	1.153	1	.283	
		CULT_SPEND	1.510	1	.219	
	Overall Statistics		9.028	8	.340	

Appendix 8: Split-Halves Method to Confirm the Reliability of the Final Model for Research Question 1

To confirm reliability of the conclusions drawn from the final model for research question 1, the split-halves method was utilized with the results reflected in the following tables. In this method, the population was divided into two randomly chosen halves by assigning a random number to each record and sorting the database into two separate halves based on the ranking of the random number. The results of the reliability test do not confirm the reliability of the model in its entirety; however it does confirm the most significant conclusions of the model. While the stepwise model with the entire population included twelve steps, the model for the first half included thirteen steps and the second half included fourteen steps. The increase in the number of steps results in final models with fewer remaining variables.

The final stepwise model concluded that the amount of spending on other government services (O_SPEND) and population density (POP_DEN) had the greatest predictive value in determining which municipalities would offer protection to their residents was confirmed with the split-halves method, however, neither of the secondary factors, the number of homes (HOMES) and the median age of females (MED_AGE_F) were confirmed by both halves of the reliability test. The percentage of the population classifying themselves as American, Dutch, English or Pennsylvania Dutch (A_D_E_G_PD), commute less than 15 minutes (C_15M), Violent Crime Rate (CRIME_VIO), median property value (PROP_VAL), property vacancy rate (VACANCY) and the dichotomous variable of population under 1,500 individuals (UNDER_1500) were also reflected in the initial model and both halves as reflected in the Comparison of Models from the Reliability Test chart below.

RQ1 First Half Model Summary Final Step 13

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	b. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.
13	976.686[a]	.439	.586	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 13	HAVE_PF	0	500	98	83.6	
		1	129	482	78.9	
	Overall Percentage				81.2	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 13	CRIME_VIO	-.019	.004	23.004	1	.000	.981
	CRIME_PROP	.003	.002	3.882	1	.049	1.003
	O_SPEND	.001	.000	14.945	1	.000	1.001
	VACANCY	-.033	.009	12.360	1	.000	.968
	POP_DEN	.001	.000	40.538	1	.000	1.001
	NO_RES	.000	.000	4.447	1	.035	1.000
	UNDER_1500	-.603	.199	9.235	1	.002	.547
	MED_INC_4564	.000	.000	3.152	1	.076	1.000
	IN_HH	.046	.014	10.466	1	.001	1.047
	PROP_VAL	.000	.000	6.163	1	.013	1.000
	HH_1P	.087	.020	18.260	1	.000	1.091
	A_D_E_G_PD	-.042	.008	27.679	1	.000	.959
	AG_CONST	-.020	.011	3.097	1	.078	.980
	C_15M	.035	.008	19.013	1	.000	1.035
	Constant	-4.614	1.675	7.586	1	.006	.010

Variables not in the Equation

			Score	df	Sig.
Step 13[l]	Variables	POVERTY	.733	1	.392
		MALE_FEM	.201	1	.654
		MED_AGE_M	.315	1	.575
		MED_AGE_F	.744	1	.389
		MED_INC	1.382	1	.240
		HS_PLUS	.006	1	.938
		NON_MIN	.007	1	.931
		HOMES	.072	1	.789
		RENTALS	.006	1	.936
		H_YRS	1.754	1	.185
		PA_BORN	.305	1	.581
		CULT_SPEND	.114	1	.736
	Overall Statistics		5.473	12	.940

RQ1 Second Half Model Summary Final Step 14

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.
14	909.083[a]	.469	.626	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 14	HAVE_PF	0	492	87	85.0	
		1	118	513	81.3	
	Overall Percentage				83.1	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 14	CRIME_VIO	-.014	.004	13.413	1	.000	.986
	O_SPEND	.001	.000	12.066	1	.001	1.001
	VACANCY	-.077	.014	31.897	1	.000	.926
	POP_DEN	.001	.000	74.109	1	.000	1.001
	UNDER_1500	-.419	.220	3.629	1	.057	.658
	MALE_FEM	-.011	.005	5.333	1	.021	.989
	MED_AGE_M	.063	.022	8.192	1	.004	1.065
	NON_MIN	-.072	.031	5.460	1	.019	.930
	HOMES	.000	.000	3.660	1	.056	1.000
	PROP_VAL	.000	.000	6.150	1	.013	1.000
	A_D_E_G_PD	-.041	.008	29.784	1	.000	.960
	C_15M	.027	.007	13.602	1	.000	1.028
	CULT_SPEND	-.002	.001	9.293	1	.002	.998
	Constant	7.711	3.424	5.071	1	.024	2232.193

Variables not in the Equation

			Score	df	Sig.
Step 14[m]	Variables	CRIME_PROP	.646	1	.422
		POVERTY	.472	1	.492
		NO_RES	1.924	1	.165
		MED_AGE_F	.531	1	.466
		MED_INC	.009	1	.927
		MED_INC_4564	.315	1	.574
		HS_PLUS	2.051	1	.152
		IN_HH	.724	1	.395
		RENTALS	2.619	1	.106
		HH_1P	.556	1	.456
		H_YRS	.382	1	.537
		PA_BORN	2.561	1	.110
		AG_CONST	2.700	1	.100
	Overall Statistics		14.437	13	.344

RQ1 First Half Model Variables Removed

a. Variable(s) removed on step 2: HOMES.
b. Variable(s) removed on step 3: MED_AGE_M.
c. Variable(s) removed on step 4: PA_BORN.
d. Variable(s) removed on step 5: HS_PLUS.
e. Variable(s) removed on step 6: CULT_SPEND.
f. Variable(s) removed on step 7: NON_MIN.
g. Variable(s) removed on step 8: MALE_FEM.
h. Variable(s) removed on step 9: MED_AGE_F.
i. Variable(s) removed on step 10: RENTALS.
j. Variable(s) removed on step 11: POVERTY.
k. Variable(s) removed on step 12: MED_INC.
l. Variable(s) removed on step 13: H_YRS.

RQ1 Second Half Model Variables Removed

a. Variable(s) removed on step 2: MED_INC.
b. Variable(s) removed on step 3: MED_AGE_F.
c. Variable(s) removed on step 4: IN_HH.
d. Variable(s) removed on step 5: MED_INC_4564.
e. Variable(s) removed on step 6: HH_1P.
f. Variable(s) removed on step 7: NO_RES.
g. Variable(s) removed on step 8: POVERTY.
h. Variable(s) removed on step 9: CRIME_PROP.
i. Variable(s) removed on step 10: HS_PLUS.
j. Variable(s) removed on step 11: H_YRS.
k. Variable(s) removed on step 12: RENTALS.
l. Variable(s) removed on step 13: PA_BORN.
m. Variable(s) removed on step 14: AG_CONST.

RQ1 - Comparison of Models from the Reliability Test

RQ1 Full Model		RQ1 First Half Model		RQ1 Second Half Model	
Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
Most Significant factors					
O_SPEND	0.001188	O_SPEND	0.001010	O_SPEND	0.001297
POP_DEN	0.000873	POP_DEN	0.000697	POP_DEN	0.001114
Secondary					
HOMES	0.000155	HOMES	-na-	HOMES	0.000154
MED_AGE_F	0.053644	MED_AGE_F	-na-	MED_AGE_F	-na-
Included in all three models					
A_D_E_G_PD	-0.040886	A_D_E_G_PD	-0.041603	A_D_E_G_PD	-0.041097
C_15M	0.025699	C_15M	0.034662	C_15M	0.027201
CRIME_VIO	-0.017503	CRIME_VIO	-0.019065	CRIME_VIO	-0.014181
PROP_VAL	-0.000002	PROP_VAL	-0.000004	PROP_VAL	-0.000003
UNDER_1500	-0.518227	UNDER_1500	-0.603450	UNDER_1500	-0.418743
VACANCY	-0.046441	VACANCY	-0.032594	VACANCY	-0.077360
Included in two models					
AG_CONST	-0.020826	AG_CONST	-0.020073	AG_CONST	-na-
CRIME_PROP	0.002439	CRIME_PROP	0.003063	CRIME_PROP	-na-
CULT_SPEND	-0.001061	CULT_SPEND	-na-	CULT_SPEND	-0.002471
MALE_FEM	-0.005456	MALE_FEM	-na-	MALE_FEM	-0.011357
Included in one model					
RENTALS	0.015750	RENTALS	-na-	RENTALS	-na-
HH_1P	-na-	HH_1P	0.087050	HH_1P	-na-
IN_HH	-na-	IN_HH	0.046226	IN_HH	-na-
MED_AGE_M	-na-	MED_AGE_M	-na-	MED_AGE_M	0.063381
MED_INC_4564	-na-	MED_INC_4564	0.000013	MED_INC_4564	-na-
NO_RES	-na-	NO_RES	0.000055	NO_RES	-na-
NON_MIN	-na-	NON_MIN	-na-	NON_MIN	-0.072488
Excluded from all models					
H_YRS	-na-	H_YRS	-na-	H_YRS	-na-
HS_PLUS	-na-	HS_PLUS	-na-	HS_PLUS	-na-
MED_INC	-na-	MED_INC	-na-	MED_INC	-na-
PA_BORN	-na-	PA_BORN	-na-	PA_BORN	-na-
POVERTY	-na-	POVERTY	-na-	POVERTY	-na-
Constant	0.067947	Constant	-4.613961	Constant	7.710740

Appendix 9: Split-Halves Method to Confirm the Reliability of the Final Model for Research Question 2

The split-halves method was utilized to confirm the reliability of the conclusions drawn from the final model for research question 2 similar to that done for the first research question. The results of the reliability test do not confirm the reliability of the model in its entirety; however it does confirm the most significant and secondary conclusions of the model. The stepwise model with the entire population included nine steps, the model for the first half included ten steps and the second half included nine steps.

The full stepwise model reflected in the research concluded that the number of homes in the municipality (HOMES) had the greatest predictive value in determining which municipalities would offer protection in collaboration followed by the percentage of the population classifying themselves as American, Dutch, English or Pennsylvania Dutch (A_D_E_G_PD). The impact of both of the variables as predictors was confirmed by the reliability test as was the impact of the dichotomous variable of population under 1,500 individuals (UNDER_1500). Six other variables were reflected in one or two of the tests but not all three.

RQ2 First Half Model Summary Final Step 10

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.
10	696.143[a]	.148	.206	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 10	SHARE	0	356	57	86.2	
		1	121	89	42.4	
	Overall Percentage				71.4	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 10	UNDER_1500	1.513	.223	45.834	1	.000	4.538
	HS_PLUS	.014	.007	3.628	1	.057	1.014
	HOMES	.000	.000	2.757	1	.097	1.000
	HH_1P	-.037	.013	8.211	1	.004	.964
	A_D_E_G_PD	.020	.008	6.541	1	.011	1.021
	Constant	-1.468	.746	3.865	1	.049	.230

Variables not in the Equation

			Score	df	Sig.
Step 10[i]	Variables	CRIME_PROP	.189	1	.664
		POVERTY	.226	1	.634
		POP_DEN	.623	1	.430
		NON_MIN	.025	1	.874
		IN_HH	.046	1	.829
		RENTALS	.013	1	.910
		H_YRS	.611	1	.434
		AG_CONST	1.407	1	.236
		CULT_SPEND	1.001	1	.317
	Overall Statistics		4.934	9	.840

a. Variable(s) removed on step 2: RENTALS.
b. Variable(s) removed on step 3: NON_MIN.
c. Variable(s) removed on step 4: IN_HH.
d. Variable(s) removed on step 5: CRIME_PROP.
e. Variable(s) removed on step 6: POVERTY.
f. Variable(s) removed on step 7: CULT_SPEND.
g. Variable(s) removed on step 8: POP_DEN.
h. Variable(s) removed on step 9: H_YRS.
i. Variable(s) removed on step 10: AG_CONST.

RQ2 Second Half Model Summary Final Step 9

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	b. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.
9	701.120[a]	.156	.215	

Classification Table[a]

Observed			Predicted HAVE_PF 0	Predicted HAVE_PF 1	Percentage Correct	a. The cut value is .500
Step 9	SHARE	0	354	51	87.4	
		1	128	90	41.3	
	Overall Percentage				71.3	

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 9	CRIME_PROP	-.004	.002	4.684	1	.030	.996
	POVERTY	-.047	.015	9.491	1	.002	.954
	UNDER_1500	1.029	.232	19.669	1	.000	2.799
	NON_MIN	-.029	.011	6.272	1	.012	.972
	HOMES	.000	.000	7.711	1	.005	1.000
	A_D_E_G_PD	.044	.008	29.022	1	.000	1.045
	Constant	1.602	1.249	1.646	1	.200	4.964

Variables not in the Equation

			Score	df	Sig.
Step 9[h]	Variables	POP_DEN	.081	1	.776
		HS_PLUS	.029	1	.866
		IN_HH	.921	1	.337
		RENTALS	.162	1	.687
		HH_1P	.001	1	.975
		H_YRS	1.025	1	.311
		AG_CONST	.864	1	.353
		CULT_SPEND	.901	1	.343
	Overall Statistics		5.664	8	.685

a. Variable(s) removed on step 2: RENTALS.
b. Variable(s) removed on step 3: HS_PLUS.
c. Variable(s) removed on step 4: POP_DEN.
d. Variable(s) removed on step 5: HH_1P.
e. Variable(s) removed on step 6: H_YRS.
f. Variable(s) removed on step 7: CULT_SPEND.
g. Variable(s) removed on step 8: AG_CONST.
h. Variable(s) removed on step 9: IN_HH.

RQ1 - Comparison of Models from the Reliability Test

RQ2 Full Model		RQ2 First Half Model		RQ2 Second Half Model	
Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
Most Significant factor					
HOMES	0	HOMES	0	HOMES	0
Secondary					
A_D_E_G_PD	0.025	A_D_E_G_PD	0.02	A_D_E_G_PD	0.044
Included in all three models					
UNDER_1500	1.343	UNDER_1500	1.513	UNDER_1500	1.029
Included in two models					
HH_1P	-0.022	HH_1P	-0.037	HH_1P	-na-
POVERTY	-0.032	POVERTY	-na-	POVERTY	-0.047
Included in one model					
H_YRS	-0.04	H_YRS	-na-	H_YRS	-na-
CRIME_PROP	-na-	CRIME_PROP	-na-	CRIME_PROP	-0.004
HS_PLUS	-na-	HS_PLUS	0.014	HS_PLUS	-na-
NON_MIN	-na-	NON_MIN	-na-	NON_MIN	-0.029
Excluded from all models					
AG_CONST	-na-	AG_CONST	-na-	AG_CONST	-na-
RENTALS	-na-	RENTALS	-na-	RENTALS	-na-
CULT_SPEND	-na-	CULT_SPEND	-na-	CULT_SPEND	-na-
IN_HH	-na-	IN_HH	-na-	IN_HH	-na-
POP_DEN	-na-	POP_DEN	-na-	POP_DEN	-na-
Constant	-0.388	Constant	-1.468	Constant	1.602

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