The Phoenix Project:

Predictors of Suspect Use of Force

Principal Investigator: Russell A. Johnson
Charlotte Research Center Incorporated

Sincere thanks to Dr. Robert W. Brame, Dr. Charles W. Dean and Dr. J. David Hirschel For their assistance and direction during the course of this research.

This research was funded by award # 98-IJ-CX-0071 from the National Institute of Justice. Points of view expressed in this report are those of the author and do not necessarily represent the official position of the National Institute of Justice.

FINAL REPORT

Approved By: _____

Draft: October 5, 1999 Date: 4/6/01

Table of Contents

Understanding the Use of Force By and Against the Police

Executive Summary

Principal Investigator
Joel Garner, Rutgers University

Co-Principal Investigators
Tom Schade, Arizona State University
John Hepburn, Arizona State University
Jeffrey Fagan, Rutgers University

Research Assistant
Aogan Mulcahy, Arizona State University

Project Director
Commander John Buchanan, Phoenix Police Department

Deputy Project Director
Sergeant Richard Groeneveld, Phoenix Police Department

This research was supported by award 92-IJ-CX-K028 from the National Institute of Justice, the contributions of the participating officers of the Phoenix Police Department, and the assistance of the Maricopa County Sheriff's Department. Points of view expressed in this report are those of the authors and do not necessarily represent the official position of the Phoenix Police Department, the Maricopa County Sheriff's Department or the National Institute of Justice.

Understanding the Use of Force By and Against the Police
Summary of Results

Based on a survey of 1,585 adult custody arrests completed by the Phoenix Police Department during two weeks in June 1994:

1. Police used some physical force in about one in every five arrests.
   Suspects used some physical force in about one in every six arrests.

2. We developed three measures of force: Physical Force,
   Continuum of Force and
   Maximum Force.

   When force was used by the police or by suspects, it was typically at the low end of force severity on each measure of force.

3. Phoenix police officers have the authority to not handcuff suspects and they used this discretion in 20 percent of all adult custody arrests studied.

4. Weapons were used by the police in 2 percent of all arrests. The weapon most frequently used by the police was a flashlight (12 times in 1,585 arrests).

5. The single best predictor of police use of force is suspect use of force; suspect use of force, however, does not predict all police use of force.

6. Consistent Predictors of the use of more force by the police are:

   Suspect Use of Force
   Suspect Gang Involvement
   Suspect Alcohol Impairment
   Suspect Known to be Resistive, Assaultive or to Carry Weapons
   Both Suspect and Police Officer Are Male
   Type of Offense (Violent)
   Presence of Bystanders
   Police Use of Contact and Cover Tactic
   Increased Numbers of Police Present

7. Measures of force obtained by interviewing suspects were at levels similar to measures obtained from surveys with the police.

8. Similar studies in other jurisdictions are needed to determine how accurately the results from Phoenix reflect national patterns of force by and against the police.

Executive Summary
Understanding the Use of Force By and Against the Police

The Phoenix Police Department, in conjunction with Rutgers University and Arizona State University, designed and implemented a study of the use of force by and against Phoenix police officers. This study was concerned with describing the amount of force used and the characteristics of arrest situations, suspects and officers associated with the use of more or less force. The research was motivated by a perceived need on the part of the Phoenix Police Department and the National Institute of Justice, which sponsored this research, to generate systematic information about arrest situations and arrest tactics policy, training and practice.

This research was designed to address some of the more important limitations of prior research on use of force. First, it focused on and developed measures to capture the continuum of force actually employed. Measures of the simple dichotomy between force/no force (or excessive/ reasonable force) do not capture the full range of police or suspect behavior or recognize the great variety of force behavior in police work. Second, this study collected data from a representative sample of arrests. Our concern was not limited to small number of instances where high levels of force (i.e., those resulting in firearm discharges, deaths or serious injury) were used or where complaints against the police were made but to those instances where force could be used. This project had a third distinguishing focus: identifying the correlates of force. Although helpful, describing the arrest situations or the amount of force is by itself not a sufficient basis for developing arrest tactics training. Our goal was to understand under what circumstances and in which situations more or less force is used to accomplish an arrest and to use that information to improve arrest tactics training and practice.

Our primary source of information was a one-page, front and back, survey completed by Phoenix police officers after arrests were made during a two week period in June 1994. (See Figure 1). This form was used to record specific behavioral aspects of the arrests as well as how the police were mobilized, the nature of the offense, and officer and suspect characteristics. We found no evidence to suggest that the use of this survey form influenced normal police behavior.

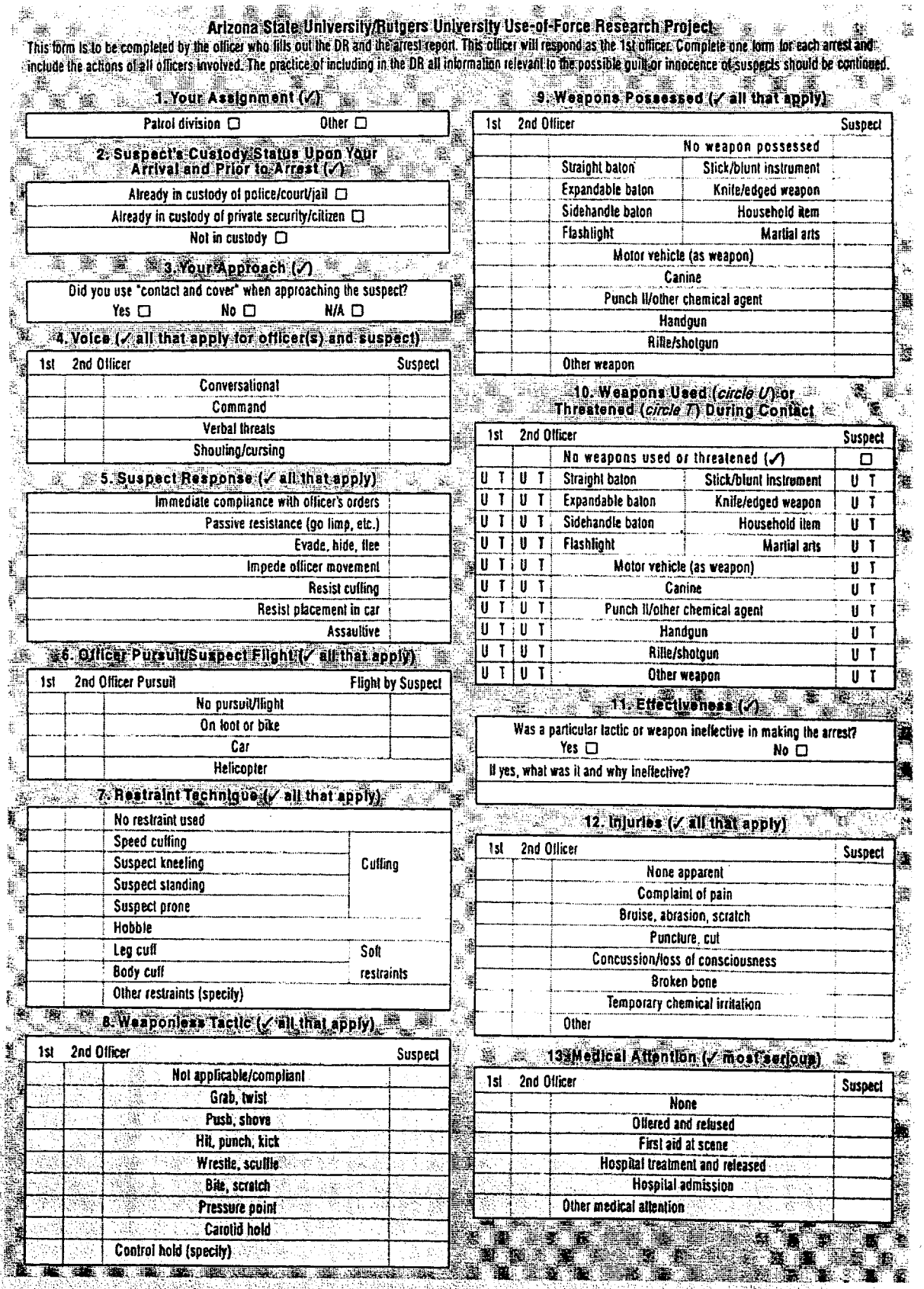
We compared the detailed information in the officer survey with each of the three measures of force and we developed multivariate statistical models to evaluate the extent to which officer, suspect and arrest characteristics predicted the amount of force used. The range of predictors available in prior research was limited in number and scope and considered an inadequate basis for developing arrest tactic policies or testing theories of police behavior.

Good research practice, like good police work, recognizes that after-the-fact reports by an interested party may not always provide complete information about a particular incident. We assessed the reliability of our officer survey by interviewing a sample of suspects booked in the Maricopa County Jail and their interviews were matched to the officer surveys. Both the officer surveys and the suspect interviews were voluntary and anonymous. No unique officer or suspect identifiers were collected and the completed forms and interviews were always in the custody of the university-based researchers. We implemented these procedures to encourage participation, to obtain candid responses and to protect the confidentiality of research subjects. [See Chapter 2.]

Results

We developed, field tested, revised and implemented the two page survey in Phoenix, Arizona, the eighth largest city in the United States. During the two week study period in June 1994, 1,777 surveys were obtained and 1,585 of these were for adults that were booked by Phoenix Police officers at the Maricopa County Jail. During this same period, the Phoenix police department's automated information system (PACE) recorded 1826 arrests where an adult suspect was booked at the Maricopa County Jail. Thus, we obtained surveys in over 85% of arrests of detained adults.

Figure ES-1: Police Survey Form



Arizona State University/Rutgers University Use-of-Force Research Project

This form is to be completed by the officer who fills out the DR and the arrest report. This officer will respond as the 1st officer. Complete one form for each arrest and include the actions of all officers involved. The practice of including in the DR all information relevant to the possible guilt or innocence of suspects should be continued.

1. Your Assignment (✓)

Patrol division ☐ Other ☐

2. Suspect's Custody Status Upon Your Arrival and Prior to Arrest (✓)

Already in custody of police/court/jail ☐
Already in custody of private security/citizen ☐
Not in custody ☐

3. Your Approach (✓)

Did you use "contact and cover" when approaching the suspect?
Yes ☐ No ☐ N/A ☐

4. Voice (✓ all that apply for officer(s) and suspect)

1st	2nd Officer		Suspect
		Conversational	
		Command	
		Verbal threats	
		Shouting/cursing	

5. Suspect Response (✓ all that apply)

Immediate compliance with officer's orders	
Passive resistance (go limp, etc.)	
Evade, hide, flee	
Impede officer movement	
Resist cuffing	
Resist placement in car	
Assaultive	

6. Officer Pursuit/Suspect Flight (✓ all that apply)

1st	2nd Officer Pursuit		Flight by Suspect
		No pursuit/flight	
		On foot or bike	
		Car	
		Helicopter	

7. Restraint Technique (✓ all that apply)

		No restraint used	
		Speed cuffing	Cuffing
		Suspect kneeling	
		Suspect standing	
		Suspect prone	
		Hobble	
		Leg cuff	Soft restraints
		Body cuff	
		Other restraints (specify)	

8. Weaponless Tactic (✓ all that apply)

1st	2nd Officer		Suspect
		Not applicable/compliant	
		Grab, twist	
		Push, shove	
		Hit, punch, kick	
		Wrestle, scuffle	
		Bite, scratch	
		Pressure point	
		Carotid hold	
		Control hold (specify)	

9. Weapons Possessed (✓ all that apply)

1st	2nd Officer			Suspect
		No weapon possessed		
		Straight baton	Stick/blunt instrument	
		Expandable baton	Knife/edged weapon	
		Sidehandle baton	Household item	
		Flashlight	Martial arts	
		Motor vehicle (as weapon)		
		Canine		
		Punch II/other chemical agent		
		Handgun		
		Rifle/shotgun		
		Other weapon		

10. Weapons Used (*circle U*) or Threatened (*circle T*) During Contact

1st		2nd Officer			Suspect
			No weapons used or threatened (✓)		☐
U	T	U T	Straight baton	Stick/blunt instrument	U T
U	T	U T	Expandable baton	Knife/edged weapon	U T
U	T	U T	Sidehandle baton	Household item	U T
U	T	U T	Flashlight	Martial arts	U T
U	T	U T	Motor vehicle (as weapon)		U T
U	T	U T	Canine		U T
U	T	U T	Punch II/other chemical agent		U T
U	T	U T	Handgun		U T
U	T	U T	Rifle/shotgun		U T
U	T	U T	Other weapon		U T

11. Effectiveness (✓)

Was a particular tactic or weapon ineffective in making the arrest?
Yes ☐ No ☐

If yes, what was it and why ineffective?

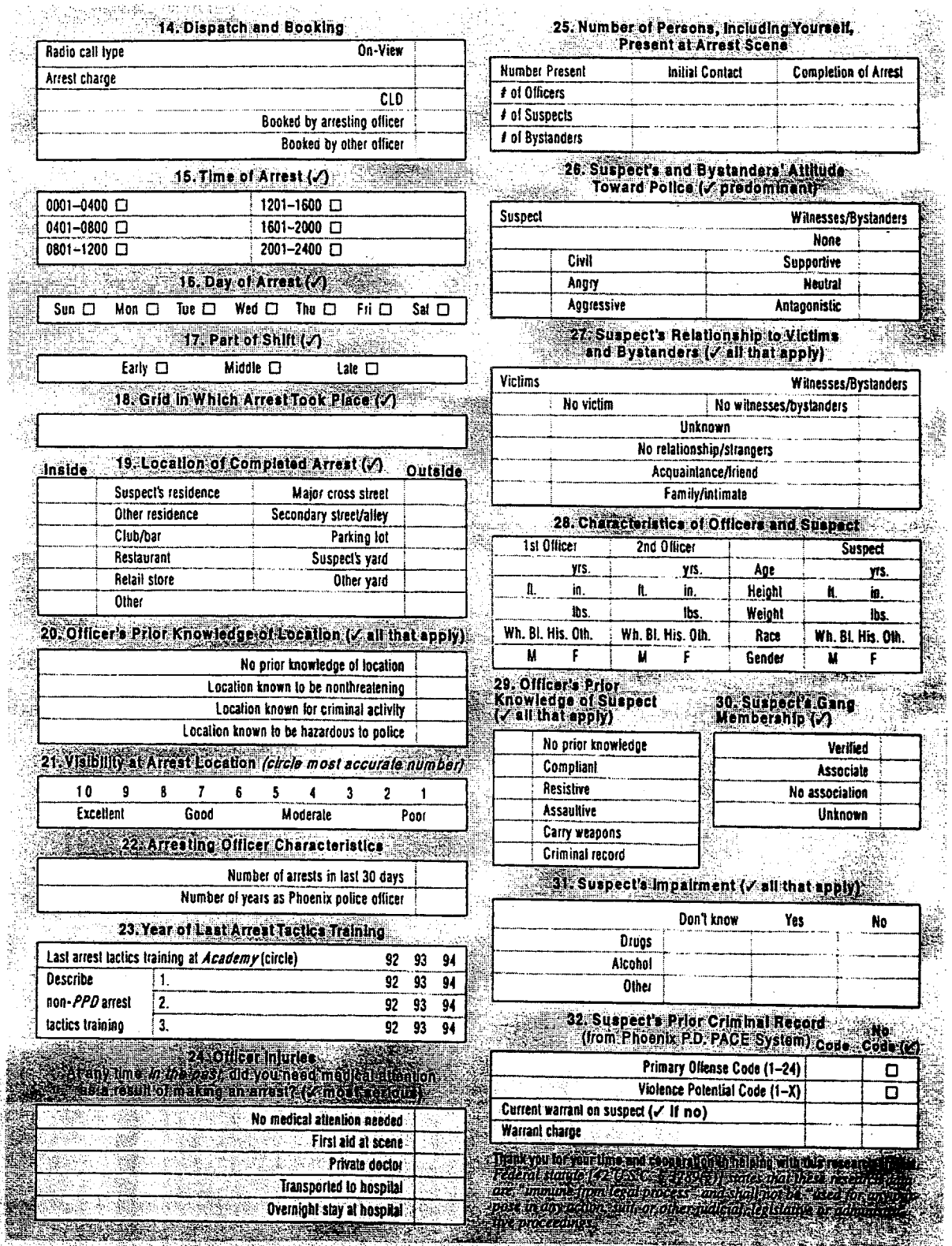
12. Injuries (✓ all that apply)

1st	2nd Officer		Suspect
		None apparent	
		Complaint of pain	
		Bruise, abrasion, scratch	
		Puncture, cut	
		Concussion/loss of consciousness	
		Broken bone	
		Temporary chemical irritation	
		Other	

13. Medical Attention (✓ most serious)

1st	2nd Officer		Suspect
		None	
		Offered and refused	
		First aid at scene	
		Hospital treatment and released	
		Hospital admission	
		Other medical attention	

Figure ES-1 Continued: Police Survey Form



14. Dispatch and Booking

Radio call type: On-View	
Arrest charge	
CLD	
Booked by arresting officer	
Booked by other officer	

15. Time of Arrest (✓)

0001–0400 ☐	1201–1600 ☐
0401–0800 ☐	1601–2000 ☐
0801–1200 ☐	2001–2400 ☐

16. Day of Arrest (✓)

Sun ☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐ Sat ☐

17. Part of Shift (✓)

Early ☐ Middle ☐ Late ☐

18. Grid in Which Arrest Took Place (✓)

19. Location of Completed Arrest (✓)

Inside			Outside
	Suspect's residence	Major cross street	
	Other residence	Secondary street/alley	
	Club/bar	Parking lot	
	Restaurant	Suspect's yard	
	Retail store	Other yard	
	Other		

20. Officer's Prior Knowledge of Location (✓ all that apply)

No prior knowledge of location	
Location known to be nonthreatening	
Location known for criminal activity	
Location known to be hazardous to police	

21. Visibility at Arrest Location *(circle most accurate number)*

10 9 8 7 6 5 4 3 2 1

Excellent — Good — Moderate — Poor

22. Arresting Officer Characteristics

Number of arrests in last 30 days	
Number of years as Phoenix police officer	

23. Year of Last Arrest Tactics Training

Last arrest tactics training at *Academy* (circle)		92	93	94
Describe non-*PPD* arrest tactics training	1.	92	93	94
	2.	92	93	94
	3.	92	93	94

24. Officer Injuries

At any time *in the past*, did you need medical attention as a result of making an arrest? (✓ most serious)

No medical attention needed	
First aid at scene	
Private doctor	
Transported to hospital	
Overnight stay at hospital	

25. Number of Persons, Including Yourself, Present at Arrest Scene

Number Present	Initial Contact	Completion of Arrest
# of Officers		
# of Suspects		
# of Bystanders		

26. Suspect's and Bystanders' Attitude Toward Police (✓ predominant)

Suspect		Witnesses/Bystanders	
		None	
	Civil	Supportive	
	Angry	Neutral	
	Aggressive	Antagonistic	

27. Suspect's Relationship to Victims and Bystanders (✓ all that apply)

Victims		Witnesses/Bystanders	
	No victim	No witnesses/bystanders	
	Unknown		
	No relationship/strangers		
	Acquaintance/friend		
	Family/intimate		

28. Characteristics of Officers and Suspect

1st Officer		2nd Officer			Suspect	
	yrs.		yrs.	Age		yrs.
ft.	in.	ft.	in.	Height	ft.	in.
	lbs.		lbs.	Weight		lbs.
Wh. Bl. His. Oth.		Wh. Bl. His. Oth.		Race	Wh. Bl. His. Oth.	
M	F	M	F	Gender	M	F

29. Officer's Prior Knowledge of Suspect (✓ all that apply)

No prior knowledge	
Compliant	
Resistive	
Assaultive	
Carry weapons	
Criminal record	

30. Suspect's Gang Membership (✓)

Verified	
Associate	
No association	
Unknown	

31. Suspect's Impairment (✓ all that apply)

	Don't know	Yes	No
Drugs			
Alcohol			
Other			

32. Suspect's Prior Criminal Record (from Phoenix P.D. PACE System)

	Code	No Code (✓)
Primary Offense Code (1–24)		☐
Violence Potential Code (1–X)		☐
Current warrant on suspect (✓ if no)		
Warrant charge		

Thank you for your time and cooperation in helping with this research effort. Federal statute (42 U.S.C. § 3789g(c)) states that these records data are "immune from legal process" and shall not be "used for purposes in any action, suit or other judicial, legislative or administrative proceedings."

From these surveys, we obtained detailed information about the frequency of specific behavior of the police and of arrested suspects along 5 dimensions: Voice, Motion, Restraints, Tactics, and Weapons. During arrests in this study, officers used threats or shouts less than 4% of the time, pursued a fleeing suspect 7% of the time, placed cuffs or restraints on 77% of the suspects, used a weaponless tactic (holding, hitting, etc.) 17% of the time, threatened to use a weapon in 3.7% of the arrests, and used a weapon in 2% of the arrests. The most frequent weapon threatened was a handgun (45 arrests); the most frequent weapon used was a flashlight (12 arrests). In 20% of the adult custody arrests, no restraint was used.

From this kind of detailed information, we constructed three measures of force used by police officers--Physical Force, the Continuum of Force, and Maximum Force--and three parallel measures for force used by suspects. Each of these measures were designed to capture low levels of force not traditionally included in research on police use of force; however, our central finding is that force was rarely used by police officers (or by arrested suspects) and that when some form of force was used, it was typically at the low end of our measures. [See Chapter 3 for details].

Physical Force

The first measure is a traditional dichotomy of those arrests where physical force was or was not used. We defined the use of physical force for officers and for suspects in parallel but slightly different ways.

Definition 1: Measures of Physical Force

POLICE	SUSPECT
Use of Severe Restraints*	
Use of Any Weaponless Tactic	Use of Any Weaponless Tactic
Use or Threatened Use of Any Weapon	Use, Threatened Use or Possession of Any Weapon

*Severe restrains include cuffing while suspect prone, hobble, leg cuff and body restraint.

Table ES - 1 displays the frequency with which the Phoenix police used physical force during two weeks in June 1994 . In 349 or 22% of the 1585 surveyed arrests, the police used some form of physical force. In nearly 4 out of every 5 adult custody arrests police officers used no physical force at all. Physical force by the suspects (See Table ES - 1) occurred in 228 or 14.4% of the 1585 surveys. In roughly 5 out of every 6 adult custody arrests the suspects used no physical force.

Table ES - 1: Use of Physical Force by Police and By Suspects

1585 Adult Custody Arrests	Number	Percent
Physical Force by Police	**349**	**22.0%**
Physical Force by Suspects	**228**	**14.4%**

Continuum of Force

The second measure of force we developed (See Definition 2) captures the two six-step rankings of force used by the Phoenix Police Department. These gradients of force are similar to those used by many other police departments. The rankings are independent; thus, a 3 on the police scale (restraints) is not necessarily equivalent to a 3 on the suspect scale (passive resistance). Our measurement of this "continuum of force" is intended not only to reflect the official policies of the Phoenix Police Department but also to incorporate into our research the widely-held notion that the force/no force dichotomy is inadequate to capture all the important variation in the ways police handle encounters with the public.

Definition 2: Measures of the Phoenix Police Department Continuum of Force

POLICE	SUSPECTS
0. No Force	0. No Resistance
1. Police Presence	1. Psychological Intimidation
2. Verbal Commands	2. Verbal Non-Compliance
3. Control and Restraint (handcuffs)	3. Passive Resistance
4. Chemical Agents	4. Defensive Resistance
5. Tactics and Weapons*	5. Active Aggression
6. Firearms/Deadly Force	6. Firearms/Deadly Force

* includes all physical tactics and weapons used except chemical agents and firearms.

Table ES -2 displays the frequency with which these levels of force and resistance were observed in our study. In 57.9% (918) of the arrests, the highest level of force used by the police were restraints; in another 22.1% (350) of the arrests, no restraints were used. Chemical weapons were the highest level of force used by the police in .01% (2) of the arrests; firearms were used or threatened in 3.4% (54) of the arrests. [Note: Firearm use did not involve the discharge of a weapon]. Other weapons and weaponless tactics were used in 16.5% (261) of the arrests.

In 61.6% (977) of the arrests, the suspects offered no resistance to officers. In another 12.3% (196), the levels of resistance were either psychological or verbal. In 136 arrests (almost 9%), the suspects used or threatened to use a physical tactic or a weapon; in 11 of those arrests (.7%), the weapon was a firearm. [See also Figure ES - 2].

Table ES - 2: Highest Level of Force Used By Police and By Suspects

Continuum of Force: Highest Level Reached in 1585 Adult Custody Arrests					
Police	N	%	**Suspects**	N	%
One Officer	106	6.7%	No Resistance	977	61.6%
Two or More Officers	185	11.7%	Psychological	104	6.6%
Verbal Commands	59	3.7%	Verbal	92	5.8%
Restraints	918	57.9%	Passive	75	4.7%
Chemicals	2	0.1%	Defensive	201	12.7%
Tactics and Weapons	261	16.5%	Aggressive	125	7.9%
Firearms*	54	3.4%	Firearms*	11	0.0%
Total	1585	100.0%	Total	1585	100.0%

*These categories include any use or threatened use of a firearm. During the two week study period, one suspect discharged a firearm; during this same period, there is no indication that the police discharged a firearm. Suspect and police rankings do not necessarily represent equivalent amounts of force.

Maximum Force

We constructed a measure of the maximum force used by the police by identifying the single most severe use of force used by the police based on a ranking of 80 different types of police statements, physical restraints, tactics, and weapon use. These rankings can vary from 0 to 100 (with 100 reflecting maximum force) and reflect the average judgment from a survey of 11 experienced Phoenix police officers. In a similar exercise, we constructed a measure of the maximum amount of force used by suspects. The distribution of force generated by this measure is displayed in Figure ES - 3B.

Using each of these three alternative measures of force, our survey of adult custody arrests in Phoenix found that no force or only low levels of force are used in a large proportion of cases. In hindsight, this may appear obvious; in the research on the use of force or in official policy and training on the use of force, appreciation for the commonplace absence of force is not obvious. Recognition that force is rare and, when used, varies along a continuum has implications for law enforcement policy, training and street behavior.

Interviews with Suspects

In order to assess the reliability of our measures of force, we matched suspect interviews and police surveys from a sample of 185 suspects taken into custody during the two week study period in June 1994. Trained interviewers from Arizona State University asked these individuals about the force used by the police during their arrest and the force which they themselves used. From these 185 suspects we obtained aggregate level indications of force used by police quite comparable to those obtained in the police surveys.

Table ES-4: Summary Measures from Police Survey and Suspect Screens

Type of Force By Police	Police Survey		Suspect Interview	
	Number	Percent	Number	Percent
No Force	152	82.2%	147	79.5%
Hit or Push	4	2.2%	10	5.4%
Other Weaponless Tactic	18	9.7%	18	9.7%
Use or Threatened Use of Weapon	11	5.9%	10	5.4%
Total	185	100.0%	185	100.0%

Models of Force

In addition to developing three measures of force, we used the 1585 surveys to compile detailed information about how the police were mobilized, the nature of offense, the location of the offense, and the personal characteristics of officers and suspects. We collected information about each arrest on some 41 specific items which from prior research or professional experience were thought to influence the use of force. [For more detailed information on these measures, see Chapter 4].

We compared how each of our measures of force varied simultaneously with each of these characteristics. Our analyses led us to four sets of findings:

1. Identification of 16 consistent non-predictors of the use of force.
2. Identification of 16 inconsistent predictors of the use of force.
3. Identification of 9 consistent predictors of the use of force.
4. The importance of suspect use of force as a predictor of police use of force.

Consistent Non-Predictors of Force

We grouped these predictors into 6 Domains:
Mobilization of the Police
Nature of the Arrest Situation
Nature of the Arrest Location
Personal Characteristics of the Police
Personal Characteristics of the Suspect, and
Interaction of Police and Suspect Characteristics.

We determined that more than a third of the considerations we tested predicted **none** of our measures of suspect use force or police use of force. [For more detail on predictors of force, see Chapter 5].

Consistent Non-Predictors of Either Suspect or Police Use of Force

Mobilization of the Police
Custody Status of Arrestee
Dispatch or On - View Arrest
Night Time
Weekends
Weekend Nights

Nature of the Offense Situation
Number of Suspects at Initial Contact
Number of Suspects at Arrest Completion
Victim and Suspect Same Family
Bystander and Suspect Same Family

Nature of the Arrest Location
Inside a Residence
Location Known for Criminal Activity

Personal Characteristics of the Police
Number of Arrests in Past 30 Days
Years Since Last Training

Personal Characteristics of Suspects
Known to have Criminal Record

Suspect and Officer Characteristics
Height
Weight

Given the large and representativeness of our sample of adult custody arrests from which a large variety of measures of potential predictors were obtained and the strength of the multivariate analyses employed, these findings of "no effect" cannot be attributed to the inability of the research design or its implementation to identify such predictors, if they do exist. While generalization of these findings awaits replication, future discussions of police use of force policies and practices (and designs for additional research on police use of force) need to be cognizant of the absence of systematic evidence documenting the predictive strength of these 16 considerations.

Inconsistent Predictors of Police Use of Force

Of the 41 measures considered in our study, 16 predicted one or two but not all three of our measures of police use of force. These remain candidates as predictors of force and warrant inclusion in subsequent research on the use of force. They all predict some measure of force but do not meet our conservative standard of predicting all three measures of force developed here.
These inconsistent predictors are:

Inconsistent Predictors of Police Use of Force

Mobilization of the Police
Patrol Division (-)
Early, Middle or Late Phase of Shift
Number of Police at Initial Contact

Nature of the Offense Situation
Traffic Offense
Property Offense
Vice Offense
Domestic Call
Bystander's Demeanor

Nature of the Arrest Location
Visibility(-)
Inside a Building - not a residence(-)
Location Known to be Hazardous

Personal Characteristics of the Police
Length of Service
Past Injury

Personal Characteristics of Suspects
Drug Impaired

Interaction of Personal Characteristics
Age
Race(-)

NOTE: The minus (-) signs indicate a negative relationship. Thus, as a predictor (such as visibility) increases in value, the use of force decreases. The negative sign on the race variable is determined by the fact that Hispanic suspects on average use less force against the police.

Because suspect use of force influences police use of force, we included in this list of inconsistent predictors any consideration that predicted one measure of suspect use of force. For instance, prior injury to an officer does not predict police use of force directly but it does predict one of our three measures of suspect force. Similarly, the race of officers and suspects plays no role in predicting police use of force, but because Hispanic suspects use less force on one measure, we list race as an inconsistent predictor of force.

Consistent Predictors of Police Use of Force

In the six domains that we examined, our analyses identified 9 characteristics which consistently predicted police use of force.

Mobilization of the Police
Use of Contact and Cover Tactics
Increased Number of Police

Nature of the Offense
Arrest for a Violent Offense

Nature of the Location
Presence of Bystanders

Police Characteristics: [None]

Suspect Characteristics

Suspect Use of Force
Suspect Gang Involvement
Suspect Alcohol Impairment
Suspect Known to be Resistive, Assaultive, or Carry Weapons

Combination of Police and Suspect Characteristics

Both Suspect and Police Are Male

Some predictors affect police use of force directly; others affect police use of force through their influence on suspect use of force. Some characteristics predict both. Figure ES - 4 depicts the relationship among the consistent predictors.

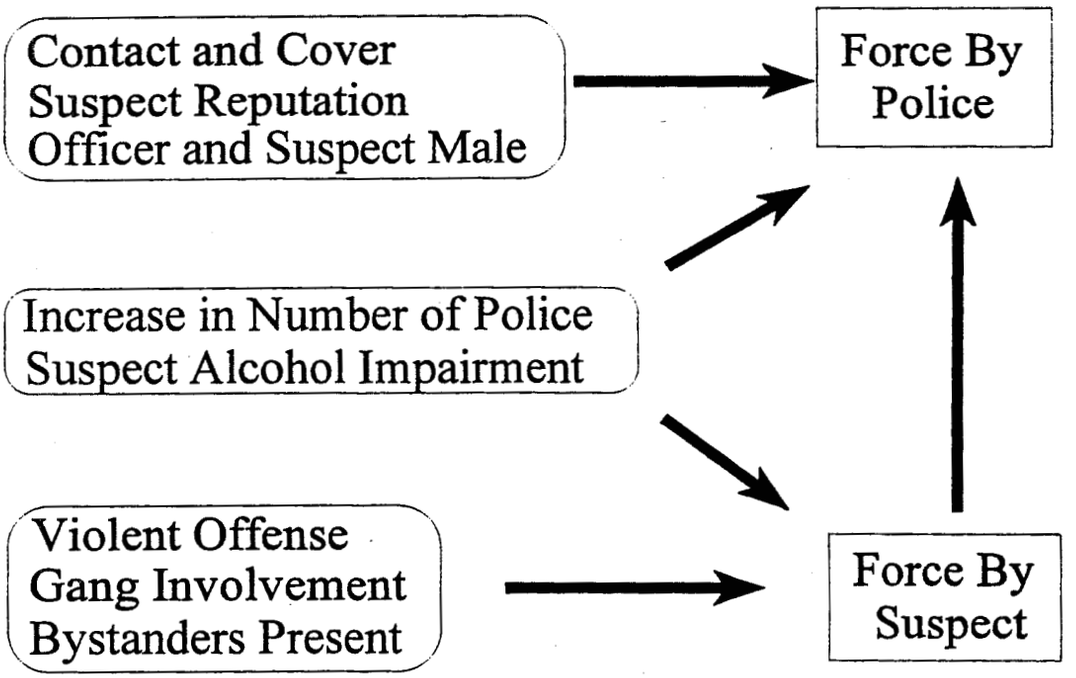
Among the predictors of police use of force, suspect use of force had the largest impact on each of our three measures of police use of force. This remains true when controlling for the possibility that some suspect force could be a reaction to police use of force. This finding supports the perspective that underlies use of force policies and arrest tactics training in the Phoenix Police Department and in many other departments around the country. Police are authorized to use force and do use force in response to levels of resistance from suspects. However, suspect use of force does not explain all or even a large proportion of the variation in the amount of force used by the police. This finding supports the perspective that response to suspect force, although significant, is not the only situation in which the police use force.

Implications for Policy

This research has specific implications for police use of force policy, training, and practice. First, this research provides systematic evidence that the use of force in Phoenix is infrequent and when used is typically at the lower end of our measures of force. When force is used, we found it is not applied unevenly or in discriminatory ways against racial minorities. Had our results been different, a recommendation for a general revision of current policies, training and tactics would be part of this report. Those are not our findings nor do we recommend sweeping changes in the current approach to the use of force by the Phoenix Police Department.

The findings of this research do raise some areas of concern. For instance, the single most frequent weapon used when arrests are made in Phoenix was the flashlight. At the present time, the arrest tactics training program provides limited guidance regarding the use of a flashlight as a weapon. Officers are currently instructed that the same rules that apply to the use of batons apply to flashlights. A second area of concern is the connection between the widely promoted contact and cover tactic which in our research is consistently associated with increased use of force. We are not so mindless as to assert on the basis of the evidence we have that the use of this tactic **causes** the police in Phoenix to use more force. However, our research design includes controls characteristics of the arrest situation that might lead officers to use contact and cover--suspect use of force, violent offense, number of suspects and bystanders, low visibility, etc. and, therefore, these concerns cannot explain the consistent association between the use of contact and cover and all three of our measures of force. In addition, the contact and cover tactic is intended to provide officers with a tactical advantage should a physical confrontation occur. That advantage, some might assume, should reduce the amount of force used by police and suspects; we find no evidence to support that assumption. Our recommendation is a thorough examination of all aspects of the use of contact and cover, beginning with a more in-depth review of the data collected in this study.

Figure ES-4: Final Model of Police Force



The third implication of our findings for arrest tactics policy, training and practice stems from the finding that the sex of the suspect and the police officer directly affect the amount of force used by the police. We found that there was more force by the police when both officer and suspect are male compared to arrests where both officer and suspect are female (or when officer and suspect sex was not reported). The research literature would consider the role of sex as an extra-legal factor; a consideration that should not influence the performance of a public responsibility and we agree the sex of the officer and suspect should not influence the amount of force used to make arrests, all other things being controlled.

We did not find that male suspects use more force against the police than female suspects when all of our predictors are considered. For most officers and researchers, this is counter-intuitive. We have included statistical controls for the height and weight of officers and suspects as well as the use of force by the suspect and these controls or other factors not included in our research may account for the absence of an effect for suspect sex on suspect use of force. Since most arrests (1059 or 67%) involve a male officer and a male suspect, we interpret these findings as meaning that arrests of female suspects by female officers involve less force than the typical arrest.

A fourth area of concern is use of restraints and the possibility that Phoenix police officers are using too little force when they make custody arrests. In more than 20% of the adult custody arrests in this research, the police officers asserted that they had used no hand cuffs or other restraints. In another 3% of the arrests, this item was missing. Our data were recorded after the arrest was completed so this figure may not include some arrests where Phoenix police officers initially did not restraint the suspect but changed their mind before the arrest was completed. Our data do not provide a basis for determining whether the current policy which authorizes and encourages officers to restraint any custody arrestee but requires them to do so only on felons and belligerent suspects is a good one or not. Our concern is based on what appears to be a high frequency with which that discretion is exercised..

The last area of concern raised by this research is the generic and imprecise quality of some of the 12 categories of suspect resistance and officer response that are central to the department's use of force policies. We developed behavioral indicators for each of these categories but not without difficulty and we suspect that officers may have similar difficulties determining whether, for instance, flight in a 2,000 pound automobile belongs in category 4 defensive resistance or category 5 active aggression. Similarly, the policy separates chemical agents from other weapon use and groups together all other weapon use except firearms. We are not recommending the kind of detailed ranking distinguishing weapon possession, threat and use that was useful for this research or the use of more than 6 categories but we think that the policy can be more clearly stated and the relative rankings based more explicitly on the relative severity of officers and suspect behaviors. Lastly, as new weapons and tactics become available, the review of the continuum of force categories is inevitable.

Implications for Research

This research used a representative sample of police behavior, developed a variety of measures of police and suspect use of force, and employed explicit models and appropriate multivariate statistical procedures to assess the strength of individual predictors of force. Prior research has not met these accepted research standards and we argue that future research not only should do so but should also make improvements on the innovations reported here.

Our sampling was representative, though not systematic. We used one two-week period in June 1994 and we are unable to discern if there is any seasonal variation in the amount or distribution of force. Other sampling schemes which will provide a more formal statistical basis to make inferences about all arrests in a particular jurisdiction need to be developed and implemented.

Our data collection was anonymous. This precluded understanding the behavior of individual officers or suspects over time. It also complicated the matching of officer surveys and suspect interviews.

Federal protections for the confidentiality of research subjects, even police officers, is very strong and future research should attempt to integrate survey, interview and official records of police and suspect behavior.

Our measures of force are improvements over simple dichotomies of the past but as ordinal or interval measures they are just illustrative. At best they are early prototypes of measurement models that reflect true scales or the full extent of harm caused by different forceful actions.

Our data collection instrument includes many items thought to be important in police use of force and this was a burden to participating police officers. The length of this form reflects the fact that we could not match officer responses to official records about the arrest, the suspect's prior record or the officers career. Improvements on weapon possession and use are essential and the crucial concern about the sequencing of officer and suspect behaviors must be a high priority.

The use of multivariate statistical models improves the rigor of this research but the available methods used here are but a small subset of approaches to assessing causal influences. Most police professionals and researchers think that community context is an important consideration in how much force is used and this research does not incorporate contextual models to account for such influences.

This research is one study in one jurisdiction at one point in time. The results we obtained here may not generalize to other jurisdictions and the relationships between the citizens and their police. There is no substitute for replication.

All prior assessment of police use of force that use a systematic sample of police behavior as their base report that the use of force is infrequent and that many of the factors commonly thought to influence the use of force do not. Limitations in prior research left the validity and reliability of those findings uncertain. This research implemented a design to overcome some of these limitations and we reach the same conclusion: force is infrequent and when used is at low ends of use of force measures. In addition, our results do not support the notion that the race of officers or suspects directly or indirectly impacts the amount of force used in adult custody arrests. Subsequent research must be attentive to the low base rate for use of force by police and the even lower base rate for force by suspects; the popular focus on racial factors in use of force seems to be unsupported by the available research evidence.

In conclusion, this research implemented an innovative approach to measuring the amount of force used by and against the police. The findings of this research are that force is infrequently used by the police and even less frequently used by suspects. Interviews with suspects record similar levels of force by the police as those obtained from self-reports by the police. Of the 41 predictors used, only 9 consistently contributed to the prediction of our three measures of police use of force. The single largest predictor of police use of force was suspect force. At best we could explain no more than one-third of the variation in use of force. Two-thirds or more of the variation in use of force remains unexplained.

The Phoenix Project: Predictors of Suspect Use of Force

Executive Summary

Principal Investigator: Russell A. Johnson

This study includes several separate analyses using data from the NIJ funded study "Understanding the Use of Force By and Against the Police" by Garner, Buchanan, Hepburn, Schade and Fagan (1995). The data includes information regarding 1585 arrests made in Phoenix, Arizona in 1994. The original study identified factors likely to result in police use of force in effecting an arrest. This reanalysis is divided into three main parts. First, the original study by Garner et al. is replicated using the same methods as accurately as possible. Second, the methods of that study are reversed to determine likely predictors of suspect use of force. Finally, the Phoenix data are used in an analysis similar to a study of citizen compliance conducted by Mastrofski, Snipes, and Supina (1996).

Sincere thanks to Dr. Robert A. Brame, Dr. Charles W. Dean and Dr. David Hirschel for their assistance and direction during the course of this research.

This research was funded by award # 98-IJ-CX-0071 from the National Institute of Justice. Points of view expressed in this report are those of the author and do not necessarily represent the official position of the National Institute of Justice.

Findings from the Reanalysis of the Phoenix Study of Police Force

The original study of police use of force conducted by Garner et al. (1995) was replicated using the same methods as accurately as possible. Below are the results of this reanalysis.

1. Consistent predictors of police use of force include the following:
   - Suspect Use of Force
   - Number of Officers Initially at the Scene*
   - Change in the Number of Police
   - Police Use of the Contact and Cover Tactic
   - Bystanders Present at Arrest*
   - Visibility at Arrest Scene (-)*
   - Suspect Known to be Assaultive or Resistive or Carry a Weapon
   - Suspect Male*

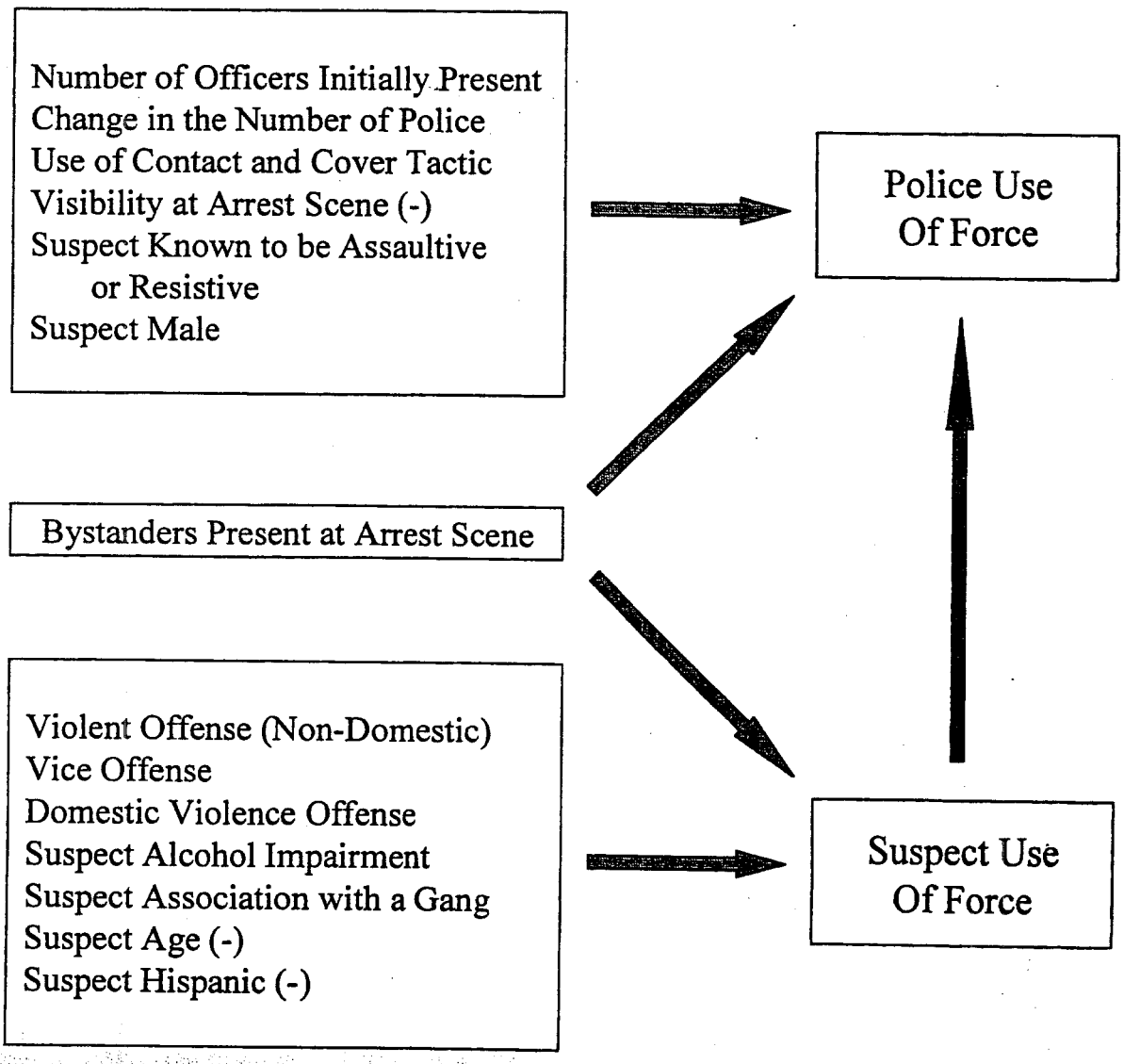
2. Consistent predictors of suspect use of force include the following:
   - Violent Offense, Non-domestic
   - Vice Offense*
   - Domestic Violence Offense*
   - Bystanders Present at Arrest
   - Suspect Impaired by Alcohol*
   - Suspect Association with a Gang
   - Suspect Age (-)*
   - Suspect Hispanic (-)*

   (-) Indicates a negative relationship, associated with less force.
   * Not identified as a consistent predictor in the original study.

3. Though the findings of this reanalysis differ from those of the original Phoenix study it is not suggested that the original findings are incorrect or inappropriately presented. All predictors identified in the original study are also identified in this reanalysis. The reanalysis also identified predictors in addition to those identified in the original study. If errors were made in the original analysis they were Type II errors, failing to identify relationships that do exist. If errors were made in this reanalysis they were Type I errors, identifying relationships that in fact do not exist.

4. A graphic representation of the final model from this reanalysis is provided below as Figure 1.

Figure 1: Police Force Model From Reanalysis



(-) Indicates negative relationship, associated with less force.

Findings from the Study of Suspect Use of Force

The methods of the Phoenix study of police force were reversed to determine likely predictors of suspect use of force. To avoid a redundancy of regression models and potential problems with collinearity, a complete reversal of the original methods was not employed. Instead, the model of suspect force constructed in the reanalysis was used as one model, excluding police use of force as a predictor. In addition, a second model was developed using the actual value (not a predicted value) of police force as a predictor. No model using predicted values of police force was constructed using the methods of the original study.

1. The purpose of this study of suspect force was to identify factors increasing the likelihood of suspect force against the police so that officers may exercise additional caution when these conditions exist. Therefore, slightly less stringent standards were applied in the identification of consistent predictors. Also, predictors identified in either of the two models of suspect force, one excluding police force as a predictor and one including police force, were included in the final model.

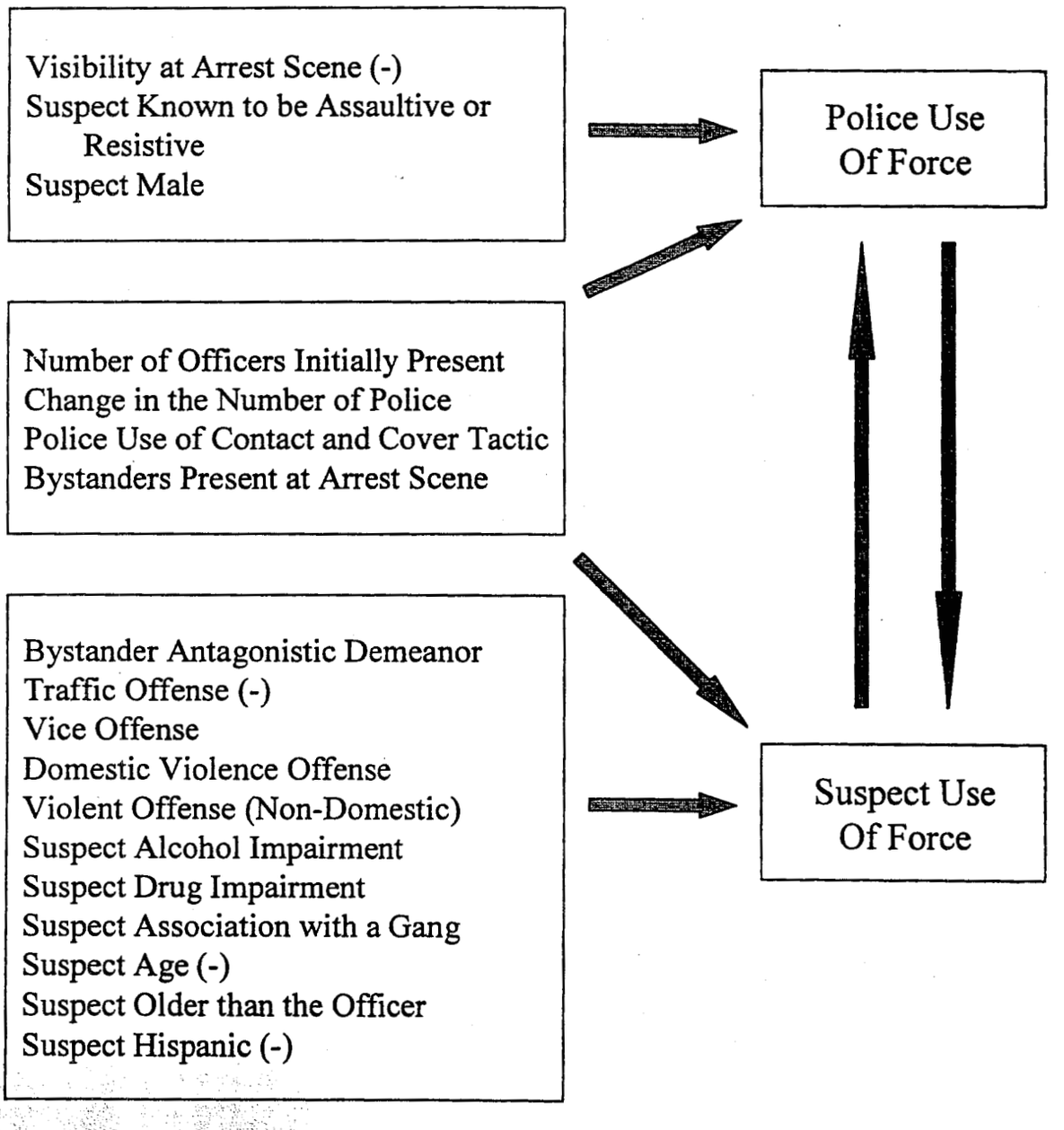
2. Consistent predictors of suspect use of force include the following:
   - Police Use of Force
   - Number of Officers Initially
   - Change in the Number of Police
   - Police Use of the Contact and Cover Tactic
   - Bystanders Present at the Arrest
   - Bystander Antagonistic Demeanor
   - Traffic Offense (-)
   - Vice Offense
   - Domestic Violence Offense
   - Violent Offense (Excluding Domestic Violence)
   - Suspect Alcohol Impairment
   - Suspect Drug Impairment
   - Suspect Association with a Gang
   - Suspect Age (-)
   - Suspect Younger than the Officer (-)
   - Hispanic Suspect (-)

   (-) Indicates a negative relationship, associated with less force.

3. Three variables concerning officer characteristics were also identified as consistent predictors of suspect force: the officer requiring past medical attention, officer part of shift, and officer length of service. The influence of these variables is not logical except as result of officer behavior. It may be that these officers use more aggressive tactics that increase the likelihood of suspect force against them. This demonstrates the complexity of interactions between police and suspects during an arrest. It also demonstrates the importance of time sequencing in determining causation, if suspect force resulted in police force or vice versa. These variables were excluded from the final model.

4. A graphic representation of the final model from this analysis is shown below as Figure 2.

Figure 2: Model of Police and Suspect Force



(-) Indicates negative relationship, associated with less force.

Findings from the Study of Suspect Compliance to Police Demands

Using variables in the Phoenix data similar to those used in a 1996 study by Mastrofski et al., a model was developed to determine what factors are likely to increase suspect compliance to officer requests or demands.

1. In the Mastrofski et al. study, observational researchers rode along with police officers collecting data on 346 incidents in Richmond, Virginia. Findings were as follows:

   Factors Significantly Reducing the Likelihood of Citizen Compliance.
   - Situations involving more serious problems or offenses
   - The presence of additional officers
   - The citizen being intoxicated, highly emotional, or irrational
   - Officer use of physical force
   - The officer showing disrespect toward the citizen
   - Cases involving a minority officer and white citizen

   Factors Significantly Increasing the Likelihood of Citizen Compliance.
   - Public area or police controlled location
   - Cases involving a white officer and minority citizen.
   - A male citizen
   - Police familiarity with the citizen
   - Officer years of experience

2. A similar analysis was conducted using the Phoenix data. Care must be taken in interpreting the results because the Phoenix data do not include the order of events as the Richmond data do. For this study, we are not able to determine to what extent the police showing respect increases the likelihood of suspect compliance vs. the extent to which suspect compliance increases the likelihood of an officer showing respect.

3. The following were found to significantly increase the likelihood of suspect compliance:
   - A male officer
   - Citizen possession of a weapon
   - Officer use of a friendly, nonthreatening tone of voice

4. The following were found to significantly decrease the likelihood of suspect compliance:
   - Arrest for a more serious offense
   - Officer use of a commanding or threatening tone of voice
   - Officer use of physical force

5. Not only does officer use of force significantly decrease the likelihood of compliance, but their use of the commanding or threatening voice does as well. In addition, the officer using a friendly, conversational voice significantly increases the chance that they will gain compliance from the suspect. Again, because the Phoenix data do not include the ordering of events, we are not able to infer causality.

Implications for Policy

Police use of the contact and cover tactic, the presence of additional officers, and an increase in the number of officers were all identified as consistent predictors of both police and suspect force. Though these tactics provide police with an advantage if force is used against them, this advantage must be weighed against the possibility that the presence of additional officers might increase the likelihood of conflict. It is not suggested that officers exercise a lesser amount of caution, but in some situations it may work to their advantage to limit the number of officers at the scene. As explained in the original report, it is also possible that officers assess when a suspect is likely to use force and prepare by using the contact and cover tactic and increasing the number of officers (Garner et al., 1995).

Garner states: "When force is used, we found no evidence that it is applied unevenly or in discriminatory ways against racial minorities" (Garner et al. 1995:27). The results of this reanalysis were not so affirmative. The suspect being Black, a white officer and Black suspect, and the suspect being Hispanic (a negative relationship) were each identified as significant in some of the police force regressions. Though none of these relationships were demonstrated consistently enough to be included in the final model, they came close. The racial analyses conducted prior to the study of suspect force also provided mixed results. The second officer being white had significant relationships with all three measures of both suspect and police force (though not for all types of analyses). Also of interest, the first officer being white, all white police officers, and all Hispanic police officers had significant relations in some of the analyses. Somewhat perplexing are the directional variations of these relationships. For instance, according to certain analyses, white second officers increased police or suspect force; and white first officers also increased police or suspect force in some of the analyses; but in some relationships all white police officers reduced the amount of suspect or police force. The mixture of inconsistent race related findings do not suggest so much that police are consistently racist in any direct manner, but that there may be racial interactions more complex than these data or methods are able to accurately demonstrate. Therefore, it is not suggested that sweeping revisions in current policies or training are required, but that some amount of consideration should be given to the possibility that Phoenix police officers may not be above and beyond all racial influence.

Poor visibility was found to increase the likelihood of police use of force, controlling for the arrest occurring after dark. The presence of bystanders consistently increased the likelihood of both police and suspect use of force, suggesting that officers and suspects may be getting "caught up" in the circumstances. The suspect being known as assaultive, resistive or to carry a weapon increased the likelihood of police use of force but was not a predictor of suspect force. Finally, this study found evidence that officer use of force was more likely when the suspect was male or when both the officer and suspect were male but there was not evidence that male suspects were more likely to use force against the police. Aside from the influence of visibility, these findings are similar to those of the original Phoenix study. There is some concern that officers may be influenced by factors other than the suspect's actions in some situations. It may be appropriate to emphasize that officer use of force is to be administered in response to and in relation to suspect use of force. Literature emphasizes that police force should be proportional to and not exceed suspect force (Buchanan, 1993; Connor, 1991). Literature also suggests that police departments use continuums of force such as the measures of force utilized in the Phoenix study to educate officers of the appropriate police response to different levels of suspect force (Connor, 1991).

Garner et al. assert a similar concern in their policy implications:

> The last area of concern raised by this research is the generic and imprecise quality of some of the 12 categories of suspect resistance and officer response that are central to the department's use of force policies. . . . We are not recommending the kind of detailed ranking distinguishing weapon possession, threat and use that was useful for this research or the use of more than 6 categories but we think that the policy can be more clearly stated and the relative rankings based more explicitly on the relative severity of officers and suspect behaviors. (Garner et al. 1995:29)

For the most part, policy implications regarding factors related to suspect force are simply to inform officers of the risks. In fact, most of these implications provide a statement of the obvious. Suspect force was less likely for traffic related offenses but more likely in domestic violence situations, for vice offenses and for violent offenses. Force was more likely when bystanders were present and when bystanders expressed an antagonistic demeanor. Force was more likely if the suspect was impaired by alcohol or drugs or associated with a gang. Younger suspects were more likely to use force. Probably not as obvious, Hispanic suspects were less likely to use force than either white suspects or Black suspects.

Reconstruction of the Mastrofski et al. study of compliance provided evidence that suspects are more likely to comply to officer requests or demands when the officer uses a calm, nonthreatening tone of voice. Officer use of a commanding or threatening tone of voice and officer use of physical force were shown to reduce the likelihood of suspect compliance. This does not mean that an officer should try to become friends with the suspect, but they may be able to gain compliance simply by treating the suspect fairly and with respect. These tactics may be less likely to work in cases involving more serious offenses or when the suspect is impaired by drugs or alcohol, but compliance may be more likely when the suspect is in possession of a weapon.

Implications for Research

The Phoenix Study is the first study of police force to record all arrests over a period of time, making it possible to study the frequency of forceful interactions between police and suspects relative to the overall number of arrests. Though having officers complete questionnaires subjects the data to their interpretations, it is a practical method of collecting data on a large number of cases, which is important due to the low rate of police and suspect force. One focus of this study is the importance of the order of events during police/suspect interactions, which the Phoenix data do not include. Garner et al. explain that excluding time sequencing was a necessary sacrifice in limiting the questionnaire to both sides of a single page, in order to increase the response rate and study all arrests over a period of time. It may have been worth the sacrifice necessary to include questions concerning not only who did what, but also at least who acted first. Perhaps a more elaborate measure of the order of events could be employed using simple check-boxes or a numbering scheme. Accepting that officers may not always be truthful, may not respond correctly, or may not respond whatsoever, it would still provide some measure of time ordering and implications of causality. Otherwise, from a strictly substantive assessment of the Phoenix data based on the analyses so far, police are as likely to cause suspects to use force as suspects are to cause police to use force. This study provides evidence that some amount of suspect force can be explained by police force just as some amount of police force can be explained by suspect force. However, these relationships involve different magnitudes

according to the interval and ratio measures of force. Based on the regression analyses, suspect use of force against police results in a lesser increase in police force than vice versa. Police use of force against a suspect is likely to result in a greater increase of force by the suspect. An analysis employing instrumental variable techniques may help to better determine causality using the Phoenix data.

Garner et al. describe their measures of force as early prototypes for later studies. In the study of suspect force in Chapter 3, a number of predictors were identified for the continuum of force and maximum force models, but not for suspect physical force (the dichotomous measure). It is possible that the suspect physical force variable fails to represent suspect force as well as the other two measures and that a different construction of this variable would be more appropriate.

The relationship between age and suspect use of force remains elusive. In general, younger suspects were more likely to use force against the police. However, suspect force was more likely when the suspect was older than the officer. It is possible that younger suspects in general are more likely to use force against police, but suspects ranging in age from perhaps 30 to 40 years old are more likely to use force against younger officers who may only be in their twenties. Further analysis may help to clarify the nature of these relationships.

In the original study of police force, in the reanalysis of that study, and in the primary models of the study of suspect force, missing values were replaced with variable means to prevent the exclusion of these cases in the regression models. Both models of suspect force in Chapter 3 are reconstructed excluding cases with missing data to study the effects. Excluding cases with missing values reduced the sample size by 41.4%, from N=1585 to N=929, and also reduced the number of significant predictors identified in both models. However, this had little effect on the pseudo R^2 and adjusted R^2 values in the regressions. It may be worth further analysis to determine if methods excluding cases with data would be more appropriate.

Chapter 1
A Review of the Research and Literature

Police and Suspect Use of Force

The use of force by and against the police is an important issue both for the police and the public. Police sometimes must use verbal or physical coercion in performing their duties of law enforcement and order maintenance (Scharf and Binder, 1983; Walker and Fridell, 1993; Sherman, 1980), but the use of physical force is rarely considered the optimum approach. Instead, police departments prefer to minimize the potential for violence and the force required in patrol encounters with citizens. Consequently, there is an interest in knowing if there are tactics that officers can adopt to avoid or prevent violence (Bayley and Garofalo, 1989). Citizen and officer safety, public perceptions of the police, and public relations with the police all accentuate this interest (U.S. Department of Justice, 1987).

Management of force by police provides an ongoing challenge for police administrators (Buchanan, 1993). Previous studies have found strong correlations between the amount of force used against the police and the amount of force used by the police (Kania and Mackey, 1977; Sherman et al.1986; Fyfe, 1980). Therefore, reducing the amount of force used against the police could be considered a means of reducing the amount of force the police must use. A better understanding of the factors that contribute to suspect use of force against the police is prerequisite to its reduction.

Use of force research has to date focused almost entirely on predicting police use of force. The failure to consider predictors of *suspect* use of force is detrimental in at least two ways. First, many prior studies have found suspect use of force to be the strongest or one of the strongest predictors of police use of force. Not considering factors related to suspect force entails the failure to consider some of the root causes of police force. Second, predicting suspect force has great practical importance to police officers, both to enable preparation for the potential use of force against them and/or to attempt to prevent it.

Sherman explained that reducing citizen violence could lower the risk for both citizens and police. Nearly 20 years ago he stated that: "[a]s little as we know about how to do police work to reduce civic disobedience, we know even less about how to reduce violence against the police" (Sherman, 1980:7). Unfortunately, this situation has improved very little. Further studying the factors leading to suspect use of force, including police behavior, would contribute greatly to our understanding of this relationship and the promotion of both officer and citizen safety. Additionally, knowing factors likely to increase suspect or citizen compliance would improve officers' ability to gain willing compliance and/or improve their ability and preparedness to respond when compliance is not likely.

A number of studies have been conducted on the use of both lethal and non-lethal force by the police with varying results. There is some consensus that lethal force by police is more likely when the suspect resists or attempts to flee (Alpert and Fridell, 1992; Geller and Scott, 1991; Sherman, 1980; Blumberg, 1989; Fyfe, 1988). There is less consensus on the use of non-lethal force by the police or suspects. Only a limited number of studies attempt to measure factors likely to cause the use of force, the amount of force, or how the force could have been prevented (Reiss, 1971; Friedrich, 1980; Bayley and Garofalo, 1989; Worden, 1995). Past research involves general methodological weaknesses in measuring force and unsystematic samples of cases involving unusually high amounts of force. A few studies on police use of force have systematically observed police-citizen interaction in order to prevent sampling biases due to including only cases in which force is used (Reiss, 1971; Bayley and Garofalo, 1989; Worden, 1995; Fyfe, 1989). While these studies report that police rarely use force, they vary in units of observation and how force is operationally defined.

Reiss (1971) collected data on 5,360 encounters between police and citizens, including 1,565 incidents involving offenders or potential offenders. Both citizens and the police behaved civilly in 83% of the encounters and police use of force was infrequent. Reanalyzing Reiss's data using multivariate regression, Friedrich (1980) concluded that police were most likely to use force in response to suspect

actions and "[o]nly the behavior of the offender and the visibility of the encounter to peers and public emerge as significant influences on police use of force" (Friedrich,1980:82).

Bayley and Garofalo (1989) observed 62 police officers during approximately 350 eight-hour tours of duty in New York in 1986 (nonrandom, nonsystematic). They observed 467 police-citizen encounters with some possibility of resulting in violence. In about one quarter (120) of the cases there were clear indications of violence or potential for violence at the initiation of the encounter (fighting, weapons, injuries, etc.). Among these incidents, reported violence was actually quite low. The areas and times of observation were chosen to maximize observed conflict, yet officers were involved in only 37 incidents involving physical force either by themselves or by citizens (3.4% of all encounters), and most of these involved only grabbing, shoving, pushing, or restraining. The low occurrence of violence limited their ability to test the effectiveness of police tactics, the intended purpose of the study, but they did report some limited findings. As would be expected, incidents involving conflict at the arrival of police (such as a dispute in progress) were more likely to result in police or citizen use of force. Citizen possession of a weapon or the making of obscene or insulting remarks also had significant influence, but explanatory power of these variables was quite weak.

Fridell and Binder (1992), from 1977 to 1980 in Birmingham, Miami, Newark, and Oakland (California), collected data on shootings between police and citizens on confrontations that could reasonably have been expected to result in the use of deadly force by police. Information regarding potential shootings was obtained through interviews with 316 officers and nonsworn officials. The majority of incidents studied did involve the actual use of deadly force, 226 incidents in which the police did shoot at the suspect vs. 90 incidents in which they did not. They found that situations resulting in shooting are more often characterized by ambiguity and surprise. In these situations, police were less likely to be familiar with the suspect, could not determine the emotional state of the suspect, and did not perceive the situation to be potentially deadly. Exchange of information was stated to be of critical

importance in determining if deadly force will be used by police.

Fyfe (1980) studied all reported shootings by New York police officers (n=2,746) from 1971-1975 and tested three hypotheses. First he hypothesized that zones with higher violent crime arrest rates would have higher rates of police shootings and did find a significant positive relationship. Second he hypothesized that areas with higher homicide rates would have higher rates of police shootings and again found a significant positive relationship. Finally, he hypothesized that both of the previous relationships will be strongest for on duty officers and weakest for off duty officers, which he also found to be true.

The Phoenix Study of Police Use of Force

Given the methodological problems of the previous studies and the critical importance of the issue, a more adequate study was needed. Employing a systematic sample of all arrests for a designated time, and using more sophisticated measurement and statistical techniques than in previous studies, Garner, Buchanan, Hepburn, Schade and Fagan (1995) conducted the NIJ funded Phoenix Use of Force Project.

One objective of the Phoenix study was to utilize more elaborate means of statistical analysis than previous studies, which often used only dichotomous measures of force. Here the researchers utilized three measures: one dichotomous (*Force Used* - yes/no, referring to any physical force beyond handcuffing); one ordinal (C*ontinuum of Force* - a seven item scale ranging from no force used to firearm used); and one interval (*Maximum Force*). This scale, *Maximum Force,* was a newly developed speculative measure ranking from 0 (no force) to 100 (maximum force), for police and suspects. In developing the scale, 11 Phoenix officers were asked to rank various behaviors according to their

perceived level of severity.[1] The methods of this study are discussed in detail in Chapter 2 of this report.

Consistent predictors in the final model of suspect force include the nature of offense (violent vs. non violent), the presence of bystanders, and gang affiliation. Consistent predictors of police force include police use of the contact and cover tactic (where one officer stays back to provide support for the officer that approaches the suspect), suspect use of force, the suspect being known to be resistive, assaultive, or to carry a weapon, and both the officer and suspect being male. Suspect alcohol impairment and an increase in the number of officers present were not consistent predictors but had strong influences and were therefore included in the final model. A graphic representation of this model is provided as Figure 2-1 in Chapter 2.

Up to the Phoenix use of force study, little attention was given to measures of the amount of force used between officers and suspects. For instance, Worden (1995) and Bayley and Garofalo (1989) incorporated individual measures of citizen behavior such as "possessed weapon," "fought with police," and "used weapon," but did not report the frequency with which these behaviors occurred and did not construct a single measure to capture any, all, or the most serious amount of force used by citizens against police. Thus, although they used individual behavioral indicators for suspect use of force, they relied on expert judgments to assess whether the police used physical force. Reiss (1971) reported only that 12 percent of all citizens encountered had been violent or aggressive, and Friedrich (1980) included no measure of suspect use of force.

The Phoenix analyses provide the most elaborate use of force study to date. However, the study focused on the *police* use of force as the overall outcome measure. Factors likely to result in *suspect* use of force were considered but only as indirect predictors of police use of force. Chapter 2 of this report contains a

[1] Detailed descriptions of the measures of force used in the original study and this study are provided in Garner et al.'s Executive Summary at the beginning of this report.

reanalysis of the Phoenix data, attempting to replicate the methods and results as closely as possible. In Chapter 3 the approach is reversed to determine factors likely to result in suspect use of force against the police.

Citizen and Suspect Compliance

One idealistic objective of policing is the ability to quickly gain control of a situation. Though there is no "magic pill" that can be applied to all situations, there may be tactics that officers can adopt to avoid or defuse potentially violent situations. Bayley and Garofalo (1989) report anecdotal stories of officers who have defused situations "with clever retorts, humorous asides, or unexpected approaches" (Bayley and Garofalo, 1989:2). Though evidence that police can routinely apply clever or crafty tactics in difficult situations is limited, there is substantial evidence that police can influence the actions of an individual in order to obtain compliance to his or her requests or demands.

In a study of New York police officers, Bayley and Garofalo (1989) compared a group of officers identified (by other officers) as especially skilled in diffusing violent situations to a control group. Interestingly, the officers identified as skilled in defusing violence used force more often than the control group (in 9% vs. 6% for all observed situations). However, these officers did perform differently in general, were more proactive and showed more initiative than officers in the control group (as observed by the researchers). They tended to be somewhat more responsive to complainants, more likely to give advice, provide information, or make a referral, and they were more willing to take a lead role to resolve issues involved during the encounter. They were more versatile and utilized a broader range of responses and actions during encounters. However, in the end, there were no significant differences in the outcomes of encounters handled by the selected officers versus the control group. This does provide some evidence that police officers themselves appreciate and respect officers who are not only active and motivated, but who are also responsive, versatile, and inventive in responding to situations. This

may be affected largely by age and experience, as the selected officers tended to be older and to have more experience in policing.

In the 1992 study by Fridell and Binder, they found evidence that an exchange of information between police and citizens in a potentially violent encounter can be of critical importance in determining if deadly force will be used by police. They summarize that "[s]hoot scenarios are characterized by verbal interactions that make the subject angrier and result in noncompliance" (Fridell and Binder, 1992:397).

In an effort to describe in detail the actions of patrol officers during problematic situations, Bayley (1986) systematically observed officers in Denver during the summer of 1982. Researchers observed 164 traffic stops and 94 domestic disturbances during 85 shifts. Their observations focused on more active areas and shifts to maximize occurrence of problematic situations. Therefore, the study is not representative of patrol work in Denver. Bayley reports that most often, police force follows some "contribution" on the part of the citizen but, the interactions between the police and citizen are important.

Tyler (1990) considered the effects of normative and instrumental factors on citizen behaviors in a longitudinal study of randomly selected citizens in Chicago. For the first wave of the study, 1,575 citizens were interviewed concerning their views of the law and their behavior toward the law. A subset of 804 respondents were interviewed about the same topics one year later. He describes two types of normative commitment, one based on morality where people obey the law because it is just, and one based on legitimacy where people obey the law because they believe "the authority enforcing the law has the right to dictate behavior" (Tyler, 1990:4). He reports a positive relationship between legitimacy and compliance, that people are concerned with police honesty and fairness, not just the outcome. Tyler explains that citizens are more likely to believe they are being treated fairly if their views are considered by police and they are given the opportunity to influence the events of the incident. Tyler also reports

that people are reluctant to commit crimes that would result in sanctions from family or friends. The presence of others, such as a group, may also influence behavior if a person looks to the group for signs of expected or appropriate behavior. In a given situation, instead of focusing on gain or loss, people focus on what behavior they assess to be appropriate.

The Richmond Study of Citizen Compliance

In a study methodologically different from Tyler but considering similar factors, Mastrofski, Snipes and Supina (1996) investigate factors likely to result in citizen compliance to officer requests or demands. The methods of this study are discussed in Chapter 4 of this report, but the approach was based on aspects of social control and psychological interactionism. As explained by the authors, social control considerations (calculative, instrumental factors) involve the processes of rational decision making and potential deterrence; the idea that people comply to avoid negative consequences. Interactionist considerations (normative, legitimizing factors) involve the perceived legitimacy of the officer and what they stand for, namely the law; people comply either because it is morally right or because the police have the right to tell them what to do.

Significant calculative factor outcomes include the following: Officers who initiated contact with a high degree of authoritativeness (force) were much less likely to gain compliance. Increasing the number of officers lowered the likelihood of compliance. Citizens were less likely to comply in instances involving more serious problems, and more irrational citizens were less likely to comply. Legitimizing factor outcomes include: Officers who showed respect to the citizen were more likely to gain compliance, and citizens were much more likely to comply in incidents occurring on public / police controlled settings than in private settings. Other findings include: Males and minority citizens were more likely to comply. Minority citizens were more likely to comply than white citizens when the officer was white. Minority officers dealing with white citizens were less likely to gain compliance than any other racial

combination. And officers with more years of experience were more likely to obtain compliance. Overall, legitimizing factors were found to have stronger influences on citizen compliance than calculative factors (those involving rational decision making). Essentially, officers were more likely to gain compliance when suspects perceived them and/or their intentions to be legitimate.

In Chapter 4 of this report, the Mastrofski et al. study is "reconstructed" using data from the Phoenix study of police force.

The Importance of Time Sequencing in Force and Compliance Studies

Lawrence Sherman (1980) explains that our understanding of force by and against the police is inhibited by the paradox of police use of "violence to stop violence" and the complexities of police-citizen encounters. For certain, determining what factors influence police use of force, what factors influence suspect use of force, how suspect use of force influences police use of force and vice versa, and other potential interaction affects in this dynamic process is an ambitious undertaking. Even with direct observation by trained observers the study of time sequencing and causation remain elusive, but many studies have strived to do so.

In Bayley's (1986) study of police officers in Denver, officers were observed during traffic stops and domestic disputes. The observations were recorded according to three stages of the incidents: contact, processing, and exit. Bayley recorded a number situational factors that may influence officer tactics similar to those used in the Phoenix Study of Police Force (characteristics of the citizen, citizen and police demeanor, number of police and citizens, location, etc.) and found the array of tactical choices made by police officers to be quite extensive. He concludes that studying these choices requires the time sequencing of events during the encounters because "[c]hoices made at one stage of an encounter affect subsequent decisions" (Bayley and Garofalo, 1989:347). The study provides evidence that officers know

what actions in the early stages of an encounter will lead to in the later stages of an encounter, and that the sequence of events depends both on the circumstances and police direction of the encounter.

Similarly, Fridell and Binder (1992) separate police-citizen encounters into four phases: anticipation, entry and initial contact, information exchange, and the final frame. Their conclusions emphasize that the use of deadly force depends largely upon the actions, interactions, and decisions occurring early in the encounter.

Garner et al.(1995) explain that omitting the study of time sequencing was a necessary sacrifice in the effort to study all arrests over a period of time. Sending observers with all officers to record the chain of events during all arrests would simply not be feasible. Instead, officers were asked to complete a questionnaire at the intake center following each arrest. To maximize the response rate, the questionnaire was limited to both sides of one page, which did not allow for the recording of the order of events. Acknowledging the importance of time sequencing during the interactions of police and citizens, the findings of the Garner study must be considered with some prudence. This is not intended to discredit their findings, but simply to propose that equal consideration should be given to a reversed analysis of factors likely to result in suspect use of force. Essentially, their findings regarding officer use of force tell only half of the story.

Though the Garner study does include a regression model of suspect force, police use of force is not included as a predictor and the predictors identified are included only as indirect predictors of police force. Also to be considered is the possibility that police force against suspects results in the responsive use of force against the police. Of course, the general presumption is that police do not use force unless in response to suspect use of force, but this is not always the case. Many studies of police force (including the Phoenix study) and studies of citizen compliance provide evidence that police actions influence suspect actions. Thus, it must be considered that in some unknown portion of Phoenix cases,

police actions and/or some combination of other variables resulted in suspects using force against them. The nature of the Phoenix data makes the consideration even more appropriate. As described above, the study employed three measures of force for police and suspects: one dichotomous, one ordinal and one interval. The ordinal and interval measures rank possible actions from no force to verbal commands to firearms. It is likely that in some situations an officer's aggressive commands or tactics could result in a suspect responding with equal or greater aggression.

The consideration of time sequencing will also be important in the reconstruction of the Mastrofski et al. study of citizen compliance. For the Richmond study of compliance, researchers observed interactions of police and civilians to record the events, including the order of occurrence. This suggests some measure of causality, or at least of who acted first. Though the Phoenix data provide many variables similar to those considered in the Richmond study, there is no measure of who acted first. Thus we cannot assess if the police showing respect resulted in suspect compliance or vise versa. However, as with the Garner study of police force and the upcoming study of suspect force, the results are worth some consideration.

Chapter 2
Replicating the Original Phoenix Study of Police Force

The Original Phoenix Use of Force Study

For two weeks in June of 1994, Phoenix police officers completed a two page questionnaire following each arrest. The questionnaire included characteristics of the officer, the suspect, and the arrest incident, including the amount of force used by both the officer and suspect. For the study, 41 items are grouped into six conceptual categories of force predictors: (i) police mobilization; (ii) offense nature; (iii) offense location; (iv) first officer characteristics; (v) suspect characteristics; and (vi) the interaction of officer and suspect characteristics (including differences in age, race, height, weight and sex) (Garner et al., 1995). A copy of the survey instrument is provided in Appendix A of this report.

One objective of the Phoenix study is to utilize more elaborate means of statistical analysis than previous studies, which often had used only dichotomous measures of force. The researchers utilize three measures of force: one dichotomous (*Force Used* - yes/no, referring to any physical force beyond handcuffing); one ordinal (*Continuum of Force* - a seven item scale ranging from no force used to firearm used); and one interval (*Maximum Force*). This scale, *Maximum Force,* is a newly developed speculative measure ranking from 0 (no force) to 100 (maximum force) for both police and suspects. To develop the scale, 11 Phoenix officers were asked to rank various behaviors according to their perceived level of severity.[2]

Overall, the reported amounts of force are quite low. For the dichotomous variable *Physical Force,* officers report using some form of force in 22% of the arrests and suspects using some form of force in 16% of the arrests. Similarly, on the *Continuum of Force,* weapons or weaponless tactics (such as pushing, hitting, wrestling) are used by police in 20% of the arrests and suspects either use or threaten to

[2] Detailed descriptions of the measures of force used in the original study and this study are provided in Garner et al.'s Executive Summary at the beginning of this report.

use a physical tactic or weapon in about 9% of the arrests. According to the *Maximum Force* scale, weapons or weaponless tactics are used by police in 20% of arrests and suspects threaten to use or use physical tactics or weapons in 9% of the arrests.

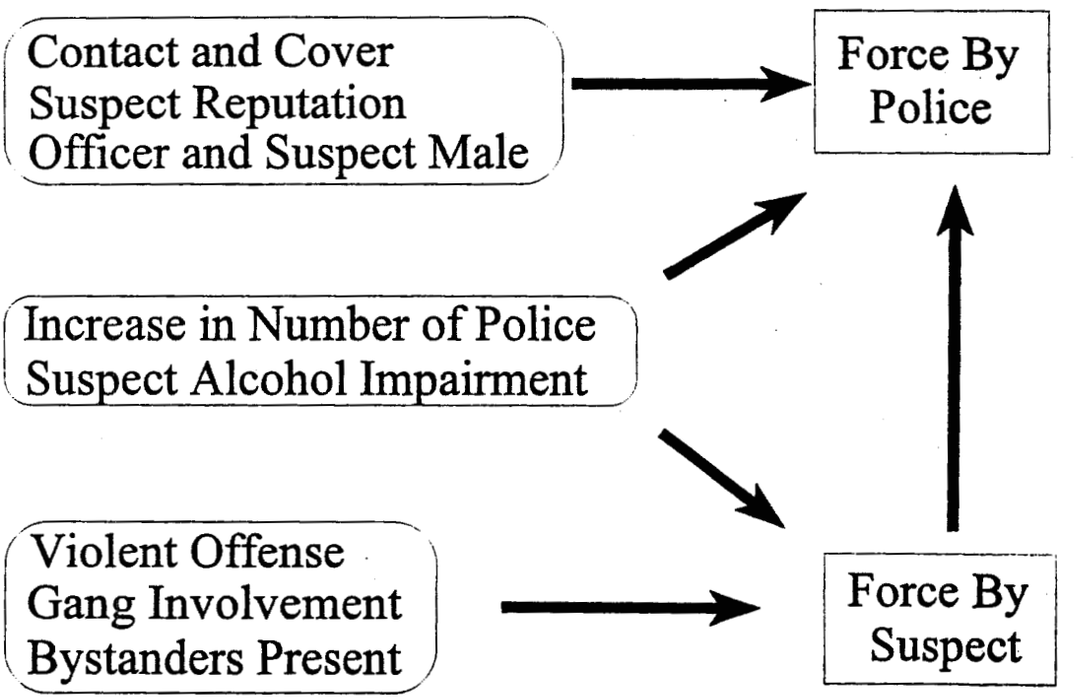
The researchers first conduct bivariate analyses between the 41 potential predictor variables and each of the three measures of force for police and suspects. Overall, they report that few of the 41 potential predictors are consistently associated with police use of force. The strongest predictor of police use of force is suspect use of force and the second strongest predictor is suspect demeanor. Garner et al. suggest that, though these findings make intuitive sense, they highlight the importance of focusing on suspect behavior during the incident.

Three regression models are developed for the prediction of police use of force and one for the prediction of suspect use of force. All three of the police force models include the 41 variables from the six previously discussed conceptual categories as predictors of police force, but differ in their consideration of suspect use of force as a predictor of police force. The first model, *No Suspect Force,* presents police use of force as the result of only those factors within the six categories, excluding suspect force as a predictor. The second model, *Direct Suspect Force,* is similar to the first but includes suspect force as a predictor. The final model, *Reciprocal Use of Force,* is similar to the second but includes predicted values of suspect force based on factors in the six categories. The suspect force model presents suspect force as the result of factors in the six categories, excluding police force.

Each model of police or suspect force involves several regressions and the methods are discussed in detail later in this report, but essentially the results are as follows. Consistent predictors of suspect force included the nature of offense (violent vs. non violent), the presence of bystanders, and gang affiliation. Consistent predictors of police force include police use of the contact and cover tactic (where one officer stays back to provide support for the officer that approaches the suspect), suspect use of force, the

suspect known to be resistive, assaultive or to carry a weapon, and both the officer and suspect being male. Suspect alcohol impairment and an increase in the number of officers are not consistent predictors but have strong influences and are therefore included in the final model. A graphic representation of this model is provided as Figure 2-1.

Figure 2-1: Garner et al. Model of Police Force



Description of Variables

As previously explained, the original study describes 41 predictor variables in six domains. However, due to the grouping of some related variables into group variables there are a total of 53 individual predictors used in the SPSS programs. Table 2-1 provides a listing of the variables used.

Table 2-1: Variables Used in the Phoenix Study of Police Force

Domain and Variable Description	Variable Name[3]	Values
Mobilization of Police		
Police Assigned to Patrol Division	patrol	0,1
Suspect Already in Custody	custody	0,1
Number of Officers Initially	numberpi	0,1,2,3,4,5 or more
More than One Officer at Initial Contact	polinit2	0,1
Change in the Number of Police	changepn	-4,-3,-2,-1,0,1,2,3,4 fewer at end to more at end
Police Used Contact and Cover	cover	0,1
Officer Dispatched to Scene	dispatch	0,1
Offense Occurred During Weekend	weekend	0,1
Arrest after Dark	night	0,1
Occurred During Weekend Night	endnight	0,1
Part of Shift	shift	1,2,3 early, middle, late
Nature of Offense		
Violent Offense, Non-domestic	violent2	0,1
Property Offense	property	0,1
Traffic Offense Including DWI	traffic	0,1
Vice Offense	vice	0,1
Call Dispatched as Domestic Violence	domestic	0,1
Victim and Suspect Friends or Family	family	0,1
More than One Suspect Initial Contact	susinit2	0,1
More than One Suspect at Completion	suscomp2	0,1
Bystanders Present at Arrest	witness	0,1
Bystanders Friends or Family of Suspect	byfamily	0,1
Bystanders Have Antagonistic Demeanor	byantag	0,1

[3] Variable name provided in the data and as used in the analysis.

Location of Offense		
Arrest Occurred at Residence	house	0,1
Offense Occurred Inside, Not at Residence	inside2	0,1
Location Known to Be Hazardous	lochazrd	0,1
Location Known for Criminal Behavior	loccrime	0,1
Visibility at Arrest Scene	visible	1-10 poor to excellent
Characteristics of First Officer		
First Officers Age	age1	1,2,3,4,5,6 under 21, 21-25, 26-30, 31-35, 36-40, 41 or more
First Officer is White	white1	0,1
First Officer Height	height1	1,2,3,4,5,6 less than 5'3", 5'3"+, 5'6"+, 5'9"+, 6'+, 6"3" or more
First Officer Weight	weight1	1,2,3,4,5,6 less than 125, 126-150, 151-175, 176-200, 201-225, over 225
First Officer is Male	male1	0,1
Length of Time on Phoenix PD	lengthpd	1,2,3,4,5,6 1 or less, 2 to 5, 6 to 10, 11 to 15, 16 to 20, over 20
Past Medical Attention Needed	q24inj	1,2,3,4,5 no med. att., first aid at scene, private doctor, taken to hospital, overnight at hospital
Number of Arrests in Last Month	arrestn	0,1,2,3,4,5,6 none, 1-5, 6-10, 11-15, 16-20, 21-25, 26 or more
Years since Last Training	train	1-3
Characteristics of Suspects		
Suspects Age	ages	1,2,3,4,5,6 under 21, 21-25, 26-30, 31-35, 36-40, 41 or more
Suspect is Black	blacks	0,1
Suspect is Hispanic	hisps	0,1
Suspect Height	heights	1,2,3,4,5,6 less than 5'3", 5'3"+, 5'6"+, 5'9"+, 6'+, 6"3" or more
Suspect Weight	weights	1,2,3,4,5,6 less than 125, 126-150, 151-175, 176-200, 201-225, over 225
Suspect is Male	males	0,1
Suspect Impaired by Drugs	drugs	0,1
Suspect Impaired by Alcohol	alcohol	0,1
Known to Be Assaultive or Resistive	probsusp	0,1
Suspect Known to Have Record	knowrecd	0,1

Suspect is Associated with Gang	gang	0,1
Interaction of Officer and Suspect Characteristics		
Difference in Police and Suspect Ages	agedif	-4,-3,-2,-1,0, 1,2,3,4 older suspect to older police
White Police Black Suspect	wpbs	0,1
White Police Hispanic Suspect	wphs	0,1
Difference in Police and Suspect Height	heighdif	-4,-3,-2,-1,0, 1,2,3,4 taller suspect to taller police
Difference in Police and Suspect Weight	weighdif	-4,-3,-2,-1,0, 1,2,3,4 heavier suspect to heavier police
Officer and Suspect Both Male	bothmale	0,1
Police Use of Force		
Physical Force	physical	0,1
Continuum of Force	continue	0-6 no force, police presence, verbal commands, restraints, chemicals, tactics and weapons, firearms
Maximum Force	maxforce	0-99
Suspect Use of Force		
Suspect Physical Force	physsus	0,1
Suspect Resistance	levels	0-6 no resistance, psychological intimidation, verbal resistance, passive resistance, defensive resistance, active aggression, firearms
Suspect Maximum Force	smxforce	0-99

Group variables are constructed as follows. The variable age consists of officer age, suspect age, and the age difference between the officer in suspect. Race is comprised of a series of dichotomous variables: if the officer was white, if the suspect was black, if the suspect was Hispanic, if the officer was white and a suspect was Black, and if the officer was white and the suspect was Hispanic. Sex includes if the officer was male, if the suspect was male, and if the officer and suspect were both male. Height consists of officer height, suspect height, and the difference in height between the officer and suspect. Similarly, weight consists of officer weight, suspect weight, and the difference in weight between the officer and suspect. The number of police at initial contact is represented by two separate variables. One variable counts officers present at initial contact from zero to five or more (numberpi), and the other is dichotomous, stating if there was more than one officer present at initial contact (polinit2). No explanation is given in the report as to why two variables are used.

Frequencies

Comparing frequencies for force variables between the original analysis and the current analysis, the distributions are identical for all variables except one, the police continuum of force. The original report states that in 185 arrests the maximum reported force is the presence of two or more officers (Table 3-2, Garner et al. 1995). The reanalysis shows one less, 184. Opposing this, the original study reports that police used firearms in 54 arrests and reanalysis finds police used firearms in 55 arrests. It is possible that a later revision of the data caused this difference. Because the frequencies are identical with this single exception, frequency tables are not included in this report.

Correlations

Next, correlations are conducted as in the original study. Predictor variables are correlated with each of the measures of police and suspect force. The results are identical to the original study except for two minor differences. First, due to the slight variation in the frequencies for the police continuum of force variable, there are slight variations in the correlations of this variable with other predictor variables. For instance, in correlating the continuum of force with whether or not the suspect was in custody, the original study reports r=-.1051, p=.000 and reanalysis shows r=-.1103, p=.000. There are similar differences in the correlations of the continuum with the other 40 predictor variables but the differences are small and do not affect the significance of the findings. The only other discrepancy found is a slightly different R value correlating suspect physical force with police maximum force. Again, the significance of the relationship is not changed.[4] Because the new correlations are nearly identical to those in the original analysis, correlation tables are not included in this report.

[4] The original study states an R value of .29, p<.01 (Table 4-2, Garner et al. 1995) and the reanalysis found .248, p=.0001.

As in the original analysis, suspect use of force is the strongest correlate of police use of force. For instance, the police use physical force in 22% of all cases. This increases to 66% when the suspect uses physical force. Few of the other predictors have significant correlations with police use of force. The strongest correlations with these predictors involve characteristics of the offense, such as if the offense is violent and the attitude of bystanders, and characteristics of the location. No officer characteristics are consistently correlated with police use of force. These findings are identical to those of the original study except for the fractional differences correlating the police continuum of force with other variables.

Regression Analyses

In reconstructing the regression analyses, the objective is to replicate the original methods and models as closely as possible. The original report describes a three step process to identify predictors for each measure of force. The same process is used in constructing models for both police and suspect use of force. Step 1: the force variable is regressed on the 41 predictors, entering all predictors at once. Step 2: a similar regression is conducted using a stepwise method. Step 3: significant predictors from each regression are identified for inclusion in the model (Garner et al. 1995:VI-8). Therefore, each regression model consists of six regressions, one standard regression and one stepwise regression for each of the three measures of force.

Once significant predictors are identified for each measure of force, they are labeled as "consistent non-predictors," "inconsistent predictors," or "consistent predictors." Consistent non-predictors are those found not to be significant in the analysis of any of the three measures of force. Inconsistent predictors significantly influence one or two measures of force, but not all three. Finally, consistent predictors are those identified as significant in the analysis of all three measures of force. Only significant predictors are included in the final models of the original study.

For all regression analyses, logistic regression is used for the dichotomous variable physical force and OLS regression is used for the continuum of force and maximum force. For the multiple regression models, R^2 is used as a measure of explanatory power. Pseudo R^2 is used as the measure of explanatory power in the logistic models.[5] Descriptions of Models 1 and 2 in the original report do not include listings of the predictors found to be significant so they cannot be compared to those identified here. Also, the report does not describe using stepwise regressions in constructing Models 1 and 2 but stepwise regressions are included in this analysis.[6]

Missing values are replaced with variable means for all regression analyses. Though this is not explained specifically in the original report, it is evident in the regression results provided as an attachment to the report and in the SPSS programs provided by the authors. It is assumed that this is done to avoid excluding large amounts of data from the regression analyses. Because many variables are being used, and because values for many variables are missing in many cases, the resulting regression models are based on a significantly reduced sample size if cases with missing data are excluded.

Group Variables

For the regression analyses, the officer and suspect demographic characteristics of age, sex, race, height, and weight are tested as group variables. Using the group variable age as an example, the report explains that is done because the individual variables are highly inter-related and because the authors' "substantive interest is whether or not age makes a difference and to assess that concept we need to look at the age of the officer, the age of the suspect and the difference in their ages in one test" (Garner et al. 1995:VI-5). Interpretation of the group variables sex and race also includes a reference group. They explain using sex as an example:

---

[5] Pseudo R^2 values are calculated using the "Efron" equation as provided by Long (1997).

[6] Except for a statement in the section for Model 4 that, "Model 4 is the same as Model 2 except that our predicted value of suspect force replaces actual suspect force." This implies that Model 2 also includes stepwise regressions.

> Another central element to understanding group variables is the reference group. All the individual coefficients, say "First Officer Male," are a comparison of that group with the reference category for the group variable "Sex." In this case the reference group is all arrests not included in any of the three individual variables that constitute the group variable "Sex." Thus, the reference group for each of the individual sex variables is all cases where both the first officer and the suspect are female or where the sex of the officer or the suspect is unknown. Table 6-2 displays how each of those 9 combinations are utilized in constructing the sex variables, including the reference category. (Garner et al. 1995:VI-6)

Table 6-2 and Table 6-3 from the original report are included as Table 2-2 and Table 2-3, respectively, in this report. Both tables are copied from Garner et al. 1995.

Table 2 - 2:Construction of the Group Variable "Sex"

Individual Variables	Cases Included	Number of Cases
Male Officer	Male Officer and Female Suspect	227
	Male Officer and Suspect Sex Unknown	35
Male Suspect	Male Suspect and Female Officer	71
	Male Suspect and Officer Sex Unknown	40
Officer and Suspect Male	Both Officer and Suspect Male	1059
Reference Category	Female Officer and Female Suspect	55
	Female Officer and Suspect Sex Unknown	6
	Female Suspect and Officer Sex Unknown	6
	Officer and Suspect Sex Unknown	86
	Total Reference Category for Sex	153
	Total Cases	1585

Table 2 - 3: Construction of Group Variable "Race"

Individual Variables	Cases Included	Number of Cases
White Officer	White Officer and White Suspect	622
	White Officer and Other Race Suspect	59
	White Officer and Suspect Race Unknown	25
Black Suspect	Black Suspect and Black Officer	11
	Black Suspect and Hispanic Officer	34
	Black Suspect and Other Race Officer	8
	Black Suspect and Officer Race Unknown	12
Hispanic Suspect	Hispanic Suspect and Black Officer	13
	Hispanic Suspect and Hispanic Officer	61
	Hispanic Suspect and Other Race Officer	7
	Hispanic Suspect and Officer Race Unknown	12
White Officer/Black Suspect	White Officer and Black Suspect	178
White Officer/Hispanic Suspect	White Officer and Hispanic Suspect	293
Reference Category	White Suspect and Black Officer	23
	White Suspect and Hispanic Officer	53
	White Suspect and Other Officer	15
	White Suspect and Officer Race Unknown	17
	Other Suspect and Black Officer	2
	Other Suspect and Hispanic Officer	8
	Other Suspect and Other Officer	2
	Other Suspect and Officer Race Unknown	4
	Suspect Race Unknown and Black Officer	4
	Suspect Race Unknown and Hispanic Officer	7
	Suspect Race Unknown and Other Race Officer	4
	Suspect and Officer Race Unknown	111
	Total Reference Category for Race	250
	Total Cases	1585

It is explained in the original report that the "[i]nterpretation of the group variables involves a statistical test (F test) for all the individual variables in one group as a whole. If the group variable makes a significant contribution to the explanation of R^2, then the contribution of the individual components as measured by the "t" test is meaningful" (Garner et al. 1995:VI-5). However, in later describing the three step model development process the authors explain, "Since some of the . . . individual variables this process identified are part of the group variables discussed above, we included all components of a group variable when anyone element of the group was identified in the first two steps" (Garner et al. 1995:VI-8). This would invalidate the group variable methodology previously described. The regression results provided in the attachments of the report establish that group variables are entered and tested in blocks for the standard regressions, but this is not apparent for the stepwise regressions.[7] If group variables are not entered and deleted in blocks for the stepwise regressions, this would exclude the analysis of variables in the reference categories for sex and race.

Assuming the original stepwise regressions did not test the significance of group variables, exploratory stepwise regressions were conducted to determine the effects of variables in the reference categories. No variables in the reference categories of race or sex were found to make consistent contributions to the stepwise regression models. Thus, to avoid adding to the already long list of predictors included in the regressions, and to replicate the original study as closely as possible, these variables are not included in the upcoming analyses. The study of suspect force in Chapter 3 of this report includes a more detailed analysis of force and race relationships.

Model 1: Predicting Police Force Not Considering Suspect Force

Model 1 presents police use of force regressed on 41 predictor variables, excluding suspect use of force as a predictor. The three measures of police force are each regressed on the 41 predictor variables, first

[7] Stepwise regression results do not appear to be provided in the attachments.

in standard regressions and then in stepwise regressions.

Police Physical Force: Logistic regression of physical police force on the 41 predictors provides a pseudo R^2 value of 13.6, compared to value of 9.0 in the original analysis. Significant predictors in this analysis include: number of police and initial contact, change in the number of police by completion, use of the contact in cover tactic, violent offense, vice offense, offense dispatched as domestic violence, bystanders present, officer needed past medical attention, suspect was impaired by alcohol, suspect was known to be assaultive or resistive, and the group variables age and sex. The following stepwise regression identifies these additional variables as significant: traffic offense, offense occurred inside but not at a residence, suspect drug impairment, and the group variable height.[8]

Police Continuum of Force: Linear regression of the police continuum of force on the 41 predictors returns an adjusted R^2 value of 16.8, compared to a value of 16.6 in the original analysis. Significant predictors in this analysis include: number of police at initial contact, change in the number of police by completion, use of the contact in cover tactic, violent offense, property offense, vice offense, dispatched as a domestic violence, bystanders present at time of the arrest, visibility at the arrest scene (negative relationship), weight of the suspect, suspect known to be assaultive or resistive. The subsequent stepwise regression identifies these additional variables as significant: officer required prior medical attention, location known to be hazardous, and the group variables sex, age, height, and weight.

Police Maximum Force: Linear regression of police maximum force on the 41 predictors provides an adjusted R^2 value of 14.2, compared to 14.1 in the original analysis. Significant predictors in this model include: number of police at initial contact, change in the number of police by completion, use of the contact and cover tactic, violent offense, property offense, bystanders present, visibility at the arrest

[8] Variables found to be significant in the stepwise regression are not listed if they were already listed as significant for the initial regression.

scene (negative relationship), and the group variable race. The subsequent stepwise regression identifies the following: traffic offense, suspect known to be assaultive or resistive, and the group variables sex and age. Below is a listing of insignificant and significant predictors.

Variables Not Significant in Predicting Any of the Three Measures of Police Force:

Police Assigned to Patrol Division
Suspect Already in Custody
More than One Officer at Initial Contact
Officer Dispatched to Scene
Arrest Occurred During the Weekend
Arrest Occurred at Night (after dark)
Arrest Occurred During Weekend Night
Part of Officer's Shift
Victim and Suspect Friends or Family
More than One Suspect at Initial Contact
More than One Suspect at Completion of Arrest
Bystanders Friends or Family of Suspect
Bystanders Have Antagonistic Demeanor
Arrest Occurred at a Residence
Location Known for Criminal Behavior
Officer Length of Time On Phoenix P.D.
Officer's Number of Arrests in Last Month
Years Since Officer's Last Training
Suspect Known to Have Criminal Record
Suspect is Associated with a Gang

Variables Significant in Predicting One Measure of Police Force:

Offense Occurred Inside but Not a Residence	P
Location Known to Be Hazardous	C
Suspect Impaired by Drugs	P
Suspect Impaired by Alcohol	P
Group Variable Race	M
Group Variable Weight	C

Variables Significant in Predicting Two Measures of Police Force:

Property Offense	C,M
Traffic Offense	P,M
Vice Offense	P,C
Called Dispatched as Domestic Violence	P,C
Visibility Arrest Scene	C,M (-)
Officer Required Past Medical Attention	C,P
Group Variable Height	C,P

Variables Significant in Predicting All Three Measures of Police Force:

Number of Officers Initially at the Scene
Change in the Number of Officers
Police Use of Contact and Cover Tactic
Violent Offense
Presence of Bystanders
Suspect Known to Be Assaultive or Resistive
Group Variable Age
Group Variable Sex

Note: Significant predictors are not identified in the original study.
P = Physical Force, C = Continuum of Force, M = Maximum Force
(-) Indicates a negative relationship (associated with less force).

Ideally, once a group variable is shown to be significant, the same individual variables within the group variable would be identified as significant in the different regressions identifying that group variable as a significant predictor. Unfortunately this is not the case. For the group variable age, the physical force and continuum of force models each identify suspect age as significant but the maximum force model identifies the difference between suspect and officer age. Suspect age has a negative influence in its relationships with the force variables. For the group variable sex, the physical force model identifies the officer and suspect both being male as significant while the continuum and maximum force models each identify the suspect being male.

As in the original study, Model 1 is rejected because Model 2, which includes suspect use of force as a predictor, offers considerably more explanatory power. The original report states that, "[a]nother reason to reject Model 1 is that the measure of suspect force is not only statistically significant with all three measures of police use of force, it is consistently the single most powerful predictor of police use of force" (Garner et al. 1995:VI-1). Because Model 1 is not included for later consideration in this study, the full regression results are not included in this report.

Model 2: Predicting Police Force Including Suspect Force as a Predictor

Model 2 includes the same 41 predictors as Model 1 but also includes suspect force as a predictor. Like measures of suspect force are used for each measure of police force. That is, in regressing police physical force on the predictors, suspect physical force is used as the predictor of suspect force, and likewise for the continuum and maximum models. Full regression results are provided in Appendix B.

Police Physical Force: Regressing police physical force on the 41 predictors and suspect physical force, the pseudo R^2 value is 27.8, compared to 19.2 in the original analysis. Significant predictors in this model include: number of police at initial contact, change in the number of police by completion, use of the contact and cover tactic, arrest occurred at night (after dark), vice offense, call was dispatched as a domestic violence offense, suspect was known to be assaulted were resistive, and suspect physical force. In addition, the following stepwise regression identifies: traffic offense, visibility, officer requiring past medical attention, suspect alcohol use, and the group variables race, weight, and height.

Police Continuum of Force: Linear regression of the police continuum of force on the 41 predictors and the suspect continuum of force results in an adjusted R^2 value of 30.8, compared to 28.4 in the original analysis. Significant predictors in this model include: police were assigned to a patrol division, number of police president at initial contact, change in the number of police by completion of the arrest, use of the contact cover tactic, arrest made it night; bystanders present, suspect known to be assaultive or resistive, the group variables race and sex, and the suspect continuum of force. The following stepwise regression identifies as significant: visibility, victim and suspect friends or family, and the group variables sex and weight.

Police Maximum Force: Regressing police maximum force on the 41 predictors and suspect maximum force, the R^2 value is 22.7, compared to 22.6 in the original analysis. Significant predictors in this model

include: number of police initially at the scene, change in number of police by completion of arrest, use of contact and cover tactic, property offense, bystanders present at time of arrest, arrest occurred at a residence, visibility at the arrest scene, suspect known to be assaultive or resistive, the group variable race, and suspect use of maximum force. And the following stepwise regression identifies the group variable sex as significant.

Variables Not Significant in Predicting Any of the Three Measures of Police Force:

Suspect Already in Custody
More than One Officer at Initial Contact
Officer Dispatched to Scene
Arrest Occurred During the Weekend
Arrest Occurred During Weekend Night
Part of Officer's Shift
Violent Offense, Non-Domestic
Property Offense
More than One Suspect at Initial Contact
More than One Suspect at Completion of Arrest
Bystanders Friends or Family of Suspect
Bystanders Have Antagonistic Demeanor
Offense Occurred Inside, Not at a Residence
Location Known to Be Hazardous
Location Known for Criminal Behavior
Officer Length of Time On Phoenix P.D.
Officer's Number of Arrests in Last Month
Years Since Officer's Last Training
Suspect Impaired by Drugs
Suspect Known to Have Criminal Record
Suspect is Associated with a Gang
Group Variable Age

Variables Significant in Predicting One Measure of Police Force:

Police Assigned to Patrol Division	C
Property Offense	M
Traffic Offense	P
Vice Offense	P
Call Dispatched as Domestic Violence	P
Victim and Suspect Friends or Family	C
Arrest Occurred at a Residence	M
Officer Required Past Medical Attention	P
Suspect Impaired by Alcohol	P
Group Variable Height	P

Variables Significant in Predicting Two Measures of Police Force:

Arrest Occurred After Dark	P,C
Bystanders Present at Arrest	C,M
Group Variable Weight	P,C

Variables Significant in Predicting All Three Measures of Police Force:

Number of Officers Initially at the Scene	
Change in the Number of Police by Completion	
Police Use of the Contact and Cover Tactic	
Visibility at the Arrest Scene	(-)
Suspect Known to be Assaultive or Resistive	
Group Variable Sex	
Group Variable Race	
Suspect Use of Force	

Note: Significant predictors are not identified in the original study.
P = Physical Force, C = Continuum of Force, M = Maximum Force
(-) Indicates a negative relationship (associated with less force).

As is the case in Model 1, the same group variable components are not identified in the different models. The male officer male suspect variable is identified as significant in the physical and continuum of force models, while just a male suspect is identified in the continuum and maximum force models. The suspect being Hispanic is identified in the physical and maximum force models while the suspect being Black is identified in the continuum and maximum force models. The suspect being Hispanic has a negative influence in its relationships with the force variables. The officer being white and suspect being Black is also identified in the continuum of force model.

Model 1 excludes suspect use of force as a predictor of police use of force. Model 2 includes the same predictors as Model 1 but also includes suspect force as a predictor. Before Model 4 is constructed, which substitutes the recorded values of suspect force with calculated values, the next step is to regress suspect force on the 41 predictors to determine what factors are likely to cause suspects to use force against the police. The prediction of suspect use of force constitutes Model 3.

Model 3: Predicting Suspect Use of Force

As in the police force models, each measure of suspect force is regressed on the 41 predictor variables twice, first entering all of the predictors at once and then using a stepwise method. Regression results are provided in Appendix C.

Suspect Physical Force: Regressing suspect physical force on the 41 predictors results in a pseudo R^2 value of 10.2 compared to 5. in the original study.[9] Variables identified as significant include: part of shift during which the arrest occurred*; violent offense, vice offense, domestic offense*, bystanders present at arrest; offense occurred inside but not at a residence, if past medical attention was ever needed by the arresting officer*; and the group variables age* and race. In addition to these predictors, the stepwise regression identifies suspect alcohol impairment* and suspect gang association. Predictors marked with an asterisk* are not identified in the original study. Predictors identified in the original study include[10]: violent offense, traffic offense, vice offense, bystanders present at arrest, arrest occurred inside but not a residence, suspect association with a gang, and the group variable race. The one predictor identified as significant in the original study but not shown to be significant in the reanalysis is if the offense is traffic related.

Suspect Continuum of Force: Linear regression of the suspect continuum of force on the 41 predictors results in an adjusted R^2 value of 10.9, compared to 11. in the original study. Variables identified as significant include: number of police at initial contact, change in number of police by completion, use of the contact in cover tactic, violent offense, vice offense*, call dispatched as domestic violence,

---

[9] R^2 values for the suspect force regressions are provided in Table 6-5 of the original study as .05 for physical force, .11 for the continuum of force, and .08 for maximum force.

[10] The original report is not specific regarding which variables are identified as significant in the initial regression model and which are identified as significant in the subsequent stepwise model.

bystanders present, bystanders had antagonistic demeanor, visibility at arrest scene, length of time the arresting officer has spent on the Phoenix police department, arresting officer required past medical attention, suspect impaired by drugs, suspect impaired by alcohol, suspect association with a gang, and the group variable age. The subsequent stepwise regression identifies as significant: traffic offense and the group variable race. Again, the variable marked by an asterisk* is not identified as significant in the original analysis. Predictors found to be significant in the original study include: number of police at initial contact, change in number of police by completion, use of contact and cover tactic, violent offense, traffic offense, call dispatched as domestic violence, bystander presence, bystanders had antagonistic demeanor, visibility at arrest scene, officer length of service, officer required past medical attention, suspect impaired by drugs, suspect impaired by alcohol, suspect associated with a gang, and the group variables age and race. The only predictor found significant in the original analysis that is not identified as significant here is traffic offense.

Suspect Maximum Force: The linear regression of suspect maximum force on the 41 predictors produces an adjusted R^2 value of 7.9, compared to 8. in the original study. Variables identified as significant include: change in the number of police by completion of arrest, part of shift, violent offense, vice offense, call dispatched as domestic violence*, bystanders present at arrest, bystanders having antagonistic demeanor, arrest occurred inside but not at a residence*, officer length of service*, officer required prior medical attention, suspect alcohol impairment, and the group variable age. The subsequent stepwise regression identifies as significant: number of police initially at the scene, police use of the contact and cover tactic*, traffic offense*, location known for criminal behavior*, suspect drugs impairment*, suspect associated with a gang, and the group variable race. Variables marked by an asterisk* are not identified in the original study. Predictors found to be significant in the original study include: number of officers initially, change in number of officers by completion, part of shift, violent offense, vice offense, bystanders present at arrest, bystanders having antagonistic demeanor, officer requiring prior medical attention, suspect impaired by alcohol, suspect association with a gang, and the

group variables age and race. No predictors are identified in the original study the are not identified here for suspect maximum force.

Variables Not Significant in Predicting Any of the Three Measures of Suspect Force:

Police Assigned to Patrol Division
Suspect Already in Custody
More than One Officer at Initial Contact
Officer Dispatched to Scene
Arrest Occurred During the Weekend
Arrest Occurred at Night (After Dark)
Occurred During Weekend Night
Property Offense
Victim and Suspect Friends or Family
More than One Suspect at Initial Contact
More than One Suspect at Completion of Arrest
Bystanders Friends or Family of Suspect
Arrest Occurred at Residence
Location Known to Be Hazardous
Officer's Number of Arrests in Last Month
Years Since Officer's Last Training
Suspect Known to Have Criminal Record
Suspect Known to Be Assaultive or Resistive
Group Variable Sex
Group Variable Height
Group Variable Weight

Variables Significant in Predicting One Measure of Suspect Force:

Location Known for Criminal Behavior	M
Visibility at the Arrest Scene	C (-)

Variables Significant in Predicting Two Measures of Suspect Force:

Number of Officers Initially	C,M
Change in the Number of Police	C,M
Police Use of the Contact in Cover Tactic	C,M
Part of Officer's Shift	P,M
Traffic Offense	C,M
Bystanders Have Antagonistic Demeanor	C,M
Arrest Occurred Inside, Not at a Residence	P,M (-)
Officer Length of Time on the Phoenix Police Department	C,M
Suspect Impaired by Drugs	C,M

Variables Significant in Predicting All Three Measures of Suspect Force:

Violent Offense, Non-domestic
Vice Offense*
Domestic Violence Offense*

Bystanders Present at Arrest
Officer Required past Medical Attention*
Suspect Impaired by Alcohol*
Suspect Associated with a Gang
Group Variable Age (Suspect Age)(-)*
Group Variable Race (Hispanic Suspect)(-)*

* Not identified as consistent predictors in the original study.
P = Physical Force, C = Continuum of Force, M = Maximum Force
(-) Indicates a negative relationship (associated with less force).

There are several significant differences between these findings and the original study. Most notable is that the reanalysis found eight consistent predictors of suspect force whereas the original analysis only identifies three. It is possible that different assumptions were made regarding the inclusion of predictors identified in the follow-up stepwise regressions and/or the inclusion of group variables, but even this would not explain all of the discrepancies. These results also suggest that, for suspect force, requiring inclusion in the physical force model for inclusion in the final model as a consistent predictor may significantly limit the overall findings. Seven of the 11 inconsistent predictors of suspect force are included in both the continuum and maximum force models but not in the physical force model.

For the group variables age and race, the individual components suspect age and Hispanic suspect are each consistently identified as significant predictors of suspect force, unlike the ambiguous results for group variables in the Police Force Models 1 and 2.

All of the consistent predictors are viable predictors of suspect force except an officer requiring past medical attention. Its inclusion makes little sense unless as the byproduct of police behavior. It may be that these officers are more aggressive and more likely to use force against suspects, or that they use a more aggressive approach and demeanor and suspects then are more likely to use force in return. Police use of force against the suspect may be influencing the model even though the actual variable is not included as a predictor. The same logic applies to the officer's part of shift (early, middle or late) which is identified as an inconsistent predictor in this study and the original study. The original study states

that the authors are "unable to develop a logic for why suspects would use more physical force in the later stages of an officer's current shift" (Garner et al. 1995:VI-12).

Model 4: Predicting Police Force Using a Predicted Value of Suspect Force

Calculating Suspect Force

Finally, for Model 4, calculated values of suspect force are used as predictors in police force regressions. To predict suspect force, each measure of suspect force is regressed on the 41 predictors and predicted values are calculated as part of the regression. However, the original report is somewhat ambiguous in explaining how these values are predicted in the original study. The report states that, "[a]lthough our models for predicting suspect force explain only a small portion of the variance in each of the three measures, they do predict some of the variance and we can use that predictive strength to compute the predicted value of suspect force. This value was computed for each case using the coefficients listed in Table 6-5 (and a constant term)" (Garner et al. 1995:VI-13). From this description and the format of Table 6-5, it is difficult to determine if the same variables identified as consistent predictors of suspect force are used to calculate predicted values for each of the three measures of suspect force, or if different variables are used for different measures of force, referred to as "each case". One of the original authors explained the process as follows.[11] Each of the three measures of suspect force are first regressed on the 41 predictor variables. Using a 0.1 standard of significance, all of the variables identified in any of these regressions are included in the following step. Next, each of the three suspect force variables are regressed on this subset of predictors using a .05 standard of significance.[12] These new subsets of

[11] The methods were described in a conversation with Joel Garner. It is difficult to determine the exact methods for this section as described in the original report.

[12] This process requires six additional regressions. Because these regressions are used only to identify variables for use in calculating suspect force for later regressions, the results are not included in Appendix B with the results of the other police force regression models.

predictors are kept separate for each force model and used in yet another series of regressions to calculate a predicted value of suspect force for that model.[13] Predictors identified for use in the final regressions to calculate suspect force are listed below. These predicted values of suspect force will then be used as predictors of police force. The original report explains that "[t]hese predicted values can be understood as a part of suspect use of force that can be explained independently from police use of force" (Garner et al. 1995:VI-13). Therefore, if the predicted values of suspect force contribute to the upcoming police force models (and they do), this provides evidence that part of officer force can be explained by suspect force.

Variables Used to Calculate Predicted Values of Suspect Force

Suspect Physical Force: violent offense, vice offense, domestic offense, bystanders present at arrest, offense occurred inside, male first officer, officer required prior medical attention, officer part of shift, suspect age, Hispanic suspect, male suspect.

Suspect Continuum of Force: number of police initially at the scene, change in the number of police, police use of the contact in cover tactic, violent offense, property offense, vice offense, domestic offense, bystanders present at the arrest, bystanders had antagonistic demeanor, male first officer, officer length of service, officer required prior medical attention, suspect age, Hispanic suspect, suspect alcohol impairment, suspect drug impairment, suspect gang association.

Suspect Maximum Force: number of police initially at the scene, change in the number of police, officer part of shift, violent offense, vice offense, property offense, domestic offense, bystanders present, bystanders had antagonistic demeanor, officer length of service, officer required prior medical attention, suspect age, Hispanic suspect, male suspect, suspect drug impairment, suspect alcohol impairment, suspect gang association.

[13] This methodology fails to identify entirely the same predictors as those used in the original study. It could not be determined exactly how the predictors in the original study were identified. The predictors identified in this reanalysis are used to calculate the predicted values of suspect force, rather than substituting the predictors used in original analysis. Also, the predictors identified here are very similar to those identified in the initial regressions of suspect force, simply regressing force on the 41 predictors using a .05 standard of significance.

Developing a New Model of Police Force

The calculated suspect force variables are now used as predictors in the final police force regressions. According to the original report and the programs provided by the authors, the three measures of police force are regressed on the 41 predictor variables plus the calculated values of suspect force. However, this results in a collinearity problem because the predicted values of suspect force are constructed from subsets of the same 41 predictors used in the police force regressions, making the police force regressions impossible. Again, one of the original authors[14] explained that this problem was avoided by first regressing the police force variables on the 41 predictors and selecting a subset of significant predictors. This permits the regression unless the suspect force subset is wholly contained in the police force subset for any of the models.[15]

To replicate this as explained, the three measures of police force are each regressed on the 41 predictor variables excluding suspect force. Predictors are identified using a 0.1 standard of significance. Following this, the police force measures are again regressed on the 41 predictors, this time employing a stepwise regression method with a 0.1 measure of significance necessary to stay in the model and a 0.11 measure of significance required to then reject a variable from the model. All predictors identified in any of these standard or stepwise regressions are included in a new subset of predictors used for the following regressions. Group variables are tested using an F test for the initial regression models. For the stepwise regressions, a group variable is included if any of the individual variables in that group are identified as significant.[16] The variables identified in these regressions and thus constituting the new

---

[14] From a conversation with Joel Garner.

[15] However, this does not eliminate the problem of potential collinearity.

[16] This process includes an additional six regressions which serve only to identify predictors for use in the following regression models. Therefore, the results of these regressions are not included in Appendix B with other police force regression results.

subset of predictors are listed below.[17]

> *Predictor Subset for Model 4, Police Use of Force:* number of police initially at the scene, change in the number of police, police use of the contact and cover tactic, officer part of shift, violent offense, property offense, traffic offense, vice offense, domestic offense, bystanders present at the arrest, bystanders had antagonistic demeanor, arrest occurred at a residence, arrest occurred inside but not at a residence, location known for criminal behavior, visibility, officer length of service, officer required prior medical attention, suspect drug impairment, suspect alcohol impairment, suspect gain association, and the group variables age, race, and sex.

Though potential for collinearity remains, this makes the following regressions possible provided that not all of the variables included in the suspect force subset are included as predictors in the police force subset. Unfortunately, this turns out to be exactly the case. For each of the three measures of force, all variables contained in the suspect force subset are also included in the police force subset. Not knowing exactly how this part of the original study was conducted and with virtually endless possibilities of methods for selecting subsets of variables for both the suspect force and police force regressions, a simple solution is sought. One variable not included in the police force subset is added to each of the suspect force subsets. The variable chosen is the difference in height between the suspect and officer, simply because this variable is significant or approaches significance in some of the regression analyses, but the group variable height is not consistently significant in any of the prior models. Though this method does not actually solve the collinearity problem and constitutes a failure to accurately replicate the original study, it is employed as a simple and practical means of dealing with the problem. The potential for altering the results of the police force regressions is limited because only one additional variable is included for the prediction of suspect force, which is then used as a predictor in the police force regressions.

Using the subset of police force predictors, the model is completed using methods similar to those used

---

[17] This subset of predictors is used only in the first regressions for each measure of police force. All of the original 41 predictors are included in the stepwise regressions because the elimination of variables in the stepwise procedure allowes the regression to be completed, avoiding the collinearity problem.

in the prior regression models. First, each of the three measures of police force is regressed on the subset of police force variables and the predicted values of suspect force, entering all predictors at the same time. Following this, similar regressions are conducted using a stepwise method. For the initial regressions, group variable significance is tested using an F test. If an individual variable that is part of a group variable is identified as significant in a stepwise regression, then that group variable is included in the model. Variables identified as significant in either the initial or stepwise method regressions are included in the model for that measure of force. Predictors are then identified as consistent non-predictors, inconsistent predictors, or consistent predictors of police force. Only variables identified as significant predictors for all three measures of police force are included in the final model as consistent predictors.

Predictors Identified in Model 4

Below are the findings from regressing police force on the subset of predictors and the calculated values of suspect force. Full regression results are provided in Appendix B.

Police Physical Force: Logistic regression of police physical force on the predictor subset and suspect force results in a pseudo R^2 of 12.2, compared to 8. in the original study.[18] Variables found to be significant include: number of police initially at the scene*, change in the number of police, use of the contact and cover tactic, part of police shift*, violent offense*, vice offense*, domestic offense, presence of bystanders*, the offense occurred inside but not at a residence*, visibility*, officer requiring prior medical attention*, suspect alcohol impairment, the group variables age and sex, and the calculated value of suspect force. Identified significant in the following stepwise logistic regression are: traffic offense*, officer length of service, suspect drug impairment, suspect known to be assaultive or resistive, and the group variables height* and race*. Predictors marked within an asterisk* are not identified as

[18] R^2 values are presented in decimal form in Table 6-7 of Garner et al. 1995.

significant in the original study. Predictors identified in the original study include: police assigned to patrol division, use of the contacting cover tactic, change in the number of police, domestic call, location known to be hazardous, officer length of service, suspect alcohol impairment, suspect drug impairment, suspect known to be assaultive or resistive, the group variables age and sex, and the calculated value of suspect force. The only variable found to be significant in the original study but not identified as significant here is if the first officer was assigned to patrol division.

Police Continuum of Force: Linear regression of the police continuum of force on the predictor subset and suspect force produces an adjusted R^2 of 13.3, compared to 14. in the original study. Significant predictors include visibility* and the group variable race[19]*. The following stepwise regression identifies the following as significant: use of the contact and cover tactic, number of police originally at the scene, change in the number of police*, victims and suspect were friends or family*, presence of bystanders*, suspect known to be assaultive for resistive, the group variables sex, and the calculated value of suspect continuum of force. Again, variables marked by an asterisk* are not identified as significant in the original study. Predictors identified as significant in the original study include: use of the contacting cover tactic, number of police initially at the scene, suspect known to be assaultive for resistive, the group variable sex, and the calculated value of suspect force.

Police Maximum Force: Linear regression of police maximum force on the predictor subset and suspect force provides an adjusted R^2 of 11.3, compared to 11. in the original study. Two predictors are shown to be significant: visibility and use of the contact and cover tactic. The following stepwise regression identifies the following: number of police initially at the scene, change in the number of police, presence of bystanders, suspect known to be assaultive or resistive, the group variables in sex and race*, and the calculated value of suspect maximum force. These are identical to the variables identified in the original

[19] The group variable tested near significant (p=.0526). The suspect being Black and white police Black suspect were each significant (p=.0068 and p=.0052 respectively).

study with the exclusion of the group variable race.

Variables Not Significant in Predicting Any of the Three Measures of Police Force:

Police Assigned to Patrol Division
Suspect Already in Custody
More than One Officer at Initial Contact
Officer Dispatched to Scene
Arrest Occurred During the Weekend
Arrest Occurred at Night (After Dark)
Occurred During Weekend Night
Property Offense
More than One Suspect at Initial Contact
More than One Suspect at Completion of Arrest
Bystanders Friends or Family of Suspect
Bystanders Have Antagonistic Demeanor
Arrest Occurred at Residence
Location Known to Be Hazardous
Location Known for Criminal Behavior
Officer's Number of Arrests in Last Month
Years Since Officer's Last Training
Suspect Known to Have Criminal Record
Suspect is Associated with a Gang
Group Variable Weight

Variables Significant in Predicting One Measure of Police Force:

Officer's Part of Shift	P
Violent Offense (non-domestic)	P
Traffic Offense	P
Vice Offense	P
Domestic Call	P
Victim and Suspect are Friends or Family	C
Offense Occurred Inside, Not at a Residence	P (-)
Length of Time on Phoenix Police Dept.	P
Officer Required Past Medical Attention	P
Suspect Impaired by Drugs	P
Suspect Impaired by Alcohol	P
Group Variable Age	P
Group Variable Height	P

Variables Significant in Predicting Two Measures of Police Force:

Group Variable Race	P, M

Variables Significant in Predicting All Three Measures of Police Force:

Number of Officers Initially at the Scene*
Change in the Number of Police*
Police Use of the Contact and Cover Tactic

Bystanders Present at Arrest*
Visibility at Arrest Scene* (-)
Suspect Known to be Assaultive or Resistive
Group Variable Sex (Suspect Male)
Predicted Suspect Force

* Not identified as consistent predictors in the original study
P = Physical Force, C = Continuum of Force, M = Maximum Force
(-) Indicates a negative relationship (associated with less force).

As is the case in Police Force Models 1 and 2, the same component variables for sex and race are not consistently identified in Model 4. For the group variable sex, the physical force model identifies the officer being male (a negative relationship) and the officer and suspect both being male as significant predictors. These are not included in the model. The continuum and maximum force models each identify the suspect being male as a significant predictor, which is included in the model.

Poor visibility at the arrest scene increases the likelihood of police use of force. This measure does not differentiate for types of conditions such as fog, bad weather or the amount of light. Though the arrest occurring at night is controlled for, this does not include lighting conditions such as street lights. It is possible that suspects are more likely to believe they can escape police custody in poor visibility conditions.

By strict standards requiring a 95% level of significance for all three measures of force in the police force models, race must be excluded. The linear regression of police physical force identifies a Black suspect as significant but not the group variable race. The following stepwise regression identifies Hispanic suspect as having a significant negative relationship with police force. The linear regression of the continuum of force identifies Black suspect and white-police-Black-suspect as significant and the group variable race as almost significant (p=.0526). The following stepwise procedure does not identify any race variables as significant. Finally, the linear regression of maximum force shows Black suspect and white-police-Black-suspect as significant but the group variable race not to be significant. The following stepwise regression identifies Hispanic suspect as significant. Race must excluded as a

consistent predictor in Model 4 due to its failure to meet requirements for the continuum of force model. However, it is worth noting that it came quite close. The inconsistent race related findings do not suggest so much that police are consistently racist in any direct manner, but that there may be racial interactions more complex than these data or methods are able to demonstrate.

Summary: Constructing the Final Model of Police Force

The array of regressions presented in this chapter have the potential to overwhelm, and summarizing the findings into a final model presents the challenge of determining what to present and in how to present it. The original report describes the construction of the final model as follows:

> Our final model for understanding the use of force by and against the police (See Figure 6-2) is based on integrating the results from Stage 2 -- predicting suspect use of force -- and Stage 3 -- predicting police use of force. We created a single set of results by using the three consistent predictors from Stage 1, the four consistent predictors from Stage 2, and two inconsistent predictors -- Suspect Alcohol Impairment and the Change in the Number of Police -- from Stage 2 and Stage 3. These considerations are inconsistent predictors in each stage but contribute to the prediction of all three measures of force, sometimes directly influencing police use of force and sometime indirectly influencing police use of force through suspect use of force. We include these two predictors because when their role in both suspect use of force and police use of force is considered together, they become consistent predictors. (Garner et al. 1995:VI-19)

Figure 6-2 of the original report, a depiction of the final model, is provided in this report as Figure 2.1. Three models of police force are constructed in this chapter. Model 1 presents the prediction of police force based on the 41 predictor variables. Model 2 presents the prediction of police force based on the same 41 predictors and suspect force. Finally, Model 4 presents the prediction of police force based on the 41 predictors and calculated/predicted values of suspect force. These models are similar except for the inclusion of suspect force. Models 2 and 4 are similar in construction and nearly identical in results, differing only in that Model 4 identifies the presence of bystanders as significant and Model 2 does not. The final model of police force for this study includes the variables identified in Model 4 as direct predictors of police force and the variables identified in Model 3, the prediction of suspect use of force, as indirect predictors of police force. The variables included are listed below and a graphic representation of the model is provided in Figure 2.2.

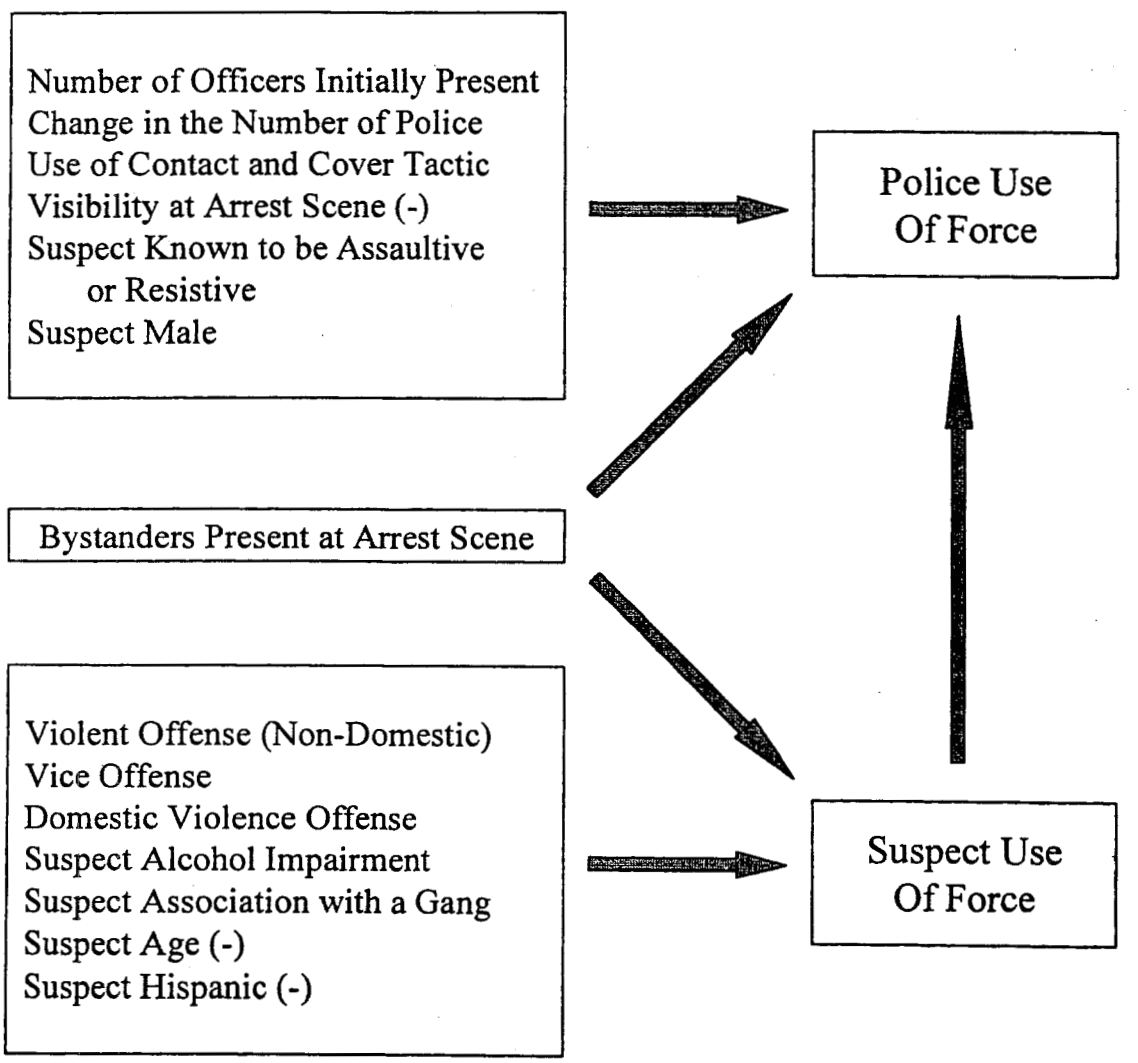
Predictors Included in the Final Model of Police Force

Predictors of Police Force	Predictors of Suspect Force
Number of Officers Initially at the Scene	Violent Offense, Non-domestic
Change in the Number of Police	Vice Offense
Police Use of the Contact and Cover Tactic	Domestic Violence Offense
Bystanders Present at Arrest	Bystanders Present at Arrest
Visibility at Arrest Scene (-)	Suspect Impaired by Alcohol
Suspect Known to be Assaultive or Resistive	Suspect Associated with a Gang
Suspect Male	Suspect Age (-)
Suspect Use of Force (Predicted)	Hispanic Suspect (-)

(-) Indicates a negative relationship (associated with less force).

Though the findings of this reanalysis differ somewhat from those of the original study, it is not suggested that this diminishes or refutes the original findings. It is possible that a simple but undetermined difference in assumptions led to the identification of different predictors. There is no evidence that any of the findings in the original study are incorrect or inappropriately presented. All of the predictors identified as significant in the original study are also identified as significant in this reanalysis, but this study also identifies additional predictors as significant. Therefore, if errors were made in the original analysis they were Type II errors due to more conservative or stringent standards, excluding factors that were actually significant. If errors were made in this study they were Type I errors due to less stringent standards, including factors that actually were not significant.

Figure 2-2: Model of Police Force From Reanalysis



(-) Indicates negative relationship, associated with less force.

Chapter 3
Study of Suspect Use of Force Against the Police

Introduction: A New Approach

The purpose of this chapter is to identify factors related to the increased potential for suspect use of force. To do so, the original intent was to replicate in reverse the four models constructed in the previous reanalysis of the Phoenix Study of Police Force. According to a strict reversed construction, Model 1 would consist of regressing the three measures of force on the 41 predictors. Model 2 would be similar but include police force as a predictor of suspect force. Model 3 would involve regressing the three measures of police force on the 41 predictors, excluding suspect force as a predictor. Finally, Model 4 would use calculated values of police force as predictors in the regressions of suspect force on the 41 predictors and these calculated variables. However, the original study was quite thorough and much of this work is already done. Suspect Force Model 1 is the same as Police Force Model 3, the regression of suspect force on the 41 predictors, excluding police use of force. And Suspect Force Model 3 is the same as Police Force Model 1, the regression of police force on the 41 predictors, excluding suspect use of force. The only models remaining are Suspect Force Model 2, the regression of suspect force on the 41 predictors and police force, and Model 4, the same regression but using calculated/predicted values of police force. But the potential value of a Suspect Force Model 4 is questionable for several reasons that are described below. Essentially, the logic behind using predicted values may not justify the added complication and difficulties.

A Look Back at the Original and Study and Its Reanalysis

The authors of the original report describe the logic for using predicted values of suspect force as follows:

> These predicted values can be understood as a part of suspect use of force that can be explained independently from police use of force. In Model 2, we had assumed that all the association

> between suspect and officer force was the result of suspect force causing officer force; if the predicted (as opposed to the actual) value of suspect force contributes to the prediction of officer use of force (and it does), it gives us an empirical basis for asserting that some of the association observed in Model 2 is from suspect force to officer force. (Garner et al. 1995:VI-13).

Thus, it is proposed that using predicted values of suspect force helps to compensate for the lack of time sequencing of events. Since we do not know directly from the data who was first to use force, the suspect or officer, this provides a means of demonstrating that a portion of officer force can be explained as the result of suspect force. Though this logic is admirable, the methodology itself adds substantial complexity and may in fact fall short of its intent. For both the original study and the reanalysis in Chapter 2, the same 41 variables are used first to create predicted values of suspect force, and then for the regression of police force including the newly predicted values of suspect force. Essentially, the same set of variables are entered into the police force regression twice, once directly and again in the calculated value of suspect force. To keep collinearity problems from preventing the regressions, subsets of predictors have to be identified for the suspect and police force models.[20] The methods for identifying these subsets of variables require an additional 12 regressions, plus three more regressions used to create the predicted values of suspect force, all in addition to the six regressions used to actually construct Model 4. In the reanalysis, even after the additional regressions, each of the suspect force subsets are still wholly contained in the police force subset, thus creating the same collinearity problem. To allow the regressions to be conducted, an additional variable is added to each of the suspect force subsets. However, though this allows the regressions to be conducted, it does not actually solve the problem of collinearity. Then, once the predicted values of suspect force are calculated and the police force variables are regressed on them and the police force subset of predictors, Model 4 identifies exactly the same predictors (with the exception of one variable) as are identified in Model 2, which uses the actual values of suspect force. This comparison between Models 2 and 4 cannot be made for the original study because the report does not include the predictors identified in Model 2. Still, is questionable if the methodology behind calculating predicted

[20] Linear regression is not possible if one independent variable is a linear combination of other independent variables included in the regression.

values of suspect force and inserting them in place of the actual values is worth the addition of a single predictor of police force; a variable (if bystanders were present at the arrest) that is identified as significant in both the continuum and maximum regressions for Model 2.

The collinearity problems encountered in Model 4 demonstrate the complexities of interactions between police force, suspect force, and the variables found to predict each. These interactions are also demonstrated in Model 3, the prediction of suspect use of force. In both the original study and the reanalysis, an officer's part of shift (early, middle, or late) is identified as an inconsistent predictor of suspect use of force. Furthermore, the reanalysis identifies an officer's medical history -- if the officer required past medical attention -- as a consistent predictor of suspect force, and officer length of service as an inconsistent predictor. These findings are difficult to understand unless they demonstrate influences of police behavior. Interestingly, an officer requiring past medical attention is not identified as a consistent predictor in any of the police force models, but is identified as an inconsistent predictor in all three of the models. Officer part of shift is identified as an inconsistent predictor of police force but only in Model 4 of the reanalysis. Though these findings are inconsistent and thus inconclusive, they demonstrate that separating the influences of police and suspect force may be asking too much of the Phoenix data. An analysis employing instrumental variable techniques may help to better determine causality but is beyond the scope of this study.

Also a consideration at this point is the redundancy of regression models. So far the three measures of police force and suspect force have each been regressed on the 41 predictors and subsets of the 41 predictors, including and excluding the opposing measures of force as predictors, using standard and stepwise regression techniques. Considering that the complex methods used to include predicted values of suspect force failed to provide substantially different results in the reanalysis, a reversal of these techniques is not employed in this study of suspect force. Instead, two basic models suspect force are constructed in this study, one excluding police force and one including police force as a predictor.

Group Variables

As previously explained, the officer and suspect demographic characteristics of age, sex, race, height, and weight are tested as group variables. The authors of the original study explain that group variables are constructed because the individual variables are highly inter-related and they wanted to test their significance with a single test. Though on one hand it does make intuitive sense to combine, for instance, all age variables or all race variables into one group variable, on the other hand each of these individual variables can be considered entirely independent of the others. For instance, how are officer age and suspect age actually inter-related? In fact, these variables are conceptualized in separate domains (officer characteristics vs. suspect characteristics) as described in Chapter IV of the original report. The same point can be addressed with each of the other group variables.

The original report describes two methods for the analysis of group variables. First it is explained that the group variable must test significant using an F test before the individual components can be considered for significance based on their T values. Later it is stated that all components of a group variable are included when any one component is identified as significant. For the reanalysis of police force and this study of suspect force it is assumed that the first method is applied to standard regressions and the second method is applied to stepwise regressions. For the standard regressions requiring a group variable to test significant (F test), a significant component variable may be excluded because the group variable fails to pass the test. This makes it possible for variables that do not have a significant effect to "wash-out" the effects of those that do. This may be overcome if an individual variable tests significant in the following stepwise regression for that model, but this is not always the case. The overlooking or washing out of significant findings for individual components of the group variables is not a substantial problem in the reanalysis of police force, but significant individual variable findings are excluded on occasion because the group variable failed to test significant. To determine the extent of this in the suspect force study, each model is reconstructed excluding the analysis of group variables. For these

models, each individual variable regarding age, race, sex, height, and weight is tested on its own merits, and the appropriate variables are added to compensate for the lack of race and sex reference categories.

Race Considerations

The questionnaire completed by officers recorded the race for the first officer, the second officer, and the suspect. Race categories included white, Black, Hispanic, and other. From this data, a number of other race variables are constructed, mostly dichotomous variables describing if the first officer is white, if the second officer is white, if both officers are white, etc.; then similar variables for Black and Hispanic officers and suspects, etc. There are also numerous dichotomous race interaction variables, such as white police and white suspect, white police and Black suspect, white police and Hispanic suspect, etc., for all possible race combinations from the available data. The result is a total of 24 dichotomous race variables constructed from the original data.

Explaining how it is determined which of these many possible race variables would be included in the group variable, the authors state that their "substantive concerns are not just with the average effect of officer or suspect race but with certain combinations of officer and suspect race. One longstanding substantive concern in the police use of force deals directly with arrests involving White officers and Black suspects and arrests involving White officers and Hispanic suspects. For this reason, we constructed individual variables to provide an assessment of this crucial interaction term" (Garner et al. 1995:IV-7). The individual variables used to construct the group variable race include: white officer, Black suspect, Hispanic suspect, white-officer-Black-suspect, and white-officer-Hispanic-suspect. Again, because race is tested as a group variable in all of the standard regression models, cases with these race characteristics are compared to a reference category of all other possible racial combinations. The variables constituting this reference category are shown in Table 2-3 above, copied from the original report, and essentially include all cases where the officer is not white and the suspect is not Black or Hispanic, and combinations other than white-officer-Black-suspect and white-officer-Hispanic-suspect.

While using these specific variables does make sense to test for white on minority racism, it may be worthwhile to test the significance of other racial combinations. The original report only includes correlations of the five race variables constituting the group variable race with the suspect and police force variables. In order to determine the potential predictive value of the different race variables for suspect and/or police force, a number of exploratory correlations, crosstabs, t-tests, and regressions are conducted between these race variables and the different measures of police and suspect force. This "shot in the dark" methodology is used only to determine if any specific race variables or group of race variables show patterns of significant relationships that should be considered for inclusion in the regression analyses. These studies provide the following limited results.[21]

Bivariate correlations in the original study found no significant relationships between the included five race variables and the six force variables (three measures of police force and three measures of suspect force). Similarly, no significant relationships between these variables are identified in the reanalysis. Of the 24 race variables considered in this analysis, only two have significant relationships in their correlations with any of the force variables. The Hispanic suspect variable is significantly negatively correlated with suspect physical force and suspect maximum force.[22] The second officer being white is significantly positively correlated with five of the six force variables and nearly significantly correlated to the sixth.[23]

Each measure of suspect and police force is regressed on all of the race variables. Though this would not be appropriate for developing a model due to the probable correlations and interactions among the

---

[21] Because these are only exploratory analyses the tables and complete results are not included in Appendix C with other suspect force findings.

[22] $r=-.057$, $p<.03$ and $r=-.049$, $p<.05$ respectively

[23] $r=.102$, $p<.001$ for suspect physical force; $r=.091$, $p<.001$ for suspect continuum of force; $r=.104$, $p<.001$ for suspect maximum force; $r=.047$, $p=.064$ for police physical force; $r=.125$, $p<.001$ for police continuum of force; and $r=.101$, $p<.001$ for police maximum force.

various race variables, this is again only exploratory to determine which race variables may act as predictors of suspect force. In the logistic regression of suspect physical force on the race variables, the second officer being white has a nearly significant positive relationship, and there being white only police officers has a significant negative relationship. The linear regression of the suspect continuum of force on the race variables indicates that the Hispanic suspect variable has a significant positive relation; the second officer being white has a significant negative relation; and white only police officers has a significant positive relation. Regressing suspect maximum force on the race variables indicates that a white second officer has a significant negative relation and white only police officers has a significant positive relation.

Logistic regression of police physical force on the race variables indicates that the second officer being white has a positive significant influence and all officers being white has a significant negative influence on the dependent variable. Regression of the suspect continuum of force on the race variables indicates that the second officer being white has a significant positive influence; white only police officers has a significant negative influence, and Hispanic only police officers has a significant positive influence. Finally, regressing police maximum force on the race variables, the first officer being white has a significant positive influence; the second officer being white also has a significant positive influence; white only police officers has a significant negative influence; and Hispanic only police officers is has a significant positive influence on the dependent variable.

Because all of the race variables being considered are dichotomous, such as whether or not the suspect is white, the next exploratory analyses between these variables and the force variables are t-tests. Only a few relationships are found to be significant. The presence of a white second officer has significant relationships with the suspect and police continuum of force and maximum force variables. In all of these relationships, cases in which the second officer is white have a higher average use of force. In addition, cases where the suspect is Hispanic have a significantly lower average use of suspect

maximum force. T-tests are not conducted using the physical measures of suspect or police force because these measures are dichotomous and t-tests are not appropriate for studying relationships between two dichotomous variables. Instead, crosstabs and chi-square values are used to study these relationships.

Crosstabs are conducted between the race variables and the physical and continuum measures of suspect and police force. Because the maximum force measures are interval, ranging from 0 to 100, crosstabs would not be appropriate. The following relationships are shown to be significant. Hispanic suspects are less likely to use physical force than non-Hispanic suspects. There is more likely to be physical suspect force in cases where the second officer is white (there is also more often police physical force when the second officer is white but this relationship is not significant, p=.064). There is more likely to be suspect and police continuum force when the second officer is white. And there is less likely to be police continuum force when the second officer is Hispanic.

These analyses provide some interesting though inconclusive findings, especially in the relations of police officer race and force variables. For instance, the second officer being white is significantly related to all three measures of both suspect and police force (though not for all types of analyses). Also of interest, the first officer being white, all white police officers, and all Hispanic police officers are significantly related in some of the analyses. Somewhat perplexing are the directions of some relationships. For instance, according to some analyses, white second officers increase police or suspect force; and white first officers also increase police or suspect force in some of the analyses. But in some relationships the presence of all white police officers reduces the amount of suspect or police force. This suggests that there may be important race interactions that we are not able to grasp using this data or these techniques. Therefore, it makes more sense to include race variables in the regression analyses according to a specified logic, as is done in the original study. Even though the second officer being white has the most significant and often the strongest relationships with force variables, it will not be

included as a predictor in the following regression analyses simply because an explanation cannot be offered as to why it has such an effect. It would not be appropriate to include predictors in a model without having reason for doing so other than the fact that they have a significant impact. The regression analyses in this study of suspect force will use the same race variables as are used in the original study of police force and the reanalysis. However, for the models not testing the significance of group variables, the variables white suspect, Black officer, Hispanic officer, Black-officer-white-suspect, and Hispanic-officer-white-suspect will be added to compensate for the lack of a reference category. Also for these models, though not included in the reference category, the variables white only police officers, Black only police officers, and Hispanic only police officers will be added.

Measures of Force

The methods of the original study require that any specific predictor be significant for all three measures of force to be included in the final model. The researchers were conservative because they did not want to include inconsistent predictors of police force. This is appropriate for the police force models because inconsistent predictors vary widely in which measures of force they influence. This can be seen by reviewing those variables significant in predicting one or two measures of force in Models 1, 2, or 4 of Chapter 2. However, in Model 3, the prediction of suspect force, seven of the 11 inconsistent predictors are identified in the continuum and maximum force models but are not significant in the physical force model. This suggests that the suspect physical force variable may fail to represent suspect force as well as the other two measures of suspect force, or as well as the police physical force variable represents police force. This may be due to differences in the questions regarding suspect force compared to those for police force,[24] or it may be that the recoding of suspect force into a dichotomous variable failed to grasp the variance in the same manner as the recoding of police force. Because the purpose of this new

[24] For instance, one question regarding police force was whether or not the suspect was handcuffed. A reversed question asking if the suspect handcuff the police would obviously not be appropriate.

analysis is to identify factors increasing the likelihood of force against police, it is important that likely predictors of suspect force not be excluded. For this reason, predictors found significant in the continuum and maximum suspect force models will be given increased consideration as consistent predictors in this study.

Missing Values

As explained in the reanalysis, missing values are replaced with variable means in the original study to avoid excluding large amounts of data. This also simplifies the testing of group variables because sample size must remain constant between models to do so. Each model in this study of suspect force will be reconstructed to test the effects of excluding cases with missing data.

Models to be Constructed in this Study

As previously explained, reversing the entire original study to focus on suspect use of force would involve reconstructing Models 1 through 4, reversing the roles of police and suspect force. Though this was the original intent, it would have limited value due to the redundancy of regressions. Instead, two models are constructed for the study of suspect force. First, Model 1 remains the same as Model 3 in the reanalysis, the regression of suspect force on the 41 predictors, excluding police use of force. To avoid the assumption that suspect force is most likely the result of police force, this model is not rejected as Model 1 is rejected in the original study and the reanalysis. Second, Model 2 is constructed the same as Model 1 except including police force as a predictor. These models are also tested to determine the effects of excluding the analysis of group variables and excluding cases with missing data. A final model is then developed integrating the results of Model 1 and Model 2.

The methodology used in constructing these models is the same as that employed in the original study

and the reanalysis. As explained in the "Regression Analyses" section of Chapter 2, constructing each model is a three step process. Step 1: the force variable is regressed on the 41 predictors, entering all predictors at once. Step 2: next, a similar regression is conducted using a stepwise method. Step 3: the final step simply consists of identifying the predictors found to be significant in either of these regressions and listing them as predictors for that model. Therefore, each regression model consists of six regressions, one standard regression and one stepwise regression for each of the three measures of force. Once significant predictors are identified for each measure of force, they are labeled as consistent non-predictors, inconsistent predictors, or consistent predictors. Consistent non-predictors are those found not to be significant in the regressions of any of the three measures of force. Inconsistent predictors significantly influence one or two measures of force, but not all three. However, predictors of both the continuum and maximum measures of suspect force will be included as consistent here, along with those identified as significant in the regressions of all three measures of force.

For all analyses, logistic regression is used for the dichotomous variable physical force and OLS regression is used for the continuum of force and maximum force. For the linear regression models, R^2 is used as a measure of explanatory power for the model. Pseudo R^2 is used as the measure of explanatory power in logistic models

Model 1: Suspect Force Regressed on the 41 Predictors

As explained above, Suspect Force Model 1 is the same as Police Force Model 3 from the reanalysis, the regression of suspect force on the 41 predictors, excluding police use of force. Below is a listing of insignificant and significant predictors as previously listed in Chapter 2.

Variables Not Significant in Predicting Any of the Three Measures of Suspect Force:

Police Assigned to Patrol Division
Suspect Already in Custody
More than One Officer at Initial Contact

Officer Dispatched to Scene
Arrest Occurred During the Weekend
Arrest Occurred at Night (After Dark)
Occurred During Weekend Night
Property Offense
Victim and Suspect Friends or Family
More than One Suspect at Initial Contact
More than One Suspect at Completion of Arrest
Bystanders Friends or Family of Suspect
Arrest Occurred at Residence
Location Known to Be Hazardous
Officer's Number of Arrests in Last Month
Years Since Officer's Last Training
Suspect Known to Has Criminal Record
Suspect Known to Be Assaultive or Resistive
Group Variable Sex
Group Variable Height
Group Variable Weight

Variables Significant in Predicting One Measure of Suspect Force:

Location Known for Criminal Behavior	M
Visibility at the Arrest Scene	C (-)

Variables Significant in Predicting Two Measures of Suspect Force:

Number of Officers Initially	C,M
Change in the Number of Police	C,M
Police Use of the Contact and Cover Tactic	C,M
Traffic Offense	C,M (-)
Bystanders Has Antagonistic Demeanor	C,M
Offense Occurred Inside, Not at a Residence	P,M (-)
Officer Part of Shift	P,M
Officer Length of Time on the Phoenix Police Department	C,M
Suspect Impaired by Drugs	C,M

Variables Significant in Predicting All Three Measures of Suspect Force:

Violent Offense
Vice Offense
Domestic Violence Offense
Bystanders Present at Arrest
Officer Required Past Medical Attention
Suspect Impaired by Alcohol
Suspect Associated with a Gang
Group Variable Age (Suspect Age (-))
Group Variable Race (Hispanic Suspect (-))

P = Physical Force, C = Continuum of Force, M = Maximum Force
(-) Indicates negative relationship (associated with less force).

Note that seven of the nine variables identified as significant in two models are for the continuum of force and maximum force models. Only two of these variables are identified in the physical force model. This pattern provides the reasoning for including these variables as consistent predictors of suspect force.

Model 1: Excluding the Analysis of Group Variables

The model is also tested excluding the analysis of group variables and excluding cases with missing values. Excluding the analysis of group variables identifies virtually the same variables as shown in the above model. The suspect being Hispanic and suspect age are identified as consistent predictors, the same variables identified in the group variables race and age for the above model. Additional variables for suspect and officer sex and race are included due to the lack of reference categories, but none of these variables are shown to have a significant effect. Pseudo and adjusted R^2 values are nearly identical: a pseudo R^2 of 10.3 (vs. 10.2 in model 1) in the linear regression suspect physical force; an adjusted R^2 of 10.6 (vs. 10.9) for the continuum of force; and an adjusted R^2 of 8.0 (vs. 7.9) for suspect maximum force. Though the full regression results are not included in this report, listed below are the variables identified as inconsistent and consistent predictors.

Variables Significant in Predicting One Measure of Suspect Force:

Black Officer	M
Black Only Police	M (-)
Difference in Height	P
Location Known for Criminal Behavior	M
Visibility	C (-)

Variables Significant in Predicting Two Measures of Suspect Force:

Bystander Antagonistic Demeanor	C,M
Number of Officers Initially	C,M
Change in Number of Officers	C,M
Use of Contacting Cover Tactic	C,M
Suspect Drug Impairment	C,M
Offense Occurred Inside	P,M (-)
Officer Length of Service	C,M
Traffic Offense	C,M

Variables Significant in Predicting All Three Measures of Suspect Force:

Suspect Age	(-)
Suspect Alcohol Impairment	
Domestic Offense[25]	
Suspect Gang Association	
Hispanic Suspect	(-)
Officer or Required Prior Medical Attention	
Officer Part of Shift[26]	
Vice Offense	
Violent Offense	
Presence of Bystanders	

Model 1: Excluding the Analysis of Group Variables and Cases with Missing Values (N=929)

Excluding cases with missing values reduced the sample size by 41.4% (from N=1585 to N=929) and reduced the model to four consistent predictors: the age difference between the suspect and officer, suspect alcohol impairment, traffic offense and violent offense. Pseudo and adjusted R^2 values are as follows: 11.2 (vs. 10.2 in the initial model) for physical force, 10.0 (vs. 10.9) for the continuum of force, and 7.0 (vs. 7.9) for maximum force. Though the full regression results are not included in this report, listed below are the variables identified as inconsistent and consistent predictors.

Variables Significant in Predicting One Measure of Suspect Force:

Officer Number of Arrests in Last Month	C	
Black Officer	M	
Black Only Police Officers	M	(-)
Number of Police Initially	C	
Change in the Number of Police	C	
Suspect Drug Impairment	C	
Victim and Suspect Friends or Family	M	(-)
Mail Officer	C	
More than One Suspect at Initial Contact	P	
Officer Weight[27]	M	(-)

[25] For physical suspect force p=.0587.

[26] For suspect continuum of force p=.0668.

[27] p=.0592

Variables Significant in Predicting Two Measures of Suspect Force:

Bystander Antagonistic Demeanor	C,M
Domestic Offense[28]	C,M
Hispanics Suspect	P,M (-)
Offense Occurred Inside	P,M (-)
Location Known for Criminal Behavior	C,M (-)
Officer Required Prior Medical Attention	P,C

Variables Significant in Predicting All Three Measures of Suspect Force:

Age Difference Between Suspect and Officer	
Suspect Alcohol Impairment	
Traffic Offense	(-)
Violent Offense	

P = Physical Force, C = Continuum of Force, M = Maximum Force
(-) Indicates negative relationship (associated with less force).

Model 2: Suspect Force Regressed on the 41 Predictors and Police Force

In the second model of suspect force, the three measures of suspect force are regressed on the 41 predictors and their opposing measure of police force, first in standard and then in stepwise regressions. All predictors are then categorized as consistent non-predictors, inconsistent predictors, or consistent predictors according to the number of suspect force measures the significantly influence. Full regression results are provided in Appendix C.

Suspect Physical Force: The logistic regression of physical suspect force on the 41 predictors and police physical force resulted in a pseudo R^2 value of 26.2 and identifies the following variables as significant: officer part of shift, officer required prior medical attention, violent offense, offense occurred inside the not data residence, the group variables age, race, and height, and police use of physical force. The following stepwise regression identifies vice offense.

Suspect Continuum of Force: The linear regression of the suspect continuum of force on the 41

[28] For suspect maximum force p=.0573.

predictors and police force produces an adjusted R^2 of 25.9 and identifies: police assigned to the patrol division, police part of shift, officer length of service, officer required prior medical attention, the number of police initially, suspect drug impairment, suspect to alcohol impairment, violent trends, arrest occurred at night, bystander antagonistic demeanor, the group variable age, the group variable race (near significant, p=.0566), and the police continuum of force. The following stepwise regression identifies: suspect gang association, traffic offense, and the group variable sex.

Suspect Maximum Force: Regressing suspect maximum force on the 41 predictors and police force produces an adjusted R^2 of 17.0 and identifies the following as significant: officer part of shift, officer length of service, officer required prior medical attention, suspect drug impairment, suspect alcohol impairment, violent offense, vice offense, offense occurred inside, arrest occurred at a residence, bystander presents, bystander antagonistic demeanor, the group variables age and race, and police maximum force. The following stepwise regression does not identify any additional predictors.

Variables identified in these regressions are listed below according to the number of suspect force measures they influence.

Variables Not Significant in Predicting Any of the Three Measures of Suspect Force:

Suspect Already in Custody
More than One Officer at Initial Contact
Change in the Number of Police
Use of Contact and Cover
Officer Dispatched to Scene
Arrest Occurred During the Weekend
Occurred During Weekend Night
Property Offense
Domestic Offense
Victim and Suspect Friends or Family
More than One Suspect at Initial Contact
More than One Suspect at Completion of Arrest
Bystanders Friends or Family of Suspect
Location Known to Be Hazardous
Location Known for Criminal Behavior
Visibility at Arrest Scene

Officer's Number of Arrests in Last Month
Years Since Officer's Last Training
Suspect Known to Be Assaultive or Resistive
Suspect Known to Has Criminal Record
Group Variable Weight

Variables Significant in Predicting One Measure of Suspect Force:

Suspect Gang Association	C
Arrest Occurred at a Residence	M (-)
Arrest Occurred at Night	C (-)
Number of Police Initially	C
Police Assigned to Patrol Division	C
Traffic Offense	C
Presence of Bystanders	M
Group Variable Height	P
Group Variable Sex	C

Variables Significant in Predicting Two Measures of Suspect Force:

Suspect Alcohol Impairment	C,M
Suspect Drug Impairment	C,M
Bystander Antagonistic Demeanor	C,M
Offense Occurred Inside	P,M (-)
Officer Length of Service	C,M
Vice Offense	P,M

Variables Significant in Predicting All Three Measures of Suspect Force:

Officer Required Prior Medical Attention
Officer Part of Shift
Violent Offense
Group Variable Age (Suspect Age (-), Age Difference[29] (-))
Group Variable Race[30] (Hispanic Suspect (-))
Police Use of Force

(-) Indicates negative relationship (associated with less force).
P = Physical Force, C = Continuum of Force, M = Maximum Force

[29] The difference in age between the suspect officer is identified in the continuum of force and maximum force models, but not in the physical force model. The variable is coded negative for an older suspect and positive for an older officer. Therefore, the negative relationship indicates that the suspect being older than the officer increases the likelihood of the suspect using force against the officer (even though, in general, a younger suspect is more likely to use force).

[30] For suspect continuum of force p=.0566.

Adding police use of force as a predictor substantially reduces the number of other predictors identified as significant. Removed from the previous model are the following variables: number of officers initially, change in the number of police, police use of the contacting cover tactic, traffic offense, domestic offense, bystander presents at the arrest, and suspect gang association. No additional variables are added in Model 2 other than police use of force. However, including suspect use of force greatly increases the explanatory power of the regression models. The pseudo R^2 for suspect physical force increases from10.2 to 26.2; the adjusted R^2 for the suspect continuum of force increases from 10.9 to 25.9; and the adjusted R^2 for maximum force increases from 7.9 to 17.0. Again, a number of variables are identified in the continuum of force and maximum force models and will be included as consistent predictors in the final model.

Model 2: Excluding the Analysis of Group Variables

Excluding the analysis of group variables has little affect, as the variables identified as predictors of two or three measures of suspect force are nearly identical to those in the previous model including group variables. Though the model does not include a test for the significance of group variables, the same age and race variables are identified as in the initial model with the group variable requirements. Additional variables for suspect and officer sex and race are included due to the lack of reference categories, but none of these variables demonstrate significant effects. As in Model 1, excluding group variables has little effect on the pseudo and adjusted R^2 values: 26.1 (vs. 26.2 in the previous model) for suspect physical force; 25.7 (vs. 25.9) for the continuum of force; and 17.3 (vs. 17.0) for suspect maximum force. Though full regression results for these models are not included in this report, the inconsistent and consistent predictors are listed below.

Variables Significant in Predicting One Measure of Suspect Force:

Officer Age	M
Black Only Police	M (-)
Officer and Suspect Male	C

Black Police White Suspect	M
Suspect Gang Association	C
Difference in Officer and Suspect Height	P
Arrest Occurred at a Residence	M (-)
Arrest Occurred at Night	C (-)
Officer Assigned to Patrol Division	C
Traffic Offense	C (-)
Bystander Presence	M

Variables Significant in Predicting Two Measures of Suspect Force:

Difference in Officer and Suspect Age	C,M (-)
Suspect Alcohol Impairment	C,M
Bystander Antagonistic Demeanor	C,M
Suspect Drug Impairment	C,M
Arrest Occurred Inside	P,M (-)
Officer Length of Service	C,M
Vice Offense	P,M

Variables Significant in Predicting All Three Measures of Suspect Force:

Suspect Age	(-)
Hispanic Suspect	(-)
Officer Required Prior Medical Attention	
Officer Part of Shift	
Violent Offense	
Police Use of Force	

Model 2: Excluding the Analysis of Group Variables and Cases with Missing Values (N=929)

Excluding cases with missing values reduces the sample size by 41.4% (from N=1585 to N=929) and reduces the model to five consistent predictors: Black only police, location known for criminal behavior, suspect alcohol impairment, traffic offense, and police use of force. Pseudo and adjusted R^2 values are as follows: 26.1 (vs. 26.2 in the initial model) for physical force, 26.9 (vs. 25.9) for the continuum of force, and 18.4 (vs. 17.0) for maximum force. Though full regression results for these models are not included in this report, the inconsistent and consistent predictors are listed below.

Variables Significant in Predicting One Measure of Suspect Force:

Black Officer	M
Bystander Antagonistic Demeanor	C
Suspect Drug Impairment	C
Victim and Suspect Friends or Family	M

Hispanic Suspect	P
Offense Occurred Inside	M
Officer Length of Service	C
Violent Offense	M
Officer Weight	M

Variables Significant in Predicting Two Measures of Suspect Force:

Difference in Officer and Suspect Age	P,M
Black Only Police	C,M (-)
Location Known for Criminal Behavior	C,M (-)

Variables Significant in Predicting All Three Measures of Suspect Force:

Suspect Alcohol Impairment	
Traffic Offense	(-)
Police Use of Force	

Summary: Developing the Final Model of Suspect Force

Two models are included in this study of police force, one excluding police force as a predictor and one including police force. In the original study of police force and the reanalysis, Model 1 is rejected because suspect force provides the strongest predictor of police force. This follows the premise that police force, in general, should be in response to suspect force, though this is not always the case. Model 1 in this study of suspect force excludes police use of force as a predictor. Even though police use of force is the strongest relationship to suspect force in Model 2, Model 1 is not rejected based on the premise that suspects are more likely to be the first to use force. Again, this is only a guideline to follow and is not always the case. Because the data do not include the time sequencing of events, we are not able to determine who is first to use force. Table 3-1 below includes all of the variables identified as significant predictors in two or three measures of suspect force for Models 1 and 2.

Table 3-1: Predictors of Suspect Force

Model 1		Model 2	
Number of Officers Initially	C,M		
Change in the Number of Police	C,M		
Police Use of Contact and Cover	C,M		
Bystanders Present at Arrest			
Bystander Antagonistic Demeanor	C,M	Bystander Antagonistic Demeanor	C,M
Traffic Offense	C,M		
Vice Offense		Vice Offense	P,M
Domestic Violence Offense			
Violent Offense		Violent Offense	
Suspect Alcohol Impairment		Suspect Alcohol Impairment	C,M
Suspect Drug Impairment	C,M	Suspect Drug Impairment	C,M
Suspect Associated with a Gang			
Group Variable Age (Suspect Age (-))		Group Variable Age (Suspect Age (-))	
		(Age Difference (-))	
Group Variable Race (Hispanic Suspect (-))		Group Variable Race (Hispanic Suspect (-))	
		Police Use of Force	
Offense Occurred Inside	P,M (-)	Offense Occurred Inside	P,M (-)
Officer Required Past Medical Attention		Officer Required past Medical Attention	
Officer Part of Shift	P,M	Officer Part of Shift	
Officer Length of Service	C,M	Officer Length of Service	C,M

P = Physical Force, C = Continuum of Force, M = Maximum Force
(-) Indicates negative relationship (associated with less force).
Variables in shased cells excluded from the final model.

As explained in the introduction, many variables are identified as significant predictors of the suspect continuum of force and suspect maximum force but are not significant predictors of suspect physical force. It is possible that the suspect physical force variable fails to represent suspect force as well as the other two measures, or as well as the police physical force variable represents police force. Because this study is intended to identify factors that increase the potential for force against police, it is important that potential predictors not be excluded. Therefore, variables identified as predictors of both the continuum of force and maximum force are included in the final model, the same as predictors of all three measures of force. However, the offense occurring inside, which is identified in the police physical force model along with police maximum force, will be excluded.

The final model also excludes the three variables pertaining to officer characteristics: the officer

requiring past medical attention, officer part of shift, and officer length of service. The influence of these variables does not make sense except as the product of officer behavior. It may be that these officers use more aggressive tactics that increase the likelihood of suspect force against them. This demonstrates the complexity of interactions between police and suspects during an arrest. It also demonstrates the importance of time sequencing in determining causation, if suspect force resulted in police force or vice versa. All variables remaining in the final model of suspect use of force are listed below.

Final Model: Predictors of Suspect Force

Number of Officers Initially
Change in the Number of Police
Police Use of the Contact and Cover Tactic
Bystanders Present at the Arrest
Bystander Antagonistic Demeanor
Traffic Offense (-)
Vice Offense
Domestic Violence Offense
Violent Offense (Excluding Domestic Violence)
Suspect Alcohol Impairment
Suspect Drug Impairment
Suspect Association with a Gang
Suspect Age (-)
Suspect Younger than the Officer (-)
Hispanic Suspect (-)
Police Use of Force

Four predictors are shown to have a negative relationship with suspect force. Suspect use of force is less likely to occur when the arrest involves a traffic offense, an older suspect, an officer older than the suspect, or a Hispanic suspect. Though the age findings appear contradictory, one possible explanation is that younger suspects in general are more likely to use force against police. However, suspects ranging in age from perhaps 30 to 40 years old may be more likely to use force against younger officers who are perhaps only in their twenties.

Much attention is given to the analysis of group variables in this Chapter and Model 1 and Model 2 are each reconstructed excluding the analysis of group variables to ensure potentially significant predictors are not excluded. This is found to has little affect on the models. The same predictors are identified

except rather than testing and identifying group variables, the individual variables themselves are identified as significant. For instance, in Model 1, the group variable age is found to be a consistent predictor of all three measures of suspect force. The test model excluding the analysis of group variables identifies suspect age as a consistent predictor for all three measures of force. None of the variables added to compensate for the lack of a reference category are identified as consistent predictors.

In the original study of police force, in the reanalysis of that study, and in the primary models in this study of suspect force, missing values are replaced with variable means to prevent the exclusion of these cases in the regression models. Both models of suspect force are reconstructed excluding cases with missing data to study the effects. Excluding cases with missing values reduces the sample size by 41.4%, from N=1585 to N=929, and also reduces the number of significant predictors identified in both models. The predictors identified as significant for either two or three measures of force in Models 1 and 2 are listed below in Table 3-2.

Table 3-2: Predictors of Suspect Force Excluding Cases with Missing Values (N=929)

Model 1		Model 2	
Location Known for Criminal Behavior	C,M (-)	Location Known for Criminal Behavior	C,M (-)
Bystander Antagonistic Demeanor	C,M		
Domestic Violence Offense	C,M		
Traffic Offense	(-)	Traffic Offense	(-)
Violent Offense			
Hispanic Suspect	P,M (-)		
		Black Only Police	C,M (-)
Offense Occurred Inside	P,M (-)		
Officer Required Prior Medical Attention	P,C		
Age Difference Between Suspect and Officer		Age Difference Between Suspect and Officer	
Suspect Alcohol Impairment		Suspect Alcohol Impairment	
		Police Use of Force	

P = Physical Force, C = Continuum of Force, M = Maximum Force
(-) Indicates negative relationship (associated with less force).
Variables in shased cells are not included in initial model.

Only two predictors are significant in these models that are not identified in the initial models including cases with missing values. The location being known for criminal behavior, interestingly, reduces the likelihood of suspect force, as does the presence of only Black police officers. Just as important are the variables excluded from these models. The following variables are included in the initial Models 1 and 2 but are not identified in the models excluding cases with missing values: number of officers initially, change in the number of police, police use of the contact and cover tactic, officer length of service, vice offense, bystander presence at the arrest, officer part of shift, suspect drug impairment, and suspect association with a gang. The influences of these variables may be questionable because they fail to provide significant results when cases with missing data are excluded from the analysis.

It is difficult to assess if it more appropriate to exclude cases with missing data from the model or replace missing data with variable means and possibly skew the results. Excluding missing data has little effect on the pseudo R^2 and adjusted R^2 values, as shown in Table 3-3 below. However, the test models that exclude missing data provide these similar values with fewer significant predictors. It may be more appropriate to exclude cases with missing values.

Table 3-3: Pseudo and Adjusted R^2 Values for Suspect Force Models Including and Excluding Missing Values

	Model 1		Model 2	
	Including	**Excluding**	**Including**	**Excluding**
Physical	10.2	11.2	26.2	26.1
Continuum	10.9	10.0	25.9	26.9
Maximum	7.9	7.0	17.0	18.4

Pseudo R^2 values used for the logistic regressions of suspect physical force.
Adjusted R^2 values used for the linear regressions of the continuum of force and maximum force.

A New Model of Police and Suspect Force

Similarly to the original study, a final graphical model is included at the end of Chapter 2 in this report depicting influences on police force, influences on suspect force, and the influence of suspect force on police force. Assuming that police use force in response to suspect use of force, the original methodology does not allow for the potential of police force to influence suspect force. However, this study provides evidence that some amount of suspect force can be explained by police use of force. From a strictly substantive assessment of the analyses so far, police are as likely to cause suspects to use force as the suspects are to cause the police to use force, though at different magnitudes based on the interval and ratio measures of force. According to the regression analyses, suspect use of force against police results in a lesser increase in police force than vice versa. Police use of force against a suspect is likely to result in a greater increase of force by the suspect.[31]

This study also provides evidence of the complexity of interactions between police and suspects during an arrest. Not knowing who acted first, some consideration must be given to the potential for police use of force to result in responsive suspect use of force. In addition, the second model of suspect force identifies predictors not included in the first model. A new model of police and suspect force can be constructed using the predictors of police force from Chapter 2 and the predictors of suspect force identified in this chapter, as listed below. This model includes influences on police force, influences on suspect force, and the interaction of police force and suspect force. A graphic representation of the model is provided in Figure 3.1.

---

[31] Comparing Police Force Model 2, regression of police force on suspect force and the 41 predictors and Suspect Force Model 2, regression of suspect force on police force and the 41 predictors. Regressing police force, the regression coefficients of suspect force are B=0.32 for the continuum of force and B=0.27 for maximum force. Regressing suspect force, the regression coefficients of police force are B=0.53 for the continuum of force and B=0.37 for maximum force. P=.0001 for each.

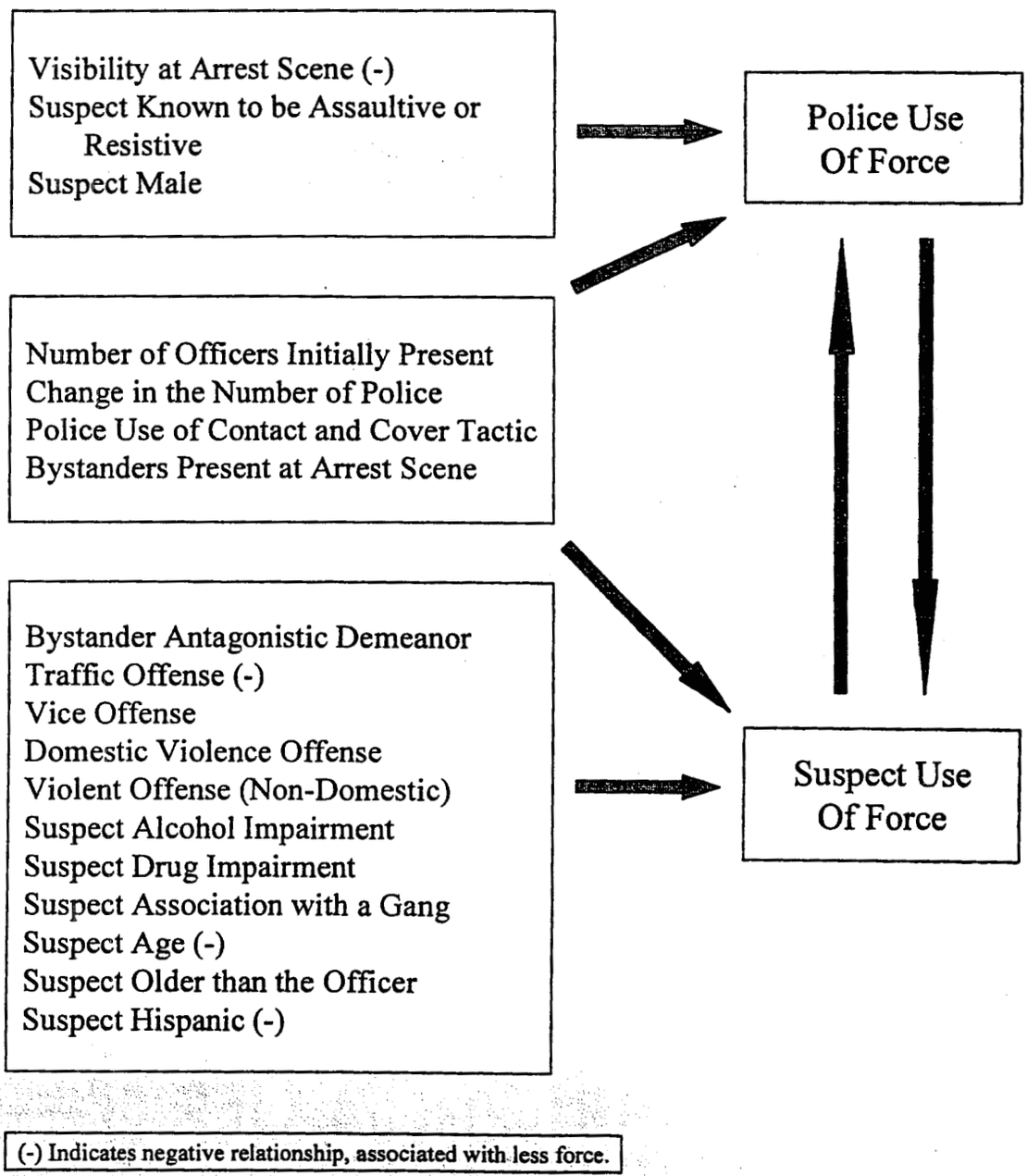
Predictors Included in the Final Model of Police and Suspect Force

Predictors of Police Force	Predictors of Suspect Force
Number of Officers Initially at the Scene	Number of Officers Initially
Change in the Number of Police	Change in the Number of Police
Police Use of the Contact and Cover Tactic	Police Use of the Contact and Cover Tactic
Bystanders Present at Arrest	Bystanders Present at the Arrest
Visibility at Arrest Scene (-)	Bystander Antagonistic Demeanor
Suspect Known to be Assaultive or Resistive	Traffic Offense (-)
Suspect Male	Vice Offense
Suspect Use of Force (Predicted)	Domestic Violence Offense
	Violent Offense (Excluding Domestic Violence)
	Suspect Alcohol Impairment
	Suspect Drug Impairment
	Suspect Association with a Gang
	Suspect Age (-)
	Suspect Younger than the Officer (-)
	Hispanic Suspect (-)
	Police Use of Force

(-) Indicates a negative relationship (associated with less force).

In the new model, factors increasing the likelihood of police force include poor visibility at the scene, the suspect known to be assaultive or resistive and the suspect being male. The number of officers initially at the scene, change in the number of officers, police use of the contact and cover tactic, and bystander presence at the arrest all increase the likelihood of both police and suspect force. Each of the following increase the likelihood of suspect use of force: bystander antagonistic demeanor, vice offense, domestic violence offense, violent offense, suspect alcohol impairment, suspect drug impairment, suspect association with a gang and the suspect being older than the officer. The situation involving a traffic offense, a younger suspect or a Hispanic suspect each decrease the likelihood of suspect force. In addition to police force and suspect force being influenced by the identified predictors, they are shown in the final model to influence each other.

Figure 3-1: Model of Police and Suspect Force



(-) Indicates negative relationship, associated with less force.

Chapter 4
Reconstruction of the Richmond Citizen Compliance Study

A Review of the Original Richmond Compliance Study

In a 1996 NIJ sponsored study, Mastrofski, Snipes and Supina 1996 investigate factors likely to result in citizen compliance to officer requests or demands. The approach is based on aspects of social control and psychological interactionism. Social control considerations (calculative factors) involved the processes of rational decision making and potential deterrence; the idea that people comply to avoid negative consequences. Interactionist considerations (legitimizing factors) involve the perceived legitimacy of the officer and what they stand for, namely the law; people comply either because it is morally right to do so or because they believe police have the right to tell them what to do. Also considered are citizen predisposition for compliance and police skill in obtaining compliance. To collect the data, observational researchers rode along with police officers in 1992 in Richmond, Virginia. They collected data on 346 incidents where police requested or demanded some sort of citizen compliance. Below is a summary of the variables recorded and used in the study.

Instrumental (Calculative) Factors

Citizen stakes in compliance are measured by problem seriousness and the size of citizen audience. Problem Seriousness is measured by the nature of the situation: 1) traffic, 2) minor offense, disturbance or nuisance, 3) drugs, or 4) serious offense such as a burglary or robbery. The authors offer two hypotheses. One is that citizens in less serious situations will be less likely to take risks and/or increase the costs. The other is that citizens in more serious situations already have more at stake and therefore are more likely to comply to avoid increasing the potential cost. A larger audience is hypothesized to make compliance less likely.

Measures of both police and citizen coercive capacity are included to determine the coercive balance of

power. Police coercive capacity is measured by the number of officers present and the sex of the first officer. More officers and male officers are hypothesized to be more coercive and therefore more likely to gain compliance. Citizen possession of a weapon is hypothesized to increase their coercive capacity and thus reduce the likelihood of compliance. If the police asked a third party (another citizen) to help control the targeted citizen is also recorded.

Authoritativeness of police tactics is measured at the initiation of the encounter and in the expressive nature of the police request. The nature of the officer's initial presentation is recorded as friendly, interrogative, commanding, threatening, or forceful. Authoritativeness of the request is measured as a suggestion, request, persuasion, command, threat. It is hypothesized that increased police use of authority will decrease the likelihood of compliance.

Citizen capacity for rational judgement is measured with a three point scale according to the number of irrational elements demonstrated by the citizen: intoxication, mental disorder, or a heightened emotional state. They hypothesize that increased irrationality will decrease the citizens ability to form accurate perceptions and make them less responsive to police tactics, decreasing the likelihood of compliance.

Normative (Legitimizing) Factors

Procedural legitimacy, involving police protecting the rights of citizens and police adherence to rules, is measured in part by who initiated the encounter, the officer or citizen. A citizen approaching an officer is considered to demonstrate an acknowledgment of the officer's legitimacy. The study differentiates between suspects and non-suspects, hypothesizing that those whom the police identify as suspects are less likely to view the intervention as legitimate and less likely to comply. Also considered is the showing of respect or concern by the officer toward the citizen. An officer showing respect is hypothesized to increase their legitimacy as perceived by a citizen and thus increase the likelihood of compliance.

Substantive legitimacy, "the perceived fairness of what the officer wants the citizen to do" (Mastrofski et al. 1996:286), is measured in part by the strength of evidence implicating the citizen in an offense and the officer mentioning the illegality of a citizen's actions. Stronger evidence and reference to illegal behavior are hypothesized to increase the legitimacy of police requests and thus increase the likelihood of compliance. An incidence occurring in a public or police controlled location, as opposed to a private location such as a person's home, is hypothesized to increase police legitimacy. Also considered is the presence of a disputant having a close or intimate relationship with the reporting citizen, which is hypothesized to diminish police legitimacy as perceived by the target citizen.

Citizen Predisposition For Compliance

Citizen age, apparent wealth, and sex are used as indicators of their predisposition for compliance with younger, poorer, and male citizens hypothesized as less likely to comply. Race is recorded considering racial similarities or differences between the officer and citizen in order to "explore the implications of status differences between the two" (Mastrofski et al. 1996:287). Also included as indicators of "social bondedness" are if the citizen is known or a stranger to the officer and community. Citizens who live, work, or own property in the area of the encounter are considered tied to the community. The bond between an officer and citizen is recorded based on their being strangers or knowing each other. Citizen association with the community and/or officer is hypothesized to increase the likelihood of compliance.

Officer Level of Skill and Work Orientation

Indicators of an officer's skill in gaining compliance include years of experience and their views toward the Richmond community policing program. More experienced officers and those supportive of community policing (and thus more community oriented) are hypothesized to be more likely to gain compliance.

Methods and Analysis of the Original Study

Findings of the Richmond study are based on the logistic regression of citizen compliance on the dependent variables. Following are a summary of their findings and a regression table as shown in the article, shown as Table 4-1 in this report.

Instrumental (Calculative) Factors: Variables no having a significant effect include: size of the audience, officer sex, citizen possessing a weapon, police using interrogation as an entry tactic, police stating commands or threats as an entry tactic, police using persuasion or negotiation in making their request, police making commands or threats in stating their request, and police mobilization of a third party. Officers who initiate contact with a high degree of authoritativeness (force) are much less likely to gain compliance. Contrary to the hypothesis, increasing the number of officers lowers the likelihood of compliance. Citizens are less likely to comply in instances involving more serious problems. Less rational citizens are less likely to comply.

Normative (Legitimizing) Factors: Variables found not to be significant include: citizen initiated encounter, the citizen being a victim or other non-suspect, officer showing respect, officer mentioning illegality, and a citizen in conflict with an intimate present. Officers who show disrespect to the citizen are significantly less likely to gain compliance. Compliance increases with the strength of evidence. Occurrences in public (police controlled) settings have almost five times the odds of compliance of those in private settings.

Compliance Predisposition: Variables not found to have a significant effect included: citizen age, minority officer and minority citizen, and citizen ties to the neighborhood. Poor citizens are significantly less likely to comply. Males and minority citizens are more likely to comply. White officers dealing with minority citizens are more likely to gain compliance than all other pairings. Minority officers dealing

with white citizens are significantly less likely to gain compliance than any other racial combination. Being known to the police (either as a trouble maker or not) decreases the likelihood of compliance.

Officer Skill and Work Orientation: More experienced officers and those supportive of community policing are both significantly more likely to gain compliance.

Discussion of Original Results

Overall, the instrumental, calculative factors (those involving rational decision making) are shown to have little influence on citizen compliance. Of the instrumental variables identified as significant, police use of force is the only factor police are able to control. There is evidence of stronger influences due to legitimizing factors. Essentially, officers are more likely to gain compliance when suspects perceive them and/or their intentions to be legitimate.

Officers who initiate contact with a high degree of authoritativeness (force) are significantly less likely to gain compliance, but initiating contact with lesser degrees of authoritativeness (interrogation, commands or threats) does not increase the likelihood of compliance. Similarly, an officer showing disrespect reduces the likelihood of compliance but showing increased respect fails to increase the likelihood of compliance. Because of this the authors state that "police officers may be able to do little to enhance their cause but a great deal to hurt it" (Mastrofski et al. 1996:296).

Table 4-1: Mastrofski Et Al. Logistic Regression of Citizen Compliance[32]

Calculation of Encounter Outcomes	Regression Coefficient	Standard Error	Exponentiated Value (b)
Stakes			
Problem Seriousness	-0.682***	0.214	0.506
Size of Citizen Audience	0.088	0.184	1.092
Coercive Balance of Power			
Number of Additional Officers Present	-0.534*	0.244	0.586
Male Officer	-0.565	0.645	0.568
Citizen Has Weapon	0.753	1.238	2.123
Authoritativeness of Entry Tactics			
Interrogation	-0.632	0.537	0.532
Command or Threat	0.525	0.580	1.691
Force	-2.619***	0.818	0.073
Authoritativeness of Request			
Persuasion or Negotiation	0.140	0.590	1.151
Command or Threat	0.583	0.481	1.790
Police Mobilized Third Party	0.493	0.708	1.637
Citizen Capacity for Rational Judgment			
Number of Irrational Elements	-0.598*	0.310	0.550
Legitimizing Factors			
Citizen Initiated Encounter	0.682	0.518	1.978
Victim, Other Non-suspect	0.405	0.534	1.500
Officer Showed Respect	0.089	0.391	1.094
Officer Showed Disrespect	-1.421*	0.625	0.242
Evidence Strength	0.420**	0.139	1.522
Officer Mentions Illegality	0.402	0.464	1.495
Public / Police-Controlled Location	1.637***	0.489	5.142
Citizen in Conflict with Intimate Present	-0.707	0.484	0.493
Citizen's Compliance Predisposition			
Citizen Young (<20 Years Old)	-0.025	0.528	0.975
Citizen Poor	-1.407***	0.433	0.245
White Officer / Minority Citizen	1.463**	0.536	4.318
Minority Officer / White Citizen	0.570	0.580	1.769
Minority Officer / Minority Citizen	-2.077*	1.090	0.103
Citizen Male	1.181**	0.424	3.258
Citizen Ties to the Neighborhood	0.033	0.466	1.034
Citizen Known	-1.951***	0.555	0.142
Police Skill and Work Orientation			
Years of Police Experience	0.103**	0.035	1.109
Community Policing Orientation	0.772***	0.178	2.164
Constant	-2.225	1.323	
N	346		
Pseudo R^2	.288		

*p<.05; **p<.01; ***p<.001 (all tests two-tailed).

[32] Regression results as shown in Table 3 of Mastrofski et al. 1996.

Reconstruction of the Richmond Compliance Study Using Phoenix Use of Force Data

Differences between the Phoenix Use of Force Study and the Richmond Compliance Study

There are several important differences, both conceptual and methodological, between the Phoenix and Richmond studies. First, the Richmond unit of analysis includes all observed police-citizen encounters whereas the Phoenix unit of analysis is all arrests. Therefore, the Richmond study is of *citizen* compliance, but this study, using Phoenix data, is of *suspect* compliance. Second, the Richmond data includes time ordering, the sequencing of events, and Phoenix does not. Both studies acknowledge the importance of the time sequencing in understanding police-citizen interactions (Garner et al, 1995; Mastrofski et al., 1996). Third, the Richmond data, recorded by third party interviewers, are subject to observer interpretations whereas the Phoenix data, recorded by police officers, are subject to officer interpretations. Finally, a number of the variables recorded in the compliance study are not included in the Phoenix study, so not all of the same or similar variables can be used in this reconstruction. The Phoenix data include few of the legitimizing factors found to have significant effects in the original study. Though the nature of the data from the Phoenix study differs from that of the Mastrofski study, considerable effort is given to formatting the variables to be used as similarly as possible as those in the Mastrofski study. Below are descriptions of how the variables are formatted and why some variables can not be included.

Variable Descriptions

In the Mastrofski et al. study, compliance is a dichotomous variable. The article states: "Observers noted how the citizens responded to each request that police made. If the citizens complied or indicated a willingness to do so in the future, then the citizens were coded as compliant. Those who explicitly refused, who failed to comply, or who gave no indication that they would comply in the future were coded as noncompliant. Some citizens are asked to comply in two or three ways. When different

requests were made, citizens were considered noncompliant if they failed to comply with *any* of them before an arrest was made or the encounter was otherwise terminated" (Mastrofski et al., 1996:281). It is also stated in an endnote that they "coded the citizen as compliant if he or she ultimately complied (before arrest, if one was made)" (Mastrofski et al., 1996:301). The Phoenix instrument offered a check box for "Suspect Response: immediate compliance with officer's orders." Care must be taken in comparing this measure of compliance with the Mastrofski measure. Not only is the concept of compliance open to interpretation by police officers in the Phoenix study, it is also presented as a one-shot occurrence during the initiation of the encounter. There is nothing on the instrument indicating how the officer should record compliance if the suspect complied to demands at the beginning of the encounter but was noncompliant later.

Instrumental (Calculative) Factors

Problem seriousness is measured with a four point scale in the Richmond study. First, or least serious, are traffic offenses. Second are "a broad range of minor offenses, disturbances, and nuisances" (Mastrofski et al., 1996 301). Drug offenses are third and the most serious category consists of violent offenses, burglary, auto theft, felonies and more serious misdemeanors. The Phoenix data include arrest codes from the arrest reports for each case, which are recoded into the previously described four categories. Missing values are replaced with variable means.

Richmond audience size is represented using the square root of the actual number of citizens present because a small number of cases having very large values, resulting in values ranging from 0-10. The Phoenix data provide variables for the number of suspects and bystanders both at the onset and at the conclusion of the incident, all ranging from zero to five (five including larger values, "five or more"). This study uses the sum of suspects and bystanders present at the initiation of the incident, resulting in a variable ranging from zero to 10 as in the original study. It is assumed that the presence of others at the

beginning of the incident will already have affected the suspect's willingness to comply.

The number of additional officers present is represented by a variable ranging from zero to six in the Mastrofski study. The new analysis uses a Phoenix variable ranging from zero to five, similar to the variables used for the number of suspects and bystanders present. Officer sex is recorded as a dummy variable in the Mastrofski study, male or not male. A similar variable is provided in the Phoenix data. For suspect or citizen weapon possession, the Phoenix data provide a variable formatted the same as that used in the Mastrofski study, a dichotomous variable representing if the suspect does or does not possess a weapon.

In the Mastrofski study, "authoritativeness toward the target citizen was measured when the officer first encountered him or her and when the officer asked for compliance" (Mastrofski et al., 1996:285). These two measures of police authoritativeness are represented with two groups of dichotomous variables. The entry approach taken by police is coded into four variables: friendly conversation, interrogation, commanding or threatening communication, or forceful intervention. The "style by which officers expressed their preferences for citizen compliance" (Mastrofski et al., 1996:285) is coded into three variables: suggestion or request, persuasion or negotiation, and command or threat. Because the Phoenix data do not allow for the time sequencing of events, the distinction between early and latter police methods cannot be made; but the Phoenix data do provide information concerning the officer's voice. The instrument allows officers to mark if they were conversational, commanding, threatening, or shouting/cursing, with the instructions explaining to mark all that apply. These responses are represented by dichotomous variables formatted the same as in the Mastrofski study. For this study, these responses are reduced to two variables. The first is if the officer used a conversational voice, leaving the variable as provided in the data. The second combines the responses of the other three options: if the officer made commands, verbal threats, or was shouting or cursing. Officer use of force is represented by a dichotomous variable provided in the Phoenix data, if the officer used force or did not. The limitations

of these variables and lack of time sequencing of events presents one of the greatest limitations of this data compared to that in the Mastrofski study.

Also important is the use of reference categories for these groups of variables in the original study. As previously explained, authoritativeness of entry tactics is represented by four dummy variables and authoritativeness of request is represented by three dummy variables. Authoritativeness of the request is used here as an example. Three dichotomous variables, if the officer made a suggestion or request, if the officer used persuasion or negotiation, or if the officer made a command or threat, together represent the authoritativeness of the officer in making their request to the citizen. Essentially, these three dummy variables constitute a single variable with three possible values in the regression analysis. Only one of the three is recorded as yes (or 1) and the other two are recorded as no (or 0) for each case. This enables the use of a reference category for which the other variables can be compared to. The officer making a suggestion or request is used as a reference category for this group of variables and thus not included as a predictor in the regression analysis. The remaining two dummy variables, persuasion or negotiation and command or threat are included in the regression and compared to the reference group. This type of analysis is not possible with the Phoenix data. On the Phoenix instrument, officers were provided with options for tone of voice and instructed to mark all that apply. More than one option may be marked for a particular case, not allowing for the analysis of a reference group. Therefore, all three Phoenix variables described above are included in the regression for this analysis.

Observers collecting the Mastrofski data recorded if "police mobilized third parties at the scene of an encounter as a way to help or control the citizen targeted for compliance" (pg. 285). There is no similar variable included in the Phoenix data and us this measure could not be included. The Mastrofski study includes an interval variable ranging from zero to three based on evidence of the following suspect characteristics: intoxication, mental disorder, or a heightened emotional state. The Phoenix data provides only one dichotomous variable representing if the suspect is impaired by either drugs or alcohol.

Normative (Legitimizing) Factors

A dichotomous variable describing if the encounter was initiated by the citizen is included in the compliance study. This information is not available in the Phoenix data. They also include a variable indicating if the citizen involved was a suspect or non-suspect. Because the Phoenix data includes only citizens who were arrested, they were all suspects and this distinction cannot be made for this study.

The officer showing respect and showing disrespect are each represented by dummy variables in the Compliance study. No similar data is included in the Phoenix study beyond the officer's tone of voice and use of force as explained above. The strength of evidence against the citizen is measured according to a scale from zero to six and the officer mentioning the illegality of citizen actions is measured with a dummy variable. Again, no similar variables are included in the Phoenix data.

The Mastrofski study includes a dichotomous variable describing if the encounter was initiated in an area offering police greater authority to intervene in citizen affairs, such as a public area or police controlled area. The Phoenix data includes a variable ranging from one to 17, describing if the arrest occurred at a residence, restaurant, store, parking lot, etc. This variable is recoded into a dummy variable according to the description provided in the compliance study. The compliance data include a variable for the presence of a "disputant having a close or intimate relationship with the targeted citizen" (Mastrofski et al., 1996:286). Though not identical to this measure, the Phoenix data include a dummy variable indicating if the victim and suspect are friends or family.

Citizen Predisposition For Compliance

Mastrofski et al. represent citizen age with a dummy variable indicating if the person was below age 20 or not. In the Phoenix data, age is measured as an ordinal variable ranging from one to six, with the

lowest category including suspects under age 21. This variable is recoded into a dummy variable indicating those included in this lowest age category vs. the other categories combined. No description is provided for how the citizen's "apparent wealth" is measured in the Richmond study except that it is a dummy variable, coded zero or one. No similar variable is provided in the Phoenix data.

In the compliance study, race similarities or differences between the officer and citizen are measured with a series of dummy variables specifying the similarity or differences of officer and citizen race. These variables include white officer and white citizen, white officer and minority citizen, minority officer and white citizen, and minority officer and minority citizen. Race categorizations for the Phoenix study include white, Black, Hispanic, and 'other' for officers and suspects. Variables similar to those listed above are constructed by combining Black, Hispanic, and 'other' into a minority category and comparing it to the white category for officers and suspects.

The citizen's sex is represented by a dummy variable indicating that they are male. A similar variable is included in the Phoenix data, with missing data included in the 'not male' category. Citizen connection to the community is represented by a dummy variable indicating "whether the citizen lived, routinely worked, or owned property in the police beat on which the encounter occurred" (pg. 287). No similar measure is included in the Phoenix data.

Observers in the Mastrofski study recorded if there was any sign that this citizen and officer knew each other. The authors explain: "Citizens known as suspects or trouble makers originally were distinguished from those known as victims, friends, witnesses, or persons in need to of assistance. But because these two groups showed the same significant effects, they were combined into one variable for parsimonious model estimation" (Mastrofski et al., 1996:302). Officers in the Phoenix study recorded if they had prior knowledge of the suspect, if the suspect was known to be compliant, resistive, assaultive, to carry weapons, or to have a criminal record. A dummy variable provided in the data indicating that the suspect

was not known to police is recoded (inversed) to match the format used in the compliance study.

Police Skill and Work Orientation

In the compliance study, years of police experience is measured on a scale ranging from zero to 30. The Phoenix data includes a similar measure ranging from zero to 50. Because the Phoenix study involves a much larger number of cases (1585 instead of 346), there are a small number of officers with significantly longer police careers. Finally, the Mastrofski et al. study includes a five point scale indicating the strength of officer support for Richmond's community policing program according to their responses to preset questions asked by the observers. No similar measure is provided in the Phoenix data.

Table 4-2 below lists the variables used in the Mastrofski study with the variable ranges for that study and for this study. This table can be compared to Table 2 of Mastrofski et al. 1996. Variables not showing a range for this study are not included due to no like variables being available in the Phoenix data.. A total of 19 independent variables are used in this study compared to 33 in the original study.

Table 4-2: Listing of Independent Variables[33]

Calculation of Encounter Outcomes	Original Study	Reconstruction
Stakes		
Problem Seriousness	1-4	1-4
Size of Citizen Audience	0-10	0-10
Coercive Balance of Power		
Number of Additional Officers Present	0-6	0-5
Male Officer	0-1	0-1
Citizen Has Weapon	0-1	0-1
Authoritativeness of Entry Tactics		
Friendly or Nonthreatening	0-1	0-1
Interrogation	0-1	.
Command or Threat	0-1	0-1
Force	0-1	0-1
Authoritativeness of Request		
Suggestion or Request	0-1	.
Persuasion or Negotiation	0-1	.
Command or Threat	0-1	.
Police Mobilized Third Party	0-1	.
Citizen Capacity for Rational Judgment		
Number of Irrational Elements	0-3	0-1
Legitimizing Factors		
Citizen Initiated Encounter	0-1	.
Victim, Other Non-suspect	0-1	.
Officer Showed Respect	0-1	.
Officer Showed Disrespect	0-1	.
Evidence Strength	0-6	.
Officer Mentions Illegality	0-1	.
Public / Police-Controlled Location	0-1	0-1
Citizen in Conflict with Intimate Present	0-1	0-1
Citizen's Compliance Predisposition		
Citizen Young (<20 Years Old)	0-1	0-1
Citizen Poor	0-1	.
White Officer / White Citizen	0-1	0-1
White Officer / Minority Citizen	0-1	0-1
Minority Officer / White Citizen	0-1	0-1
Minority Officer / Minority Citizen	0-1	0-1
Citizen Male	0-1	0-1
Citizen Ties to the Neighborhood	0-1	.
Citizen Known	0-1	0-1
Police Skill and Work Orientation		
Years of Police Experience	0-30	0-50
Community Policing Orientation	1-5	.

[33] As shown in Table 2 of Mastrofski et al., p. 282.

Frequency Distributions

Before conducting the regression analysis of suspect compliance, variable means, frequency distributions, and correlations are studied to gain a better understanding of the data and relationships. Variable means and frequency distributions for dichotomous variables are listed in Table 4-3. The Phoenix data provide several similarities and differences to the Richmond data. First, the rate of suspect compliance in the Phoenix study is nearly identical to the rate of overall citizen compliance in the Mastrofski study (78.2% vs. 78.0% respectively), but the nature of measured compliance may differ between the two studies. Though the Phoenix instrument provided a check box if the suspect volunteered "immediate compliance with officer's orders", this probably most accurately represents the suspect's compliance to the officer arresting them. The Richmond compliance variable, on the other hand, represents citizen compliance to any police request such as to keep the level of noise down, to leave the premises, to leave someone alone, to move a vehicle, etc.

Interestingly, the average problem seriousness is only slightly higher for the Phoenix study ($\bar{x}$=2.68 vs. $\bar{x}$=2.28 for the Richmond study). It might be expected that the average problem seriousness would be considerably higher for the Phoenix study considering that all cases involve arrest. However, the four level coding of the variable may limit this effect to some extent. Phoenix suspects were more likely to possess a weapon than citizens in Richmond (7% vs. 2% respectively). This might also be expected considering that the Phoenix data include all arrests.

Some consideration must be given to the variables representing the authoritativeness of police entry tactics. Mastrofski et al. coded each case in one of four groups: friendly or nonthreatening, interrogation, command or threat, or police use of physical force. Only one indicator is marked for any single case. Using the Phoenix data, three variables are constructed that are similar to these but there is no indicator of whether or not the police interrogated the suspect. In addition, the Phoenix variables indicate if any of these tactics were employed at any time during the incident, such that more than one may be true for a

single case. Therefore, the Phoenix means for these variables are not directly comparable to the Richmond means. The measure of the citizen's capacity for rational judgment is also different for this reconstruction. The Richmond variable ranges from zero to three and the Phoenix variable used here is dichotomous, indicating only if the suspect is impaired by drugs or alcohol. The means for these variables are also not comparable.

Table 4-3: Frequency Distributions and Means for Phoenix Data

Variable	Range	Mean	St. Dev.	N=1[34]	%=1
Citizen Compliance	0-1	0.78	0.41	1239	78.2%
Stakes					
Problem Seriousness	1-4	2.68	0.87		
Size of Citizen Audience	0-10	2.30	1.86		
Coercive Balance of Power					
Number of Additional Officers	0-5	1.99	0.99		
Male Officer	0-1	0.83	0.37	1321	83.3%
Citizen Has Weapon	0-1	0.07	0.26	117	7.4%
Authoritativeness of Entry Tactics					
Friendly or Nonthreatening	0-1	0.73	0.44	1162	73.3%
Command or Threat	0-1	0.34	0.48	545	34.4%
Force	0-1	0.22	0.41	349	22.0%
Citizen Capacity for Rational Judgment					
Drug or Alcohol Impairment	0-1	0.33	0.47	520	32.8%
Legitimizing Factors					
Public / Police-Controlled Location	0-1	0.64	0.48	1010	63.7%
Citizen in Conflict with Intimate	0-1	0.19	0.39	305	19.2%
Citizens Compliance Predisposition					
Citizen Young (<20 Years Old)	0-1	0.10	0.31	165	10.4%
Citizen Male	0-1	0.74	0.44	1170	73.8%
White Officer / White Citizen	0-1	0.39	0.49	622	39.2%
White Officer / Minority Citizen	0-1	0.33	0.47	530	33.4%
Minority Officer / White Citizen	0-1	0.06	0.23	91	5.7%
Minority Officer / Minority Citizen	0-1	0.09	0.29	146	9.2%
Citizen Known	0-1	0.13	0.34	206	13.0%
Police Skill and Work Orientation					
Years of Police Experience	0-50	6.97	5.32		

Number and percentage equal to one (N=1, %=1) are provided only for dichotomous variables.

[34] Out of N=1585 cases total.

Table 4-4: Comparing the Phoenix and Richmond Data

Variable	Range	Phoenix Study Mean	Phoenix Study St. Dev.	Richmond Study Mean	Richmond Study St. Dev.
Citizen Compliance	0-1	0.78	0.41	0.78	0
Stakes					
Problem Seriousness	1-4	2.68	0.87	2.28	0.95
Size of Citizen Audience	0-10	2.30	1.86	1.88	1.40
Coercive Balance of Power					
Number of Additional Officers	0-5/6	1.99	0.99	0.76	1.00
Male Officer	0-1	0.83	0.37	0.91	0.29
Citizen Has Weapon	0-1	0.07	0.26	0.02	0.13
Authoritativeness of Entry Tactics					
Friendly or Nonthreatening	0-1	0.73	0.44	0.44	0.50
Command or Threat	0-1	0.34	0.48	0.22	0.42
Force	0-1	0.22	0.41	0.05	0.21
Citizen Capacity for Rational Judgment					
Drug or Alcohol Impairment	0-1/3	0.33	0.47	0.40	0.65
Legitimizing Factors					
Public / Police-Controlled Location	0-1	0.64	0.48	0.87	0.34
Citizen in Conflict with Intimate	0-1	0.19	0.39	0.18	0.38
Citizens Compliance Predisposition					
Citizen Young (<20 Years Old)	0-1	0.10	0.31	0.20	0.40
Citizen Male	0-1	0.74	0.44	0.71	0.45
White Officer / White Citizen	0-1	0.39	0.49	0.18	0.38
White Officer / Minority Citizen	0-1	0.33	0.47	0.54	0.50
Minority Officer / White Citizen	0-1	0.06	0.23	0.02	0.15
Minority Officer / Minority Citizen	0-1	0.09	0.29	0.26	0.44
Citizen Known	0-1	0.13	0.34	0.14	0.35
Police Skill and Work Orientation					
Years of Police Experience	0-50	6.97	5.32	7.22	6.41

* Standard deviation not provided in the Richmond study. Mean compliance for the Richmond study is calculated according to the reported 78.0% rate of compliance.

Correlations

Correlations are conducted as an initial study of the magnitude and direction of relationships between suspect compliance and each of the independent variables. The results are shown in Table 4-5. Most of the independent variables demonstrate significant correlations with suspect compliance but many are weak. Problem seriousness and suspect impairment each have moderately strong negative correlations with suspect compliance (r=-.131, p=.0001 and r=-.138, p=.0001 respectively). However, the authoritativeness of entry tactics variables demonstrate the strongest relationships with compliance. If the officer uses a friendly, nonthreatening tone of voice, the suspect is more likely to comply (r=.323, p=.0001). But if the officer uses a commanding or threatening tone of voice, or uses force against the suspect, the suspect is less likely to comply (r=-.344, p=.0001 and r=-.501, p=.0001 respectively). Correlations between all variables in this study are included in Appendix D.

Table 4-5: Correlations with Suspect Compliance

Variable	R	P
Stakes		
Problem Seriousness	-0.131	0.0001
Size of Citizen Audience	-0.077	0.0021
Coercive Balance of Power		
Number of Additional Officers	-0.070	0.0054
Male Officer	0.071	0.0046
Citizen Has Weapon	-0.038	0.1332
Authoritativeness of Entry Tactics		
Friendly or Nonthreatening	0.323	0.0001
Command or Threat	-0.344	0.0001
Force	-0.501	0.0001
Citizen Capacity for Rational Judgment		
Drug or Alcohol Impairment	-0.138	0.0001
Legitimizing Factors		
Public / Police-Controlled Location	0.052	0.0372
Citizen in Conflict with Intimate	-0.052	0.0385
Citizens Compliance Predisposition		
Citizen Young (<20 Years Old)	-0.015	0.5531
Citizen Male	0.019	0.4549
White Officer / White Citizen	0.074	0.0030
White Officer / Minority Citizen	-0.056	0.0257
Minority Officer / White Citizen	0.006	0.8213
Minority Officer / Minority Citizen	0.005	0.8548
Citizen Known	-0.068	0.0065
Police Skill and Work Orientation		
Years of Police Experience	0.009	0.7240

Methods and Analysis for the Reconstruction

As in the original study, the compliance variable is regressed on the independent variables in a logistic regression. The results are shown in Table 4-6.

Variables found not to have a significant effect include: size of citizen audience, number of additional officers present, public police-controlled location, citizen in conflict with intimate present, citizen young, white officer and white citizen, white officer and minority citizen, minority officer and white citizen, minority officer and minority citizen, citizen male, citizen known, and years of police experience.

Significant findings include the following: Problem seriousness has a significant negative effect on compliance. That is, a more serious problem decreases the likelihood of compliance. A male police officer significantly increases the likelihood of compliance. Interestingly, suspect possession of a weapon has a significant positive influence on citizen compliance, opposite that hypothesized. The officer speaking in a friendly, conversational voice also increases the likelihood of compliance, while the officer speaking in a commanding or threatening voice decrease the probability of compliance. Officer use of force has the strongest influence, decreasing the likelihood of compliance nearly nine and a half times. And finely, suspect drug or alcohol impairment significantly decreases the probability of compliance.

Table 4-6: Model 1, Logistic Regression of Suspect Compliance

Calculation of Encounter Outcomes	Regression Coefficient	P	Standard Error	Odds Ratio
Stakes				
Problem Seriousness	-0.177	0.0486	0.090	0.838
Size of Citizen Audience	0.022	0.5672	0.040	1.023
Courses Balance of Power				
Number of Additional Officers Present	0.035	0.6368	0.074	1.035
Male Officer	0.519	0.0106	0.203	1.680
Citizen Has Weapon	0.550	0.0443	0.273	1.733
Authoritativeness of Entry Tactics				
Interrogation	.	.	.	.
Friendly or Nonthreatening	0.898	0.0001	0.183	2.454
Command or Threat	-0.515	0.0059	0.187	0.598
Force	-2.245	0.0001	0.165	0.106
Authoritativeness of Request				
Persuasion or Negotiation	.	.	.	.
Command or Threat	.	.	.	.
Police Mobilized Third Party	.	.	.	.
Citizen Capacity for Rational Judgment				
Drug or Alcohol Impairment	-0.500	0.0012	0.154	0.606
Legitimizing Factors				
Citizen Initiated Encounter	.	.	.	.
Victim, Other Non-suspect	.	.	.	.
Officer Showed Respect	.	.	.	.
Officer Showed Disrespect	.	.	.	.
Evidence Strength	.	.	.	.
Officer Mentions Illegality	.	.	.	.
Public / Police-Controlled Location	-0.014	0.9320	0.167	0.986
Citizen in Conflict with Intimate Present	-0.068	0.7335	0.200	0.934
Citizen's Compliance Predisposition				
Citizen Young (<20 Years Old)	-0.037	0.8793	0.242	0.964
Citizen Poor	.	.	.	.
White Officer / Minority Citizen	-0.301	0.0771	0.170	0.740
Minority Officer / White Citizen	-0.303	0.3484	0.323	0.739
Minority Officer / Minority Citizen	0.123	0.6453	0.268	1.131
Citizen Male	0.257	0.1559	0.181	1.293
Citizen Ties to the Neighborhood	.	.	.	.
Citizen Known	-0.349	0.0874	0.204	0.706
Police Skill and Work Orientation				
Years of Police Experience	0.011	0.4617	0.015	1.011
Community Policing Orientation	.	.	.	
Constant	1.660	0.0001	0.421	.
N	1585			
Pseudo ^{R2}	30.5			

Discussion

As in the original study, more serious problems are shown to significantly decrease the likelihood of suspect compliance, and suspect drug or alcohol impairment also reduces the likelihood of compliance. Again, the Phoenix data allowed only for a dummy variable pertaining to suspect impairment, whereas the Richmond study employs an interval variable ranging from zero to three, reflecting the number of irrational elements demonstrated by the suspect. Intoxication, mental disorder, and heightened emotional state are all included as irrational elements.

As hypothesized in the original study, male officers in Phoenix are more likely to obtain compliance. Mastrofski et al. expected that rates of compliance for male officers would be higher because they are more coercive. Interestingly, suspect possession of a weapon substantially and significantly increases the likelihood of their compliance. One possibility is that a suspect possessing a weapon will make every effort to comply hoping to prevent the police from searching them and finding the weapon. Or a suspect may consider the likelihood of police use of extreme force against them should they resist while in possession of a weapon, or worse, should they attempt to use the weapon against the police.

Probably the most significant findings involve officer use of voice tactics and force. Mastrofski et al. found that police force reduces the likelihood of citizen compliance, but less extreme measures such as interrogation, commands, or threats showed no significant effect. Similarly, officers who showed disrespect were significantly less likely to obtain compliance, but deliberately showing increased respect had no significant effect. This study's findings are noteably different. Not only does officer use of force significantly decrease the likelihood of compliance, but their use of the commanding or threatening voice does as well. In addition, the officer using a friendly, conversational voice significantly increases the chance that they will gain compliance from the suspect. However, caution must be exercised while interpreting these findings. Because the Phoenix data do not include the ordering of events, we are not able to infer causality. That is, we do not know to what extent the police showing respect increases the

likelihood of suspect compliance, vs. to what extent a suspect's compliance increases the likelihood of an officer showing respect. It is also acknowledged, of course, that police must use force in certain situations and that "being nice" will not always work to gain control of a situation.

Because the nature of the data used in this study differs from that of the Mastrofski study, and because certain specific variables used in this study differ from those used in the Mastrofski study, several other regression models were constructed to test several aspects of these differences. These regressions are described below as Models 2 through 5 and full regression tables are provided in Appendix D.

Model 2: Along with the compliance variable used in the initial regression (Model 1), the Phoenix instrument provided check boxes for officers to indicate if a suspect's attitude was civil, angry, or aggressive. These three variables were recoded into a single variable indicating if the suspect was civil or not, and the new variable was substituted for compliance in a separate regression. This regression, using the same independent variables, provides an R^2 value of 23.4 and identifies the following as significant: size of audience, officer speaking in a commanding or threatening voice, officer use of force, citizen impairment, and the presence of the citizen friends or family. All of these relationships are negative, decreasing the likelihood of citizen compliance.

Model 3: The Phoenix data also provide a dichotomous measure indicating if the suspect used force or did not, similar to the measure used for police force in this study. Similarly to Model 2, the suspect force variable was substituted for compliance into a regression using the same independent variables. Though the model results in a pseudo R^2 value of 61.4, it identifies only police physical force and suspect impairment as significant, and SAS outputs a warning that the validity of the model fit is questionable.

Model 4: As explained in the variable descriptions, officer tone of voice variables indicating if they were commanding, using verbal threats, or shouting and cursing were all collapsed into a single variable to

more accurately simulate the variables used in the Mastrofski study. A regression was conducted using the original measure of compliance as the dependent variable and all of the same independent variables, except including all four voice categories instead of collapsing them into two variables. This results in a pseudo R^2 of 31.0 and provides no substantial differences from the original model. Officer use of a conversational voice significantly increases compliance and use of a commanding voice significantly decreases compliance. Officer use of verbal threats or shouting/cursing both have insignificant, negative effects. Otherwise, the same variables are identified as significant: problem seriousness, male officer, citizen possession of a weapon, police use of force, and suspect impairment (relational directions for these variables are all the same as in the initial regression).

Model 5: The Mastrofski study utilized only one variable indicating the number of officers in addition to the primary officer and one variable for the size of citizen audience. The Phoenix data include variables indicating the number of officers, suspects, and bystanders at the initiation of contact and at the completion of the arrest. The initial regression utilized the number of officers present at the initiation of contact and the sum of the number of suspects and bystanders at the initiation of contact for the size of audience. One final regression was conducted using the same measure of compliance and all of the same independent variables except replacing the number of officers at initial contact with the number of officers at the completion of the arrest, and likewise replacing the number of suspects and bystanders at initial contact with the sum number of suspects and bystanders at the completion of contact. The results are nearly identical. As in the initial model, neither the number of officers present or the size of the audience are significant, as they are not significant in the initial model. This model provides the same pseudo R^2 of 30.5 and exactly the same predictors are identified as significant with very similar relationships to those in the initial regression.

Chapter 5
Policy and Research Implications

The findings of this study provide a number of implications for police policy and for future research.

Implications for Policy

Police use of the contact and cover tactic, the presence of additional officers, and an increase in the number of officers were all identified as consistent predictors of both police and suspect force. Though these tactics provide police with an advantage if force is used against them, this advantage must be weighed against the possibility that the presence of additional officers might increase the likelihood of conflict. It is not suggested that officers exercise a lesser amount of caution, but in some situations it may work to their advantage to limit the number of officers at the scene. As explained in the original report, it is also possible that officers assess when a suspect is likely to use force and prepare by using the contact and cover tactic and increasing the number of officers (Garner et al.1995).

Garner states: "When force is used, we found no evidence that it is applied unevenly or in discriminatory ways against racial minorities" (Garner et al. 1995:27). The results of this reanalysis were not so affirmative. The suspect being Black, a white officer and Black suspect, and the suspect being Hispanic (a negative relationship) were each identified as significant in some of the police force regressions. Though none of these relationships were demonstrated consistently enough to be included in the final model, they came close. The racial analyses conducted prior to the study of suspect force also provided mixed results. The second officer being white had significant relationships with all three measures of both suspect and police force (though not for all types of analyses). Also of interest, the first officer being white, all white police officers, and all Hispanic police officers had significant relations in some of the analyses. Somewhat perplexing are the directional variations of these relationships. For instance, according to certain analyses, white second officers increased police or suspect force; and white first officers also increased police or suspect force in some of the analyses; but in some relationships all white police officers reduced the amount of suspect or police force. The mixture of inconsistent race

related findings do not suggest so much that police are consistently racist in any direct manner, but that there may be racial interactions more complex than these data or methods are able to accurately demonstrate. Therefore, it is not suggested that sweeping revisions in current policies or training are required, but that some amount of consideration should be given to the possibility that Phoenix police officers may not be above and beyond all racial influence.

Poor visibility was found to increase the likelihood of police use of force, controlling for the arrest occurring after dark. The presence of bystanders consistently increased the likelihood of both police and suspect use of force, suggesting that officers and suspects may be getting "caught up" in the circumstances. The suspect being known as assaultive, resistive or to carry a weapon increased the likelihood of police use of force but was not a predictor of suspect force. Finally, this study found evidence that officer use of force was more likely when the suspect was male or when both the officer and suspect were male but there was not evidence that male suspects were more likely to use force against the police. Aside from the influence of visibility, these findings are similar to those of the original Phoenix study. There is some concern that officers may be influenced by factors other than the suspect's actions in some situations. It may be appropriate to emphasize that officer use of force is to be administered in response to and in relation to suspect use of force. Literature emphasizes that police force should be proportional to and not exceed suspect force (Buchanan, 1993; Connor, 1991). Literature also suggests that police departments use continuums of force such as the measures of force utilized in the Phoenix study to educate officers of the appropriate police response to different levels of suspect force (Connor, 1991). Garner et al. assert a similar concern in their policy implications:

> The last area of concern raised by this research is the generic and imprecise quality of some of the 12 categories of suspect resistance and officer response that are central to the department's use of force policies. . . . We are not recommending the kind of detailed ranking distinguishing weapon possession, threat and use that was useful for this research or the use of more than 6 categories but we think that the policy can be more clearly stated and the relative rankings based more explicitly on the relative severity of officers and suspect behaviors. (Garner et al. 1995:29)

For the most part, policy implications regarding factors related to suspect force are simply to inform officers of the risks. In fact, most of these implications provide a statement of the obvious. Suspect force was less likely for traffic related offenses but more likely in domestic violence situations, for vice offenses and for violent offenses. Force was more likely when bystanders were present and when bystanders expressed an antagonistic demeanor. Force was more likely if the suspect was impaired by alcohol or drugs or associated with a gang. Younger suspects were more likely to use force. Probably not as obvious, Hispanic suspects were less likely to use force than either white suspects or Black suspects. .

Reconstruction of the Mastrofski et al. study of compliance provided evidence that suspects are more likely to comply to officer requests or demands when the officer uses a calm, nonthreatening tone of voice. Officer use of a commanding or threatening tone of voice and officer use of physical force were shown to reduce the likelihood of suspect compliance. This does not mean that an officer should try to become friends with the suspect, but they may be able to gain compliance simply by treating the suspect fairly and with respect. These tactics may be less likely to work in cases involving more serious offenses or when the suspect is impaired by drugs or alcohol, but compliance may be more likely when the suspect is in possession of a weapon.

Implications for Research

The Phoenix Study is the first study of police force to record all arrests over a period of time, making it possible to study the frequency of forceful interactions between police and suspects relative to the overall number of arrests. Though having officers complete questionnaires subjects the data to their interpretations, it is a practical method of collecting data on a large number of cases, which is important due to the low rate of police and suspect force. One focus of this study is the importance of the order of events during police/suspect interactions, which the Phoenix data do not include. Garner et al. explain that excluding time sequencing was a necessary sacrifice in limiting the questionnaire to both sides of a

single page, in order to increase the response rate and study all arrests over a period of time. It may have been worth the sacrifice necessary to include questions concerning not only who did what, but also at least who acted first. Perhaps a more elaborate measure of the order of events could be employed using simple check-boxes or a numbering scheme. Accepting that officers may not always be truthful, may not respond correctly, or may not respond whatsoever, it would still provide some measure of time ordering and implications of causality. Otherwise, from a strictly substantive assessment of the Phoenix data based on the analyses so far, police are as likely to cause suspects to use force as suspects are to cause police to use force. This study provides evidence that some amount of suspect force can be explained by police force just as some amount of police force can be explained by suspect force. However, these relationships involve different magnitudes according to the interval and ratio measures of force. Based on the regression analyses, suspect use of force against police results in a lesser increase in police force than vice versa. Police use of force against a suspect is likely to result in a greater increase of force by the suspect.[35] An analysis employing instrumental variable techniques may help to better determine causality using the Phoenix data.

Garner et al. describe their measures of force as early prototypes for later studies. In the study of suspect force in Chapter 3, a number of predictors were identified for the continuum of force and maximum force models, but not for suspect physical force (the dichotomous measure). It is possible that the suspect physical force variable fails to represent suspect force as well as the other two measures and that a different construction of this variable would be more appropriate.

[35] Comparing Police Force Model 2, regression of police force on suspect force and the 41 predictors and Suspect Force Model 2, regression of suspect force on police force and the 41 predictors. Regressing police force, the regression coefficients of suspect force were B=0.32 for the continuum of force and B=0.27 for maximum force. Regressing suspect force, the regression coefficients of police force were B=0.53 for the continuum of force and B=0.37 for maximum force. P=.0001 for each.

The relationship between age and suspect use of force remains elusive. In general, younger suspects were more likely to use force against the police. However, suspect force was more likely when the suspect was older than the officer. It is possible that younger suspects in general are more likely to use force against police, but suspects ranging in age from perhaps 30 to 40 years old are more likely to use force against younger officers who may only be in their twenties. Further analysis may help to clarify the nature of these relationships.

In the original study of police force, in the reanalysis of that study, and in the primary models of the study of suspect force, missing values were replaced with variable means to prevent the exclusion of these cases in the regression models. Both models of suspect force in Chapter 3 are reconstructed excluding cases with missing data to study the effects. Excluding cases with missing values reduced the sample size by 41.4%, from N=1585 to N=929, and also reduced the number of significant predictors identified in both models. However, this had little effect on the pseudo R^2 and adjusted R^2 values in the regressions. It may be worth further analysis to determine if methods excluding cases with data would be more appropriate.

References

Alpert, Geoffrey and Lorie Fridell. 1992. Police Vehicles and Firearms: Instruments of Deadly Force, Prospect Heights, Illinois: Waveland Press.

Bayley, David H. and James Garofalo. 1989. The Management of Violence by Police Patrol Officers. Criminology 27:1-26.

Bayley, David H. 1986. The Tactical Choices of Police Patrol Officers. Journal of Criminal Justice 14:329-48.

Blumberg, Mark. 1989. Controlling Police Use of Deadly Force: Assessing Two Decades of Progress. In: Critical Issues in Policing: Contemporary Readings. Robert G. Dunham and Geoffrey P. Alpert eds., Prospect Heights, Illinois: Waveland.

Buchanan, Gary W. 1993. Managing Police Use of Force. The Police Chief 60: 20.

Connor, Greg. 1991. Use of Force Continuum: Phase II. Law and Order. March 1991: 30-32

Fridell, Lorie and Arnold Binder.1992. Police Officer Decision-Making in Potentially Violent Confrontations. Journal of Criminal Justice 20:385-399.

Friedrich, Robert J. 1980. Police Use of Force: Individuals, Situations and Organizations. The Annals of the American Academy of Political and Social Science 452:82-97.

Fyfe, James J. 1988. Police Use of Deadly Force: Research and Reform. Justice Quarterly 5:165-207.

Fyfe, James J. 1980. Geographic Correlates of Police Shootings: A Micro-Analysis. Journal of Research in Crime and Delinquency 17:101-113.

Garner, Joel, Tom Schade, John Hepburn, and Jeffry Fagan. 1995. Understanding the Use of Force by and Against the Police. Report provided to NIJ for the Phoenix Use of Force Study.

Geller, William A. and Michael Scott. 1991. Deadly Force: What We Know--A Practitioner's Desk Reference on Police-Involved Shootings in the United States. Washington, D. C.: Police Executive Research Forum.

Kania, Richard R.E. and Wade C. Mackey. 1977. Police Violence as a Function of Community Characteristics. Criminology 15:1:27-48

Long, J. Scott. 1997. Regression Models for Categorical and Limited Dependent Variables. Thousand Oaks: Sage Publications.

Mastrofski, Stephen D, Jeffrey B. Snipes and Anne E. Supina. 1996. Compliance on Demand: The Public's Response to Specific Police Requests. Journal of Research in Crime and Delinquency 33:3:296-305

Reiss, Albert J. Jr. 1971. The Police and The Public. New Haven: Yale University Press.

Scharf, Peter and Arnold Binder. 1983. The Badge and the Bullet: Police Use of Deadly Force. New York: Praeger.

Sherman, Lawrence W. 1980. Perspectives on Police and Violence. Annals of the American Academy of Political and Social Science 452:1-12.

Sherman, Lawrence W., Ellen Cohen, Patrick Gartin, Edwin Hamilton and Dennis P. Rogan. 1986. Citizens Killed By Big-City Police, 1970-1984. Washington, D. C.: Crime Control Institute.

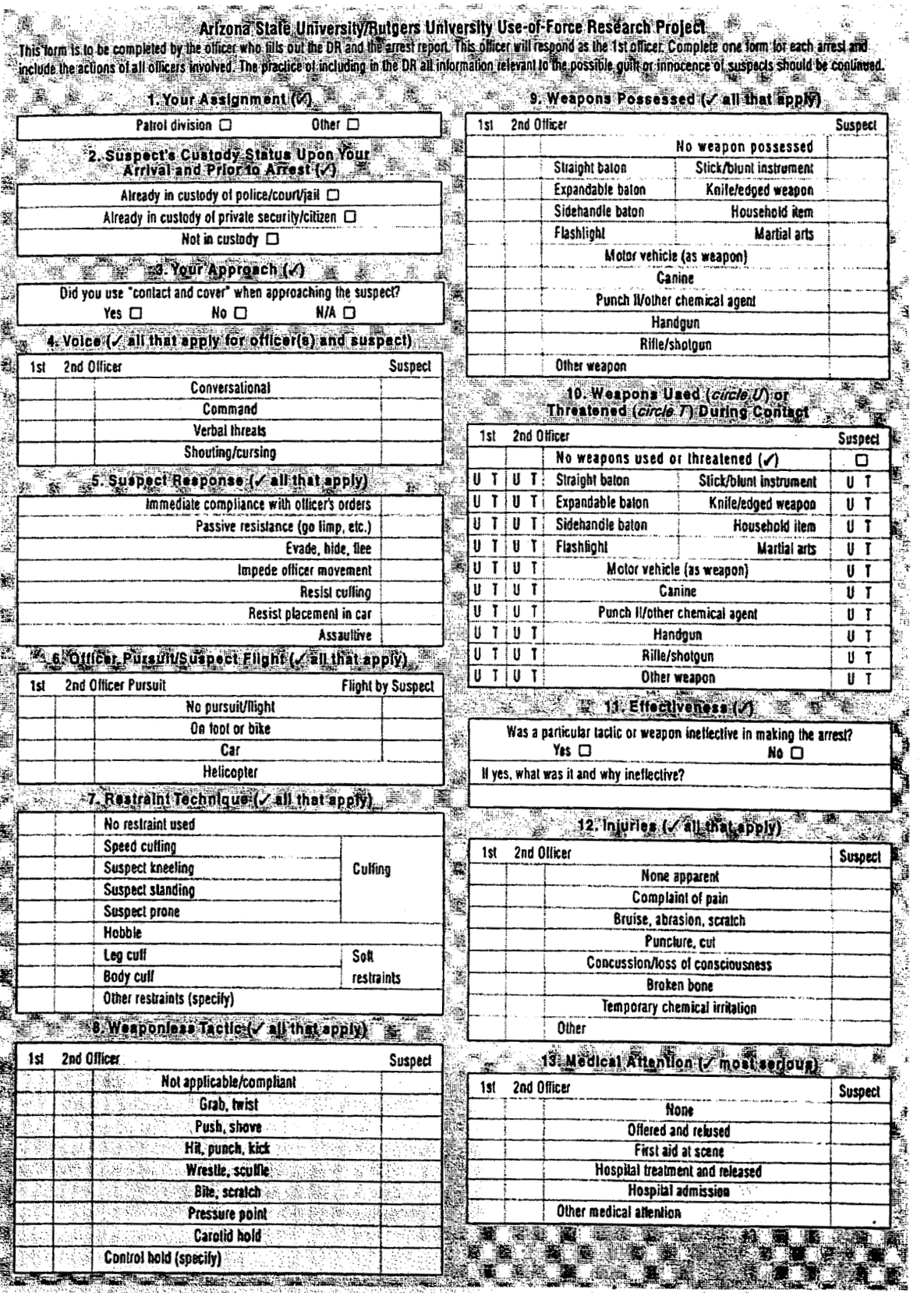
Tyler, Tom R. 1990. Why People Obey the Law. New Haven, CT: Yale University Press.

U. S. Department of Justice Community Relations Service. 1987. Principles of Good Policing: Avoiding Violence Between Police and Citizens, Washington, D. C.: U.S. Department of Justice.

Walker, Samuel and Lorie Fridell. 1993. Forces of Change in Police Policy: the Impact of Tennessee v. Garner on Deadly Force Policy. American Journal of Police 11:97-112.

Worden, Robert E. 1995. The 'Causes' of Police Brutality: Theory and Evidence on Police Use of Force. In: And Justice for All: Understanding and Controlling Police Abuse of Force. William Geller and Hans Toch, eds. Washington, D. C.: Police Executive Research Forum.

Appendix A
Phoenix Study Instrument



Arizona State University/Rutgers University Use-of-Force Research Project

This form is to be completed by the officer who fills out the DR and the arrest report. This officer will respond as the 1st officer. Complete one form for each arrest and include the actions of all officers involved. The practice of including in the DR all information relevant to the possible guilt or innocence of suspects should be continued.

1. Your Assignment (✓)

Patrol division ☐	Other ☐

2. Suspect's Custody Status Upon Your Arrival and Prior to Arrest (✓)

Already in custody of police/court/jail ☐
Already in custody of private security/citizen ☐
Not in custody ☐

3. Your Approach (✓)

Did you use "contact and cover" when approaching the suspect?		
Yes ☐	No ☐	N/A ☐

4. Voice (✓ all that apply for officer(s) and suspect)

1st	2nd Officer		Suspect
		Conversational	
		Command	
		Verbal threats	
		Shouting/cursing	

5. Suspect Response (✓ all that apply)

Immediate compliance with officer's orders	
Passive resistance (go limp, etc.)	
Evade, hide, flee	
Impede officer movement	
Resist cuffing	
Resist placement in car	
Assaultive	

6. Officer Pursuit/Suspect Flight (✓ all that apply)

1st	2nd Officer Pursuit		Flight by Suspect
		No pursuit/flight	
		On foot or bike	
		Car	
		Helicopter	

7. Restraint Technique (✓ all that apply)

		No restraint used	
		Speed cuffing	Cuffing
		Suspect kneeling	
		Suspect standing	
		Suspect prone	
		Hobble	
		Leg cuff	Soft restraints
		Body cuff	
		Other restraints (specify)	

8. Weaponless Tactic (✓ all that apply)

1st	2nd Officer		Suspect
		Not applicable/compliant	
		Grab, twist	
		Push, shove	
		Hit, punch, kick	
		Wrestle, scuffle	
		Bite, scratch	
		Pressure point	
		Carotid hold	
		Control hold (specify)	

9. Weapons Possessed (✓ all that apply)

1st	2nd Officer			Suspect
		No weapon possessed		
		Straight baton	Stick/blunt instrument	
		Expandable baton	Knife/edged weapon	
		Sidehandle baton	Household item	
		Flashlight	Martial arts	
		Motor vehicle (as weapon)		
		Canine		
		Punch II/other chemical agent		
		Handgun		
		Rifle/shotgun		
		Other weapon		

10. Weapons Used (*circle U*) or Threatened (*circle T*) During Contact

1st		2nd Officer			Suspect
		No weapons used or threatened (✓)			☐
U	T	U T	Straight baton	Stick/blunt instrument	U T
U	T	U T	Expandable baton	Knife/edged weapon	U T
U	T	U T	Sidehandle baton	Household item	U T
U	T	U T	Flashlight	Martial arts	U T
U	T	U T	Motor vehicle (as weapon)		U T
U	T	U T	Canine		U T
U	T	U T	Punch II/other chemical agent		U T
U	T	U T	Handgun		U T
U	T	U T	Rifle/shotgun		U T
U	T	U T	Other weapon		U T

11. Effectiveness (✓)

Was a particular tactic or weapon ineffective in making the arrest?	
Yes ☐	No ☐
If yes, what was it and why ineffective?	

12. Injuries (✓ all that apply)

1st	2nd Officer		Suspect
		None apparent	
		Complaint of pain	
		Bruise, abrasion, scratch	
		Puncture, cut	
		Concussion/loss of consciousness	
		Broken bone	
		Temporary chemical irritation	
		Other	

13. Medical Attention (✓ most serious)

1st	2nd Officer		Suspect
		None	
		Offered and refused	
		First aid at scene	
		Hospital treatment and released	
		Hospital admission	
		Other medical attention	

14. Dispatch and Booking

Radio call type	On-View
Arrest charge	
	CLD
	Booked by arresting officer
	Booked by other officer

15. Time of Arrest (✓)

0001–0400 ☐	1201–1600 ☐
0401–0800 ☐	1601–2000 ☐
0801–1200 ☐	2001–2400 ☐

16. Day of Arrest (✓)

Sun ☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐ Sat ☐

17. Part of Shift (✓)

Early ☐ Middle ☐ Late ☐

18. Grid In Which Arrest Took Place (✓)

19. Location of Completed Arrest (✓)

Inside		Outside
	Suspect's residence	Major cross street
	Other residence	Secondary street/alley
	Club/bar	Parking lot
	Restaurant	Suspect's yard
	Retail store	Other yard
	Other	

20. Officer's Prior Knowledge of Location (✓ all that apply)

No prior knowledge of location	
Location known to be nonthreatening	
Location known for criminal activity	
Location known to be hazardous to police	

21. Visibility at Arrest Location *(circle most accurate number)*

10	9	8	7	6	5	4	3	2	1
Excellent			Good			Moderate			Poor

22. Arresting Officer Characteristics

Number of arrests in last 30 days	
Number of years as Phoenix police officer	

23. Year of Last Arrest Tactics Training

Last arrest tactics training at *Academy* (circle)		92	93	94
Describe	1.	92	93	94
non-*PPD* arrest	2.	92	93	94
tactics training	3.	92	93	94

24. Officer Injuries

At any time *in the past*, did you need medical attention as a result of making an arrest? (✓ most serious)

No medical attention needed	
First aid at scene	
Private doctor	
Transported to hospital	
Overnight stay at hospital	

25. Number of Persons, Including Yourself, Present at Arrest Scene

Number Present	Initial Contact	Completion of Arrest
# of Officers		
# of Suspects		
# of Bystanders		

26. Suspect's and Bystanders' Attitude Toward Police (✓ predominant)

Suspect		Witnesses/Bystanders
		None
	Civil	Supportive
	Angry	Neutral
	Aggressive	Antagonistic

27. Suspect's Relationship to Victims and Bystanders (✓ all that apply)

Victims		Witnesses/Bystanders
	No victim	No witnesses/bystanders
	Unknown	
	No relationship/strangers	
	Acquaintance/friend	
	Family/intimate	

28. Characteristics of Officers and Suspect

1st Officer	2nd Officer		Suspect
yrs.	yrs.	Age	yrs.
ft. in.	ft. in.	Height	ft. in.
lbs.	lbs.	Weight	lbs.
Wh. Bl. His. Oth.	Wh. Bl. His. Oth.	Race	Wh. Bl. His. Oth.
M F	M F	Gender	M F

29. Officer's Prior Knowledge of Suspect's (✓ all that apply)

	No prior knowledge
	Compliant
	Resistive
	Assaultive
	Carry weapons
	Criminal record

30. Suspect's Gang Membership(?)

Verified	
Associate	
No association	
Unknown	

31. Suspect's Impairment (✓ all that apply)

	Don't know	Yes	No
Drugs			
Alcohol			
Other			

32. Suspect's Prior Criminal Record (from Phoenix P.D. PACE System)

	Code	No. Code ☐
Primary Offense Code (1–24)		☐
Violence Potential Code (1–X)		☐
Current warrant on suspect (✓ if no)		
Warrant charge		

Thank you for your time and cooperation in helping with this research project. Federal statute (42 U.S.C.S. 3789(g)) states that these records and data are "immune from legal process" and shall not be "admitted for use in any action, suit, or other judicial, legislative or administrative proceeding."

Appendix B
Police Force Regression Results

Model 2: Logistic Regression of Police Physical Force on the 41 Predictors and Suspect Force

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: PHYSICAL
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	PHYSICAL	Count
1	1	349
2	0	1236

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1673.057	1376.672	.
SC	1678.426	1671.930	.
-2 LOG L	1671.057	1266.672	404.386 with 54 DF (p=0.0001)
Score	.	.	422.868 with 54 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-2.7535	0.8166	11.3694	0.0007	.	.
PATROL	1	-0.3389	0.2908	1.3585	0.2438	-0.046279	0.713
CUSTODY	1	-0.2621	0.2508	1.0924	0.2959	-0.050999	0.769
NUMBERPI	1	0.4043	0.1029	15.4498	0.0001	0.220227	1.498
POLINIT2	1	-0.2616	0.2151	1.4792	0.2239	-0.069557	0.770
CHANGEPN	1	0.2825	0.0766	13.5946	0.0002	0.159436	1.326
COVER	1	0.3178	0.1586	4.0152	0.0451	0.083397	1.374
DISPATCH	1	0.0692	0.1818	0.1449	0.7034	0.018643	1.072
WEEKEND	1	0.0243	0.2365	0.0106	0.9181	0.006258	1.025
NIGHT	1	0.3999	0.2016	3.9349	0.0473	0.108937	1.492
ENDNIGHT	1	-0.4467	0.3242	1.8976	0.1683	-0.093414	0.640
SHIFT	1	0.00548	0.1010	0.0029	0.9567	0.002257	1.005
VIOLENT2	1	0.4638	0.2452	3.5765	0.0586	0.089600	1.590
PROPERTY	1	0.4155	0.2171	3.6616	0.0557	0.097831	1.515
TRAFFIC	1	-0.1973	0.2795	0.4985	0.4802	-0.037768	0.821
VICE	1	0.5598	0.2466	5.1536	0.0232	0.102076	1.750
DOMESTIC	1	0.5872	0.2715	4.6775	0.0306	0.110010	1.799
FAMILY	1	0.00320	0.2256	0.0002	0.9887	0.000696	1.003
SUSINIT2	1	0.1746	0.3227	0.2929	0.5884	0.036043	1.191
SUSCOMP2	1	-0.2942	0.3453	0.7258	0.3942	-0.056629	0.745
WITNESS	1	0.3217	0.1717	3.5096	0.0610	0.088675	1.379
BYFAMILY	1	-0.2263	0.2090	1.1725	0.2789	-0.049626	0.797
BYANTAG	1	0.3619	0.3330	1.1816	0.2770	0.039291	1.436
HOUSE	1	0.2103	0.1892	1.2356	0.2663	0.048000	1.234
INSIDE2	1	-0.2609	0.2834	0.8473	0.3573	-0.048386	0.770
LOCHAZRD	1	0.3021	0.2974	1.0318	0.3097	0.038761	1.353
LOCCRIME	1	-0.2891	0.1730	2.7947	0.0946	-0.074943	0.749
VISIBLE	1	-0.0311	0.0315	0.9729	0.3240	-0.042871	0.969
AGE1	1	0.0957	0.0971	0.9709	0.3244	0.064791	1.100
WHITE1	1	-0.0636	0.2338	0.0740	0.7856	-0.015333	0.938
HEIGHT1	1	0.0839	0.1446	0.3368	0.5617	0.047022	1.088
WEIGHT1	1	0.0371	0.1303	0.0811	0.7758	0.024139	1.038
MALE1	1	-0.4155	0.3408	1.4871	0.2227	-0.085386	0.660

LENGTHPD	1	0.1034	0.0872	1.4084	0.2353	0.066280	1.109
Q24INJ	1	0.1000	0.0724	1.9055	0.1675	0.054848	1.105
ARRESTN	1	0.0918	0.0517	3.1603	0.0754	0.073181	1.096
TRAIN	1	0.0584	0.1346	0.1884	0.6642	0.018110	1.060
AGES	1	-0.1699	0.0743	5.2342	0.0221	-0.139756	0.844
BLACKS	1	0.6880	0.3883	3.1391	0.0764	0.136704	1.990
HISPS	1	0.4972	0.3633	1.8731	0.1711	0.117686	1.644
HEIGHTS	1	-0.1858	0.1340	1.9231	0.1655	-0.123083	0.830
WEIGHTS	1	-0.1093	0.1181	0.8565	0.3547	-0.074464	0.896
MALES	1	-0.6956	0.3840	3.2808	0.0701	-0.168657	0.499
DRUGS	1	0.3206	0.2419	1.7570	0.1850	0.051292	1.378
ALCOHOL	1	0.2914	0.1696	2.9513	0.0858	0.070196	1.338
PROBSUSP	1	1.2759	0.3422	13.8993	0.0002	0.133211	3.582
KNOWRECD	1	-0.3919	0.3118	1.5804	0.2087	-0.051811	0.676
GANG	1	-0.00916	0.3420	0.0007	0.9786	-0.000994	0.991
AGEDIF	1	-0.0980	0.0671	2.1283	0.1446	-0.101349	0.907
WPBS	1	-0.5495	0.4562	1.4511	0.2284	-0.095686	0.577
WPHS	1	-0.1277	0.4051	0.0995	0.7525	-0.027349	0.880
HEIGHDIF	1	-0.3823	0.1495	6.5427	0.0105	-0.266986	0.682
WEIGHDIF	1	0.0238	0.1274	0.0348	0.8520	0.019190	1.024
BOTHMALE	1	1.1065	0.4378	6.3881	0.0115	0.287360	3.024
PHYSSUS	1	2.4022	0.1806	176.9131	0.0001	0.464920	11.047

Model 2: Stepwise Logistic Regression of Police Physical Force on the 41 Predictors and Suspect Force

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: PHYSICAL
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	PHYSICAL	Count
1	1	349
2	0	1236

Stepwise Selection Procedure

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-2.7568	0.3121	77.9979	0.0001	.	.
NUMBERPI	1	0.4351	0.0746	34.0109	0.0001	0.237009	1.545
CHANGEPN	1	0.3184	0.0715	19.8264	0.0001	0.179704	1.375
TRAFFIC	1	-0.5486	0.2339	5.5013	0.0190	-0.104994	0.578
VISIBLE	1	-0.0612	0.0270	5.1190	0.0237	-0.084335	0.941
Q24INJ	1	0.1300	0.0664	3.8297	0.0504	0.071326	1.139
HISPS	1	0.4582	0.1615	8.0546	0.0045	0.108471	1.581
ALCOHOL	1	0.3457	0.1539	5.0442	0.0247	0.083290	1.413
PROBSUSP	1	1.1147	0.3011	13.7086	0.0002	0.116378	3.049
HEIGHDIF	1	-0.2536	0.0703	13.0077	0.0003	-0.177082	0.776
WEIGHDIF	1	0.1379	0.0597	5.3312	0.0209	0.111325	1.148
PHYSSUS	1	2.4321	0.1694	206.1889	0.0001	0.470721	11.383

Model 2: Linear Regression of Police Continuum of Force on the 41 Predictors and Suspect Force

The SAS System

Model: MODEL1
Dependent Variable: CONTINUE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	54	1013.84458	18.77490	12.631	0.0001
Error	1530	2274.17687	1.48639		
C Total	1584	3288.02145			

Root MSE	1.21918	R-square	0.3083
Dep Mean	2.96467	Adj R-sq	0.2839
C.V.	41.12351		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	2.592096	0.35027220	7.400	0.0001
PATROL	1	-0.273897	0.13661759	-2.005	0.0452
CUSTODY	1	-0.117371	0.09618136	-1.220	0.2225
NUMBERPI	1	0.150473	0.04775748	3.151	0.0017
POLINIT2	1	0.113825	0.09164562	1.242	0.2144
CHANGEPN	1	0.133538	0.03534519	3.778	0.0002
COVER	1	0.282013	0.07017187	4.019	0.0001
DISPATCH	1	-0.051937	0.07675750	-0.677	0.4987
WEEKEND	1	0.047315	0.09679378	0.489	0.6250
NIGHT	1	0.206619	0.08690504	2.378	0.0176
ENDNIGHT	1	-0.225388	0.13751390	-1.639	0.1014
SHIFT	1	-0.059720	0.04312871	-1.385	0.1663
VIOLENT2	1	0.167055	0.10978521	1.522	0.1283
PROPERTY	1	0.160698	0.09058190	1.774	0.0763
TRAFFIC	1	0.044886	0.10547760	0.426	0.6705
VICE	1	0.172061	0.10917025	1.576	0.1152
DOMESTIC	1	0.226274	0.12258777	1.846	0.0651
FAMILY	1	0.139890	0.10198791	1.372	0.1704
SUSINIT2	1	-0.063450	0.15149634	-0.419	0.6754
SUSCOMP2	1	0.092949	0.16097613	0.577	0.5637
WITNESS	1	0.214061	0.07470622	2.865	0.0042
BYFAMILY	1	-0.105372	0.09491660	-1.110	0.2671
BYANTAG	1	-0.012436	0.16380366	-0.076	0.9395
HOUSE	1	0.121725	0.08582848	1.418	0.1563
INSIDE2	1	-0.026990	0.10673538	-0.253	0.8004
LOCHAZRD	1	0.195792	0.14106625	1.388	0.1654
LOCCRIME	1	-0.063319	0.07277855	-0.870	0.3844
VISIBLE	1	-0.025907	0.01383663	-1.872	0.0614
AGE1	1	-0.047329	0.04140656	-1.143	0.2532
WHITE1	1	0.080856	0.09752694	0.829	0.4072
HEIGHT1	1	0.029498	0.06099901	0.484	0.6287
WEIGHT1	1	0.040924	0.05553940	0.737	0.4613
MALE1	1	-0.233415	0.13977392	-1.670	0.0951
LENGTHPD	1	-0.038251	0.03720828	-1.028	0.3041
Q24INJ	1	0.022669	0.03272065	0.693	0.4885
ARRESTN	1	0.008262	0.02245840	0.368	0.7130
TRAIN	1	0.027119	0.05781672	0.469	0.6391
AGES	1	0.017140	0.03221774	0.532	0.5948
BLACKS	1	0.449891	0.17606547	2.555	0.0107
HISPS	1	0.205282	0.15762157	1.302	0.1930
HEIGHTS	1	-0.012965	0.05664032	-0.229	0.8190
WEIGHTS	1	-0.124717	0.05157392	-2.418	0.0157
MALES	1	-0.105324	0.16109523	-0.654	0.5133
DRUGS	1	-0.123232	0.11098189	-1.110	0.2670

ALCOHOL	1	-0.052242	0.07642700	-0.684	0.4944
PROBSUSP	1	0.449785	0.17405541	2.584	0.0099
KNOWRECD	1	-0.000810	0.13981546	-0.006	0.9954
GANG	1	0.022929	0.16339235	0.140	0.8884
AGEDIF	1	0.053294	0.02993804	1.780	0.0753
WPBS	1	-0.631977	0.20312086	-3.111	0.0019
WPHS	1	-0.119046	0.17687551	-0.673	0.5010
HEIGHDIF	1	-0.078621	0.06249499	-1.258	0.2086
WEIGHDIF	1	-0.086674	0.05479741	-1.582	0.1139
BOTHMALE	1	0.435996	0.18032079	2.418	0.0157
LEVELS	1	0.316799	0.01797440	17.625	0.0001

Dependent Variable: CONTINUE
Test: AGE Numerator: 2.1841 DF: 3 F value: 1.4694
Denominator: 1.48639 DF: 1530 Prob>F: 0.2211

Dependent Variable: CONTINUE
Test: RACE Numerator: 3.6096 DF: 5 F value: 2.4284
Denominator: 1.48639 DF: 1530 Prob>F: 0.0334

Dependent Variable: CONTINUE
Test: SEX Numerator: 5.9049 DF: 3 F value: 3.9726
Denominator: 1.48639 DF: 1530 Prob>F: 0.0078

Dependent Variable: CONTINUE
Test: HEIGHT Numerator: 1.6681 DF: 3 F value: 1.1223
Denominator: 1.48639 DF: 1530 Prob>F: 0.3388

Dependent Variable: CONTINUE
Test: WEIGHT Numerator: 3.3476 DF: 3 F value: 2.2522
Denominator: 1.48639 DF: 1530 Prob>F: 0.0805

Model 2: Stepwise Linear Regression of Police Continuum of Force on the 41 Predictors and Suspect Force

Stepwise Procedure for Dependent Variable CONTINUE

Step12 Variable MALES Removed R-square = 0.28080123 C(p) = 27.92890737

Summary of Stepwise Procedure for Dependent Variable CONTINUE

Step	Variable Entered	Removed	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
1	LEVELS		1	0.2099	0.2099	166.6826	420.6422	0.0001
2	COVER		2	0.0205	0.2304	123.4406	42.0414	0.0001
3	NUMBERPI		3	0.0103	0.2407	102.6105	21.4898	0.0001
4	CHANGEPN		4	0.0106	0.2513	81.1796	22.3531	0.0001
5	MALES		5	0.0079	0.2592	65.6519	16.8897	0.0001
6	WITNESS		6	0.0058	0.2651	54.7639	12.5094	0.0004
7	VISIBLE		7	0.0049	0.2700	45.8245	10.6831	0.0011
8	PROBSUSP		8	0.0035	0.2735	40.1563	7.5195	0.0062
9	FAMILY		9	0.0034	0.2768	34.6697	7.3712	0.0067
10	WEIGHT1		10	0.0022	0.2790	31.8721	4.7348	0.0297
11	BOTHMALE		11	0.0018	0.2809	29.8050	4.0216	0.0451
12		MALES	10	0.0001	0.2808	27.9289	0.1225	0.7263

Model 2: Linear Regression of Police Maximum Force on the 41 Predictors and Suspect Force

The SAS System

Model: MODEL1
Dependent Variable: MAXFORCE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	54	127243.25516	2356.35658	8.302	0.0001
Error	1530	434285.20288	283.84654		
C Total	1584	561528.45804			

Root MSE	16.84775	R-square	0.2266
Dep Mean	36.79054	Adj R-sq	0.1993
C.V.	45.79369		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	27.994756	4.83986465	5.784	0.0001
PATROL	1	-2.434927	1.88697335	-1.290	0.1971
CUSTODY	1	-1.134665	1.32924502	-0.854	0.3935
NUMBERPI	1	2.991617	0.65780921	4.548	0.0001
POLINIT2	1	-0.259952	1.26587865	-0.205	0.8373
CHANGEPN	1	2.294848	0.48741994	4.708	0.0001
COVER	1	4.550569	0.96887824	4.697	0.0001
DISPATCH	1	-0.316773	1.06069723	-0.299	0.7653
WEEKEND	1	0.659848	1.33757990	0.493	0.6219
NIGHT	1	1.131923	1.20036084	0.943	0.3458
ENDNIGHT	1	-2.463943	1.90015021	-1.297	0.1949
SHIFT	1	-0.763110	0.59625258	-1.280	0.2008
VIOLENT2	1	2.230880	1.52064793	1.467	0.1426
PROPERTY	1	2.507546	1.25095407	2.005	0.0452
TRAFFIC	1	-0.678205	1.45761171	-0.465	0.6418
VICE	1	0.811561	1.50875981	0.538	0.5907
DOMESTIC	1	2.027746	1.69382679	1.197	0.2314
FAMILY	1	0.437236	1.40946867	0.310	0.7564
SUSINIT2	1	-1.888725	2.09395897	-0.902	0.3672
SUSCOMP2	1	2.520977	2.22490010	1.133	0.2574
WITNESS	1	2.457446	1.03251420	2.380	0.0174
BYFAMILY	1	-1.014062	1.31161094	-0.773	0.4396
BYANTAG	1	-0.013838	2.25910378	-0.006	0.9951
HOUSE	1	2.394628	1.18714569	2.017	0.0439
INSIDE2	1	0.434475	1.47677668	0.294	0.7686
LOCHAZRD	1	1.152448	1.94932389	0.591	0.5545
LOCCRIME	1	-1.166244	1.00588973	-1.159	0.2465
VISIBLE	1	-0.524573	0.19111889	-2.745	0.0061
AGE1	1	-0.871569	0.57239121	-1.523	0.1280
WHITE1	1	1.585995	1.34760337	1.177	0.2394
HEIGHT1	1	0.064821	0.84300431	0.077	0.9387
WEIGHT1	1	0.322125	0.76741931	0.420	0.6747
MALE1	1	-2.242751	1.93244895	-1.161	0.2460
LENGTHPD	1	-0.341041	0.51374844	-0.664	0.5069
Q24INJ	1	-0.079877	0.45173240	-0.177	0.8597
ARRESTN	1	0.549819	0.31015341	1.773	0.0765
TRAIN	1	0.315238	0.79894748	0.395	0.6932
AGES	1	0.756334	0.44571719	1.697	0.0899
BLACKS	1	6.466501	2.43350459	2.657	0.0080
HISPS	1	5.779853	2.17799605	2.654	0.0080
HEIGHTS	1	0.633486	0.78292763	0.809	0.4186
WEIGHTS	1	-1.062792	0.71269313	-1.491	0.1361
MALES	1	-1.339840	2.22461014	-0.602	0.5471
DRUGS	1	-2.839132	1.53096086	-1.854	0.0639
ALCOHOL	1	-1.533095	1.05142358	-1.458	0.1450

PROBSUSP	1	4.718804	2.40358862	1.963	0.0498
KNOWRECD	1	0.211456	1.93195332	0.109	0.9129
GANG	1	2.283326	2.25702413	1.012	0.3119
AGEDIF	1	0.976606	0.41386623	2.360	0.0184
WPBS	1	-6.996449	2.80726369	-2.492	0.0128
WPHS	1	-3.449849	2.44331472	-1.412	0.1582
HEIGHDIF	1	-0.420457	0.86389185	-0.487	0.6265
WEIGHDIF	1	-0.481491	0.75720564	-0.636	0.5250
BOTHMALE	1	3.819707	2.49059544	1.534	0.1253
SMXFORCE	1	0.265368	0.02044725	12.978	0.0001

Dependent Variable: MAXFORCE
Test: AGE Numerator: 532.4182 DF: 3 F value: 1.8757
Denominator: 283.8465 DF: 1530 Prob>F: 0.1317

Dependent Variable: MAXFORCE
Test: RACE Numerator: 830.5189 DF: 5 F value: 2.9259
Denominator: 283.8465 DF: 1530 Prob>F: 0.0123

Dependent Variable: MAXFORCE
Test: SEX Numerator: 356.3573 DF: 3 F value: 1.2555
Denominator: 283.8465 DF: 1530 Prob>F: 0.2882

Dependent Variable: MAXFORCE
Test: HEIGHT Numerator: 373.9736 DF: 3 F value: 1.3175
Denominator: 283.8465 DF: 1530 Prob>F: 0.2671

Dependent Variable: MAXFORCE
Test: WEIGHT Numerator: 298.6240 DF: 3 F value: 1.0521
Denominator: 283.8465 DF: 1530 Prob>F: 0.3685

Model 2: Stepwise Linear Regression of Police Maximum Force on the 41 Predictors and Suspect Force

The SAS System 47

Stepwise Procedure for Dependent Variable MAXFORCE

Step10 Variable PROBSUSP Entered R-square = 0.20162910 C(p) = 16.40266965

Summary of Stepwise Procedure for Dependent Variable MAXFORCE

Step	Variable Entered	Removed	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
1	SMXFORCE		1	0.1250	0.1250	149.9416	226.2004	0.0001
2	COVER		2	0.0267	0.1518	99.0512	49.8629	0.0001
3	NUMBERPI		3	0.0105	0.1623	80.2288	19.8646	0.0001
4	CHANGEPN		4	0.0151	0.1774	52.2645	29.0940	0.0001
5	WITNESS		5	0.0062	0.1836	42.0554	11.9365	0.0006
6	VISIBLE		6	0.0057	0.1893	32.7131	11.1604	0.0009
7	MALES		7	0.0045	0.1939	25.7306	8.8827	0.0029
8	HOUSE		8	0.0029	0.1968	21.9935	5.6902	0.0172
9	HISPS		9	0.0025	0.1993	19.0518	4.9134	0.0268
10	PROBSUSP		10	0.0024	0.2016	16.4027	4.6332	0.0315

Model 4: Logistic Regression of Suspect Physical Force on Variable Subset to Calculate Values of Predicted Suspect Physical Force

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: PHYSSUS
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	PHYSSUS	Count
1	0	1357
2	1	228

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1307.687	1223.329	.
SC	1313.056	1293.117	.
-2 LOG L	1305.687	1197.329	108.358 with 12 DF (p=0.0001)
Score	.	.	107.236 with 12 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	2.6759	0.3634	54.2237	0.0001	.	.
SHIFT	1	-0.3200	0.1006	10.1202	0.0015	-0.131804	0.726
VIOLENT2	1	-1.0067	0.1947	26.7415	0.0001	-0.194490	0.365
VICE	1	-0.8111	0.2136	14.4216	0.0001	-0.147895	0.444
DOMESTIC	1	-0.4090	0.2190	3.4882	0.0618	-0.076626	0.664
WITNESS	1	-0.4790	0.1579	9.2095	0.0024	-0.132063	0.619
INSIDE2	1	0.6864	0.2824	5.9072	0.0151	0.127297	1.987
MALE1	1	0.5872	0.2165	7.3552	0.0067	0.120668	1.799
Q24INJ	1	-0.2742	0.0683	16.1359	0.0001	-0.150422	0.760
AGES	1	0.1903	0.0524	13.1963	0.0003	0.156521	1.210
HISPS	1	0.6935	0.1959	12.5292	0.0004	0.164150	2.001
MALES	1	-0.5988	0.2086	8.2393	0.0041	-0.145195	0.549
HEIGHDIF	1	-0.1016	0.0672	2.2862	0.1305	-0.070979	0.903

Association of Predicted Probabilities and Observed Responses

Concordant = 70.1%	Somers' D = 0.409
Discordant = 29.3%	Gamma = 0.411
Tied = 0.6%	Tau-a = 0.101
(309396 pairs)	c = 0.704

Model 4: Logistic Regression of Police Physical Force on the 41 Predictors and Predicted Suspect Physical Force

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: PHYSICAL
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	PHYSICAL	Count
1	1	349
2	0	1236

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1673.057	1552.453	.
SC	1678.426	1729.608	.
-2 LOG L	1671.057	1486.453	184.605 with 32 DF (p=0.0001)
Score	.	.	174.929 with 32 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-7.5764	2.0588	13.5428	0.0002	.	.
NUMBERPI	1	0.3052	0.0716	18.1517	0.0001	0.166228	1.357
CHANGEPN	1	0.2531	0.0669	14.3103	0.0002	0.142842	1.288
COVER	1	0.3224	0.1385	5.4184	0.0199	0.084596	1.380
SHIFT	1	0.3203	0.1240	6.6689	0.0098	0.131952	1.378
VIOLENT2	1	1.4004	0.3682	14.4622	0.0001	0.270537	4.057
PROPERTY	1	0.3164	0.1919	2.7195	0.0991	0.074506	1.372
TRAFFIC	1	-0.3146	0.2485	1.6024	0.2056	-0.060209	0.730
VICE	1	1.2317	0.3100	15.7833	0.0001	0.224587	3.427
DOMESTIC	1	0.8080	0.2368	11.6459	0.0006	0.151375	2.243
WITNESS	1	0.6025	0.1832	10.8117	0.0010	0.166105	1.827
BYANTAG	1	0.4538	0.2950	2.3665	0.1240	0.049262	1.574
HOUSE	1	0.0373	0.1628	0.0524	0.8190	0.008507	1.038
INSIDE2	1	-0.8447	0.2940	8.2543	0.0041	-0.156661	0.430
LOCCRIME	1	-0.2959	0.1483	3.9833	0.0460	-0.076702	0.744
VISIBLE	1	-0.0540	0.0260	4.3125	0.0378	-0.074367	0.947
LENGTHPD	1	0.1340	0.0755	3.1537	0.0758	0.085900	1.143
Q24INJ	1	0.3639	0.1016	12.8248	0.0003	0.199634	1.439
DRUGS	1	0.4322	0.2117	4.1686	0.0412	0.069148	1.541
ALCOHOL	1	0.3782	0.1480	6.5336	0.0106	0.091125	1.460
GANG	1	0.3686	0.2979	1.5312	0.2159	0.040015	1.446
AGE1	1	0.1287	0.0872	2.1751	0.1403	0.087121	1.137
AGES	1	-0.3437	0.0848	16.4086	0.0001	-0.282711	0.709
AGEDIF	1	-0.1013	0.0590	2.9435	0.0862	-0.104786	0.904
WHITE1	1	0.0464	0.2074	0.0501	0.8229	0.011191	1.048
BLACKS	1	0.7512	0.3441	4.7641	0.0291	0.149258	2.119
HISPS	1	-0.1707	0.3660	0.2174	0.6410	-0.040395	0.843
WPBS	1	-0.6350	0.4043	2.4664	0.1163	-0.110575	0.530
WPHS	1	-0.2158	0.3703	0.3395	0.5601	-0.046192	0.806
MALE1	1	-0.9301	0.3111	8.9399	0.0028	-0.191115	0.395
MALES	1	0.0309	0.3606	0.0074	0.9316	0.007501	1.031
BOTHMALE	1	0.8270	0.3815	4.6998	0.0302	0.214767	2.286
PHYSSUS2	1	4.9596	2.0881	5.6415	0.0175	0.262368	142.536

Model 4: Stepwise Logistic Regression of Police Physical Force on the 41 Predictors and Predicted Suspect Physical Force

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: PHYSICAL
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	PHYSICAL	Count
1	1	349
2	0	1236

Stepwise Selection Procedure

Step 13. Variable VISIBLE entered:

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1673.057	1544.347	.
SC	1678.426	1619.503	.
-2 LOG L	1671.057	1516.347	154.711 with 13 DF (p=0.0001)
Score	.	.	156.666 with 13 DF (p=0.0001)

Residual Chi-Square = 56.1439 with 41 DF (p=0.0578)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	0.6416	0.6175	1.0795	0.2988	.	.
NUMBERPI	1	0.3398	0.0693	24.0147	0.0001	0.185084	1.405
CHANGEPN	1	0.2791	0.0656	18.1137	0.0001	0.157558	1.322
COVER	1	0.2886	0.1350	4.5689	0.0326	0.075731	1.335
TRAFFIC	1	-0.4758	0.2185	4.7423	0.0294	-0.091078	0.621
LOCHAZRD	1	0.4702	0.2465	3.6392	0.0564	0.060325	1.600
VISIBLE	1	-0.0512	0.0253	4.1030	0.0428	-0.070621	0.950
LENGTHPD	1	0.1327	0.0557	5.6707	0.0173	0.085046	1.142
HISPS	1	0.3955	0.1522	6.7497	0.0094	0.093628	1.485
DRUGS	1	0.4429	0.2000	4.9036	0.0268	0.070859	1.557
ALCOHOL	1	0.3795	0.1408	7.2624	0.0070	0.091424	1.462
PROBSUSP	1	0.8306	0.2858	8.4474	0.0037	0.086719	2.295
HEIGHDIF	1	-0.1402	0.0527	7.0766	0.0078	-0.097880	0.869
PHYSSUS2	1	-3.6097	0.6518	30.6659	0.0001	-0.190958	0.027

Association of Predicted Probabilities and Observed Responses

Concordant = 70.6%	Somers' D = 0.415
Discordant = 29.0%	Gamma = 0.417
Tied = 0.4%	Tau-a = 0.143
(431364 pairs)	c = 0.708

Model 4: Linear Regression of Suspect Continuum of Force on Variable Subset to Calculate Values of Predicted Suspect Continuum of Force

The SAS System

Model: MODEL1
Dependent Variable: LEVELS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	18	626.04679	34.78038	11.554	0.0001
Error	1566	4714.06425	3.01026		
C Total	1584	5340.11104			

Root MSE	1.73501	R-square	0.1172
Dep Mean	1.26688	Adj R-sq	0.1071
C.V.	136.95170		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.028951	0.22743769	0.127	0.8987
NUMBERPI	1	0.203798	0.05066763	4.022	0.0001
CHANGEPN	1	0.202605	0.04797308	4.223	0.0001
COVER	1	0.248601	0.09509172	2.614	0.0090
VIOLENT2	1	0.679802	0.13882828	4.897	0.0001
PROPERTY	1	0.289601	0.11307371	2.561	0.0105
VICE	1	0.386608	0.14362775	2.692	0.0072
DOMESTIC	1	0.442065	0.13917263	3.176	0.0015
WITNESS	1	0.239572	0.09150831	2.618	0.0089
BYANTAG	1	0.834877	0.22716745	3.675	0.0002
MALE1	1	-0.243306	0.12011816	-2.026	0.0430
LENGTHPD	1	0.140442	0.03902738	3.599	0.0003
Q24INJ	1	0.144007	0.04529946	3.179	0.0015
AGES	1	-0.095064	0.03050301	-3.117	0.0019
HISPS	1	-0.238488	0.10511512	-2.269	0.0234
DRUGS	1	0.457065	0.15459533	2.957	0.0032
ALCOHOL	1	0.457788	0.10317746	4.437	0.0001
GANG	1	0.589071	0.22684018	2.597	0.0095
HEIGHDIF	1	0.005998	0.03575667	0.168	0.8668

Model 4: Linear Regression of Police Continuum of Force on the 41 Predictors and Predicted Suspect Continuum of Force

The SAS System

Model: MODEL1
Dependent Variable: CONTINUE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	32	495.20645	15.47520	8.600	0.0001
Error	1552	2792.81500	1.79949		
C Total	1584	3288.02145			

Root MSE	1.34145	R-square	0.1506
Dep Mean	2.96467	Adj R-sq	0.1331
C.V.	45.24796		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	2.525162	0.29918455	8.440	0.0001
NUMBERPI	1	1.942292	1.05125159	1.848	0.0649
CHANGEPN	1	1.867230	1.04265338	1.791	0.0735
COVER	1	2.433047	1.28432713	1.894	0.0584
SHIFT	1	-0.022660	0.04619581	-0.491	0.6238
VIOLENT2	1	5.980458	3.51143597	1.703	0.0887
PROPERTY	1	2.592775	1.49667848	1.732	0.0834
TRAFFIC	1	-0.057843	0.11300337	-0.512	0.6088
VICE	1	3.472991	1.99421326	1.742	0.0818
DOMESTIC	1	4.010928	2.28758701	1.753	0.0797
WITNESS	1	2.238241	1.23334176	1.815	0.0698
BYANTAG	1	7.127948	4.30863146	1.654	0.0983
HOUSE	1	0.111060	0.09016599	1.232	0.2182
INSIDE2	1	-0.145623	0.11083476	-1.314	0.1891
LOCCRIME	1	-0.107201	0.07571383	-1.416	0.1570
VISIBLE	1	-0.050254	0.01415485	-3.550	0.0004
LENGTHPD	1	1.174386	0.72722353	1.615	0.1065
Q24INJ	1	1.276868	0.74319246	1.718	0.0860
DRUGS	1	3.832856	2.36191162	1.623	0.1048
ALCOHOL	1	3.904526	2.36403211	1.652	0.0988
GANG	1	5.119639	3.04010196	1.684	0.0924
AGE1	1	-0.026154	0.04491184	-0.582	0.5604
AGES	1	-0.809540	0.49245597	-1.644	0.1004
AGEDIF	1	0.040131	0.03260263	1.231	0.2185
WHITE1	1	0.093265	0.10546843	0.884	0.3767
BLACKS	1	0.518595	0.19142248	2.709	0.0068
HISPS	1	-1.900375	1.23643293	-1.537	0.1245
WPBS	1	-0.618047	0.22082834	-2.799	0.0052
WPHS	1	-0.013957	0.19290873	-0.072	0.9423
MALE1	1	-2.283767	1.22260113	-1.868	0.0620
MALES	1	0.011860	0.17380410	0.068	0.9456
BOTHMALE	1	0.303562	0.19450624	1.561	0.1188
LEVELS2	1	-8.272507	5.15821855	-1.604	0.1090

Dependent Variable: CONTINUE
Test: AGE Numerator: 2.8554 DF: 3 F value: 1.5868
Denominator: 1.799494 DF: 1552 Prob>F: 0.1907

Dependent Variable: CONTINUE
Test: RACE Numerator: 3.9473 DF: 5 F value: 2.1936
Denominator: 1.799494 DF: 1552 Prob>F: 0.0526

Dependent Variable: CONTINUE
Test: SEX Numerator: 11.5059 DF: 3 F value: 6.3939
Denominator: 1.799494 DF: 1552 Prob>F: 0.0003

Model 4: Stepwise Linear Regression of Police Continuum of Force on the 41 Predictors and Predicted Suspect Continuum of Force

The SAS System

Stepwise Procedure for Dependent Variable CONTINUE

Summary of Stepwise Procedure for Dependent Variable CONTINUE

Step	Variable Entered Removed	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
	Label						
1	LEVELS2	1	0.0872	0.0872	98.4555	151.2846	0.0001
	Predicted Value of LEVELS						
2	MALES	2	0.0121	0.0993	78.2593	21.1882	0.0001
3	COVER	3	0.0102	0.1094	61.5814	18.0216	0.0001
4	VISIBLE	4	0.0077	0.1172	49.3829	13.8105	0.0002
5	NUMBERPI	5	0.0070	0.1241	38.5327	12.5908	0.0004
6	PROBSUSP	6	0.0047	0.1288	31.8930	8.5055	0.0036
7	CHANGEPN	7	0.0042	0.1331	26.0790	7.7255	0.0055
8	FAMILY	8	0.0034	0.1365	21.8215	6.2070	0.0128
9	WITNESS	9	0.0027	0.1392	18.9163	4.8776	0.0274
10	WEIGHT1	10	0.0022	0.1413	16.9519	3.9495	0.0471

Model 4: Linear Regression of Suspect Maximum Force on Variable Subset to Calculate Values of Predicted Suspect Maximum Force

The SAS System

Model: MODEL1
Dependent Variable: SMXFORCE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	18	68117.15856	3784.28659	8.530	0.0001
Error	1566	694756.59917	443.65045		
C Total	1584	762873.75773			

Root MSE	21.06301	R-square	0.0893
Dep Mean	13.94826	Adj R-sq	0.0788
C.V.	151.00811		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-1.868277	3.03804089	-0.615	0.5387
NUMBERPI	1	1.948008	0.60458313	3.222	0.0013
CHANGEPN	1	1.923027	0.58234983	3.302	0.0010
SHIFT	1	1.622858	0.71776195	2.261	0.0239
VIOLENT2	1	9.667608	1.68391534	5.741	0.0001
PROPERTY	1	2.029774	1.37162211	1.480	0.1391
VICE	1	4.925659	1.73849571	2.833	0.0047
DOMESTIC	1	4.335407	1.68948102	2.566	0.0104
WITNESS	1	2.630763	1.11020238	2.370	0.0179
BYANTAG	1	7.016251	2.75977208	2.542	0.0111
LENGTHPD	1	1.226257	0.47091301	2.604	0.0093
Q24INJ	1	1.489547	0.54970295	2.710	0.0068
AGES	1	-1.263506	0.37168138	-3.399	0.0007
HISPS	1	-4.441719	1.30528216	-3.403	0.0007
MALES	1	1.990571	1.31353813	1.515	0.1299
DRUGS	1	3.813589	1.87730520	2.031	0.0424
ALCOHOL	1	2.994346	1.25868723	2.379	0.0175
GANG	1	6.060246	2.75085973	2.203	0.0277
HEIGHDIF	1	0.097599	0.45417839	0.215	0.8299

Model 4: Linear Regression of Police Maximum Force on the 41 Predictors and Predicted Suspect Maximum Force

The SAS System

Model: MODEL1
Dependent Variable: MAXFORCE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	32	73537.02590	2298.03206	7.309	0.0001
Error	1552	487991.43215	314.42747		
C Total	1584	561528.45804			

Root MSE	17.73210	R-square	0.1310
Dep Mean	36.79054	Adj R-sq	0.1130
C.V.	48.19746		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	18.925751	8.34750136	2.267	0.0235
NUMBERPI	1	13.448511	8.16988466	1.646	0.0999
CHANGEPN	1	12.755850	8.03220407	1.588	0.1125
COVER	1	5.374335	0.99054940	5.426	0.0001
SHIFT	1	8.082080	6.82596524	1.184	0.2366
VIOLENT2	1	54.908015	40.57702292	1.353	0.1762
PROPERTY	1	13.139146	8.59675174	1.528	0.1266
TRAFFIC	1	-1.692690	1.49374485	-1.133	0.2573
VICE	1	27.713687	20.65229190	1.342	0.1798
DOMESTIC	1	25.291097	18.28857505	1.383	0.1669
WITNESS	1	16.642889	11.00480014	1.512	0.1307
BYANTAG	1	38.322646	29.47277945	1.300	0.1937
HOUSE	1	1.435008	1.19186699	1.204	0.2288
INSIDE2	1	-1.051687	1.46507889	-0.718	0.4730
LOCCRIME	1	-1.568187	1.00082978	-1.567	0.1173
VISIBLE	1	-0.697381	0.18710710	-3.727	0.0002
LENGTHPD	1	6.593950	5.18723105	1.271	0.2039
Q24INJ	1	8.275969	6.25279803	1.324	0.1858
DRUGS	1	18.312411	16.07424131	1.139	0.2548
ALCOHOL	1	14.988560	12.60927981	1.189	0.2347
GANG	1	36.207426	25.45341704	1.422	0.1551
AGE1	1	-0.561577	0.59367101	-0.946	0.3443
AGES	1	-6.380103	5.32562333	-1.198	0.2311
AGEDIF	1	0.716701	0.43096068	1.663	0.0965
WHITE1	1	1.848943	1.39414352	1.326	0.1850
BLACKS	1	6.894842	2.53033461	2.725	0.0065
HISPS	1	-19.264076	18.67519801	-1.032	0.3025
WPBS	1	-6.826680	2.91903853	-2.339	0.0195
WPHS	1	-2.659927	2.54998070	-1.043	0.2971
MALE1	1	-2.671898	1.97396827	-1.354	0.1761
MALES	1	9.981483	8.24966203	1.210	0.2265
BOTHMALE	1	3.655849	2.57109758	1.422	0.1553
SMX2	1	-5.218163	4.19018781	-1.245	0.2132

Dependent Variable: MAXFORCE
Test: AGE Numerator: 498.6786 DF: 3 F value: 1.5860
Denominator: 314.4275 DF: 1552 Prob>F: 0.1909

Dependent Variable: MAXFORCE
Test: RACE Numerator: 572.0793 DF: 5 F value: 1.8194
Denominator: 314.4275 DF: 1552 Prob>F: 0.1059

Dependent Variable: MAXFORCE
Test: SEX Numerator: 630.3702 DF: 3 F value: 2.0048
Denominator: 314.4275 DF: 1552 Prob>F: 0.1114

Model 4: Stepwise Linear Regression of Police Maximum Force on the 41 Predictors and Predicted Suspect Maximum Force

The SAS System

Stepwise Procedure for Dependent Variable MAXFORCE

Summary of Stepwise Procedure for Dependent Variable MAXFORCE

Step	Variable Entered Removed	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
	Label						
1	SMX2	1	0.0489	0.0489	115.0679	81.3802	0.0001
	Predicted Value of SMXFORCE						
2	COVER	2	0.0266	0.0755	69.6858	45.4656	0.0001
3	VISIBLE	3	0.0068	0.0822	59.5978	11.6773	0.0006
4	NUMBERPI	4	0.0067	0.0890	49.6163	11.6525	0.0007
5	CHANGEPN	5	0.0101	0.0991	33.6267	17.6803	0.0001
6	WITNESS	6	0.0048	0.1039	27.0282	8.4908	0.0036
7	MALES	7	0.0045	0.1083	21.0751	7.8877	0.0050
8	HISPS	8	0.0025	0.1109	18.5510	4.4968	0.0341
9	PROBSUSP	9	0.0024	0.1133	16.2696	4.2644	0.0391

Appendix C
Suspect Force Regression Results

Model 1: Logistic Regression of Suspect Physical Force on the 41 Predictors

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: PHYSSUS
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	PHYSSUS	Count
1	1	228
2	0	1357

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1307.687	1264.938	.
SC	1313.056	1554.828	.
-2 LOG L	1305.687	1156.938	148.750 with 53 DF (p=0.0001)
Score	.	.	145.865 with 53 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-3.2551	0.8757	13.8178	0.0002	.	.
PATROL	1	0.0564	0.3311	0.0291	0.8646	0.007708	1.058
CUSTODY	1	0.3163	0.2472	1.6376	0.2007	0.061553	1.372
NUMBERPI	1	0.0137	0.1097	0.0156	0.9008	0.007454	1.014
POLINIT2	1	0.2590	0.2269	1.3028	0.2537	0.068860	1.296
CHANGEPN	1	0.0991	0.0811	1.4930	0.2218	0.055941	1.104
COVER	1	0.2166	0.1694	1.6348	0.2010	0.056828	1.242
DISPATCH	1	0.0315	0.1918	0.0269	0.8696	0.008478	1.032
WEEKEND	1	0.1000	0.2476	0.1629	0.6865	0.025725	1.105
NIGHT	1	-0.0487	0.2163	0.0506	0.8220	-0.013258	0.952
ENDNIGHT	1	0.1029	0.3378	0.0927	0.7607	0.021513	1.108
SHIFT	1	0.2850	0.1068	7.1212	0.0076	0.117388	1.330
VIOLENT2	1	0.9453	0.2481	14.5215	0.0001	0.182620	2.574
PROPERTY	1	0.00810	0.2408	0.0011	0.9732	0.001906	1.008
TRAFFIC	1	-0.4769	0.3123	2.3312	0.1268	-0.091270	0.621
VICE	1	0.6679	0.2582	6.6930	0.0097	0.121785	1.950
DOMESTIC	1	0.5858	0.2896	4.0909	0.0431	0.109740	1.796
FAMILY	1	-0.1494	0.2369	0.3980	0.5281	-0.032491	0.861
SUSINIT2	1	-0.2019	0.3695	0.2987	0.5847	-0.041677	0.817
SUSCOMP2	1	0.3647	0.3808	0.9173	0.3382	0.070202	1.440
WITNESS	1	0.5334	0.1830	8.5007	0.0036	0.147055	1.705
BYFAMILY	1	-0.2147	0.2183	0.9670	0.3254	-0.047072	0.807
BYANTAG	1	0.3010	0.3379	0.7937	0.3730	0.032679	1.351
HOUSE	1	-0.2038	0.2037	1.0008	0.3171	-0.046528	0.816
INSIDE2	1	-0.8397	0.3118	7.2512	0.0071	-0.155732	0.432
LOCHAZRD	1	0.2414	0.3181	0.5759	0.4479	0.030974	1.273
LOCCRIME	1	-0.0998	0.1835	0.2955	0.5867	-0.025859	0.905
VISIBLE	1	-0.0215	0.0331	0.4202	0.5168	-0.029566	0.979
AGE1	1	0.1417	0.1038	1.8633	0.1722	0.095959	1.152
WHITE1	1	0.1000	0.2401	0.1734	0.6771	0.024108	1.105
HEIGHT1	1	-0.1543	0.1511	1.0423	0.3073	-0.086480	0.857
WEIGHT1	1	-0.0147	0.1361	0.0116	0.9141	-0.009545	0.985
MALE1	1	-0.5951	0.3580	2.7636	0.0964	-0.122279	0.552
LENGTHPD	1	0.1397	0.0921	2.3013	0.1293	0.089503	1.150

Q24INJ	1	0.2436	0.0741	10.8105	0.0010	0.133631	1.276
ARRESTN	1	-0.0234	0.0564	0.1717	0.6786	-0.018625	0.977
TRAIN	1	-0.1466	0.1436	1.0415	0.3075	-0.045447	0.864
AGES	1	-0.2644	0.0754	12.2908	0.0005	-0.217472	0.768
BLACKS	1	0.4757	0.3964	1.4405	0.2301	0.094531	1.609
HISPS	1	-0.7790	0.4590	2.8801	0.0897	-0.184406	0.459
HEIGHTS	1	0.1966	0.1413	1.9356	0.1641	0.130279	1.217
WEIGHTS	1	-0.0507	0.1260	0.1617	0.6876	-0.034519	0.951
MALES	1	0.3475	0.3726	0.8695	0.3511	0.084243	1.415
DRUGS	1	0.3808	0.2506	2.3084	0.1287	0.060921	1.463
ALCOHOL	1	0.3021	0.1795	2.8311	0.0925	0.072782	1.353
PROBSUSP	1	-0.1734	0.4095	0.1793	0.6720	-0.018101	0.841
KNOWRECD	1	0.0498	0.3261	0.0233	0.8786	0.006587	1.051
GANG	1	0.5448	0.3373	2.6092	0.1062	0.059145	1.724
AGEDIF	1	-0.0998	0.0670	2.2205	0.1362	-0.103256	0.905
WPBS	1	-0.4480	0.4671	0.9196	0.3376	-0.078005	0.639
WPHS	1	0.0901	0.5019	0.0322	0.8576	0.019281	1.094
HEIGHDIF	1	0.3073	0.1547	3.9468	0.0470	0.214597	1.360
WEIGHDIF	1	-0.0687	0.1352	0.2585	0.6111	-0.055491	0.934
BOTHMALE	1	0.2576	0.4355	0.3500	0.5541	0.066904	1.294

Model 1: Stepwise Logistic Regression of Suspect Physical Force on the 41 Predictors

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: PHYSSUS
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	PHYSSUS	Count
1	1	228
2	0	1357

Stepwise Selection Procedure

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-2.6197	0.3235	65.5920	0.0001	.	.
SHIFT	1	0.2784	0.1006	7.6487	0.0057	0.114665	1.321
VIOLENT2	1	0.8940	0.1864	22.9927	0.0001	0.172711	2.445
VICE	1	0.7323	0.2087	12.3072	0.0005	0.133525	2.080
WITNESS	1	0.4765	0.1547	9.4923	0.0021	0.131377	1.611
INSIDE2	1	-0.7106	0.2795	6.4617	0.0110	-0.131781	0.491
Q24INJ	1	0.2612	0.0675	14.9745	0.0001	0.143287	1.298
AGES	1	-0.1803	0.0531	11.5093	0.0007	-0.148301	0.835
HISPS	1	-0.6782	0.1939	12.2269	0.0005	-0.160532	0.508
ALCOHOL	1	0.3615	0.1658	4.7566	0.0292	0.087095	1.435
GANG	1	0.6141	0.3108	3.9036	0.0482	0.066663	1.848

Association of Predicted Probabilities and Observed Responses

Concordant = 69.3%	Somers' D = 0.394
Discordant = 29.9%	Gamma = 0.397
Tied = 0.8%	Tau-a = 0.097
(309396 pairs)	c = 0.697

Model 1: Linear Regression of Suspect Continuum of Force on the 41 Predictors

The SAS System

Model: MODEL1
Dependent Variable: LEVELS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	53	739.41213	13.95117	4.643	0.0001
Error	1531	4600.69891	3.00503		
C Total	1584	5340.11104			

Root MSE	1.73350	R-square	0.1385
Dep Mean	1.26688	Adj R-sq	0.1086
C.V.	136.83269		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-0.290553	0.49798389	-0.583	0.5597
PATROL	1	0.260480	0.19413746	1.342	0.1799
CUSTODY	1	0.000857	0.13675676	0.006	0.9950
NUMBERPI	1	0.250196	0.06760288	3.701	0.0002
POLINIT2	1	-0.154067	0.13024806	-1.183	0.2370
CHANGEPN	1	0.186635	0.05002917	3.731	0.0002
COVER	1	0.231721	0.09959892	2.327	0.0201
DISPATCH	1	0.082034	0.10911855	0.752	0.4523
WEEKEND	1	-0.067083	0.13761686	-0.487	0.6260
NIGHT	1	-0.169818	0.12349087	-1.375	0.1693
ENDNIGHT	1	0.096064	0.19551058	0.491	0.6232
SHIFT	1	0.112146	0.06125613	1.831	0.0673
VIOLENT2	1	0.585450	0.15538084	3.768	0.0002
PROPERTY	1	0.221775	0.12867032	1.724	0.0850
TRAFFIC	1	-0.178424	0.14990542	-1.190	0.2341
VICE	1	0.349096	0.15496858	2.253	0.0244
DOMESTIC	1	0.398879	0.17400471	2.292	0.0220
FAMILY	1	-0.056221	0.14500577	-0.388	0.6983
SUSINIT2	1	-0.053771	0.21540273	-0.250	0.8029
SUSCOMP2	1	0.024879	0.22888521	0.109	0.9135
WITNESS	1	0.324679	0.10589745	3.066	0.0022
BYFAMILY	1	-0.181913	0.13487834	-1.349	0.1776
BYANTAG	1	0.790414	0.23202876	3.407	0.0007
HOUSE	1	-0.006107	0.12203628	-0.050	0.9601
INSIDE2	1	-0.211414	0.15166693	-1.394	0.1635
LOCHAZRD	1	0.136047	0.20054682	0.678	0.4976
LOCCRIME	1	-0.171220	0.10338860	-1.656	0.0979
VISIBLE	1	-0.041689	0.01964493	-2.122	0.0340
AGE1	1	0.082636	0.05883659	1.404	0.1604
WHITE1	1	-0.074148	0.13865704	-0.535	0.5929
HEIGHT1	1	0.004385	0.08673219	0.051	0.9597
WEIGHT1	1	-0.047197	0.07896024	-0.598	0.5501
MALE1	1	-0.091864	0.19872557	-0.462	0.6440
LENGTHPD	1	0.136647	0.05278970	2.589	0.0097
Q24INJ	1	0.145474	0.04637551	3.137	0.0017
ARRESTN	1	0.046420	0.03191074	1.455	0.1460
TRAIN	1	-0.064750	0.08219083	-0.788	0.4309
AGES	1	-0.138568	0.04567214	-3.034	0.0025
BLACKS	1	0.242141	0.25026457	0.968	0.3334
HISPS	1	-0.417741	0.22386192	-1.866	0.0622
HEIGHTS	1	0.021704	0.08053290	0.270	0.7876
WEIGHTS	1	0.015441	0.07333001	0.211	0.8333
MALES	1	0.388785	0.22883981	1.699	0.0895
DRUGS	1	0.466997	0.15734910	2.968	0.0030
ALCOHOL	1	0.463611	0.10802088	4.292	0.0001
PROBSUSP	1	0.361484	0.24731053	1.462	0.1440
KNOWRECD	1	-0.106417	0.19877990	-0.535	0.5925

GANG	1	0.511421	0.23195365	2.205	0.0276
AGEDIF	1	-0.057538	0.04254240	-1.352	0.1764
WPBS	1	-0.049379	0.28880738	-0.171	0.8643
WPHS	1	0.318056	0.25136143	1.265	0.2059
HEIGHDIF	1	0.028074	0.08885645	0.316	0.7521
WEIGHDIF	1	0.034586	0.07790943	0.444	0.6572
BOTHMALE	1	-0.318540	0.25626227	-1.243	0.2140

The SAS System

Dependent Variable: LEVELS

Test: AGE	Numerator:	11.5303	DF: 3	F value:	3.8370
	Denominator:	3.005029	DF: 1531	Prob>F:	0.0094

Dependent Variable: LEVELS

Test: RACE	Numerator:	5.0157	DF: 5	F value:	1.6691
	Denominator:	3.005029	DF: 1531	Prob>F:	0.1389

Dependent Variable: LEVELS

Test: SEX	Numerator:	5.0373	DF: 3	F value:	1.6763
	Denominator:	3.005029	DF: 1531	Prob>F:	0.1702

Dependent Variable: LEVELS

Test: HEIGHT	Numerator:	0.2742	DF: 3	F value:	0.0912
	Denominator:	3.005029	DF: 1531	Prob>F:	0.9649

Dependent Variable: LEVELS

Test: WEIGHT	Numerator:	0.4252	DF: 3	F value:	0.1415
	Denominator:	3.005029	DF: 1531	Prob>F:	0.9351

Model 1: Stepwise Linear Regression of Suspect Continuum of Force on the 41 Predictors

The SAS System
Stepwise Procedure for Dependent Variable LEVELS

Summary of Stepwise Procedure for Dependent Variable LEVELS

Step	Variable Entered	Removed	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
1	WITNESS		1	0.0167	0.0167	166.4153	26.8539	0.0001
2	ALCOHOL		2	0.0128	0.0295	145.5992	20.9295	0.0001
3	BYANTAG		3	0.0105	0.0400	128.9565	17.2772	0.0001
4	VIOLENT2		4	0.0094	0.0495	114.1724	15.6953	0.0001
5	DRUGS		5	0.0080	0.0575	101.9319	13.4249	0.0003
6	Q24INJ		6	0.0076	0.0651	90.3465	12.9038	0.0003
7	NUMBERPI		7	0.0075	0.0726	79.0583	12.7153	0.0004
8	CHANGEPN		8	0.0118	0.0844	60.1390	20.2618	0.0001
9	TRAFFIC		9	0.0054	0.0898	52.4753	9.4100	0.0022
10	GANG		10	0.0052	0.0950	45.2403	9.0384	0.0027
11	LENGTHPD		11	0.0043	0.0993	39.5195	7.5880	0.0059
12	COVER		12	0.0041	0.1034	34.3025	7.1205	0.0077
13	AGES		13	0.0041	0.1075	29.0625	7.1713	0.0075
14	HISPS		14	0.0031	0.1106	25.4865	5.5391	0.0187
15	DOMESTIC		15	0.0025	0.1131	23.0858	4.3808	0.0365
16	VISIBLE		16	0.0022	0.1153	21.1243	3.9512	0.0470
17	MALE1		17	0.0019	0.1172	19.7487	3.3718	0.0665

Model 1: Linear Regression of Suspect Maximum Force on the 41 Predictors

The SAS System

Model: MODEL1
Dependent Variable: SMXFORCE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	53	83961.26830	1584.17487	3.572	0.0001
Error	1531	678912.48943	443.44382		
C Total	1584	762873.75773			

Root MSE	21.05811	R-square	0.1101
Dep Mean	13.94826	Adj R-sq	0.0793
C.V.	150.97294		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.332938	6.04937197	0.055	0.9561
PATROL	1	1.235597	2.35832872	0.524	0.6004
CUSTODY	1	0.868329	1.66128368	0.523	0.6013
NUMBERPI	1	1.569199	0.82122131	1.911	0.0562
POLINIT2	1	0.242176	1.58221776	0.153	0.8784
CHANGEPN	1	1.665415	0.60774068	2.740	0.0062
COVER	1	2.025367	1.20990039	1.674	0.0943
DISPATCH	1	0.966252	1.32554228	0.729	0.4661
WEEKEND	1	0.776601	1.67173190	0.465	0.6423
NIGHT	1	-0.971614	1.50013323	-0.648	0.5173
ENDNIGHT	1	0.082806	2.37500903	0.035	0.9722
SHIFT	1	1.610347	0.74412268	2.164	0.0306
VIOLENT2	1	8.730997	1.88752384	4.626	0.0001
PROPERTY	1	1.583415	1.56305177	1.013	0.3112
TRAFFIC	1	-2.200620	1.82100995	-1.208	0.2271
VICE	1	4.358482	1.88251593	2.315	0.0207
DOMESTIC	1	4.667578	2.11376162	2.208	0.0274
FAMILY	1	-1.073206	1.76149043	-0.609	0.5424
SUSINIT2	1	-2.191531	2.61665342	-0.838	0.4024
SUSCOMP2	1	2.026136	2.78043480	0.729	0.4663
WITNESS	1	4.038045	1.28641320	3.139	0.0017
BYFAMILY	1	-2.155436	1.63846517	-1.316	0.1885
BYANTAG	1	6.602541	2.81862183	2.342	0.0193
HOUSE	1	-2.483132	1.48246331	-1.675	0.0941
INSIDE2	1	-4.397284	1.84240836	-2.387	0.0171
LOCHAZRD	1	1.457204	2.43618783	0.598	0.5498
LOCCRIME	1	-2.263528	1.25593646	-1.802	0.0717
VISIBLE	1	-0.418420	0.23864126	-1.753	0.0797
AGE1	1	1.242180	0.71473075	1.738	0.0824
WHITE1	1	0.231040	1.68436777	0.137	0.8909
HEIGHT1	1	-0.500433	1.05359889	-0.475	0.6349
WEIGHT1	1	-0.210029	0.95918731	-0.219	0.8267
MALE1	1	-3.120020	2.41406381	-1.292	0.1964
LENGTHPD	1	1.301915	0.64127486	2.030	0.0425
Q24INJ	1	1.478761	0.56335698	2.625	0.0088
ARRESTN	1	0.153279	0.38764295	0.395	0.6926
TRAIN	1	-0.737546	0.99843168	-0.739	0.4602
AGES	1	-1.975342	0.55481267	-3.560	0.0004
BLACKS	1	3.746646	3.04014547	1.232	0.2180
HISPS	1	-4.896684	2.71941325	-1.801	0.0720
HEIGHTS	1	0.939619	0.97829160	0.960	0.3370
WEIGHTS	1	0.136301	0.89079292	0.153	0.8784
MALES	1	2.390326	2.77988335	0.860	0.3900
DRUGS	1	3.526828	1.91143379	1.845	0.0652
ALCOHOL	1	2.816649	1.31220808	2.146	0.0320
PROBSUSP	1	0.045660	3.00426065	0.015	0.9879

KNOWRECD	1	-0.523985	2.41472375	-0.217	0.8282
GANG	1	5.385419	2.81770945	1.911	0.0562
AGEDIF	1	-0.890295	0.51679341	-1.723	0.0851
WPBS	1	-2.232730	3.50835293	-0.636	0.5246
WPHS	1	2.039634	3.05346988	0.668	0.5043
HEIGHDIF	1	1.121000	1.07940384	1.039	0.2992
WEIGHDIF	1	0.199908	0.94642241	0.211	0.8327
BOTHMALE	1	0.265280	3.11300388	0.085	0.9321

Dependent Variable: SMXFORCE
Test: AGE Numerator: 2268.2245 DF: 3 F value: 5.1150
Denominator: 443.4438 DF: 1531 Prob>F: 0.0016

Dependent Variable: SMXFORCE
Test: RACE Numerator: 962.6237 DF: 5 F value: 2.1708
Denominator: 443.4438 DF: 1531 Prob>F: 0.0549

Dependent Variable: SMXFORCE
Test: SEX Numerator: 630.8599 DF: 3 F value: 1.4226
Denominator: 443.4438 DF: 1531 Prob>F: 0.2344

Dependent Variable: SMXFORCE
Test: HEIGHT Numerator: 195.3102 DF: 3 F value: 0.4404
Denominator: 443.4438 DF: 1531 Prob>F: 0.7241

Dependent Variable: SMXFORCE
Test: WEIGHT Numerator: 7.9880 DF: 3 F value: 0.0180
Denominator: 443.4438 DF: 1531 Prob>F: 0.9967

Model 1: Stepwise Linear Regression of Suspect Maximum Force on the 41 Predictors

The SAS System
Stepwise Procedure for Dependent Variable SMXFORCE

Summary of Stepwise Procedure for Dependent Variable SMXFORCE

Step	Variable Entered	Removed	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
1	VIOLENT2		1	0.0209	0.0209	103.3109	33.8612	0.0001
2	WITNESS		2	0.0090	0.0299	89.8598	14.6468	0.0001
3	INSIDE2		3	0.0063	0.0363	80.9549	10.3988	0.0013
4	Q24INJ		4	0.0055	0.0418	73.4393	9.1206	0.0026
5	SHIFT		5	0.0053	0.0471	66.3210	8.7827	0.0031
6	AGES		6	0.0047	0.0518	60.2281	7.8289	0.0052
7	HISPS		7	0.0049	0.0567	53.7181	8.2702	0.0041
8	ALCOHOL		8	0.0045	0.0612	48.0274	7.5049	0.0062
9	TRAFFIC		9	0.0043	0.0655	42.6698	7.2081	0.0073
10	BYANTAG		10	0.0040	0.0694	37.8680	6.6877	0.0098
11	LENGTHPD		11	0.0034	0.0728	34.0519	5.7356	0.0167
12	DRUGS		12	0.0033	0.0761	30.3438	5.6458	0.0176
13	COVER		13	0.0030	0.0792	27.1719	5.1289	0.0237
14	GANG		14	0.0024	0.0816	25.0370	4.1087	0.0428
15	LOCCRIME		15	0.0025	0.0840	22.7527	4.2659	0.0390
16	CHANGEPN		16	0.0026	0.0866	20.3593	4.3840	0.0364
17	NUMBERPI		17	0.0036	0.0902	16.1257	6.2411	0.0126

Model 2: Logistic Regression of Suspect Physical Force on the 41 Predictors and Police Force, Including Group Variables and Missing Values

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: PHYSSUS
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	PHYSSUS	Count
1	1	228
2	0	1357

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1307.687	1070.136	.
SC	1313.056	1365.395	.
-2 LOG L	1305.687	960.136	345.551 with 54 DF (p=0.0001)
Score	.	.	375.095 with 54 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-3.8627	0.9850	15.3788	0.0001	.	.
PATROL	1	0.2740	0.3742	0.5359	0.4641	0.037410	1.315
CUSTODY	1	0.3657	0.2743	1.7776	0.1824	0.071171	1.442
NUMBERPI	1	-0.1185	0.1210	0.9586	0.3275	-0.064525	0.888
POLINIT2	1	0.3543	0.2542	1.9421	0.1634	0.094184	1.425
CHANGEPN	1	-0.0121	0.0891	0.0183	0.8923	-0.006808	0.988
COVER	1	0.00220	0.1897	0.0001	0.9907	0.000577	1.002
DISPATCH	1	-0.0285	0.2124	0.0180	0.8932	-0.007680	0.972
WEEKEND	1	0.1167	0.2740	0.1813	0.6703	0.030030	1.124
NIGHT	1	-0.1993	0.2388	0.6967	0.4039	-0.054291	0.819
ENDNIGHT	1	0.2341	0.3751	0.3894	0.5326	0.048951	1.264
SHIFT	1	0.2836	0.1200	5.5835	0.0181	0.116825	1.328
VIOLENT2	1	0.8002	0.2817	8.0703	0.0045	0.154582	2.226
PROPERTY	1	-0.1641	0.2677	0.3757	0.5399	-0.038632	0.849
TRAFFIC	1	-0.4030	0.3365	1.4347	0.2310	-0.077143	0.668
VICE	1	0.5181	0.2850	3.3057	0.0690	0.094469	1.679
DOMESTIC	1	0.4074	0.3260	1.5617	0.2114	0.076323	1.503
FAMILY	1	-0.1915	0.2627	0.5313	0.4661	-0.041633	0.826
SUSINIT2	1	-0.3130	0.4103	0.5820	0.4455	-0.064611	0.731
SUSCOMP2	1	0.5731	0.4210	1.8528	0.1735	0.110299	1.774
WITNESS	1	0.3633	0.2029	3.2055	0.0734	0.100153	1.438
BYFAMILY	1	-0.1392	0.2431	0.3277	0.5670	-0.030519	0.870
BYANTAG	1	0.1767	0.3744	0.2229	0.6368	0.019188	1.193
HOUSE	1	-0.3786	0.2288	2.7383	0.0980	-0.086439	0.685
INSIDE2	1	-0.7563	0.3384	4.9953	0.0254	-0.140262	0.469
LOCHAZRD	1	0.0176	0.3590	0.0024	0.9608	0.002262	1.018
LOCCRIME	1	0.0444	0.2050	0.0470	0.8284	0.011521	1.045
VISIBLE	1	-0.00762	0.0363	0.0440	0.8338	-0.010505	0.992
AGE1	1	0.0830	0.1174	0.5003	0.4794	0.056217	1.087
WHITE1	1	0.1458	0.2648	0.3031	0.5819	0.035160	1.157
HEIGHT1	1	-0.1643	0.1666	0.9715	0.3243	-0.092054	0.849
WEIGHT1	1	-0.00668	0.1505	0.0020	0.9646	-0.004346	0.993
MALE1	1	-0.5142	0.3946	1.6981	0.1925	-0.105660	0.598
LENGTHPD	1	0.1032	0.1031	1.0007	0.3171	0.066122	1.109
Q24INJ	1	0.1925	0.0829	5.3964	0.0202	0.105605	1.212
ARRESTN	1	-0.0559	0.0620	0.8135	0.3671	-0.044550	0.946

TRAIN	1	-0.1696	0.1591	1.1366	0.2864	-0.052598	0.844
AGES	1	-0.2055	0.0844	5.9277	0.0149	-0.169054	0.814
BLACKS	1	0.0987	0.4444	0.0493	0.8242	0.019612	1.104
HISPS	1	-1.1597	0.5136	5.0981	0.0240	-0.274514	0.314
HEIGHTS	1	0.2872	0.1583	3.2902	0.0697	0.190278	1.333
WEIGHTS	1	-0.0364	0.1405	0.0672	0.7955	-0.024804	0.964
MALES	1	0.6814	0.4148	2.6985	0.1004	0.165221	1.977
DRUGS	1	0.2064	0.2809	0.5397	0.4626	0.033014	1.229
ALCOHOL	1	0.1370	0.2019	0.4602	0.4975	0.033005	1.147
PROBSUSP	1	-0.8355	0.4459	3.5101	0.0610	-0.087227	0.434
KNOWRECD	1	0.3005	0.3537	0.7218	0.3955	0.039719	1.350
GANG	1	0.5685	0.3720	2.3357	0.1264	0.061717	1.766
AGEDIF	1	-0.0489	0.0745	0.4314	0.5113	-0.050640	0.952
WPBS	1	-0.1936	0.5238	0.1365	0.7117	-0.033706	0.824
WPHS	1	0.2071	0.5546	0.1394	0.7089	0.044329	1.230
HEIGHDIF	1	0.4934	0.1731	8.1222	0.0044	0.344552	1.638
WEIGHDIF	1	-0.1305	0.1527	0.7298	0.3929	-0.105318	0.878
BOTHMALE	1	-0.1803	0.4827	0.1396	0.7087	-0.046830	0.835
PHYSICAL	1	2.4357	0.1836	175.9320	0.0001	0.556637	11.424

Association of Predicted Probabilities and Observed Responses

Concordant = 84.0%	Somers' D = 0.684
Discordant = 15.6%	Gamma = 0.686
Tied = 0.4%	Tau-a = 0.168
(309396 pairs)	c = 0.842

Model 2: Stepwise Logistic Regression of Suspect Physical Force on the 41 Predictors and Police Force, Including Group Variables and Missing Values

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: PHYSSUS
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	PHYSSUS	Count
1	1	228
2	0	1357

Stepwise Selection Procedure

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-3.0906	0.3500	77.9652	0.0001	.	.
SHIFT	1	0.2601	0.1105	5.5366	0.0186	0.107134	1.297
VIOLENT2	1	0.8670	0.2056	17.7824	0.0001	0.167491	2.380
VICE	1	0.5871	0.2285	6.6024	0.0102	0.107059	1.799
Q24INJ	1	0.1982	0.0754	6.9046	0.0086	0.108713	1.219
AGES	1	-0.1499	0.0584	6.5926	0.0102	-0.123285	0.861
HISPS	1	-0.7813	0.2100	13.8449	0.0002	-0.184947	0.458
PHYSICAL	1	2.3430	0.1644	203.1890	0.0001	0.535445	10.413

Association of Predicted Probabilities and Observed Responses

Concordant = 81.5%	Somers' D = 0.637
Discordant = 17.8%	Gamma = 0.641
Tied = 0.7%	Tau-a = 0.157
(309396 pairs)	c = 0.818

Model 2: Linear Regression of Suspect Continuum of Force on the 41 Predictors and Police Force, Including Group Variables and Missing Values

The SAS System

Model: MODEL1
Dependent Variable: LEVELS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	54	1515.86204	28.07152	11.231	0.0001
Error	1530	3824.24900	2.49951		
C Total	1584	5340.11104			

Root MSE	1.58098	R-square	0.2839
Dep Mean	1.26688	Adj R-sq	0.2586
C.V.	124.79378		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-1.622400	0.46041338	-3.524	0.0004
PATROL	1	0.362432	0.17715118	2.046	0.0409
CUSTODY	1	0.063240	0.12477474	0.507	0.6123
NUMBERP1	1	0.127810	0.06204479	2.060	0.0396
POLINIT2	1	-0.188703	0.11880473	-1.588	0.1124
CHANGEPN	1	0.083997	0.04599759	1.826	0.0680
COVER	1	0.042377	0.09146899	0.463	0.6432
DISPATCH	1	0.095858	0.09952109	0.963	0.3356
WEEKEND	1	-0.080967	0.12551142	-0.645	0.5190
NIGHT	1	-0.251230	0.11272048	-2.229	0.0260
ENDNIGHT	1	0.199922	0.17840637	1.121	0.2626
SHIFT	1	0.125033	0.05587143	2.238	0.0254
VIOLENT2	1	0.397650	0.14211003	2.798	0.0052
PROPERTY	1	0.098738	0.11755700	0.840	0.4011
TRAFFIC	1	-0.172224	0.13671678	-1.260	0.2080
VICE	1	0.198518	0.14159201	1.402	0.1611
DOMESTIC	1	0.211019	0.15905284	1.327	0.1848
FAMILY	1	-0.121256	0.13229924	-0.917	0.3595
SUSINIT2	1	-0.010895	0.19646607	-0.055	0.9558
SUSCOMP2	1	-0.028837	0.20876950	-0.138	0.8902
WITNESS	1	0.155848	0.09705418	1.606	0.1085
BYFAMILY	1	-0.095077	0.12311000	-0.772	0.4401
BYANTAG	1	0.663642	0.21173644	3.134	0.0018
HOUSE	1	-0.069923	0.11135807	-0.628	0.5302
INSIDE2	1	-0.161356	0.13835201	-1.166	0.2437
LOCHAZRD	1	0.008783	0.18304463	0.048	0.9617
LOCCRIME	1	-0.108592	0.09435912	-1.151	0.2500
VISIBLE	1	-0.020852	0.01795548	-1.161	0.2457
AGE1	1	0.093903	0.05366379	1.750	0.0803
WHITE1	1	-0.104709	0.12646950	-0.828	0.4078
HEIGHT1	1	-0.012070	0.07910676	-0.153	0.8788
WEIGHT1	1	-0.061032	0.07201738	-0.847	0.3969
MALE1	1	0.047986	0.18141476	0.265	0.7914
LENGTHPD	1	0.133962	0.04814536	2.782	0.0055
Q24INJ	1	0.108847	0.04234629	2.570	0.0103
ARRESTN	1	0.034184	0.02911142	1.174	0.2405
TRAIN	1	-0.068270	0.07495972	-0.911	0.3626
AGES	1	-0.124313	0.04166163	-2.984	0.0029
BLACKS	1	-0.038395	0.22879992	-0.168	0.8668
HISPS	1	-0.456600	0.20417783	-2.236	0.0255
HEIGHTS	1	0.024948	0.07344762	0.340	0.7342
WEIGHTS	1	0.079276	0.06697624	1.184	0.2367
MALES	1	0.379280	0.20870655	1.817	0.0694
DRUGS	1	0.453832	0.14350704	3.162	0.0016
ALCOHOL	1	0.413199	0.09855842	4.192	0.0001
PROBSUSP	1	0.060864	0.22619547	0.269	0.7879

KNOWRECD	1	-0.088026	0.18129370	-0.486	0.6274
GANG	1	0.412894	0.21161958	1.951	0.0512
AGEDIF	1	-0.076219	0.03881388	-1.964	0.0497
WPBS	1	0.295627	0.26412367	1.119	0.2632
WPHS	1	0.327798	0.22924663	1.430	0.1530
HEIGHDIF	1	0.065220	0.08106602	0.805	0.4212
WEIGHDIF	1	0.074923	0.07109159	1.054	0.2921
BOTHMALE	1	-0.497048	0.23393496	-2.125	0.0338
CONTINUE	1	0.532728	0.03022570	17.625	0.0001

Dependent Variable: LEVELS
Test: AGE Numerator: 8.1090 DF: 3 F value: 3.2442
Denominator: 2.499509 DF: 1530 Prob>F: 0.0212

Dependent Variable: LEVELS
Test: RACE Numerator: 5.3868 DF: 5 F value: 2.1551
Denominator: 2.499509 DF: 1530 Prob>F: 0.0566

Dependent Variable: LEVELS
Test: SEX Numerator: 5.7787 DF: 3 F value: 2.3119
Denominator: 2.499509 DF: 1530 Prob>F: 0.0744

Dependent Variable: LEVELS
Test: HEIGHT Numerator: 1.0317 DF: 3 F value: 0.4128
Denominator: 2.499509 DF: 1530 Prob>F: 0.7439

Dependent Variable: LEVELS
Test: WEIGHT Numerator: 1.1955 DF: 3 F value: 0.4783
Denominator: 2.499509 DF: 1530 Prob>F: 0.6974

Model 2: Stepwise Linear Regression of Suspect Continuum of Force on the 41 Predictors and Police Force, Including Group Variables and Missing Values

The SAS System

Stepwise Procedure for Dependent Variable LEVELS

Summary of Stepwise Procedure for Dependent Variable LEVELS

Step	Variable Entered	Removed	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
1	CONTINUE		1	0.2099	0.2099	104.9176	420.6422	0.0001
2	ALCOHOL		2	0.0082	0.2181	89.4482	16.5643	0.0001
3	BYANTAG		3	0.0071	0.2252	76.3875	14.4013	0.0002
4	LENGTHPD		4	0.0073	0.2324	62.9066	14.9335	0.0001
5	DRUGS		5	0.0055	0.2379	53.2135	11.3536	0.0008
6	VIOLENT2		6	0.0052	0.2431	44.0755	10.8824	0.0010
7	BOTHMALE		7	0.0035	0.2466	38.7113	7.2235	0.0073
8	GANG		8	0.0027	0.2493	34.9127	5.7049	0.0170
9	Q24INJ		9	0.0026	0.2519	31.4492	5.3901	0.0204
10	TRAFFIC		10	0.0027	0.2546	27.6211	5.7671	0.0164
11	HISPS		11	0.0023	0.2569	24.7181	4.8637	0.0276
12	AGES		12	0.0026	0.2595	21.1935	5.4960	0.0192
13	PATROL		13	0.0020	0.2615	18.8971	4.2831	0.0387

Model 2: Linear Regression of Suspect Maximum Force on the 41 Predictors and Police Force, Including Group Variables and Missing Values

The SAS System

Model: MODEL1
Dependent Variable: SMXFORCE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	54	151288.88125	2801.64595	7.009	0.0001
Error	1530	611584.87648	399.72868		
C Total	1584	762873.75773			

Root MSE	19.99322	R-square	0.1983
Dep Mean	13.94826	Adj R-sq	0.1700
C.V.	143.33837		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-10.161899	5.80010836	-1.752	0.0800
PATROL	1	2.023011	2.23989196	0.903	0.3666
CUSTODY	1	1.206249	1.57748891	0.765	0.4446
NUMBERPI	1	0.295595	0.78584431	0.376	0.7069
POLINIT2	1	0.315305	1.50221696	0.210	0.8338
CHANGEPN	1	0.642657	0.58236444	1.104	0.2700
COVER	1	0.123934	1.15802219	0.107	0.9148
DISPATCH	1	0.988809	1.25851196	0.786	0.4322
WEEKEND	1	0.452996	1.58738972	0.285	0.7754
NIGHT	1	-1.298266	1.42449518	-0.911	0.3622
ENDNIGHT	1	0.995385	2.25600299	0.441	0.6591
SHIFT	1	1.735829	0.70655920	2.457	0.0141
VIOLENT2	1	7.031452	1.79685171	3.913	0.0001
PROPERTY	1	0.489302	1.48640226	0.329	0.7421
TRAFFIC	1	-1.728936	1.72930503	-1.000	0.3176
VICE	1	3.622967	1.78821703	2.026	0.0429
DOMESTIC	1	3.446913	2.00907335	1.716	0.0864
FAMILY	1	-1.130174	1.67241916	-0.676	0.4993
SUSINIT2	1	-1.268369	2.48534966	-0.510	0.6099
SUSCOMP2	1	0.883100	2.64129945	0.334	0.7382
WITNESS	1	2.719229	1.22558045	2.219	0.0267
BYFAMILY	1	-1.562720	1.55627968	-1.004	0.3155
BYANTAG	1	5.952940	2.67655464	2.224	0.0263
HOUSE	1	-3.131768	1.40838350	-2.224	0.0263
INSIDE2	1	-4.123572	1.74936651	-2.357	0.0185
LOCHAZRD	1	0.882016	2.31341650	0.381	0.7031
LOCCRIME	1	-1.603222	1.19350979	-1.343	0.1794
VISIBLE	1	-0.180889	0.22731139	-0.796	0.4263
AGE1	1	1.444705	0.67876685	2.128	0.0335
WHITE1	1	-0.384569	1.59989409	-0.240	0.8101
HEIGHT1	1	-0.475029	1.00032123	-0.475	0.6349
WEIGHT1	1	-0.309580	0.91071435	-0.340	0.7340
MALE1	1	-1.972478	2.29369163	-0.860	0.3899
LENGTHPD	1	1.300253	0.60884616	2.136	0.0329
Q24INJ	1	1.361963	0.53494422	2.546	0.0110
ARRESTN	1	-0.067393	0.36843274	-0.183	0.8549
TRAIN	1	-0.782210	0.94794811	-0.825	0.4094
AGES	1	-2.062094	0.52679869	-3.914	0.0001
BLACKS	1	0.958519	2.89439176	0.331	0.7406
HISPS	1	-6.571049	2.58511621	-2.542	0.0111
HEIGHTS	1	0.609699	0.92916806	0.656	0.5118
WEIGHTS	1	0.519957	0.84626278	0.614	0.5390
MALES	1	2.653985	2.63938527	1.006	0.3148
DRUGS	1	4.238076	1.81560155	2.334	0.0197
ALCOHOL	1	3.110250	1.24605624	2.496	0.0127

PROBSUSP	1	-1.722315	2.85558903	-0.603	0.5465
KNOWRECD	1	-0.551045	2.29261423	-0.240	0.8101
GANG	1	3.998055	2.67735531	1.493	0.1356
AGEDIF	1	-1.166968	0.49112252	-2.376	0.0176
WPBS	1	0.603307	3.33809891	0.181	0.8566
WPHS	1	3.126595	2.90026812	1.078	0.2812
HEIGHDIF	1	1.166958	1.02482545	1.139	0.2550
WEIGHDIF	1	0.360020	0.89864734	0.401	0.6888
BOTHMALE	1	-1.188477	2.95770390	-0.402	0.6879
MAXFORCE	1	0.373706	0.02879497	12.978	0.0001

Dependent Variable: SMXFORCE
Test: AGE Numerator: 2255.6887 DF: 3 F value: 5.6430
Denominator: 399.7287 DF: 1530 Prob>F: 0.0008

Dependent Variable: SMXFORCE
Test: RACE Numerator: 1139.0140 DF: 5 F value: 2.8495
Denominator: 399.7287 DF: 1530 Prob>F: 0.0144

Dependent Variable: SMXFORCE
Test: SEX Numerator: 409.0045 DF: 3 F value: 1.0232
Denominator: 399.7287 DF: 1530 Prob>F: 0.3813

Dependent Variable: SMXFORCE
Test: HEIGHT Numerator: 225.1897 DF: 3 F value: 0.5634
Denominator: 399.7287 DF: 1530 Prob>F: 0.6392

Dependent Variable: SMXFORCE
Test: WEIGHT Numerator: 54.0188 DF: 3 F value: 0.1351
Denominator: 399.7287 DF: 1530 Prob>F: 0.9391

Model 2: Stepwise Linear Regression of Suspect Maximum Force on the 41 Predictors and Police Force, Including Group Variables and Missing Values

The SAS System

Stepwise Procedure for Dependent Variable SMXFORCE

Summary of Stepwise Procedure for Dependent Variable SMXFORCE

Step	Variable Entered	Removed	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
1	MAXFORCE		1	0.1250	0.1250	89.8253	226.2004	0.0001
2	VIOLENT2		2	0.0112	0.1363	70.3538	20.5947	0.0001
3	SHIFT		3	0.0048	0.1411	63.0969	8.9233	0.0029
4	Q24INJ		4	0.0049	0.1461	55.6683	9.1356	0.0025
5	HISPS		5	0.0046	0.1507	48.8399	8.5953	0.0034
6	DRUGS		6	0.0047	0.1554	41.9009	8.7455	0.0031
7	AGES		7	0.0043	0.1596	35.7782	7.9821	0.0048
8	ALCOHOL		8	0.0054	0.1650	27.4329	10.2257	0.0014
9	LENGTHPD		9	0.0036	0.1686	22.6111	6.7675	0.0094
10	BYANTAG		10	0.0039	0.1725	17.1561	7.4260	0.0065
11	AGEDIF		11	0.0021	0.1746	15.0856	4.0625	0.0440
12	AGE1		12	0.0023	0.1770	12.6479	4.4387	0.0353

Appendix D
Compliance Study Variable Information and Regression Results

Compliance Variable Frequencies

COMPLY1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	346	21.8	346	21.8
1	1239	78.2	1585	100.0

ARREST	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	79	5.0	79	5.0
2	621	39.2	700	44.2
2.6755187	380	24.0	1080	68.1
3	117	7.4	1197	75.5
4	388	24.5	1585	100.0

AUDIENC1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	31	2.0	31	2.0
1	794	50.1	825	52.1
2	260	16.4	1085	68.5
3	158	10.0	1243	78.4
4	98	6.2	1341	84.6
5	76	4.8	1417	89.4
6	126	7.9	1543	97.4
7	24	1.5	1567	98.9
8	10	0.6	1577	99.5
9	2	0.1	1579	99.6
10	6	0.4	1585	100.0

NUMBERPI	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	522	32.9	522	32.9
1.9934426	60	3.8	582	36.7
2	688	43.4	1270	80.1
3	177	11.2	1447	91.3
4	79	5.0	1526	96.3
5	59	3.7	1585	100.0

MALE1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	264	16.7	264	16.7
1	1321	83.3	1585	100.0

WEAPON	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1468	92.6	1468	92.6
1	117	7.4	1585	100.0

Q401CON	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	423	26.7	423	26.7
1	1162	73.3	1585	100.0

COMMAND	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1040	65.6	1040	65.6
1	545	34.4	1585	100.0

PHYSICAL	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1236	78.0	1236	78.0
1	349	22.0	1585	100.0

IMPAIR	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1065	67.2	1065	67.2
1	520	32.8	1585	100.0

LOCATE2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	575	36.3	575	36.3
1	1010	63.7	1585	100.0

FAMILY	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1280	80.8	1280	80.8
1	305	19.2	1585	100.0

YOUNG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1420	89.6	1420	89.6
1	165	10.4	1585	100.0

MALES	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	415	26.2	415	26.2
1	1170	73.8	1585	100.0

WPWS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	963	60.8	963	60.8
1	622	39.2	1585	100.0

WPMS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1055	66.6	1055	66.6
1	530	33.4	1585	100.0

MPWS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1494	94.3	1494	94.3
1	91	5.7	1585	100.0

MPMS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1439	90.8	1439	90.8
1	146	9.2	1585	100.0

KNOWN	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1379	87.0	1379	87.0
1	206	13.0	1585	100.0

Q22NUMYR	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	165	10.4	165	10.4
2	80	5.0	245	15.5
3	183	11.5	428	27.0
4	144	9.1	572	36.1
5	132	8.3	704	44.4
6	81	5.1	785	49.5
6.9529229	320	20.2	1105	69.7
7	72	4.5	1177	74.3
8	64	4.0	1241	78.3
9	46	2.9	1287	81.2
10	39	2.5	1326	83.7
11	27	1.7	1353	85.4
12	16	1.0	1369	86.4
13	24	1.5	1393	87.9
14	23	1.5	1416	89.3
15	27	1.7	1443	91.0
16	17	1.1	1460	92.1
17	10	0.6	1470	92.7
18	17	1.1	1487	93.8
19	21	1.3	1508	95.1
20	31	2.0	1539	97.1
21	8	0.5	1547	97.6
22	9	0.6	1556	98.2
23	6	0.4	1562	98.5
24	13	0.8	1575	99.4
25	4	0.3	1579	99.6
26	3	0.2	1582	99.8
29	1	0.1	1583	99.9
31	1	0.1	1584	99.9
50	1	0.1	1585	100.0

Compliance Variable Means

Variable	N	Mean	Std Dev	Minimum	Maximum
COMPLY1	1585	0.7817035	0.4132201	0	1.0000000
ARREST	1585	2.6755187	0.8697090	1.0000000	4.0000000
AUDIENC1	1585	2.2977918	1.8582063	0	10.0000000
NUMBERPI	1585	1.9934426	0.9879113	1.0000000	5.0000000
MALE1	1585	0.8334385	0.3727015	0	1.0000000
WEAPON	1585	0.0738170	0.2615554	0	1.0000000
Q401CON	1585	0.7331230	0.4424671	0	1.0000000
COMMAND	1585	0.3438486	0.4751412	0	1.0000000
PHYSICAL	1585	0.2201893	0.4145050	0	1.0000000
IMPAIR	1585	0.3280757	0.4696607	0	1.0000000
LOCATE2	1585	0.6372240	0.4809527	0	1.0000000
FAMILY	1585	0.1924290	0.3943326	0	1.0000000
YOUNG	1585	0.1041009	0.3054878	0	1.0000000
MALES	1585	0.7381703	0.4397691	0	1.0000000
WPWS	1585	0.3924290	0.4884455	0	1.0000000
WPMS	1585	0.3343849	0.4719239	0	1.0000000
MPWS	1585	0.0574132	0.2327040	0	1.0000000
MPMS	1585	0.0921136	0.2892775	0	1.0000000
KNOWN	1585	0.1299685	0.3363749	0	1.0000000
Q22NUMYR	1585	6.9652589	5.3177326	1.0000000	50.0000000

Compliance Variable Correlations

The SAS System
Correlation Analysis

20 'VAR' Variables: COMPLY1 ARREST AUDIENC1 NUMBERPI MALE1 WEAPON Q4O1CON COMMAND PHYSICAL IMPAIR LOCATE2 FAMILY YOUNG MALES WPWS WPMS MPWS MPMS KNOWN Q22NUMYR

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 1585

	COMPLY1	ARREST	AUDIENC1	NUMBERPI	MALE1	WEAPON	Q4O1CON
COMPLY1	1.00000	-0.13097	-0.07726	-0.06980	0.07120	-0.03773	0.32340
	0.0	0.0001	0.0021	0.0054	0.0046	0.1332	0.0001
ARREST	-0.13097	1.00000	0.03772	0.12855	-0.01295	0.09095	-0.07670
	0.0001	0.0	0.1333	0.0001	0.6063	0.0003	0.0022
AUDIENC1	-0.07726	0.03772	1.00000	0.18894	0.01515	0.04827	-0.06145
	0.0021	0.1333	0.0	0.0001	0.5468	0.0547	0.0144
NUMBERPI	-0.06980	0.12855	0.18894	1.00000	-0.04048	0.06046	-0.11351
	0.0054	0.0001	0.0001	0.0	0.1072	0.0161	0.0001
MALE1	0.07120	-0.01295	0.01515	-0.04048	1.00000	-0.02922	0.03654
	0.0046	0.6063	0.5468	0.1072	0.0	0.2449	0.1459
WEAPON	-0.03773	0.09095	0.04827	0.06046	-0.02922	1.00000	-0.10242
	0.1332	0.0003	0.0547	0.0161	0.2449	0.0	0.0001
Q4O1CON	0.32340	-0.07670	-0.06145	-0.11351	0.03654	-0.10242	1.00000
	0.0001	0.0022	0.0144	0.0001	0.1459	0.0001	0.0
COMMAND	-0.34414	0.11927	0.10847	0.11499	0.02416	0.12583	-0.59924
	0.0001	0.0001	0.0001	0.0001	0.3365	0.0001	0.0001
PHYSICAL	-0.50059	0.14732	0.16317	0.12219	-0.01173	0.15278	-0.29899
	0.0001	0.0001	0.0001	0.0001	0.6408	0.0001	0.0001
IMPAIR	-0.13820	0.03427	0.07462	0.04396	0.00581	-0.03795	-0.04625
	0.0001	0.1727	0.0030	0.0802	0.8171	0.1310	0.0656
LOCATE2	0.05235	-0.15422	-0.17220	-0.19618	0.00080	-0.00279	0.01349
	0.0372	0.0001	0.0001	0.0001	0.9746	0.9117	0.5916
FAMILY	-0.05199	0.29997	0.09320	0.11013	0.00344	0.00909	-0.00942
	0.0385	0.0001	0.0002	0.0001	0.8911	0.7175	0.7080
YOUNG	-0.01491	0.03614	0.08660	0.02518	0.04149	0.06969	-0.02319
	0.5531	0.1504	0.0006	0.3165	0.0987	0.0055	0.3562
MALES	0.01878	-0.06445	0.04449	-0.03569	0.32307	0.05837	-0.04462
	0.4549	0.0103	0.0766	0.1555	0.0001	0.0201	0.0757
WPWS	0.07438	0.00393	-0.03633	0.01569	0.10959	0.06466	0.05549
	0.0030	0.8757	0.1483	0.5325	0.0001	0.0100	0.0272
WPMS	-0.05602	-0.03008	0.11675	-0.02925	0.16610	-0.06712	-0.03796
	0.0257	0.2313	0.0001	0.2444	0.0001	0.0075	0.1309
MPWS	0.00568	0.01673	-0.06000	0.00158	0.01570	0.01330	0.02015
	0.8213	0.5057	0.0169	0.9497	0.5322	0.5966	0.4228
MPMS	0.00460	-0.00667	0.02763	-0.03554	-0.00985	-0.03986	-0.00018
	0.8548	0.7907	0.2717	0.1573	0.6952	0.1127	0.9944
KNOWN	-0.06827	0.07144	-0.00540	0.01188	-0.10418	-0.02301	-0.05524
	0.0065	0.0044	0.8300	0.6365	0.0001	0.3600	0.0279
Q22NUMYR	0.00888	0.00297	0.01018	0.01890	0.05422	0.02820	-0.01388
	0.7240	0.9060	0.6856	0.4522	0.0309	0.2619	0.5808

	COMMAND	PHYSICAL	IMPAIR	LOCATE2	FAMILY	YOUNG	MALES
COMPLY1	-0.34414	-0.50059	-0.13820	0.05235	-0.05199	-0.01491	0.01878
	0.0001	0.0001	0.0001	0.0372	0.0385	0.5531	0.4549
ARREST	0.11927	0.14732	0.03427	-0.15422	0.29997	0.03614	-0.06445
	0.0001	0.0001	0.1727	0.0001	0.0001	0.1504	0.0103
AUDIENC1	0.10847	0.16317	0.07462	-0.17220	0.09320	0.08660	0.04449
	0.0001	0.0001	0.0030	0.0001	0.0002	0.0006	0.0766
NUMBERPI	0.11499	0.12219	0.04396	-0.19618	0.11013	0.02518	-0.03569
	0.0001	0.0001	0.0802	0.0001	0.0001	0.3165	0.1555
MALE1	0.02416	-0.01173	0.00581	0.00080	0.00344	0.04149	0.32307
	0.3365	0.6408	0.8171	0.9746	0.8911	0.0987	0.0001
WEAPON	0.12583	0.15278	-0.03795	-0.00279	0.00909	0.06969	0.05837
	0.0001	0.0001	0.1310	0.9117	0.7175	0.0055	0.0201
Q401CON	-0.59924	-0.29899	-0.04625	0.01349	-0.00942	-0.02319	-0.04462
	0.0001	0.0001	0.0656	0.5916	0.7080	0.3562	0.0757
COMMAND	1.00000	0.41029	0.12221	-0.06710	0.04760	0.01855	0.05045
	0.0	0.0001	0.0001	0.0075	0.0582	0.4605	0.0446
PHYSICAL	0.41029	1.00000	0.10540	-0.08674	0.04960	0.02328	0.05326
	0.0001	0.0	0.0001	0.0005	0.0483	0.3544	0.0340
IMPAIR	0.12221	0.10540	1.00000	0.01577	0.05433	-0.02258	0.05548
	0.0001	0.0001	0.0	0.5303	0.0306	0.3689	0.0272
LOCATE2	-0.06710	-0.08674	0.01577	1.00000	-0.35402	-0.02209	-0.04045
	0.0075	0.0005	0.5303	0.0	0.0001	0.3794	0.1074
FAMILY	0.04760	0.04960	0.05433	-0.35402	1.00000	-0.01966	0.01405
	0.0582	0.0483	0.0306	0.0001	0.0	0.4342	0.5763
YOUNG	0.01855	0.02328	-0.02258	-0.02209	-0.01966	1.00000	0.01505
	0.4605	0.3544	0.3689	0.3794	0.4342	0.0	0.5494
MALES	0.05045	0.05326	0.05548	-0.04045	0.01405	0.01505	1.00000
	0.0446	0.0340	0.0272	0.1074	0.5763	0.5494	0.0
WPWS	-0.05134	-0.02793	-0.04421	-0.01976	0.03379	-0.06241	0.06718
	0.0410	0.2664	0.0785	0.4318	0.1788	0.0130	0.0075
WPMS	0.04437	0.02679	0.07440	-0.04375	0.03397	0.09558	0.12098
	0.0774	0.2865	0.0030	0.0817	0.1765	0.0001	0.0001
MPWS	0.00976	-0.01988	-0.05115	0.01699	-0.01728	-0.01308	0.01744
	0.6977	0.4290	0.0417	0.4990	0.4919	0.6027	0.4879
MPMS	0.03582	0.04134	-0.00418	0.07244	-0.07800	-0.00856	0.02098
	0.1541	0.0999	0.8680	0.0039	0.0019	0.7333	0.4040
KNOWN	0.05991	0.01196	0.00966	-0.03617	-0.00781	0.00341	-0.09416
	0.0171	0.6343	0.7009	0.1501	0.7561	0.8921	0.0002
Q22NUMYR	0.03305	0.03629	-0.08672	0.01051	-0.10302	0.00433	-0.01653
	0.1885	0.1487	0.0005	0.6759	0.0001	0.8634	0.5108

	WPWS	WPMS	MPWS	MPMS	KNOWN	Q22NUMYR
COMPLY1	0.07438	-0.05602	0.00568	0.00460	-0.06827	0.00888
	0.0030	0.0257	0.8213	0.8548	0.0065	0.7240
ARREST	0.00393	-0.03008	0.01673	-0.00667	0.07144	0.00297
	0.8757	0.2313	0.5057	0.7907	0.0044	0.9060
AUDIENC1	-0.03633	0.11675	-0.06000	0.02763	-0.00540	0.01018
	0.1483	0.0001	0.0169	0.2717	0.8300	0.6856
NUMBERPI	0.01569	-0.02925	0.00158	-0.03554	0.01188	0.01890
	0.5325	0.2444	0.9497	0.1573	0.6365	0.4522
MALE1	0.10959	0.16610	0.01570	-0.00985	-0.10418	0.05422
	0.0001	0.0001	0.5322	0.6952	0.0001	0.0309
WEAPON	0.06466	-0.06712	0.01330	-0.03986	-0.02301	0.02820
	0.0100	0.0075	0.5966	0.1127	0.3600	0.2619
Q401CON	0.05549	-0.03796	0.02015	-0.00018	-0.05524	-0.01388
	0.0272	0.1309	0.4228	0.9944	0.0279	0.5808
COMMAND	-0.05134	0.04437	0.00976	0.03582	0.05991	0.03305
	0.0410	0.0774	0.6977	0.1541	0.0171	0.1885
PHYSICAL	-0.02793	0.02679	-0.01988	0.04134	0.01196	0.03629
	0.2664	0.2865	0.4290	0.0999	0.6343	0.1487
IMPAIR	-0.04421	0.07440	-0.05115	-0.00418	0.00966	-0.08672
	0.0785	0.0030	0.0417	0.8680	0.7009	0.0005
LOCATE2	-0.01976	-0.04375	0.01699	0.07244	-0.03617	0.01051
	0.4318	0.0817	0.4990	0.0039	0.1501	0.6759
FAMILY	0.03379	0.03397	-0.01728	-0.07800	-0.00781	-0.10302
	0.1788	0.1765	0.4919	0.0019	0.7561	0.0001
YOUNG	-0.06241	0.09558	-0.01308	-0.00856	0.00341	0.00433
	0.0130	0.0001	0.6027	0.7333	0.8921	0.8634
MALES	0.06718	0.12098	0.01744	0.02098	-0.09416	-0.01653
	0.0075	0.0001	0.4879	0.4040	0.0002	0.5108
WPWS	1.00000	-0.56963	-0.19835	-0.25599	-0.08776	0.01800
	0.0	0.0001	0.0001	0.0001	0.0005	0.4739
WPMS	-0.56963	1.00000	-0.17493	-0.22577	0.03228	-0.04931
	0.0001	0.0	0.0001	0.0001	0.1990	0.0497
MPWS	-0.19835	-0.17493	1.00000	-0.07861	0.00946	-0.02734
	0.0001	0.0001	0.0	0.0017	0.7067	0.2767
MPMS	-0.25599	-0.22577	-0.07861	1.00000	-0.01282	0.04745
	0.0001	0.0001	0.0017	0.0	0.6102	0.0590
KNOWN	-0.08776	0.03228	0.00946	-0.01282	1.00000	0.04594
	0.0005	0.1990	0.7067	0.6102	0.0	0.0674
Q22NUMYR	0.01800	-0.04931	-0.02734	0.04745	0.04594	1.00000
	0.4739	0.0497	0.2767	0.0590	0.0674	0.0

Model 1: Logistic Regression of Suspect Compliance on the 19 Predictors

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: COMPLY1
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	COMPLY1	Count
1	1	1239
2	0	346

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1665.437	1242.227	.
SC	1670.805	1344.226	.
-2 LOG L	1663.437	1204.227	459.209 with 18 DF (p=0.0001)
Score	.	.	487.901 with 18 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	1.6598	0.4209	15.5482	0.0001	.	.
ARREST	1	-0.1771	0.0898	3.8894	0.0486	-0.084913	0.838
AUDIENC1	1	0.0229	0.0401	0.3274	0.5672	0.023503	1.023
NUMBERPI	1	0.0348	0.0737	0.2230	0.6368	0.018946	1.035
MALE1	1	0.5189	0.2030	6.5335	0.0106	0.106622	1.680
WEAPON	1	0.5498	0.2733	4.0466	0.0443	0.079283	1.733
Q401CON	1	0.8979	0.1825	24.1945	0.0001	0.219031	2.454
COMMAND	1	-0.5148	0.1870	7.5796	0.0059	-0.134863	0.598
PHYSICAL	1	-2.2445	0.1648	185.5834	0.0001	-0.512938	0.106
IMPAIR	1	-0.5001	0.1541	10.5336	0.0012	-0.129506	0.606
LOCATE2	1	-0.0142	0.1666	0.0073	0.9320	-0.003771	0.986
FAMILY	1	-0.0682	0.2003	0.1159	0.7335	-0.014827	0.934
YOUNG	1	-0.0367	0.2416	0.0231	0.8793	-0.006178	0.964
MALES	1	0.2573	0.1813	2.0133	0.1559	0.062376	1.293
WPMS	1	-0.3013	0.1704	3.1260	0.0771	-0.078399	0.740
MPWS	1	-0.3030	0.3231	0.8794	0.3484	-0.038874	0.739
MPMS	1	0.1234	0.2680	0.2119	0.6453	0.019675	1.131
KNOWN	1	-0.3485	0.2039	2.9210	0.0874	-0.064635	0.706
Q22NUMYR	1	0.0108	0.0146	0.5419	0.4617	0.031523	1.011

Association of Predicted Probabilities and Observed Responses

Concordant = 84.2%	Somers' D = 0.688
Discordant = 15.4%	Gamma = 0.690
Tied = 0.3%	Tau-a = 0.235
(428694 pairs)	c = 0.844

Model 2: Logistic Regression of Suspect Attitude on the 19 Predictors

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: COMPLY2
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	COMPLY2	Count
1	1	1227
2	0	358

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1695.524	1383.580	.
SC	1700.892	1485.579	.
-2 LOG L	1693.524	1345.580	347.943 with 18 DF (p=0.0001)
Score	.	.	358.426 with 18 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	2.3660	0.4022	34.6070	0.0001	.	.
ARREST	1	0.0511	0.0848	0.3633	0.5467	0.024501	1.052
AUDIENC1	1	-0.1108	0.0364	9.2504	0.0024	-0.113463	0.895
NUMBERPI	1	-0.0218	0.0686	0.1004	0.7513	-0.011847	0.978
MALE1	1	0.2018	0.1953	1.0673	0.3016	0.041464	1.224
WEAPON	1	0.2195	0.2524	0.7566	0.3844	0.031655	1.245
Q401CON	1	0.0689	0.1762	0.1531	0.6956	0.016817	1.071
COMMAND	1	-1.1494	0.1743	43.4937	0.0001	-0.301086	0.317
PHYSICAL	1	-1.3740	0.1557	77.8469	0.0001	-0.314008	0.253
IMPAIR	1	-0.8086	0.1417	32.5504	0.0001	-0.209375	0.445
LOCATE2	1	0.0308	0.1549	0.0397	0.8421	0.008180	1.031
FAMILY	1	-0.5768	0.1816	10.0855	0.0015	-0.125405	0.562
YOUNG	1	0.1270	0.2324	0.2987	0.5847	0.021391	1.135
MALES	1	0.2302	0.1693	1.8485	0.1740	0.055805	1.259
WPMS	1	-0.0393	0.1584	0.0616	0.8040	-0.010225	0.961
MPWS	1	0.0485	0.3126	0.0240	0.8768	0.006217	1.050
MPMS	1	0.2784	0.2575	1.1693	0.2795	0.044409	1.321
KNOWN	1	-0.3373	0.1924	3.0733	0.0796	-0.062552	0.714
Q22NUMYR	1	0.000825	0.0135	0.0037	0.9512	0.002418	1.001

Association of Predicted Probabilities and Observed Responses

Concordant = 79.7%	Somers' D = 0.597
Discordant = 20.0%	Gamma = 0.599
Tied = 0.3%	Tau-a = 0.209
(439266 pairs)	c = 0.798

Model 3: Logistic Regression of Suspect Use of Force on the 19 Predictors

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: SFORCE
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	SFORCE	Count
1	1	1357
2	0	228

WARNING: There is possibly a quasicomplete separation in the sample points. The maximum likelihood estimate may not exist.
WARNING: The LOGISTIC procedure continues in spite of the above warning. Results shown are based on the last maximum likelihood iteration. Validity of the model fit is questionable.

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1307.687	537.127	.
SC	1313.056	639.125	.
-2 LOG L	1305.687	499.127	806.561 with 18 DF (p=0.0001)
Score	.	.	935.608 with 18 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	5.3831	0.7570	50.5741	0.0001	.	.
ARREST	1	-0.2723	0.1401	3.7804	0.0519	-0.130581	0.762
AUDIENC1	1	-0.0142	0.0566	0.0632	0.8016	-0.014575	0.986
NUMBERPI	1	0.1218	0.1128	1.1660	0.2802	0.066364	1.130
MALE1	1	0.1553	0.3442	0.2036	0.6518	0.031909	1.168
WEAPON	1	-20.7897	377.0	0.0030	0.9560	-2.997939	0.000
Q401CON	1	-0.1375	0.2853	0.2322	0.6299	-0.033537	0.872
COMMAND	1	-0.4380	0.3128	1.9611	0.1614	-0.114745	0.645
PHYSICAL	1	-3.6019	0.3305	118.7700	0.0001	-0.823132	0.027
IMPAIR	1	-0.6349	0.2392	7.0439	0.0080	-0.164390	0.530
LOCATE2	1	-0.2023	0.2630	0.5917	0.4418	-0.053637	0.817
FAMILY	1	0.1410	0.3074	0.2105	0.6464	0.030656	1.151
YOUNG	1	-0.2579	0.3723	0.4798	0.4885	-0.043433	0.773
MALES	1	0.4397	0.2946	2.2279	0.1355	0.106597	1.552
WPMS	1	-0.1932	0.2701	0.5116	0.4745	-0.050257	0.824
MPWS	1	-0.0698	0.5750	0.0147	0.9034	-0.008951	0.933
MPMS	1	0.0660	0.3999	0.0273	0.8688	0.010530	1.068
KNOWN	1	0.0706	0.3375	0.0438	0.8342	0.013101	1.073
Q22NUMYR	1	-0.0169	0.0213	0.6282	0.4280	-0.049519	0.983

WARNING: The validity of the model fit is questionable.

Association of Predicted Probabilities and Observed Responses

Concordant = 95.3%		Somers' D = 0.910	
Discordant = 4.3%		Gamma = 0.915	
Tied = 0.5%		Tau-a = 0.224	
(309396 pairs)		c = 0.955	

Model 4: Logistic Regression of Suspect Compliance, Including Separate Police Voice Levels

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: COMPLY1
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	COMPLY1	Count
1	1	1239
2	0	346

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1665.437	1240.363	.
SC	1670.805	1353.098	.
-2 LOG L	1663.437	1198.363	465.074 with 20 DF (p=0.0001)
Score	.	.	494.009 with 20 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	1.7088	0.4213	16.4519	0.0001	.	.
ARREST	1	-0.1901	0.0901	4.4486	0.0349	-0.091166	0.827
AUDIENC1	1	0.0285	0.0403	0.4986	0.4801	0.029161	1.029
NUMBERPI	1	0.0299	0.0742	0.1620	0.6873	0.016262	1.030
MALE1	1	0.5182	0.2036	6.4793	0.0109	0.106471	1.679
WEAPON	1	0.5860	0.2765	4.4898	0.0341	0.084499	1.797
Q401CON	1	0.9099	0.1777	26.2291	0.0001	0.221957	2.484
Q401COM	1	-0.4644	0.1793	6.7083	0.0096	-0.120546	0.629
Q401VBL	1	-0.7827	0.4100	3.6440	0.0563	-0.064315	0.457
Q401SHT	1	-0.7162	0.5030	2.0274	0.1545	-0.048236	0.489
PHYSICAL	1	-2.2084	0.1652	178.6331	0.0001	-0.504672	0.110
IMPAIR	1	-0.5100	0.1545	10.8957	0.0010	-0.132054	0.601
LOCATE2	1	-0.0403	0.1681	0.0575	0.8104	-0.010694	0.960
FAMILY	1	-0.0803	0.2008	0.1600	0.6892	-0.017463	0.923
YOUNG	1	-0.0279	0.2434	0.0131	0.9087	-0.004699	0.972
MALES	1	0.2598	0.1818	2.0422	0.1530	0.062985	1.297
WPMS	1	-0.3128	0.1710	3.3466	0.0673	-0.081383	0.731
MPWS	1	-0.3286	0.3224	1.0386	0.3081	-0.042155	0.720
MPMS	1	0.1345	0.2704	0.2475	0.6189	0.021451	1.144
KNOWN	1	-0.3462	0.2043	2.8720	0.0901	-0.064202	0.707
Q22NUMYR	1	0.0103	0.0147	0.4931	0.4825	0.030243	1.010

Association of Predicted Probabilities and Observed Responses

Concordant = 84.4%	Somers' D = 0.690
Discordant = 15.3%	Gamma = 0.692
Tied = 0.3%	Tau-a = 0.236
(428694 pairs)	c = 0.845

Model 5: Logistic Regression of Suspect Compliance, Using Number of Police and Size of Audience at the Completion of Arrest Instead of at Initiation

The SAS System
The LOGISTIC Procedure

Data Set: WORK.FRAME1
Response Variable: COMPLY1
Response Levels: 2
Number of Observations: 1585
Link Function: Logit

Response Profile

Ordered Value	COMPLY1	Count
1	1	1239
2	0	346

Model Fitting Information and Testing Global Null Hypothesis BETA=0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1665.437	1242.511	.
SC	1670.805	1344.509	.
-2 LOG L	1663.437	1204.511	458.926 with 18 DF (p=0.0001)
Score	.	.	487.520 with 18 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	1.8680	0.4213	19.6565	0.0001	.	.
ARREST	1	-0.1704	0.0897	3.6086	0.0575	-0.081726	0.843
AUDIENC2	1	0.00799	0.0408	0.0384	0.8446	0.007905	1.008
NUMBERPO	1	-0.0426	0.0703	0.3668	0.5448	-0.024973	0.958
MALE1	1	0.5168	0.2029	6.4859	0.0109	0.106186	1.677
WEAPON	1	0.5575	0.2728	4.1768	0.0410	0.080387	1.746
Q401CON	1	0.8871	0.1828	23.5608	0.0001	0.216402	2.428
COMMAND	1	-0.5102	0.1871	7.4392	0.0064	-0.133660	0.600
PHYSICAL	1	-2.2165	0.1644	181.6768	0.0001	-0.506535	0.109
IMPAIR	1	-0.4921	0.1539	10.2232	0.0014	-0.127412	0.611
LOCATE2	1	-0.0483	0.1656	0.0851	0.7706	-0.012806	0.953
FAMILY	1	-0.0678	0.2001	0.1149	0.7346	-0.014743	0.934
YOUNG	1	-0.0118	0.2414	0.0024	0.9610	-0.001987	0.988
MALES	1	0.2577	0.1812	2.0225	0.1550	0.062477	1.294
WPMS	1	-0.3019	0.1701	3.1475	0.0760	-0.078538	0.739
MPWS	1	-0.3144	0.3226	0.9497	0.3298	-0.040340	0.730
MPMS	1	0.1399	0.2689	0.2706	0.6029	0.022310	1.150
KNOWN	1	-0.3550	0.2036	3.0387	0.0813	-0.065830	0.701
Q22NUMYR	1	0.0107	0.0146	0.5366	0.4639	0.031328	1.011

Association of Predicted Probabilities and Observed Responses

Concordant = 84.2%	Somers' D = 0.687
Discordant = 15.5%	Gamma = 0.690
Tied = 0.3%	Tau-a = 0.235
(428694 pairs)	c = 0.844

Appendix E
SAS Programs[36]

Police Force Model 2: Regression of Police Force on the 41 Predictors and Suspect Force

```
option ls=80 ps=63 nodate;

DATA frame1;
INFILE 'c:\4 force\data\data.txt' LRECL=942;
INPUT
  QID 1-4                 QNUMBER 5-8             Q1ASSIGN 9-9
  Q2CUST 10-10            Q3APP 11-11             Q401CON 12-12
  Q401COM 13-13           Q401VBL 14-14           Q401SHT 15-15
  Q402CON 16-16           Q402COM 17-17           Q402VBL 18-18
  Q402SHT 19-19           Q4SCON 20-20            Q4SCOM 21-21
  Q4SVBL 22-22            Q4SSHT 23-23            Q5COMPLY 24-24
  Q5PASSIV 25-25          Q5EVADE 26-26           Q5IMPEDE 27-27
  Q5CUFF 28-28            Q5PLACE 29-29           Q5ASSLT 30-30
  Q601NONE 31-31          Q601FOOT 32-32          Q601CAR 33-33
  Q601HELI 34-34          Q602NONE 35-35          Q602FOOT 36-36
  Q602CAR 37-37           Q602HELI 38-38          Q6SNONE 39-39
  Q6SFOOT 40-40           Q6SCAR 41-41            Q701NONE 42-42
  Q701SPD 43-43           Q701KNL 44-44           Q701STND 45-45
  Q701PRON 46-46          Q701HOBB 47-47          Q701LEG 48-48
  Q701BODY 49-49          Q701OTH 50-50           Q701SPEC $ 51-70
  Q702NONE 71-71          Q702SPD 72-72           Q702KNL 73-73
  Q702STND 74-74          Q702PRON 75-75          Q702HOBB 76-76
  Q702LEG 77-77           Q702BODY 78-78          Q702OTH 79-79
  Q702SPEC $ 80-99        Q801COMP 100-100        Q801GRAB 101-101
  Q801PUSH 102-102        Q801HIT 103-103         Q801WRST 104-104
  Q801BITE 105-105        Q801PRES 106-106        Q801CARO 107-107
  Q801OTH 108-108         Q801SPEC $ 109-128      Q802COMP 129-129
  Q802GRAB 130-130        Q802PUSH 131-131        Q802HIT 132-132
  Q802WRST 133-133        Q802BITE 134-134        Q802PRES 135-135
  Q802CARO 136-136        Q802OTH 137-137         Q802SPEC $ 138-157
  Q8SCOMP 158-158         Q8SGRAB 159-159         Q8SPUSH 160-160
  Q8SHIT 161-161          Q8SWRST 162-162         Q8SBITE 163-163
  Q8SPRES 164-164         Q8SCARO 165-165         Q8SOTH 166-166
  Q8SSPEC $ 167-186       Q901STRT 187-187        Q901EXP 188-188
  Q901SIDE 189-189        Q901FLA 190-190         Q901HAND 191-191
  Q901CHEM 192-192        Q901RIFL 193-193        Q901MOTR 194-194
  Q901DOG 195-195         Q901OTH 196-196         Q901SPEC $ 197-216
  Q902STRT 217-217        Q902EXP 218-218         Q902SIDE 219-219
  Q902FLA 220-220         Q902HAND 221-221        Q902CHEM 222-222
  Q902RIFL 223-223        Q902MOTR 224-224        Q902DOG 225-225
  Q902OTH 226-226         Q902SPEC $ 227-246      Q9SNONE 247-247
  Q9SSTICK 248-248        Q9SKNIFE 249-249        Q9SHITEM 250-250
  Q9SMARTS 251-251        Q9SHAND 252-252         Q9SCHEM 253-253
  Q9SRIFL 254-254         Q9SMOTOR 255-255        Q9SDOG 256-256
  Q9SOTHER 257-257        Q9SSPEC $ 258-277       Q1001STR 278-278
  Q1001EXP 279-279        Q1001SID 280-280        Q1001FLA 281-281
  Q1001HAN 282-282        Q1001CHE 283-283        Q1001RIF 284-284
  Q1001MOT 285-285        Q1001DOG 286-286        Q1001OTH 287-287
  Q1001SPE $ 288-307      Q1002STR 308-308        Q1002EXP 309-309
  Q1002SID 310-310        Q1002FLA 311-311        Q1002HAN 312-312
  Q1002CHE 313-313        Q1002RIF 314-314        Q1002MOT 315-315
  Q1002DOG 316-316        Q1002OTH 317-317        Q1002SPE $ 318-337
```

[36] Not all of the programs are include because they are so similar. The first included program, Police Force Model 2, includes the data preparation and regression procedures. Then Police Force Model 4 presents the additional procedures for calculating the predicted values of suspect force. Suspect Force Model 2 is included to demonstrate the simple reversal of police and suspect force variables. And the Richmond Citizen Compliance program presents the additional variable recodes and all five regression models.

Q10SNONE 338-338
Q10SITEM 341-341
Q10SCHEM 344-344
Q10SDOG 347-347
Q11INEFF 369-369
Q1201NON 430-430
Q1201CUT 433-433
Q1201IRR 436-436
Q1202NON 458-458
Q1202CUT 461-461
Q1202IRR 464-464
Q12SNONE 486-486
Q12SCUT 489-489
Q12SIRR 492-492
Q1301MED 514-514
Q1302SPE $ 536-555
Q14CALL1 577-580
Q14BOOK 584-584
Q19IN $ 588-607
Q20NONTH 629-629
Q21VISIB 632-633
Q22NUMMO 639-640
Q23T1YR 663-664
Q23T3 $ 687-706
Q25OFFIN 712-713
Q25SUSCO 718-719
Q26SATT 727-728
Q27VUNK 732-732
Q27VFMLY 735-735
Q27BSTRG 738-738
Q28SRACE 741-741
Q2801SEX 744-744
Q29NONE 747-747
Q29ASSLT 750-750
Q30SGANG 753-753
Q31OTHER 756-756
Q32WRNT1 761-762
LOCATION 766-767
INSIDE2 770-770
LENGTHPD 774-774
WHITES 777-777
WHITE1 780-780
WHITE2 783-783
RACEMIX 786-786
HISPP 789-789
HEIGHT1 792-792
WEIGHT1 795-795
AGE2 798-798
SUSKNOW 801-801
IMPAIRED 804-804
COVER 807-807
DOMESTIC 810-810
VIOLENT2 814-814
VICE 817-817
WEEKEND 820-820
FAMILY 823-823
BYFAMILY 826-826
LOCCRIME 829-829
GANG 832-832
OTHERS 835-835
WPHS 838-838
BPBS 841-841
HPWS 844-844
HPOS 847-847
OPHS 850-850
TRAIN 853-853
NUMBERPO 856-856
SUSINIT2 859-859
NUMBERBO 862-862
CHANGEBN 866-867
ARRESTN 872-872
MALES 875-875

Q10SSTIK 339-339
Q10SMART 342-342
Q10SRIF 345-345
Q10SOTH 348-348
Q11WHAT $ 370-389
Q1201PAI 431-431
Q1201CON 434-434
Q1201OTH 437-437
Q1202PAI 459-459
Q1202CON 462-462
Q1202OTH 465-465
Q12SPAIN 487-487
Q12SCONC 490-490
Q12SOTH 493-493
Q1301SPE $ 515-534
Q13SMED 556-556
Q14VIEW 581-581
Q17SHIFT 585-585
Q19OUT $ 608-627
Q20CRIM 630-630
Q22NUMAR 634-636
Q23ACDMY 641-642
Q23T2 $ 665-684
Q23T3YR 707-708
Q25OFFCO 714-715
Q25BYIN 720-723
Q26BYATT 729-730
Q27VSTRG 733-733
Q27BNONE 736-736
Q27BFRND 739-739
Q28SSEX 742-742
Q2802RAC 745-745
Q29COMP 748-748
Q29WPNS 751-751
Q31DRUGS 754-754
Q32POC 757-758
FILE 763-763
INSIDE 768-768
KNOWLOC 771-771
RELVICT 775-775
BLACKS 778-778
BLACK1 781-781
BLACK2 784-784
WHITEP 787-787
SAMERACE 790-790
HEIGHT2 793-793
WEIGHT2 796-796
AGES 799-799
KNOWEAPN 802-802
DRUGS 805-805
PATROL 808-808
CHARGE 811-812
PROPERTY 815-815
DISPATCH 818-818
ENDNIGHT 821-821
BYATTIT 824-824
DEMEANOR 827-827
LOCKNOW 830-830
FEMALES 833-833
WPWS 836-836
WPOS 839-839
BPHS 842-842
HPBS 845-845
OPWS 848-848
OPOS 851-851
NUMBERPI 854-854
NUMBERSI 857-857
SUSCOMP2 860-860
WITNESS 863-863
CHANGESN 868-869
MALEP 873-873
RACEDIF 876-876

Q10SKNIF 340-340
Q10SHAND 343-343
Q10SMOTR 346-346
Q10SSPEC $ 349-368
Q11WHY $ 390-429
Q1201BRU 432-432
Q1201BRO 435-435
Q1201SPE $ 438-457
Q1202BRU 460-460
Q1202BRO 463-463
Q1202SPE $ 466-485
Q12SBRUI 488-488
Q12SBROK 491-491
Q12SSPEC $ 494-513
Q1302MED 535-535
Q13SSPEC $ 557-576
Q14CHRG1 582-583
Q19LOCN 586-587
Q20NONE 628-628
Q20HAZRD 631-631
Q22NUMYR 637-638
Q23T1 $ 643-662
Q23T2YR 685-686
Q24INJ 709-711
Q25SUSIN 716-717
Q25BYCO 724-726
Q27VNONE 731-731
Q27VFRND 734-734
Q27BUNK 737-737
Q27BFMLY 740-740
Q2801RAC 743-743
Q2802SEX 746-746
Q29REST 749-749
Q29RECRD 752-752
Q31ALCO 755-755
Q32VPC 759-760
BATCH 764-765
HOUSE 769-769
LENGTH 772-773
RELBYST 776-776
HISPS 779-779
HISP1 782-782
HISP2 785-785
BLACKP 788-788
HEIGHTS 791-791
WEIGHTS 794-794
AGE1 797-797
SEXMIX 800-800
KNOWRECD 803-803
ALCOHOL 806-806
CUSTODY 809-809
VIOLENT 813-813
TRAFFIC 816-816
NIGHT 819-819
SHIFT 822-822
BYANTAG 825-825
LOCHAZRD 828-828
PROBSUSP 831-831
OTHER1 834-834
WPBS 837-837
BPWS 840-840
BPOS 843-843
HPHS 846-846
OPBS 849-849
RACEUNK 852-852
POLINIT2 855-855
NUMBERSO 858-858
NUMBERBI 861-861
CHANGEPN 864-865
VISIBLE 870-871
MALE1 874-874
AGEDIF 877-878

```
WEIGHDIF 879-880        HEIGHDIF 881-882        SEXDIF 883-883
BOTHMALE 884-884        VOICE 885-885           SVOICE 886-886
RESPONSE 887-887        RESPONDN 888-888        MOVE 889-889
MOVEN 890-890           SMOVE 891-891           RESTRAIN 892-893
RESTRAI 894-894         TACTIC 895-896          STACTIC 897-898
TACTICN 899-899         STACTICN 900-900        WEAPONP 901-902
WEAPONN 903-904         WEAPONU 905-905         WEAPONT 906-907
WEAPONUN 908-908        WEAPON 909-909          SWEAPONP 910-911
SWEAPPN 912-912         SWEAPONU 913-914        SWEAPONT 915-916
SWEAPUN 917-917         SWEAPTN 918-918         INJURY 919-919
INJURYN 920-920         SINJURY 921-921         SINJURYN 922-922
MEDICAL 923-923         SMEDICAL 924-924        SINJCAT 925-925
INJCAT 926-926          SMEDCAT 927-927         MEDCAT 928-928
PHYSICAL 929-929        PHYSSUS 930-930         BATON 931-931
CHEMICAL 932-932        CANINE 933-933          FLASHLIT 934-934
VEHICLE 935-935         FIREARM 936-936         CONTINUE 937-937
LEVELS 938-938          MAXFORCE 939-940        SMXFORCE 941-942 ;

IF QNUMBER=9999 THEN QNUMBER=.;     IF Q1ASSIGN=9 THEN Q1ASSIGN=.;
IF Q2CUST=9 THEN Q2CUST=.;          IF Q3APP=9 THEN Q3APP=.;
IF Q3APP=8 THEN Q3APP=.;            IF Q4Q1CON=9 THEN Q4Q1CON=.;
IF Q4Q1COM=9 THEN Q4Q1COM=.;        IF Q4Q1VBL=9 THEN Q4Q1VBL=.;
IF Q4Q1SHT=9 THEN Q4Q1SHT=.;        IF Q4Q2CON=9 THEN Q4Q2CON=.;
IF Q4Q2COM=9 THEN Q4Q2COM=.;        IF Q4Q2VBL=9 THEN Q4Q2VBL=.;
IF Q4Q2SHT=9 THEN Q4Q2SHT=.;        IF Q4SCON=9 THEN Q4SCON=.;
IF Q4SCOM=9 THEN Q4SCOM=.;          IF Q4SVBL=9 THEN Q4SVBL=.;
IF Q4SSHT=9 THEN Q4SSHT=.;          IF Q5COMPLY=9 THEN Q5COMPLY=.;
IF Q5PASSIV=9 THEN Q5PASSIV=.;      IF Q5EVADE=9 THEN Q5EVADE=.;
IF Q5IMPEDE=9 THEN Q5IMPEDE=.;      IF Q5CUFF=9 THEN Q5CUFF=.;
IF Q5PLACE=9 THEN Q5PLACE=.;        IF Q5ASSLT=9 THEN Q5ASSLT=.;
IF Q6Q1NONE=9 THEN Q6Q1NONE=.;      IF Q6Q1FOOT=9 THEN Q6Q1FOOT=.;
IF Q6Q1CAR=9 THEN Q6Q1CAR=.;       IF Q6Q1HELI=9 THEN Q6Q1HELI=.;
IF Q6Q2NONE=9 THEN Q6Q2NONE=.;      IF Q6Q2FOOT=9 THEN Q6Q2FOOT=.;
IF Q6Q2CAR=9 THEN Q6Q2CAR=.;       IF Q6Q2HELI=9 THEN Q6Q2HELI=.;
IF Q6SNONE=9 THEN Q6SNONE=.;        IF Q6SFOOT=9 THEN Q6SFOOT=.;
IF Q6SCAR=9 THEN Q6SCAR=.;          IF Q7Q1NONE=9 THEN Q7Q1NONE=.;
IF Q7Q1SPD=9 THEN Q7Q1SPD=.;        IF Q7Q1KNL=9 THEN Q7Q1KNL=.;
IF Q7Q1STND=9 THEN Q7Q1STND=.;      IF Q7Q1PRON=9 THEN Q7Q1PRON=.;
IF Q7Q1HOBB=9 THEN Q7Q1HOBB=.;      IF Q7Q1LEG=9 THEN Q7Q1LEG=.;
IF Q7Q1BODY=9 THEN Q7Q1BODY=.;      IF Q7Q1OTH=9 THEN Q7Q1OTH=.;
IF Q7Q2NONE=9 THEN Q7Q2NONE=.;      IF Q7Q2SPD=9 THEN Q7Q2SPD=.;
IF Q7Q2KNL=9 THEN Q7Q2KNL=.;        IF Q7Q2STND=9 THEN Q7Q2STND=.;
IF Q7Q2PRON=9 THEN Q7Q2PRON=.;      IF Q7Q2HOBB=9 THEN Q7Q2HOBB=.;
IF Q7Q2LEG=9 THEN Q7Q2LEG=.;        IF Q7Q2BODY=9 THEN Q7Q2BODY=.;
IF Q7Q2OTH=9 THEN Q7Q2OTH=.;        IF Q8Q1COMP=9 THEN Q8Q1COMP=.;
IF Q8Q1GRAB=9 THEN Q8Q1GRAB=.;      IF Q8Q1PUSH=9 THEN Q8Q1PUSH=.;
IF Q8Q1HIT=9 THEN Q8Q1HIT=.;        IF Q8Q1WRST=9 THEN Q8Q1WRST=.;
IF Q8Q1BITE=9 THEN Q8Q1BITE=.;      IF Q8Q1PRES=9 THEN Q8Q1PRES=.;
IF Q8Q1CARO=9 THEN Q8Q1CARO=.;      IF Q8Q1OTH=9 THEN Q8Q1OTH=.;
IF Q8Q2COMP=9 THEN Q8Q2COMP=.;      IF Q8Q2GRAB=9 THEN Q8Q2GRAB=.;
IF Q8Q2PUSH=9 THEN Q8Q2PUSH=.;      IF Q8Q2HIT=9 THEN Q8Q2HIT=.;
IF Q8Q2WRST=9 THEN Q8Q2WRST=.;      IF Q8Q2BITE=9 THEN Q8Q2BITE=.;
IF Q8Q2PRES=9 THEN Q8Q2PRES=.;      IF Q8Q2CARO=9 THEN Q8Q2CARO=.;
IF Q8Q2OTH=9 THEN Q8Q2OTH=.;        IF Q8SCOMP=9 THEN Q8SCOMP=.;
IF Q8SGRAB=9 THEN Q8SGRAB=.;        IF Q8SPUSH=9 THEN Q8SPUSH=.;
IF Q8SHIT=9 THEN Q8SHIT=.;          IF Q8SWRST=9 THEN Q8SWRST=.;
IF Q8SBITE=9 THEN Q8SBITE=.;        IF Q8SPRES=9 THEN Q8SPRES=.;
IF Q8SCARO=9 THEN Q8SCARO=.;        IF Q8SOTH=9 THEN Q8SOTH=.;
IF Q9Q1STRT=9 THEN Q9Q1STRT=.;      IF Q9Q1EXP=9 THEN Q9Q1EXP=.;
IF Q9Q1SIDE=9 THEN Q9Q1SIDE=.;      IF Q9Q1FLA=9 THEN Q9Q1FLA=.;
IF Q9Q1HAND=9 THEN Q9Q1HAND=.;      IF Q9Q1CHEM=9 THEN Q9Q1CHEM=.;
IF Q9Q1RIFL=9 THEN Q9Q1RIFL=.;      IF Q9Q1MOTR=9 THEN Q9Q1MOTR=.;
IF Q9Q1DOG=9 THEN Q9Q1DOG=.;        IF Q9Q1OTH=9 THEN Q9Q1OTH=.;
IF Q9Q2STRT=9 THEN Q9Q2STRT=.;      IF Q9Q2EXP=9 THEN Q9Q2EXP=.;
IF Q9Q2SIDE=9 THEN Q9Q2SIDE=.;      IF Q9Q2FLA=9 THEN Q9Q2FLA=.;
IF Q9Q2HAND=9 THEN Q9Q2HAND=.;      IF Q9Q2CHEM=9 THEN Q9Q2CHEM=.;
IF Q9Q2RIFL=9 THEN Q9Q2RIFL=.;      IF Q9Q2MOTR=9 THEN Q9Q2MOTR=.;
IF Q9Q2DOG=9 THEN Q9Q2DOG=.;        IF Q9Q2OTH=9 THEN Q9Q2OTH=.;
IF Q9SNONE=9 THEN Q9SNONE=.;        IF Q9SSTICK=9 THEN Q9SSTICK=.;
IF Q9SKNIFE=9 THEN Q9SKNIFE=.;      IF Q9SHITEM=9 THEN Q9SHITEM=.;
IF Q9SMARTS=9 THEN Q9SMARTS=.;      IF Q9SHAND=9 THEN Q9SHAND=.;
IF Q9SCHEM=9 THEN Q9SCHEM=.;        IF Q9SRIFL=9 THEN Q9SRIFL=.;
```

```
IF Q9SMOTOR=9 THEN Q9SMOTOR=.;
IF Q9SOTHER=9 THEN Q9SOTHER=.;
IF Q1001EXP=9 THEN Q1001EXP=.;
IF Q1001FLA=9 THEN Q1001FLA=.;
IF Q1001CHE=9 THEN Q1001CHE=.;
IF Q1001MOT=9 THEN Q1001MOT=.;
IF Q1001OTH=9 THEN Q1001OTH=.;
IF Q1002EXP=9 THEN Q1002EXP=.;
IF Q1002FLA=9 THEN Q1002FLA=.;
IF Q1002CHE=9 THEN Q1002CHE=.;
IF Q1002MOT=9 THEN Q1002MOT=.;
IF Q1002OTH=9 THEN Q1002OTH=.;
IF Q10SSTIK=9 THEN Q10SSTIK=.;
IF Q10SITEM=9 THEN Q10SITEM=.;
IF Q10SHAND=9 THEN Q10SHAND=.;
IF Q10SRIF=9 THEN Q10SRIF=.;
IF Q10SDOG=9 THEN Q10SDOG=.;
IF Q11INEFF=9 THEN Q11INEFF=.;
IF Q1201PAI=9 THEN Q1201PAI=.;
IF Q1201CUT=9 THEN Q1201CUT=.;
IF Q1201BRO=9 THEN Q1201BRO=.;
IF Q1201OTH=9 THEN Q1201OTH=.;
IF Q1202PAI=9 THEN Q1202PAI=.;
IF Q1202CUT=9 THEN Q1202CUT=.;
IF Q1202BRO=9 THEN Q1202BRO=.;
IF Q1202OTH=9 THEN Q1202OTH=.;
IF Q12SPAIN=9 THEN Q12SPAIN=.;
IF Q12SCUT=9 THEN Q12SCUT=.;
IF Q12SBROK=9 THEN Q12SBROK=.;
IF Q12SOTH=9 THEN Q12SOTH=.;
IF Q1302MED=9 THEN Q1302MED=.;
IF Q14CALL1=9999 THEN Q14CALL1=.;
IF Q14CHRG1=99 THEN Q14CHRG1=.;
IF Q17SHIFT=9 THEN Q17SHIFT=.;
IF Q20NONE=9 THEN Q20NONE=.;
IF Q20CRIM=9 THEN Q20CRIM=.;
IF Q21VISIB=99 THEN Q21VISIB=.;
IF Q22NUMYR=99 THEN Q22NUMYR=.;
IF Q23ACDMY=99 THEN Q23ACDMY=.;
IF Q23T2YR=99 THEN Q23T2YR=.;
IF Q24INJ=9 THEN Q24INJ=.;
IF Q25OFFCO=99 THEN Q25OFFCO=.;
IF Q25SUSCO=99 THEN Q25SUSCO=.;
IF Q25BYCO=999 THEN Q25BYCO=.;
IF Q26BYATT=9 THEN Q26BYATT=.;
IF Q27VUNK=9 THEN Q27VUNK=.;
IF Q27VFRND=9 THEN Q27VFRND=.;
IF Q27BNONE=9 THEN Q27BNONE=.;
IF Q27BSTRG=9 THEN Q27BSTRG=.;
IF Q27BFMLY=9 THEN Q27BFMLY=.;
IF Q28SSEX=9 THEN Q28SSEX=.;
IF Q2801SEX=9 THEN Q2801SEX=.;
IF Q2802SEX=9 THEN Q2802SEX=.;
IF Q29COMP=9 THEN Q29COMP=.;
IF Q29ASSLT=9 THEN Q29ASSLT=.;
IF Q29RECRD=9 THEN Q29RECRD=.;
IF Q31DRUGS=9 THEN Q31DRUGS=.;
IF Q31OTHER=9 THEN Q31OTHER=.;
IF Q32VPC=99 THEN Q32VPC=.;
IF KNOWLOC=9 THEN KNOWLOC=.;
IF LENGTHPD=9 THEN LENGTHPD=.;
IF RELBYST=9 THEN RELBYST=.;
IF HEIGHTS=9 THEN HEIGHTS=.;
IF HEIGHT2=9 THEN HEIGHT2=.;
IF WEIGHT1=9 THEN WEIGHT1=.;
IF AGE1=9 THEN AGE1=.;
IF AGES=9 THEN AGES=.;
IF SUSKNOW=9 THEN SUSKNOW=.;
IF SHIFT=9 THEN SHIFT=.;
IF DEMEANOR=9 THEN DEMEANOR=.;
IF TRAIN=9 THEN TRAIN=.;
IF NUMBERPO=9 THEN NUMBERPO=.;
IF Q9SDOG=9 THEN Q9SDOG=.;
IF Q1001STR=9 THEN Q1001STR=.;
IF Q1001SID=9 THEN Q1001SID=.;
IF Q1001HAN=9 THEN Q1001HAN=.;
IF Q1001RIF=9 THEN Q1001RIF=.;
IF Q1001DOG=9 THEN Q1001DOG=.;
IF Q1002STR=9 THEN Q1002STR=.;
IF Q1002SID=9 THEN Q1002SID=.;
IF Q1002HAN=9 THEN Q1002HAN=.;
IF Q1002RIF=9 THEN Q1002RIF=.;
IF Q1002DOG=9 THEN Q1002DOG=.;
IF Q10SNONE=9 THEN Q10SNONE=.;
IF Q10SKNIF=9 THEN Q10SKNIF=.;
IF Q10SMART=9 THEN Q10SMART=.;
IF Q10SCHEM=9 THEN Q10SCHEM=.;
IF Q10SMOTR=9 THEN Q10SMOTR=.;
IF Q10SOTH=9 THEN Q10SOTH=.;
IF Q1201NON=9 THEN Q1201NON=.;
IF Q1201BRU=9 THEN Q1201BRU=.;
IF Q1201CON=9 THEN Q1201CON=.;
IF Q1201IRR=9 THEN Q1201IRR=.;
IF Q1202NON=9 THEN Q1202NON=.;
IF Q1202BRU=9 THEN Q1202BRU=.;
IF Q1202CON=9 THEN Q1202CON=.;
IF Q1202IRR=9 THEN Q1202IRR=.;
IF Q12SNONE=9 THEN Q12SNONE=.;
IF Q12SBRUI=9 THEN Q12SBRUI=.;
IF Q12SCONC=9 THEN Q12SCONC=.;
IF Q12SIRR=9 THEN Q12SIRR=.;
IF Q1301MED=9 THEN Q1301MED=.;
IF Q13SMED=9 THEN Q13SMED=.;
IF Q14VIEW=9 THEN Q14VIEW=.;
IF Q14BOOK=9 THEN Q14BOOK=.;
IF Q19LOCN=99 THEN Q19LOCN=.;
IF Q20NONTH=9 THEN Q20NONTH=.;
IF Q20HAZRD=9 THEN Q20HAZRD=.;
IF Q22NUMAR=999 THEN Q22NUMAR=.;
IF Q22NUMMO=99 THEN Q22NUMMO=.;
IF Q23T1YR=99 THEN Q23T1YR=.;
IF Q23T3YR=99 THEN Q23T3YR=.;
IF Q25OFFIN=99 THEN Q25OFFIN=.;
IF Q25SUSIN=99 THEN Q25SUSIN=.;
IF Q25BYIN=999 THEN Q25BYIN=.;
IF Q26SATT=9 THEN Q26SATT=.;
IF Q27VNONE=9 THEN Q27VNONE=.;
IF Q27VSTRG=9 THEN Q27VSTRG=.;
IF Q27VFMLY=9 THEN Q27VFMLY=.;
IF Q27BUNK=9 THEN Q27BUNK=.;
IF Q27BFRND=9 THEN Q27BFRND=.;
IF Q28SRACE=9 THEN Q28SRACE=.;
IF Q2801RAC=9 THEN Q2801RAC=.;
IF Q2802RAC=9 THEN Q2802RAC=.;
IF Q29NONE=9 THEN Q29NONE=.;
IF Q29REST=9 THEN Q29REST=.;
IF Q29WPNS=9 THEN Q29WPNS=.;
IF Q30SGANG=9 THEN Q30SGANG=.;
IF Q31ALCO=9 THEN Q31ALCO=.;
IF Q32POC=99 THEN Q32POC=.;
IF LOCATION=99 THEN LOCATION=.;
IF LENGTH=99 THEN LENGTH=.;
IF RELVICT=9 THEN RELVICT=.;
IF RACEMIX=9 THEN RACEMIX=.;
IF HEIGHT1=9 THEN HEIGHT1=.;
IF WEIGHTS=9 THEN WEIGHTS=.;
IF WEIGHT2=9 THEN WEIGHT2=.;
IF AGE2=9 THEN AGE2=.;
IF SEXMIX=9 THEN SEXMIX=.;
IF CHARGE=99 THEN CHARGE=.;
IF BYATTIT=9 THEN BYATTIT=.;
IF RACEUNK=9 THEN RACEUNK=.;
IF NUMBERPI=9 THEN NUMBERPI=.;
IF NUMBERSI=9 THEN NUMBERSI=.;
```

```
  IF NUMBERSO=9 THEN NUMBERSO=.;        IF NUMBERBI=9 THEN NUMBERBI=.;
  IF NUMBERBO=9 THEN NUMBERBO=.;        IF CHANGEPN=9 THEN CHANGEPN=.;
  IF CHANGEBN=9 THEN CHANGEBN=.;        IF CHANGESN=9 THEN CHANGESN=.;
  IF VISIBLE=99 THEN VISIBLE=.;         IF ARRESTN=9 THEN ARRESTN=.;
  IF AGEDIF=9 THEN AGEDIF=.;            IF WEIGHDIF=9 THEN WEIGHDIF=.;
  IF HEIGHDIF=9 THEN HEIGHDIF=.;        IF SEXDIF=9 THEN SEXDIF=.;
  IF VOICE=9 THEN VOICE=.;              IF SVOICE=9 THEN SVOICE=.;
  IF RESPONSE=9 THEN RESPONSE=.;        IF MOVE=9 THEN MOVE=.;
  IF SMOVE=9 THEN SMOVE=.;              IF RESTRAIN=99 THEN RESTRAIN=.;
  IF TACTIC=99 THEN TACTIC=.;           IF STACTIC=99 THEN STACTIC=.;
  IF SWEAPONP=99 THEN SWEAPONP=.;       IF SWEAPONU=99 THEN SWEAPONU=.;
  IF SWEAPONT=99 THEN SWEAPONT=.;       IF INJURY=9 THEN INJURY=.;
  IF SINJURY=9 THEN SINJURY=.;          IF MEDICAL=9 THEN MEDICAL=.;
  IF SMEDICAL=9 THEN SMEDICAL=.;

/*Replace Missing Values with Variable Means*/

  if numberpi=. then numberpi=1.9934426;
  if changepn=. then changepn=.4422006;
  if shift=. then shift=1.8963964;
  if visible=. then visible=7.4958625;
  if age1=. then age1=3.6266846;
  if height1=. then height1=4.1747238;
  if weight1=. then weight1=3.7798785;
  if lengthpd=. then lengthpd=2.8270073;
  if q24inj=. then q24inj=1.5758645;
  if arrestn=. then arrestn=2.8098160;
  if train=. then train=1.5111111;
  if ages=. then ages=3.4138158;
  if heights=. then heights=3.4363636;
  if weights=. then weights=2.846;
  if agedif=. then agedif=-.0285146;
  if heighdif=. then heighdif=.5984308;
  if weighdif=. then weighdif=.7657222;


/* Model 2: Physical on the 53 Predictors and Physsus. Logistic */

proc logistic data=frame1 descending;
  model physical=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale physsus; run;

/* Model 2: Physical on the 53 Predictors and physsus. Stepwise Logistic*/
proc logistic data=frame1 descending;
  model physical=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale physsus
      / selection=stepwise slentry=.05 slstay=.10; run;
```

```
/* Model 2: Continue on the 53 Predictors and Levels.*/

proc reg data=frame1;
  model continue=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale levels;
        age:    test age1, ages, agedif =0;
        race:   test white1, blacks, hisps, wpbs, wphs =0;
        sex:    test male1, males, bothmale =0;
        height: test height1, heights, heighdif =0;
        weight: test weight1, weights, weighdif =0; run;

/* Model 2: Continue on the 53 Predictors and Levels. Stepwise */

proc reg data=frame1;
  model continue=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale levels
      / selection=stepwise slentry=.05 slstay=.1; run;

/* Model 2: Maxforce on the 53 Predictors and Smxforce.*/

proc reg data=frame1;
  model maxforce=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale smxforce;
        age:    test age1, ages, agedif =0;
        race:   test white1, blacks, hisps, wpbs, wphs =0;
        sex:    test male1, males, bothmale =0;
        height: test height1, heights, heighdif =0;
        weight: test weight1, weights, weighdif =0; run;

/* Model 2: Maxforce on the 53 Predictors and Smxforce. Stepwise */

proc reg data=frame1;
  model maxforce=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale smxforce
      / selection=stepwise slentry=.05 slstay=.1; run;
```

Police Force Model 4: Regression of Police Force on the 41 Predictors and Predicted Suspect Force

```
/*Calculate Predicted Values of Suspect Continuum of Force: Level3 */
proc reg data=frame1;
  model levels=
      numberpi changepn cover violent2 property vice domestic witness
      byantag male1 lengthpd q24inj ages hisps drugs alcohol gang heighdif;
  output out=frame1 p=levels2; run;

/*Continue on the Predictor Subset and Levels2.*/
proc reg data=frame1;
  model continue=
      numberpi changepn cover shift violent2 property traffic vice domestic witness
      byantag house inside2 loccrime visible lengthpd q24inj drugs alcohol gang
      age1 ages agedif white1 blacks hisps wpbs wphs male1 males bothmale
      levels2;
        age:    test age1, ages, agedif =0;
        race:   test white1, blacks, hisps, wpbs, wphs =0;
        sex:    test male1, males, bothmale =0; run;

/*Continue on the 53 Predictors and Levels2. Stepwise */
proc reg data=frame1;
  model continue=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale levels2
      / selection=stepwise slentry=.05 slstay=.1; run;

/* Calculate Predicted Values of Suspect Maximum Force: Smx3 */
proc reg data=frame1;
  model smxforce=
      numberpi changepn shift violent2 property vice domestic witness
      byantag lengthpd q24inj ages hisps males drugs alcohol gang heighdif;
  output out=frame1 p=smx2; run;

/* Maxforce on the Predictor Subset and Smx2 */
proc reg data=frame1;
  model maxforce=
      numberpi changepn cover shift violent2 property traffic vice domestic witness
      byantag house inside2 loccrime visible lengthpd q24inj drugs alcohol gang
      age1 ages agedif white1 blacks hisps wpbs wphs male1 males bothmale
      smx2;
        age:    test age1, ages, agedif =0;
        race:   test white1, blacks, hisps, wpbs, wphs =0;
        sex:    test male1, males, bothmale =0; run;

/* Maxforce on the 53 Predictors and Smx2. Stepwise */
proc reg data=frame1;
  model maxforce=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale smx2
      / selection=stepwise slentry=.05 slstay=.1; run;
```

Suspect Force Model 2: Logistic Regression of Suspect Force on the 41 Predictors and Police Force

```
/* Model 2: Physsus on the 53 Predictors and Physical. Logistic */
/*proc logistic data=frame1 descending;
  model physsus=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale physical; run;*/
/* Model 2: Physsus on the 53 Predictors and Physical. Stepwise Logistic*/
/*proc logistic data=frame1 descending;
  model physsus=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 black1 hispl height1 weight1 male1 lengthpd q24inj arrestn train
      ages whites blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif whitep blackp hispp wpws wpbs wphs heighdif weighdif bothmale physical
      / selection=stepwise slentry=.05 slstay=.1; run;*/
/* Model 2: Levels on the 53 Predictors and Continue.*/
/*proc reg data=frame1;
  model levels=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale continue;
        age:    test age1, ages, agedif =0;
        race:   test white1, blacks, hisps, wpbs, wphs =0;
        sex:    test male1, males, bothmale =0;
        height: test height1, heights, heighdif =0;
        weight: test weight1, weights, weighdif =0; run;*/
/* Model 2: Levels on the 53 Predictors and Continue. Stepwise */
/*proc reg data=frame1;
  model levels=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 black1 hispl height1 weight1 male1 lengthpd q24inj arrestn train
      ages whites blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif whitep blackp hispp wpws wpbs wphs heighdif weighdif bothmale continue
      / selection=stepwise slentry=.05 slstay=.1; run;*/
/* Model 2: Smxforce on the 53 Predictors and Maxforce.*/
/*proc reg data=frame1;
  model smxforce=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 height1 weight1 male1 lengthpd q24inj arrestn train
      ages blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif wpbs wphs heighdif weighdif bothmale maxforce;
        age:    test age1, ages, agedif =0;
        race:   test white1, blacks, hisps, wpbs, wphs =0;
        sex:    test male1, males, bothmale =0;
        height: test height1, heights, heighdif =0;
        weight: test weight1, weights, weighdif =0; run;*/
/* Model 2: Smxforce on the 53 Predictors and Maxforce. Stepwise */
/*proc reg data=frame1;
  model smxforce=
      patrol custody numberpi polinit2 changepn cover dispatch weekend night endnight shift
      violent2 property traffic vice domestic family susinit2 suscomp2 witness byfamily byantag
      house inside2 lochazrd loccrime visible
      age1 white1 black1 hispl height1 weight1 male1 lengthpd q24inj arrestn train
      ages whites blacks hisps heights weights males drugs alcohol probsusp knowrecd gang
      agedif whitep blackp hispp wpws wpbs wphs heighdif weighdif bothmale maxforce
      / selection=stepwise slentry=.05 slstay=.1; run;*/
```

```
 if q5comply=1      then comply1=1;
 if q5comply=.      then comply1=0;
 if physsus=0       then sforce=1;
 if physsus=1       then sforce=0;
 if q26satt=1       then comply2=1;
 if q26satt=2       then comply2=0;
 if q26satt=3       then comply2=0;
 if comply2=.       then comply2=1;

 if q14chrg1=1      then arrest=4;
 if q14chrg1=2      then arrest=4;
 if q14chrg1=3      then arrest=4;
 if q14chrg1=4      then arrest=4;
 if q14chrg1=5      then arrest=4;
 if q14chrg1=6      then arrest=4;
 if q14chrg1=7      then arrest=2;
 if q14chrg1=8      then arrest=4;
 if q14chrg1=9      then arrest=4;
 if q14chrg1=10     then arrest=4;
 if q14chrg1=11     then arrest=4;
 if q14chrg1=12     then arrest=4;
 if q14chrg1=13     then arrest=4;
 if q14chrg1=14     then arrest=4;
 if q14chrg1=15     then arrest=3;
 if q14chrg1=16     then arrest=2;
 if q14chrg1=17     then arrest=2;
 if q14chrg1=18     then arrest=2;
 if q14chrg1=19     then arrest=2;
 if q14chrg1=20     then arrest=1;
 if q14chrg1=21     then arrest=4;
 if q14chrg1=22     then arrest=4;
 if q14chrg1=23     then arrest=2;
 if q14chrg1=24     then arrest=2;
 if q14chrg1=25     then arrest=2;
 if q14chrg1=26     then arrest=2;
 if q14chrg1=27     then arrest=4;
 if q14chrg1=28     then arrest=2;
 if q14chrg1=29     then arrest=2;
 if q14chrg1=30     then arrest=4;
 if q14chrg1=31     then arrest=2;
 if q14chrg1=32     then arrest=2;
 if q14chrg1=33     then arrest=2;
 if q14chrg1=34     then arrest=4;
 if q14chrg1=35     then arrest=2;
 if q14chrg1=36     then arrest=2;
 if q14chrg1=37     then arrest=2;
 if q14chrg1=38     then arrest=2;
 if q14chrg1=39     then arrest=2;
 if q14chrg1=40     then arrest=2;
 if q14chrg1=41     then arrest=2;
 if q14chrg1=42     then arrest=4;
 if q14chrg1=43     then arrest=2;
 if q14chrg1=44     then arrest=.;
 if q14chrg1=45     then arrest=.;
 if q14chrg1=98     then arrest=.;
 if q14chrg1=99     then arrest=.;

 if numberbi=.      then numberbi=0;
 if numberbo=.      then numberbo=0;
 if numbersi=.      then numbersi=1;
 if numberso=.      then numberso=1;
 audienc1 = numbersi + numberbi;
 audienc2 = numberso + numberbo;
 if sweappn=0       then weapon=0;    else weapon=1;
```

```
    , q4olcon=.    then q4olcon=0;
   if q4olcom=.    then q4olcom=0;
   if q4olvbl=.    then q4olvbl=0;
   if q4olsht=.    then q4olsht=0;
   if q4olcom=1 or q4olvbl=1 or q4olsht=1 then command=1; else command=0;
   if drugs=1 or alcohol=1 then impair=1; else impair=0;

   if location=1      then locate2=0;
   if location=2      then locate2=0;
   if location=3      then locate2=1;
   if location=4      then locate2=1;
   if location=5      then locate2=1;
   if location=6      then locate2=1;
   if location=7      then locate2=1;
   if location=8      then locate2=1;
   if location=9      then locate2=0;
   if location=10     then locate2=0;
   if location=11     then locate2=0;
   if location=12     then locate2=0;
   if location=13     then locate2=1;
   if location=14     then locate2=1;
   if location=15     then locate2=1;
   if location=16     then locate2=0;
   if location=17     then locate2=1;
   if location=.      then locate2=0;
   if ages=1          then young=1;
   if 2<=ages<=6      then young=0;
   if ages=.          then young=0;
   if q29none=.        then known=1;
   if q29none=1        then known=0;
   if wpbs=1 or wphs=1 or wpos=1 then wpms=1; else wpms=0;
   if bpws=1 or hpws=1 or opws=1 then mpws=1; else mpws=0;
   if bpbs=1 or bphs=1 or bpos=1 or hpbs=1 or hphs=1 or hpos=1
      or opbs=1 or ophs=1 or opos=1 then mpms=1; else mpms=0;

/*replace missing values with variable means*/
   if arrest=.        then arrest=2.6755187;
   if numberpi=.      then numberpi=1.9934426;
   if numberpo=.      then numberpo=2.4257358;
   if q22numyr=.      then q22numyr=6.9529229;

/*Model 1: Regression of Suspect Compliance on the 19 Predictors*/
proc logistic data=frame1 descending;
    model comply1=
        arrest audienc1 numberpi male1 weapon q4olcon command physical impair
        locate2 family young males wpms mpws mpms known q22numyr; run;

/*Model 2: Regression of Suspect Attitude on the 19 Predictors*/
proc logistic data=frame1 descending;
    model comply2=
        arrest audienc1 numberpi male1 weapon q4olcon command physical impair
        locate2 family young males wpms mpws mpms known q22numyr; run;

/*Model 3: Regression of Suspect Use of Force on the 19 Predictors*/
proc logistic data=frame1 descending;
    model sforce=
        arrest audienc1 numberpi male1 weapon q4olcon command physical impair
        locate2 family young males wpms mpws mpms known q22numyr; run;

/*Model 4: Regression of Suspect Compliance Including Separate Police Voice Levels*/
proc logistic data=frame1 descending;
    model comply1=
        arrest audienc1 numberpi male1 weapon q4olcon q4olcom q4olvbl q4olsht
        physical impair locate2 family young males wpms mpws mpms known q22numyr; run;

/*Model 5: Regression of Suspect Compliance Using Number of Police and Size of
     Audience at the Completion of Arrest Instead of at Initiation*/
proc logistic data=frame1 descending;
    model comply1=
        arrest audienc2 numberpo male1 weapon q4olcon command physical impair
        locate2 family young males wpms mpws mpms known q22numyr; run;
```