UNIVERSITY OF HOUSTON
Center for PUBLIC POLICY

PART III
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A STATISTICAL ANALYSIS OF THE USE OF CONDUCTED ENERGY DEVICES BY THE HOUSTON POLICE DEPARTMENT

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SUMMARY

Using statistical analysis and data visualization/geo-spatial tools[1], the research group assembled by the University of Houston Center for Public Policy[2] (UH CPP) studied the following questions pertaining to the use of *conducted energy devices* (CEDs) within the Houston Police Department (HPD):

- **Incidence**: *Who is subject to being shocked by a CED? What are the demographic characteristics of suspects and officers in these events? Where have these incidents[3] occurred?*
- **Injuries**: *Have the number of injuries to officers and suspects been affected by the CED policy?*
- **Substitution***: Are CEDs used as substitutes for alternative intermediate weapons or lethal weapons?*
- **Complaints**: *How many complaints have been filed for CED use? What are the demographic characteristics of the complainant and the officer(s)? How many complaints have been validated?*

The results in this analysis are subject to data limitations; however, the available data are sufficient for this exploratory analysis. The short duration of time (the period reviewed) combined with an overall small number of incident reports (less than 1% of the 1.4 million cases recorded during this period) disallowed ***strong*** causal interpretations. In future statistical analyses, new control variables and the natural extension of the time period for investigation can assist in providing greater certainty in answering the questions above.

Throughout this analysis we will note where data and design limitations limit the overall certainty of our conclusions.

[1] The use of visualization tools and "mapping" to find patterns and relations in quantitative data has a long history. Among the more famous examples is Dr. John Snow's investigation of a cholera epidemic in 19th century England (see Tufte 2001). We thank Governor Bill Hobby for bringing this information to our attention.

[2] The members of the research team that contributed to this analysis include Renée Cross (University of Houston Center for Public Policy), Tom Duncavage (Prototype, Fusion & Modeling, LLC), Jim Granato (University of Houston Center for Public Policy), Mark Jones (Rice University), Terry Mayes (Prototype, Fusion & Modeling, LLC), Bill Reed (Rice University), Matt Soltis (Prototype, Fusion & Modeling, LLC), and M.C. Sunny Wong (University of San Francisco). Stephanie Eguia (University of Houston Center for Public Policy) provided research assistance.

[3] The term "incidents" refers to calls for service.

Incidence Results

We noted that the incidence results must be viewed with caution. One challenge was the lack of adequate data on suspect and officer characteristics. This affected the confidence we put in the results of our suspect data analysis. On the other hand, the data utilized for the officer data analysis allows us to draw inferences with much greater confidence. Yet another complication was in the Council District analysis. **While the Council District analysis allowed us to control for important contextual factors, it was crucial to remember that the number of CED events in most of the nine Council Districts was sufficiently small so as to warrant caution in our interpretation.**

For the period December 2004 to June 2007, the principal statistical and geo-spatial results were as follows:

- Of the 1.4 million incident reports, there were 1,284 (.08%) events where the CED was deployed. This equates to 8 CED deployments for every 10,000 incidents.
- There were approximately 700,000 incidents in the data where primary suspects could be matched to an HPD officer (who could have deployed a CED). Of those 700,000 incidents, 1,030 involved the use of CEDs. This translated into approximately a .14% likelihood of having a CED involved in an incident. Alternatively for every 10,000 incidents, 14 involved the use of a CED.
- Among suspects, African Americans had the greatest probability of having a CED used on them. Latinos and Anglos followed in overall likelihood.
- Among officers, there were no gender differences in the overall likelihood of employing a CED.
- Among suspects, males were more likely to be involved in a CED incident than females.
- African American officers were least likely to deploy a CED. Latino and Anglo officers followed in overall likelihood, with both equally likely to use a CED.
- African American officers had an equal likelihood of using a CED on African American, Latino, and Anglo suspects.
- Latino and Anglo officers had a much greater likelihood of using a CED on an African American suspect than on Anglo or Latino suspects. Latino and Anglo officers were equally likely to use a CED on an Anglo suspect. Latino officers had a greater likelihood of using a CED on a Latino suspect than Anglo officers.
- When looking at CED use within City Council Districts in Houston: Districts D and H have the highest likelihood of CED deployment.
- African American officers were just as likely to use a CED as were their Anglo counterparts in Council District D.
- Council Districts A, C, E, F, G, and I are similar in CED deployment.
- Council District B has a greater likelihood of CED use than Council District F and G.
- **The relationships between officers and suspects disappear or change when Council Districts are used as a statistical control.**

Injury Results

Due to the relatively short time period when the CED policy was in place (at the time of this analysis) the findings presented here need to be interpreted with caution. With the passage of time, it will be possible to find effects related to the CED policy.

For the period January 2000 to June 2007, the principal statistical results were as follows:

- Injury indicators, in general, indicated incidence shifts (also known as structural breaks) prior to the CED policy being instituted.
- The estimated total number of workers' compensation claims by the officers has fallen by an accumulated 20% that began in June 2004.
- The estimated level of monthly expenditures on claims shows an accumulated reduction of approximately $50,000 per month (50%). This began in May 2003.
- Both decreases began prior to the incorporation of the CED program at HPD.
- The decline in the injury indicators has continued during the Scope period.

Substitution Results

As with the injury analysis, the substitution analysis and results presented here covered a relatively short time period when the CED policy was in place. **Again, the findings presented here need to be interpreted with caution.** Over time, it will be possible to find affects related to the CED policy.

In addition, due to lack of available data, the results in this section did not cover intermediate weapons so the test for substitution effects will need to be extended if the data become available.

For the period January 2000 to June 2007, the principal statistical results were as follows:

- There was no evidence that the introduction of CEDs served as a substitute for the use of firearms by an officer.
- There was evidence in the data of an incidence shift (structural break) in the accidental discharge of firearms, but this occurred prior to the introduction of the CED policy.
- There was evidence of an incidence shift in citizen death due to the discharge of firearms, but this occurred prior to the introduction of the CED policy.
- There was evidence of an incidence shift in officer deaths due to the discharge of firearms, but this occurred prior to the introduction of the CED policy.
- There was evidence of an incidence shift in the total discharge of firearms, but this occurred prior to the introduction of the CED policy.

Complaint Results

For the period December 2004 to June 2007, the principal statistical results were as follows:

- Since December 2004, there were 55 complaints filed where CEDs have been mentioned in some manner.
- Complaints were leveled at 57 male officers while 2 were directed at female officers (note that the 55 complaints included a total 59 officers).
- Of the 59 officers noted in the 55 complaints, 27 were Anglo, 20 were African American, 9 were Latino, and 3 were Asian.

The disposition of complaints is summarized in Table 1a as follows:

TABLE 1a CED COMPLAINTS

CED Complaints[4]	Total
No Disposition	12
Exonerated	13
Information	1
Never Formalized	2
Not Sustained	9
Open Case	4
Sustained	3
Unfounded	11
Total CED Complaints	**55**

[4] **No Disposition** - CED activity was not the focus of the complaint and the investigation found CED usage to be proper and appropriate.

According to GO # 200-03:
Exonerated: Incident occurred, but was lawful and proper.
Information: No evidence to prove that an incident even occurred.
Never Formalized: Complainant refused to make a formal written statement or if a written statement was made, refused to swear or affirm that the statement was true (notarized).
Not Sustained: insufficient evidence to either prove or disprove justification for the incident.
Open Case: Investigation is on-going.
Sustained: Evidence is sufficient to prove the allegation.
Unfounded: Allegation is false or not factual.

BACKGROUND

The introduction and use of CEDs or what are frequently referred to as Tasers has produced considerable controversy.[5] HPD introduced CEDs in December 2004. By March 2005, all HPD patrol officers were issued a CED upon completion of a training course.

City Controller Annise D. Parker included a Taser Performance Audit in her 2007 Audit Plan that was issued to the Mayor and City Council on August 10, 2006. Controller Parker subsequently contracted with Mir•Fox & Rodriguez, P.C. (MFR) to audit CED use by HPD. The UH CPP was subcontracted by MFR to conduct the statistical analysis of the CED Performance Audit.[6]

The public concern about CED incidence was also echoed in the 2007 Houston Area Survey conducted by Stephen Klineberg (http://houstonareasurvey.org/). Dr. Klineberg's survey included responses from 656 people in the Houston area. For a sample of 650, there is a 95-percent probability that the data found in the survey will be true for the entire Harris County adult population within a margin of error of plus or minus 3.5 percent.

Regarding CEDs, the survey asked whether the respondent agrees or disagrees with the following statements:

1. The use of Taser devices by the police makes deadly force less likely.

   Agree: 60.7%
   Disagree: 29.1%
   Do Not Know or Refuse To Answer: 10.2%.

2. The police are more likely to use Taser devices than less aggressive methods when the suspect is African American or Latino.

   Agree: 49.4%
   Disagree: 35.7%
   Do Not Know or Refuse To Answer: 14.9%.

However these results mask substantial variations. In particular, the cross-tabulations of the responses showed distinct cleavages along racial and ethnic lines. In general, Anglos were more likely than African Americans or Latinos to have a positive view regarding the use of CEDs.

This polarization of opinion is consistent with the most available data on CEDs provided by HPD.

[5] We use the term *Conductive Energy Device* (*CED*) in this document since it is not a commercial term. *Taser* is a brand name.

[6] Since the implementation of the CED policy, allegations were made that the HPD frequently applies racial profiling when using CEDs. On November 30, 2006, it was reported in the *Houston Chronicle* that Mayor Bill White supported a statistical analysis of CED incidence. The *Chronicle* reports, "With Houston police facing complaints about Tasers being deployed disproportionately on African Americans, Mayor Bill White said Wednesday that he wants an independent, statistical analysis of how the department has used the devices."

Table 1b shows that CED incidence was not equally distributed under a variety of categories. Furthermore, Table 1 summarizes HPD police divisions; shifts where CED events took place; the number of HPD officers that deployed CEDs for the particular event; the suspect's race; the suspect's gender; and the suspect's age.[7]

See Table 1b on next page.

[7] In addition the Audit Team noted total CED deployments during the Scope period represent 0.47% of the approximately 273,000 individuals who were incarcerated in the City's Jail system.

TABLE 1b CED INCIDENCE SUMMARY: DECEMBER 2004 TO JUNE 2007

Source: Crime Analysis and Training Divisions

DIVISION			# OF OFFICERS THAT DEPLOYED TASERS	
AIRPORT	2		I OFFICER	1,133
CENTRAL	112		2 OFFICERS	107
CLEAR LAKE	36		3 OFFICERS	16
CRIME ANALYSIS & COMMAND CENTER	1		4OFFICERS	8
EASTSIDE	31		5 OFFICERS	3
FONDREN	69		MULTIPLE SUSPECTS	17
KINGWOOD	7		**TOTAL**	1,284
NARCOTICS	4			
NORTH DIVISION	190		**# OF OFFICERS SERIOUSLY INJURED AT TASER EVENTS**	
NORTHEAST	216		NO	0
NORTHWEST	40		YES	3
SOUTH CENTRAL	78		**TOTAL**	3
SOUTHEAST	192			
SOUTHWEST	67			
SPECIAL OPS	5		**SUSPECT RACE**	
SWAT	4		ASIAN	9
TRAFFIC	8		AFRICAN AMERICAN	810
WESTSIDE	123		LATINO	285
X-JOB	82		ANGLO	162
TOTAL	1,267		ANIMAL	17
			OFFICER	1
SHIFT			**TOTAL**	1,284
DAYS	305			
EVENINGS	518		**SUSPECT GENDER**	
NIGHTS	444		MALE	1,187
TOTAL	1,267		FEMALE	79
			OFFICER	1
REASON FOR POLICE RESPONSE TO TASER EVENTS			ANIMAL	17
OFFICER DISPATCHED	747		**TOTAL**	1,284
OFFICER SELF INITIATED'ON-VIEW	520			
MULTIPLE SUSPECTS	17		**SUSPECT AVERAGE AGE**	
TOTAL	1,284		15-16	24
			17-22	197
REASON FOR TASER DEPLOYMENT			23-28 (most violent prone years)	331
COMBATIVE RESISTING	1,095		29-34	245
THREATENED OFFICER W-WEAPON	53		35-42	242
VERBAL AGGRESSION PHYSICAL GESTURE	131		43-49	144
ACCIDENTAL DISCHARGE	5		50-69	71
TOTAL	1,284		UNKNOWN	12
			ANIMAL	17
SUCCESSFUL TASER DEPLOYMENT			OFFICER	1
NO	267		**TOTAL**	1,284
YES	1,017			
TOTAL	1,284		**# OF SUSPECTS SERIOUSLY INJURED AT TASER EVENTS**	
			NONE	0
			TOTAL	0

During the period December 2004 to June 2007, the data for the 1,284 CED incidents are summarized below:

- 47% of all incidents occurred in the Northeast (216), Southeast (192), and North (190) divisions.
- 75% of all events occurred in the evening (518) or night shifts (444).
- 88% of all events involving one police officer at the scene were deploying the CED (1,133).
- 63% of all suspects were African American (810), 22% were Latino (285), 13% were Anglo (162), and .7% were Asian (9).[8]
- 92% of all suspects were male (1187) and 6% were female (79)[9].
- 60% of all suspects were between the ages of 17 and 34 (773). 5% of all suspects were over the age of 50 (71). The modal category was between the ages 23 and 28.
- The total CED deployments during the Scope period represent 0.47% of the approximately 273,000 individuals who were incarcerated in the City's Jail system.

Therefore it was not surprising to find differences in public opinion across geographic and demographic lines when it comes to this issue.

In general, we noted that the summary data in Table 1 is typical of our experience with other social science data. Specifically, the data was *not equally distributed* across a variety of categories. Rather, there was a concentration or *clustering.* This clustering raises important questions for the subsequent analysis.

[8] The remaining 17 were animals (e.g., dogs) and one officer accidentally deployed the device on himself.
[9] The remaining 17 were animals (e.g., dogs) and one officer accidentally deployed the device on himself.

STUDY COMPONENTS

HPD's CED program is intended to accomplish the following:

- Assist officers in securing and controlling combative individuals,
- Reduce injuries to officers and suspects,
- Reduce financial impact of civil liability in use-of-force incidents, and
- In limited situations, provide an alternative to deadly force.

The analysis of these aspects involved the following: statistical, research design, and measurement challenges that could corrupt valid inference. Addressing these challenges was fundamental if the policy evaluation conclusions were to have any validity.

Statistical Challenges

To obtain the valid aggregation level and inference, while also accounting for potentially confounding factors, we examined the probability of CED incidents as a function of individual and contextual factors, both individually and combined.

Our preliminary examination of CED incidence data suggested that the data possess unique measurement, sampling, and timing challenges. These challenges required a fairly comprehensive approach involving several tools that, when taken as a whole, minimized the threat of drawing false inferences from the data.

We addressed issues of measurement accuracy, sampling validity, and timing through the following:

- **Measurement**. The first step in the statistical analysis subjected the CED incidence to tests for measurement, validity, and reliability. This type of assessment was extended when feasible to other data collected for the analysis.
- **Sampling.** Along with assessing the measurement accuracy of the samples, we broke the data down by various aggregation levels including HPD division, City Council District, zip code, and police "beat" levels by combining the CED City incident data with data contained in the HPD's Offense Incident Report database. An array of statistical methodologies including basic descriptive analysis of the main variables of interest and complex rare-event analysis of matched samples were then employed.
- **Timing.** An intervention analysis was employed to determine if statistically significant changes occurred in the metrics of interest after the CED technology was announced in December 2004. The determinants of CED use and the consequences of CEDs that have evolved from December 2004 to June 2007 were evaluated as well as before and after the policy was announced or implemented. We chose January 2000 as the beginning date.

Design Challenges

A common mistake in interpreting data is to take the facts and then directly interpret causal mechanisms from these facts and correlations. For example, Table 1 shows a set of facts, but in no way can facts and correlations substitute for causal reasoning.

The Audit Team emphasized that these observations are preliminary and are only the start of a process to enhance our understanding. This statistical study employs the protocols of social science, and in particular, we wanted to separate systematic effects of the CED policy from random chance. A scientific bias requires us to set the barrier high before making any causal pronouncements. False claims of causation only harm the process of public policy decision making.

In what sense do we refer to the word *cause*? Two variables are related if certain values of one variable tend to coincide with the values of the other variable, but the relation could be purely episodic. On the other hand, when values of one variable produce the values of the other variable, then the relation is causal. In other words, correlation is about variables moving together (they coincide), but causality involves saying not only that two variables coincide but one variable's values produce distinct values of the other.

Isolating a causal relation requires the use of controls and holding variables constant. If two variables, say A and B, "move" together the practice of holding a variable constant means we introduce a third variable, call it C, and then determine if the introduction of variable C influences variables A and B such that they no longer move together. Take a hypothetical example where we find that people with blond hair are more likely to vote for a particular political party (Shively 2008: 76). The fact that a variable representing an adult's particular hair color *is associated with* voting for a particular party's candidates may or may not be a causal relation. Now, if we add a third variable, socio-economic status, and take people of the same socio-economic status (i.e., hold socio-economic status constant) we may find that there is no difference between people with blond hair and everyone else when it comes to voting for a particular party's candidates.

The goal of the research designs the Audit Team employed was to isolate the effects of the CED policy, and in doing so, separate facts and correlations from causes. In an ideal world we would want to use a true or natural experiment. A "true" experiment involves a process that follows the sequence (Shively 2008: 82-84).

Step 1: The random assignment of subjects to a test group and a control group.
Step 2: The measurements of the dependent variable for both groups.
Step 3: A treatment administered to the test group.
Step 4: A subsequent measure of the dependent variable for the test and control group.
Step 5: If the test group "measurements" differ between the first and second measurements (and subsequent measurements if feasible) then there is support that the treatment has an effect.

Natural experiments follow a similar structure but the analyst does not have the ability to assign subjects into test and control groups.

Unfortunately neither of these designs was an option for this study since obtaining control groups or control locations with the current data was unavailable. As a result, we did not have a way to randomize the "treatment" over individuals.
The second design challenge was that there was a difference between when the CED policy was announced and when it was actually implemented. It is difficult to determine with confidence the date on which implementation of the intervention began and even more difficult to determine the date of any effect without looking at the data.

To address these matters, we utilized both time series and cross section analysis as "second best" alternatives to uncover causal patterns. The time series analysis was applied to policy "intervention" questions. The combination of time series and cross section analysis was applied to CED incidents where we controlled for characteristics of behavior (with the available data).

Securing Valid Metrics for the Analysis

While issues of measurement, sampling, and timing are essential to avoiding invalid inferences, a truly comprehensive research design should make use of contextual information. This contextual information has enormous potential in making for an accurate assessment of the true causal factors in any analysis. For this study, the contextual components of the analysis included several variables that were currently available and can be linked to data or dates of the CED policy.

There were four categories in this analysis:

1. **Incidence**: *Who is subject to being shocked by a CED?*

   To determine *who* is shocked by a CED, the following information was sought:

   - Demographic information on the individuals who come into contact with the HPD officers to identify the correct population (as well as various sub-populations based on the nature of the contact)
   - Demographic information on HPD officers
   - The number of CED incidents in this population
   - The inclusion of contextual factors such as:
     - Location
     - Time
     - Number of HPD officers present
     - Reason for contact (potential violent/potential non-violent offense).

2. **Injuries***: Have the number of injuries to HPD officers and suspects been affected by the CED policy?*

   The following information allowed an assessment of CED related injuries or reduction in injuries:

   - The number of injuries to HPD officers before and after the CED policy went into effect
   - The use of the CED compared to alternative methods that involve greater physical harm (e.g., firearm, baton, flashlight, physical restraint, or negotiation)

3. **Substitution:** *Are CEDs used as substitutes for alternative intermediate weapons or lethal weapons?*

The following information led to a determination of whether the CED was used as a substitute for other weapons:

- The use of the CED compared to alternative methods that involved greater physical harm (e.g., firearm, baton, flashlight, physical restraint, or negotiation)

4. **Complaints:** *How many complaints have been filed against HPD officers for CED use? What are the demographic characteristics of the complainant and the HPD officer(s)? How many complaints have been validated?*

The following information was used to analyze the CED complaints against HPD Officers:

- The number of complaints filed and the corresponding demographic data about CED usage
- An analysis of CED usage with HPD officers that used it on more than one occasion

DATA

The data categories we analyzed deal with the issues of *incidence, injury, substitution, and complaints.* Data sources came from the HPD Crime Analysis Division, the HPD Payroll Office, and the Internal Affairs Division.[10]

Incident Data: The best measurable representations that exist in current HPD databases provide the following information:

- Location (zip code, City Council District)
- Type of Incident (UCR subject code)[11]
- Shift (three point: days, evenings, and nights)
- Officer Characteristics (race/ethnicity, gender)
- Suspect Characteristics (race/ethnicity, gender)

The data are in daily intervals. The period covered was December 2004 to June 2007.

Injury Data: Data on injuries was collected from the City Health and Safety Unit's workers' compensation claims. Data was screened to ensure that *only claims related to physical altercations* were used in the analysis.[12] Data collected pertained to the number of cases that involved:

- Physical altercation (variable name: Altercation)
- Foot pursuit that ends in physical altercation (variable name: Pursuit)
- Total amount of physical altercations (variable name: Total Comp)
- Cost due to physical altercation (variable name: Altercation$)
- Cost due to foot pursuit that ends in physical altercation (variable name: Pursuit$)
- Total cost of physical altercations (variable name: Total$)
- Lost days due to physical altercation (variable name: Altercation Days Lost)
- Lost days due to foot pursuit that ends in physical altercation (variable name: Foot Days Lost)
- Lost time due to physical altercation (variable name: Altercation Lost Time) which is equivalent to the total number of filed claims.
- Lost time due to foot pursuit that ends in physical altercation (variable name: Foot Lost Time) which is equivalent to the number of filed claims.
- Total amount of lost days due to physical altercations (variable name: Total Days Lost)
- Total amount of lost time due to physical altercations (variable name: Total Lost Time) which is equivalent to the total number of filed claims.

[10] Note that we also consider the effects of population changes and these changes can influence magnitudes. Population dynamics are likely to be highly correlated across geographic units (i.e., zip code, council district, etc.), particularly since the period of analysis is no more than 7 years (within the same Census period). To account for this potential threat, we create an alternative data scale that standardizes the data as deviation from means. We find no statistically meaningful difference between using scaled data (deviation from means) and the raw data.

[11] Background information on the Uniform Crime Report Program (UCR) can be found at http://www.fbi.gov/ucr/ucr.htm.

[12] The total number of claims for the period January 2000 to June 2007 was 6,260. Of this total, 1,971 (31.5%) were due to aggressive acts (involving physical altercation).

The data covered the period January 2000 to June 2007. The descriptive statistics are presented in Tables 2a and 2b.

TABLE 2a. MONTHLY WORKERS' COMPENSATION SUMMARY STATISTICS: JANUARY 2000 TO JUNE 2007

	Altercation	Altercation$	Pursuit	Pursuit$	Total Comp	Total$
Mean	15.84	$82,148.20	6.05	$29,524.76	21.90	$111,673.00
Median	16.00	$57,324.50	6.00	$10,290.33	22.00	$85,304.92
Maximum	25.00	$705,392.60	15.00	$184,145.00	32.00	$708,218.40
Minimum	8.00	$130.28	0.00	$0.00	13.00	$2,441.15
Std. Dev.	3.87	$99,049.24	2.94	$40,423.04	4.75	$106,320.90
Total number of altercations	1,426.00	$7,393,338.00	545.00	$2,657,228.00	1,971.00	$10,050,566.00

Source: HPD Payroll Office

TABLE 2b. MONTHLY LOST DAYS AND LOST TIME SUMMARY STATISTICS: JANUARY 2000 TO JUNE 2007

	Foot Lost Time	Foot Days Lost	Altercation Days Lost	Altercation Lost Time	Total Lost Time	Total Days Lost
Mean	1.69	65.20	188.00	4.02	5.71	253.00
Median	1.50	18.50	158.00	4.00	5.50	226.00
Maximum	8.00	563.00	778.00	10.00	14.00	844.00
Minimum	0.00	0.00	0.00	0.00	1.00	4.00
Std. Dev	1.54	96.88	160.00	2.03	2.71	181.64
Total	152.00	5,867.00	16,893.00	362.00	514.00	22,760.00

Source: HPD Payroll Office

According to the HPD Payroll office "Days Lost" in Table 2b refers to the total number of days lost. "Lost Time" refers to the number of claims that pertain to the 8 hour work shifts that were lost.

Among the results (see Table 2a), the mean level of monthly expenditures on workers' compensation claims was $111,673, with approximately 22 claims made per month. The maximum dollar expenditure for non foot pursuit claims (Altercation$) occurred in February 2003 with a total of $705,393 and the minimum occurred in June 2007 with a total of $130.28.[13] The total dollars spent for the entire period was $10,050,566 (see Table 2a) while the total days lost for the period was 22,760 days (see Table 2b). In Table 2b the average monthly total for days lost (Total Days Lost) was 253 days with a maximum of 844 days and a minimum of 4 days.

In Figures 1 through 4, are the time series behavior of total monthly claims (Total Comp), total monthly expenditures (Total$), total days lost due to aggressive acts (Total Days Lost), and total lost time due to aggressive acts (Total Lost Time).

[13] The expenditures were calculated so that any expenses after the claim were always rolled into the date of the original claim. This may be a reason for the low total in June 2007.

FIGURE 1

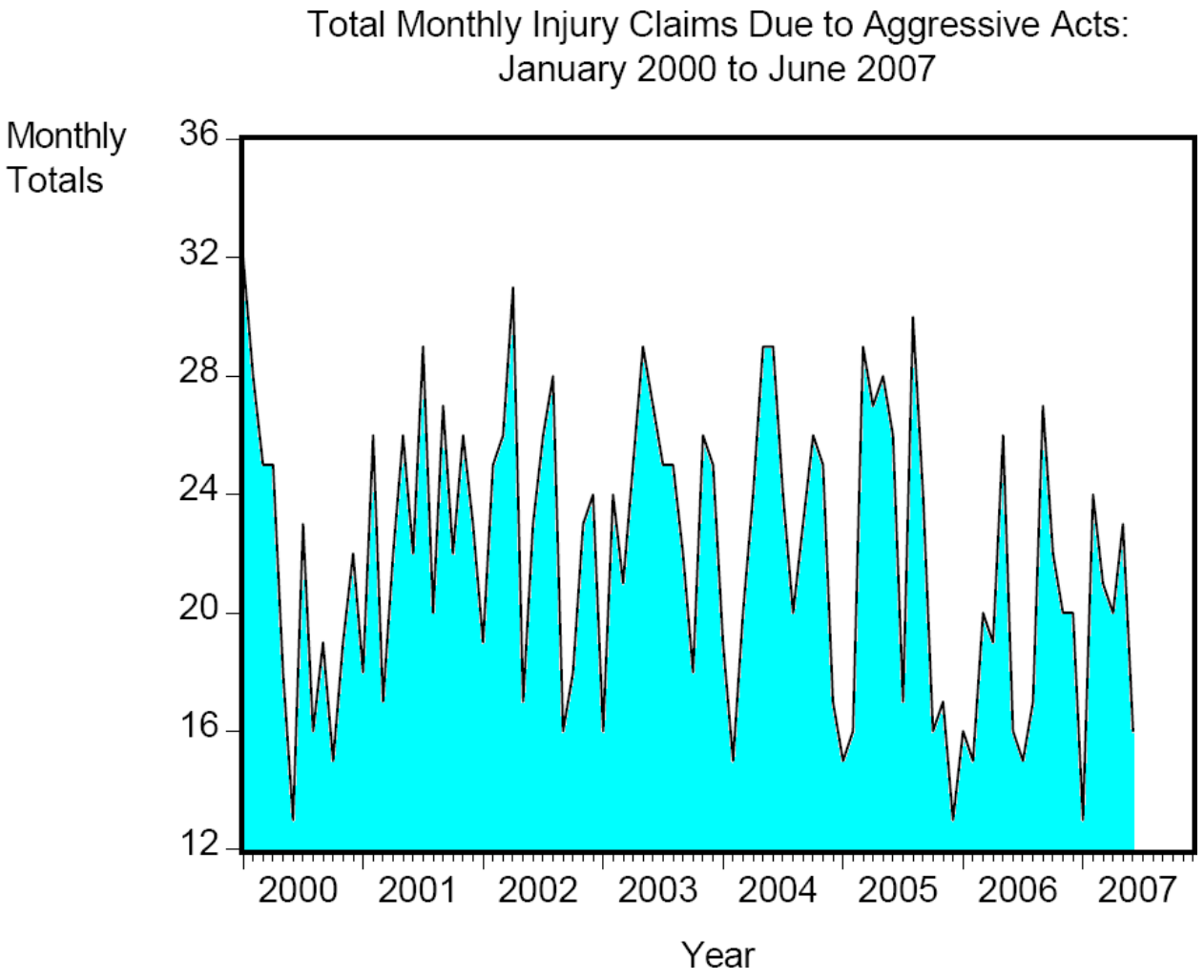

Total Monthly Injury Claims Due to Aggressive Acts:
January 2000 to June 2007
Monthly Totals
36
32
28
24
20
16
12
2000
2001
2002
2003
2004
2005
2006
2007
Year

FIGURE 2

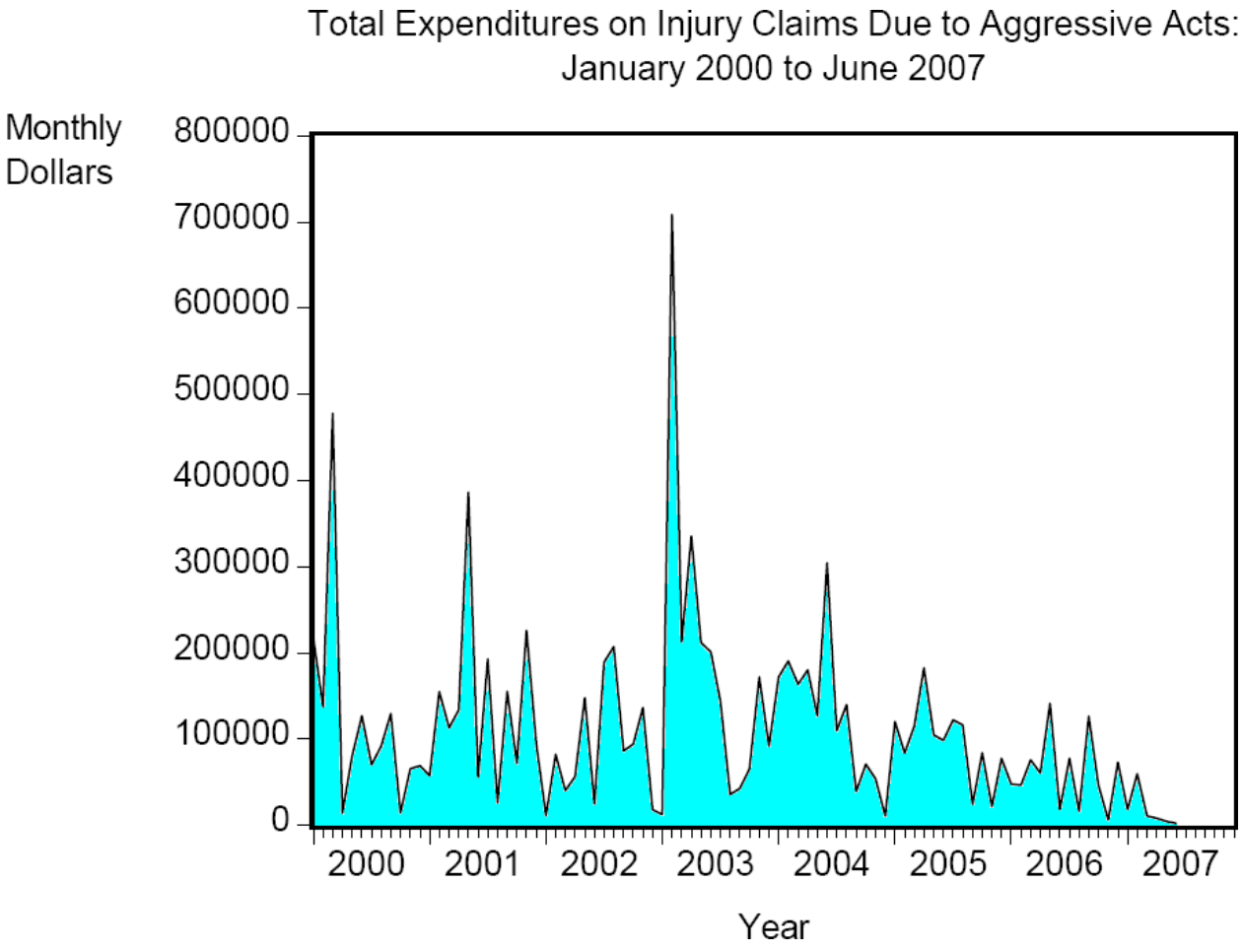

Total Expenditures on Injury Claims Due to Aggressive Acts:
January 2000 to June 2007
Monthly Dollars
800000
700000
600000
500000
400000
300000
200000
100000
0
2000
2001
2002
2003
2004
2005
2006
2007
Year

FIGURE 3

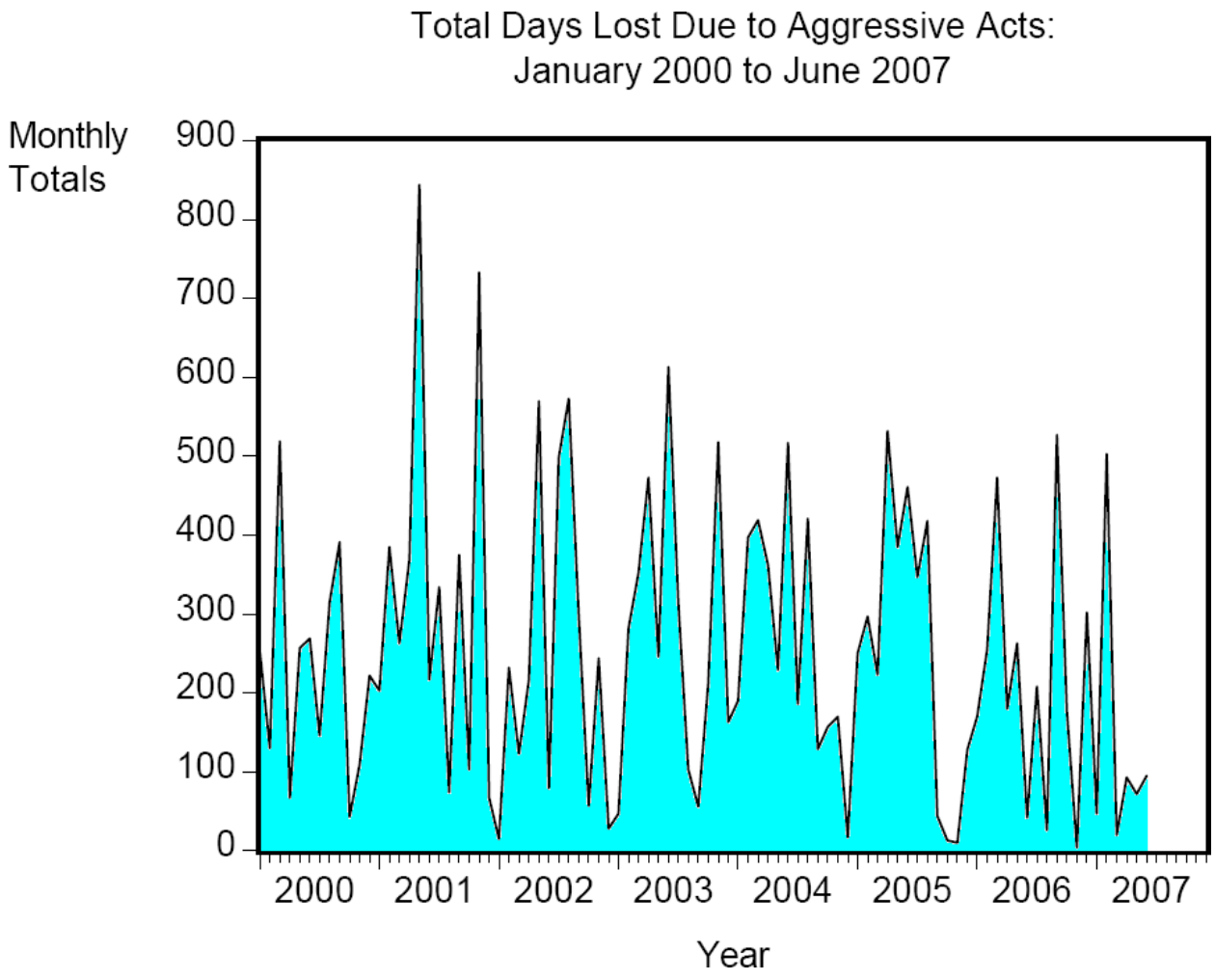
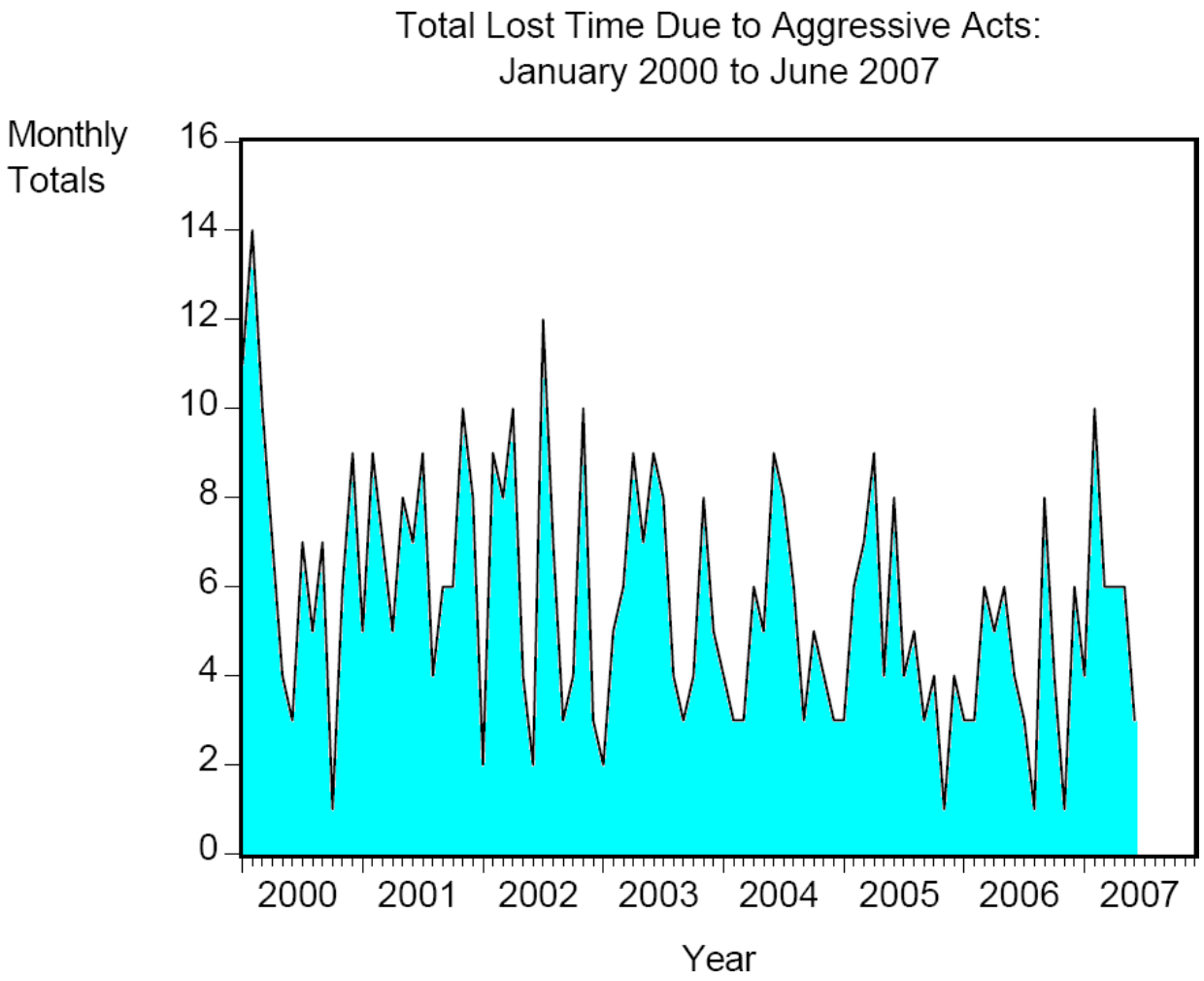

Total Days Lost Due to Aggressive Acts:
January 2000 to June 2007
Monthly Totals
900
800
700
600
500
400
300
200
100
0
2000
2001
2002
2003
2004
2005
2006
2007
Year

FIGURE 4


Total Lost Time Due to Aggressive Acts:
January 2000 to June 2007
Monthly Totals
16
14
12
10
8
6
4
2
0
2000
2001
2002
2003
2004
2005
2006
2007
Year

Substitution Data: Data on weapon substitution was collected from the HPD Internal Affairs Division (see Table 3). Existing data collected pertained to the number of cases that involved:

- Discharge of firearms that was an accident (variable name: Accident)
- Discharge of firearms that resulted in a citizen's death (variable name: Citizen Death)
- Discharge of firearms that resulted in a citizen's injury (variable name: Citizen Injury)
- Discharge of firearms that resulted in a citizen's death and injury (variable name: Citizen Death/Injury)
- Discharge of firearms that resulted in an officer's death (variable name: Officer Death)
- Discharge of firearms that resulted in an officer's injury (variable name: Officer Injury)
- Discharge of firearms that resulted in an officer's death and injury (variable name: Officer Death/Injury)
- Discharge of firearms that resulted in property damage (variable name: Property Damage)
- Discharge of firearms - total from categories above (variable name: Total/No Animal).

The data covered the period January 2000 to June 2007. The descriptive statistics are presented in Table 3.

TABLE 3. MONTHLY DISCHARGE OF FIREARMS SUMMARY STATISTICS: JANUARY 2000 TO JUNE 2007

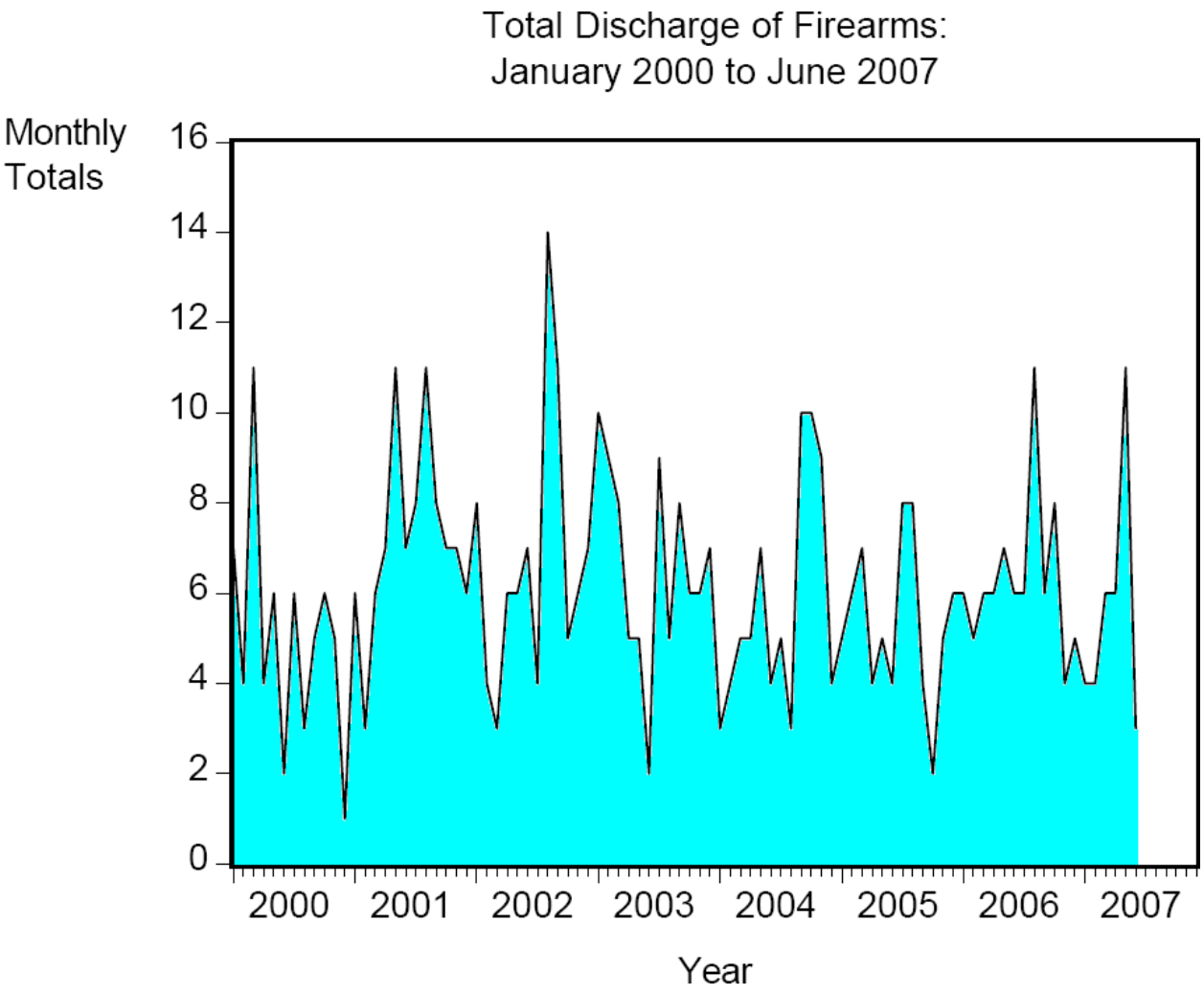
	Accident	Citizen Death	Citizen Injury	Citizen Death/ Injury	Officer Death	Officer Injury	Officer Death/ Injury	Property Damage	Total/No Animal
Mean	0.58	0.59	1.08	1.67	0.08	0.04	0.12	0.06	4.62
Median	0.00	0.00	1.00	2.00	0.00	0.00	0.00	0.00	4.00
Maximum	3.00	3.00	4.00	5.00	2.00	1.00	2.00	1.00	14.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Std. Dev.	0.72	0.70	1.07	1.34	0.34	0.21	0.39	0.23	2.26
Total	52.00	53.00	97.00	150.00	7.0	4.0	11.00	5.00	416.00

Source: HPD Internal Affairs Division

We noted that the mean level for the total discharge of firearms (not involving animals) was 4.62 and the total for the period was 416. The monthly maximum for the total discharge of firearms total was 14 and the minimum was 1. For citizen and officer deaths due to the discharge of firearms, the totals for the period were 53 and 7 respectively.

Figure 5 provides a summary of the time series behavior for a selected variable: the total discharge of firearms (Total/No Animals).

FIGURE 5



Complaint Data: The data found in Table 4 contains all complaints filed against HPD officers in regard to the use of CEDs between December 2004 and June 2007. The data contained the following information:

- Demographic characteristics of complainants and officers
- Number of officers and complainants present
- Reason for contact (potential violent/potential non-violent offense)
- Disposition of the complaint

TABLE 4. CED COMPLAINT STATISTICS: DECEMBER 2004 TO JUNE 2007

CED Allegation Totals

CHIEF INFORMATION OFFICER (CIO) ISSUE	3	5%
CONDUCT AND BEHAVIOR	5	9%
CRIMINAL ACTIVITY	1	2%
DEATH IN CUSTODY*	1	2%
IMPROPER POLICE PROCEDURE	6	11%
MISCONDUCT	4	7%
OPEN CASE	4	7%
TASER NOT ADDRESSED IN SYNOPSIS**	9	16%
USE OF FORCE	22	40%
Total:	55	100%

* In custody death. Harris County Medical examiner ruled death due to cocaine toxicity. Death not related to CEDs.

** CED was used. but was not the focus of the complaint or investigation. CED use was deemed to be appropriate.

CED Disposition Totals

No Disposition***	12	22%
EXONERATED	13	24%
INFORMATION	1	2%
NEVER FORMALIZED	2	4%
NOT SUSTAINED	9	16%
OPEN CASE	4	7%
SUSTAINED	3	5%
UNFOUNDED	11	20%
Total:	55	100%

*** No Disposition - CIO Issues, or CED was not addressed in the synopsis. In these instances. CED activity was not the focus of the complaint and the investigation found CED usage to be proper and appropriate.

Officer Demographics

Total Officers	59	
Race		
Anglo:	27	46%
African America:	20	34%
Latino:	9	15%
Asian:	3	5%
Other or Unknown:	0	0%
Gender		
Male:	57	97%
Female:	2	3%

Complainant Demographics

Total Complainants:	51	
Race		
Anglo:	7	14%
African American:	36	71%
Latino:	7	14%
Asian:	1	2%
Other or Unknown:	0	0%
Gender		
Male:	39	76%
Female:	12	24%

Some officers were involved in multiple complaints. Some complaints had more than one officer involved.

METHODS OF ANALYSIS

Tests for Incidence

There were four pieces of data that we used in our analysis of CED utilization. We started with the universe of incidents over our time period.[14] We then created subsets by breaking these incident data down to incidents that could be matched with a suspect. In the case that an incident had more than one suspect, we used the first listed suspect. Next, we matched officers to this data. Finally, we matched this data with the CED data.

Econometric Analysis

We constructed a statistical model of CED utilization that could provide an estimate of the probability of CED use as a function of incident characteristics, suspect characteristics, and officer characteristics. Specifically, we estimated a linear probability model to evaluate the relative effects of incident, suspect, and officer characteristics. From these models we simulated the predicted probability and their 90% confidence intervals of CED utilization as a function of our observable variables. We conducted several robustness checks to be sure our results were not a function of any particular assumption of the linear probability model. To address the fact that CED use is an indicator variable, we used maximum likelihood estimation to obtain the estimated probability of CED use. This robustness check suggested that our initial results from the linear probability model were consistent. In addition, we used a model to correct for the empirical fact that CED use was a rare event. Although these models do not tend to fit the data particularly well, on the whole, the results were comparable to the results obtained from the linear probability model.

Visualization Analysis

We augmented this particular statistical analysis with a *visualization platform*. The visualization platform maps all incidence data by geographic placement within Harris County and over time. The platform is available on the UH CPP website at http://www.uh.edu/cpp.

[14] We chose the universe of cases, where the universe of cases for this period of analysis involved merging primary suspect data with an incident and an HPD officer (who could have deployed a CED). We relied on using a data set that was much larger than the number of CED incidents. In particular, we wanted to provide a control group to make probabilistic comparisons of how the distribution of observable variables in the CED data may differ from the distribution of the observable variables in the incidents where a CED was not deployed. There were many ways to segment the data, from the very broadest categorization to much narrower ones. In this initial analysis, we chose the broadest categorization because it required us to make no assumptions about how the probability of CED utilization might shift as a function of observable variables. We allowed the data to speak rather than make such assumptions.

Tests for Policy Effects

The tests for policy effects involved the use of time series data. The analysis involved the following:

- Determination of incidence shifts (or structural breaks) in the data
- The combination of linking data persistence with incidence shifts when possible (intervention analysis with dummy variables)

To identify incidence shifts in the data and to determine if they corresponded with the introduction of the CED policy, we employed two types of tests.[15] The first test showed the timing of the largest break in the data (Andrews 1993). The second test analyzed how many breaks occurred in the data (rolling paired t-test). The tests are described as follows:

The Andrews Test

Instead of setting break points by some subjective assessment of timing, the Andrews test uses the entire time series to determine if any break points exist. The focus on the largest and most significant break point secures information on whether the changes in the series structure occurred before or after policy changes. The Andrews statistic is calculated as follows. First, compute and find the maximum Wald statistic for the entire series.[16] Then determine if the maximum Wald statistic exceeds the critical value. Maximum values for a given series that are larger than the critical value are interpreted as rejections of the null hypothesis.[17]

There are two limitations to the Andrews test. First, it allows for only one break in the time series. Second, the Andrews test is tied to a specific regression specification.

The Rolling Paired t-test

An alternative estimation is to compare the mean of variable for two sample periods - before and after the treatment - using a rolling paired t-test (Cureton 1957). While the Andrews test determines a break point in a regression form where controlled variables are necessarily included, the rolling paired t-test only examines the equality of means in two groups (or periods). We relaxed the restriction of controlling variables in regressions and searched for break points by running rolling paired t-tests over the break points to search break points with the highest t-statistics.[18]

---

[15] In the case of the CED policy, HPD announced the policy in December 2004, but the training and distribution of the CED was not completed until March 2005.

[16] In applying the test we followed Andrew's "trimming" rule. Trimming involves how deep into the sample (a proportion) to look for structural breaks (shifts) as well as how close to the end of the sample to end the search. The proportions should be large enough to include sufficient data points and small enough to encompass the largest number of potential breaks. In this paper, we used 25 percent trimming as a baseline, but compared these results with other trimming proportions. The conclusions were robust to alternative proportions.

[17] The null hypothesis is traditionally set to indicate no break (i.e., no program effect).

[18] This type of test is similar to Quandt (1958), Goldfeld and Quandt (1973), Hinkley (1971), and McGee and Carlton (1970). They also run regressions over the break point periods to search for break points with the minimum residual sum of squares (RSS).

Intervention Analysis

We combined the results of the Andrews and rolling paired t-tests with an intervention analysis. The dates for incidence shifts were identified by these two tests, but we also placed these dates within a regression framework to determine the actual change in the level of the dependent variable. In addition, one of the attributes of time series analysis was that point estimates for the immediate effect were adjusted to determine the long-run or steady state effect. It was sometimes the case that analysts ignored the cumulative effect and focus on the point estimates. This would be a mistake as the point estimate effect could be dwarfed by the long-run cumulative effect. A useful way to test a hypothesis is to examine the effect of a specific policy change. These possibilities are great since many subjects in the social sciences are influenced by changes in regime or policy. The interventions can be characterized in many ways, but they generally can be categorized as either temporary or permanent.

RESULTS

Incidence Analysis

The main purpose of the incidence analysis was to examine the role of suspect and officer race/ethnicity in the use of CEDs by HPD officers between December 2004 and June 2007. The results of the analysis focused on suspects, then officers, and then relevant governmental/geographical units (the nine Houston City Council Districts).

To conduct this analysis we merged data from three separate datasets: Offense Incident, Suspect, and Officer Employee Number for the period December 2004 through June 2007. HPD officers were equipped with CEDs (analysis was also done excluding the first four months when not all officers were equipped with CEDs). Four sets of variables were employed in the analysis:

- Suspect
- Officer
- Crime Context
- Geographic/Temporal Context[19]

Two types of Suspect data were utilized: suspect race/ethnicity (African American, Anglo, Latino, or other) and gender (male or female).[20] All offenses without a suspect or when the suspect was not human were excluded from the analysis. Information on an officer's physical characteristics (i.e., height, weight, strength) was not available.

[19] Recall that the variables we used involved:
- Incident Location (zip code, Council District)
- Type of Incident (UCR subject code)
- Shift (three point: days, evenings, and nights)
- Officer Characteristics (race/ethnicity, gender)
- Suspect Characteristics (race/ethnicity, gender)

[20] An insufficient number of cases with Asian suspects and Asian officers exist to conduct reliable analysis when these two groups are examined separately.

Additional desirable suspect data such as physical characteristics (weight/height/size) were unavailable for a large majority of suspects, and even in those instances when available, the data was considered unreliable (or at best, extremely imprecise). A possible critical variable, information on a suspect's past criminal record, was not available. The lack of information on suspect characteristics required that we be very cautious in interpreting all of the suspect related data analysis (i.e., that analysis which examines the impact of suspect race/ethnicity on the likelihood that they are the subject of a CED event). In contrast, we are more comfortable making interpretations based on the officer related data (i.e., the analysis which examines the impact of officer race/ethnicity on the likelihood that an officer employs a CED), since most important contextual factors are controlled for in this analysis by the essentially random assignment of officers to incidents.

As of 2006, the City's population had the following racial/ethnic distribution: Latino (41.9%), Anglo (27.6%), African American (24.7%), and Other Groups (5.8%).

The Audit Team compared the race/ethnicity of suspects in the Total Service/Incident Reports Analysis Population to the race/ethnicity of the suspects noted by HPD in the CED Service/Incident Reports. The results of our comparison are as follows:

Table 5a summarizes the Race/Ethnicity of the suspects that were in the Analysis Population of the Service/Incident Reports and the Race/Ethnicity of the CED Service/Incident Reports.

TABLE 5a. RACE/ETHNICITY OF SUSPECTS

Suspect's Race/Ethnicity	**Total Service/Incident Reports Analysis Population**	**CED Service/Incident Reports**	**Difference**
African American	46.0 %	66.9 %	20.9 %
Latino	28.2 %	23.5 %	-4.7 %
Anglo	24.4 %	9.0 %	-15.4 %
Other Groups	1.4 %	0.6%	-0.8 %

Based on the above analysis, African American suspects were involved in a proportionally greater number of total Service/Incident Reports analyzed as well as CED service/incident reports. In addition, the proportion of CED Service/Incident Reports was 20.9% more than the total service/incident reports. The Latino, Anglo, and Other Group suspects were involved in proportionally less service/incident reports.

According to HPD, the Department-wide officer demographics (see table 5b) during the Scope period were as follows:

TABLE 5b. NUMBER OF CLASSIFIED OFFICERS BY RACE/ETHNICITY AND GENDER

2004 Classified	Male					Total M	Female					Total F	Total M/F
	W	P	A	B	H		W	P	A	B	H		
********** No data available **********													

2005 Classified	Male					Total M	Female					Total F	Total M/F
	W	P	A	B	H		W	P	A	B	H		
January	1,361	79	3	445	508	2,396	132	4	-	93	51	280	2,676
February	1,333	78	3	442	501	2,357	131	3	-	91	50	275	2,632
March	1,327	78	3	440	498	2,346	129	3	-	91	49	272	2,618
April	1,304	79	3	439	495	2,320	126	3	-	90	47	266	2,586
May	1,289	78	3	438	492	2,300	125	3	-	89	47	264	2,564
June	1,281	77	3	439	487	2,287	124	3	-	88	47	262	2,549
July	1,277	77	3	436	487	2,280	124	3	-	88	47	262	2,542
August	1,272	77	3	434	489	2,275	125	3	-	87	47	262	2,537
September	1,237	85	3	440	507	2,272	125	3	-	90	46	264	2,536
October	1,286	84	3	440	501	2,314	126	3	-	90	46	265	2,579
November	1,275	84	3	438	500	2,300	126	3	-	89	46	264	2,564
December	1,268	82	3	431	499	2,283	124	3	-	87	45	259	2,542
2005 Average	**1,293**	**80**	**3**	**439**	**497**	**2,311**	**126**	**3**	**-**	**89**	**47**	**266**	**2,577**

2006 Classified	Male					Total M	Female					Total F	Total M/F
	W	P	A	B	H		W	P	A	B	H		
January	1,260	84	3	436	496	2,279	120	3	-	88	47	258	2,537
February	1,274	89	3	454	526	2,346	125	3	-	95	55	278	2,624
March	1,263	90	3	453	524	2,333	125	3	-	95	56	279	2,612
April	1,267	91	4	459	531	2,352	126	3	-	110	55	294	2,646
May	1,265	91	4	456	525	2,341	124	4	-	110	53	291	2,632
June	1,258	91	4	457	533	2,343	126	4	-	110	54	294	2,637
July	1,258	91	6	460	532	2,347	129	4	-	112	55	300	2,647
August	1,256	98	6	463	542	2,365	130	4	-	112	52	298	2,663
September	1,255	98	6	467	541	2,367	132	4	-	111	53	300	2,667
October	1,248	98	5	461	544	2,356	129	3	1	110	53	296	2,652
November	1,247	96	5	459	537	2,344	130	4	1	110	54	299	2,643
December	1,249	97	5	460	537	2,348	130	4	1	113	51	299	2,647
2006 Average	**1,258**	**93**	**5**	**457**	**531**	**2,343**	**127**	**4**	**0**	**106**	**53**	**291**	**2,634**

TABLE 5b (continued). NUMBER OF CLASSIFIED OFFICERS BY RACE/ETHNICITY AND GENDER

2007 Classified	Male					Total M	Female					Total F	Total M/F
	W	P	A	B	H		W	P	A	B	H		
January	1,245	94	4	457	551	2,351	127	4	1	11	47	290	2,641
February	1,246	98	4	458	550	2,356	128	4	1	110	49	292	2,648
March	1,246	100	3	455	554	2,358	123	4	1	114	46	288	2,646
April	1,256	101	3	462	561	2,383	123	4	1	116	49	293	2,676
May	1,263	105	3	460	564	2,395	123	5	1	119	49	297	2,692
June	1,263	107	4	453	569	2,396	119	6	-	117	49	291	2,687
2007 Average	**1,253**	**101**	**4**	**458**	**558**	**2,373**	**124**	**5**	**1**	**98**	**48**	**292**	**2,665**

W = White
P = Asian or Pacific Islander
A = American Indian or Alaskan Native
B = Black
H = Hispanic

The Audit Team compared the race/ethnicity of officers in the Total Service/Incident Reports Analysis Population to the race/ethnicity of the officers noted by HPD in the CED Service/Incident Reports. Table 5c summarizes the results of our comparison are as follows:

Table 5c summarizes the Race/Ethnicity of the Officers that were in the Analysis Population of the Service/Incident Reports and the Race/Ethnicity of the CED Service/Incident Reports.

TABLE 5c RACE/ETHNICITY OF OFFICER'S

Officer's Race/Ethnicity	Total Service/Incident Reports Analysis Population	CED Service/Incident Reports	Difference
African American	25.1 %	17.3 %	-7.8 %
Latino	24.3 %	27.9 %	3.6 %
Anglo	46.2 %	52.3 %	6.1 %
Other Groups	4.4 %	2.5 %	-1.9 %

Based on the above analysis, the positive values in the Difference column indicate the officer racial/ethnic group was involved in a proportion of CED events that was larger than the proportion represented by it for all HPD incidents in the Analysis Population. Negative values indicate the officer racial/ethnic group was involved in a proportion of CED events that was smaller than the proportion represented by it for all HPD incidents in the Analysis Population.

For our statistical analysis, the crime context was measured using splines (both individual and grouped) based on the UCR subject codes. Geographic context was measured using two types of data: zip code splines and splines for the nine City Council Districts. We focused on the City Council Districts in the analysis presented here given their more substantively meaningful status within this analysis.[21] The nine City Council Districts were employed as substantively meaningful dummy variables which allowed us to control for one key contextual variable (the geographic location of the officer-suspect interaction).

The City Council Districts had the advantage of representing distinct regions of the City. They were independent of any HPD or investigator decisions (e.g., they could not be altered to affect the outcome of the analysis). They were mutually exclusive (i.e., events can occur in one, and only one Council District) and, in part as a consequence of the Voting Rights Act (combined with moderate to high racial/ethnic housing segregation) are representative of the ethnic/racial context within which officer-suspect interactions take place in the City.

[21] Recall that we used a host of statistical procedures in the incidence analysis. In particular, we used Ordinary Least Squares regression analysis, Logistic regression analysis, and Rare Events regression analysis. In addition, under each of these econometric regimes a variety of diagnostics were employed ranging from extreme bounds tests to sub-group evaluation. The results presented here represented our summary judgment regarding the impact of the variables taking into account the combined results of this meta-analysis. The main analysis population was approximately 570,000 individual cases (due to missing data issues, the actual number varied somewhat depending on the specific analysis population).

In contrast, alternative geographic variables, such as HPD Divisions, could not provide context since they were not mutually exclusive in terms of their geographic coverage (some Divisions were City-wide and thematic while others were geographically based). At the same time the reliability of the decision-rules utilized to place incidents were under different HPD Divisions was not entirely clear.

The City Council District level analysis opened an important window on the context in which officer-suspect interaction took place in the City of Houston, providing important caveats to broad-brush City-wide interpretations of the data. For instance (see Table 9), while City-wide Anglo officers were more likely to utilize their CED when interacting with African American suspects than were African American officers, in District D (the Council District in which the largest number of African American suspects were involved in a CED event), African American officers were just as likely to use a CED as were their Anglo counterparts (both when speaking of all suspects as well as when limiting the analysis to African American suspects).

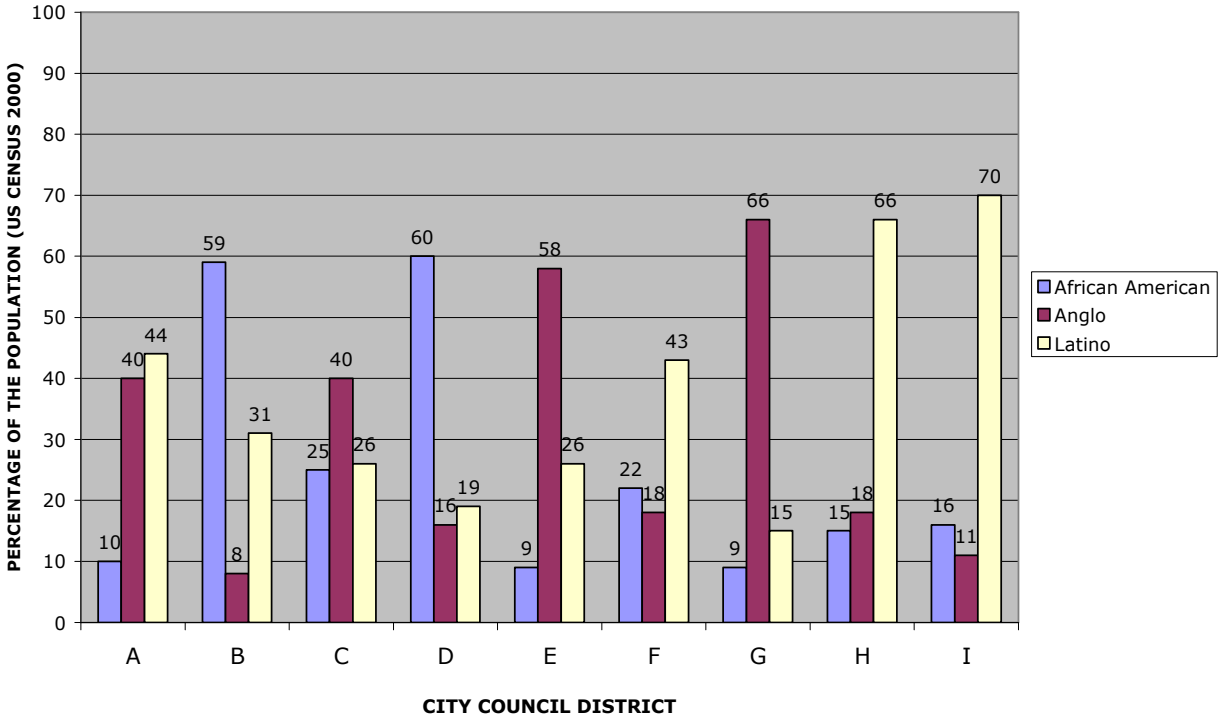
For the present data analysis, the number of CED events was too fragmented across HPD's 19 Divisions to allow for valid City-wide analysis of CED events while employing HPD Divisions rather than Council Districts as the contextual control variables. In fact, even if we focused on Division-level analysis comparable to that conducted for the nine City Council Districts, it would only be possible to conduct this analysis for 9 of the 19 HPD Divisions (eight of which are geographically defined Divisions, and one of which is the City-wide "Extra Jobs" Division).

Council Districts

Guided by social science protocol, we determined that the most objective unit of analysis was City Council Districts.

Using U.S. Census 2000 data, the racial/ethnic breakdown of the various City Council Districts are shown in Figure 6.

FIGURE 6. THE RACIAL/ETHNIC DISTRIBUTION OF THE POPULATION OF THE HOUSTON CITY COUNCIL DISTRICTS



CED deployments took place in all City Council Districts during the scope period. Table 6 below summarizes the total number of CED deployments by Council District for the periods November and December 2004, 2005, 2006, and January through June 2007.

TABLE 6. CED DEPLOYMENTS BY CITY COUNCIL DISTRICT

Council District	Scope Period				Total
	November and December 2004	2005	2006	January through June 2007	
A	3	31	25	18	77
B	5	101	85	42	233
C	2	48	49	21	120
D	7	123	93	37	260
E	4	31	20	10	65
F	3	29	37	16	85
G	3	20	24	13	60
H	4	85	82	26	197
I	4	62	64	22	152
Total	**35**	**530**	**479**	**205**	**1,249**

Suspect Component

The results suggest that African American suspects were significantly more likely to be subject to a CED shock than Anglo or Latino suspects (see Tables 7A, 7B, and 7C). This is an observation that was significant, for both City-wide and within five of the nine City Council Districts of Anglos and three of the nine City Council Districts for Latinos (see Table 8).[22] Latino suspects were significantly more likely to have a CED used on them than Anglo suspects, although this observation was not especially strong as well as only present in one of the nine Council Districts. Male suspects were significantly more likely to be subject to a CED shock than female suspects (see Table 9). This observation was present in all nine Council Districts.

[22] A result that was strong and significant in some Districts does not imply that it was not present in others; rather it means that we do not consider the finding as strong as what we found at the City-wide level. We did not find results "flipping" signs in a significant manner at the District level.

TABLE 7a. CED USE IN HOUSTON, AFRICAN AMERICAN SUSPECTS

COMPARISON SUSPECT GROUP	THE LIKELIHOOD THAT A CED IS USED WHEN AN AFRICAN AMERICAN IS THE SUSPECT COMPARED TO:					
Anglo Suspect	**Much Higher**	**Much Higher**	Equal	Equal	**Much Higher**	**Much Higher**
Latino Suspect	**Much Higher**	**Much Higher**	Equal	Equal	**Much Higher**	Equal
Analysis Population	Full	Male Officers	Female Officers	African American Officers	Anglo Officers	Latino Officers

TABLE 7b. CED USE IN HOUSTON, LATINO SUSPECTS

COMPARISON SUSPECT GROUP	THE LIKELIHOOD THAT A CED IS USED WHEN A LATINO IS THE SUSPECT COMPARED TO:					
African American Suspect	**Much Lower**	**Much Lower**	Equal	Equal	**Much Lower**	Equal
Anglo Suspect	**Higher**	**Higher**	Equal	Equal	Equal	**Higher**
Analysis Population	Full	Male Officers	Female Officers	African American Officers	Anglo Officers	Latino Officers

TABLE 7c. CED USE IN HOUSTON, ANGLO SUSPECTS

COMPARISON SUSPECT GROUP	THE LIKELIHOOD THAT A CED IS USED WHEN AN ANGLO IS THE SUSPECT COMPARED TO:					
African American Suspect	**Much Lower**	**Much Lower**	Equal	Equal	**Much Lower**	**Much Lower**
Latino Suspect	**Lower**	**Lower**	Equal	Equal	Equal	**Lower**
Analysis Population	Full	Male Officers	Female Officers	African American Officers	Anglo Officers	Latino Officers

TABLE 8. LIKELIHOOD A SUSPECT OF THE GROUP IN COLUMN A WILL BE INVOLVED IN A CED DEPLOYMENT COMPARED TO A SUSPECT OF THE GROUP IN COLUMN B: FULL POPULATION AND INVOLVING OFFICERS BY RACE/ETHNICITY

ANALYSIS	SUSPECT	SUSPECT	CITY COUNCIL DISTRICT								
POPULATION	COLUMN A	COLUMN B	A	B	C	D	E	F	G	H	I
Full	African American	Anglo									
	African American	Latino									
	Latino	Anglo									
African American											
Officers	African American	Anglo									
	African American	Latino									
	Latino	Anglo									
Anglo Officers	African American	Anglo									
	African American	Latino									
	Latino	Anglo									
Latino officers	African American	Anglo									
	African American	Latino									
	Latino	Anglo									

RED = Much Higher Likelihood
ORANGE = Higher Likelihood
Blank = Equal Likelihood

TABLE 9. CED USE IN HOUSTON, FEMALE SUSPECTS

COMPARISON SUSPECT GROUP	THE LIKELIHOOD THAT A CED IS USED WHEN A FEMALE IS THE SUSPECT COMPARED TO:					
A MALE SUSPECT	Much Lower	Much Lower	Lower	Much Lower	Much Lower	Much Lower
ANALYSIS POPULATION	Full	Male Officers	Female Officers	African American Officers	Anglo Officers	Latino Officers

When the analysis population was restricted to incidents involving African American Officers (see Tables 7A, 7B, and 7C), there were no racial/ethnic differences in the probability of suspects having a CED used on them. In other words, all suspects - whether African American, Anglo, or Latino - were all equally likely to be subject to a CED shock by African American officers.

When the analysis population was restricted to incidents involving Latino officers (see Tables 7A 7B, and 7C), African American suspects were significantly more likely to be subject to a CED shock than Anglo suspects. This was a strong and significant relationship that was present in three council districts (see Table 8). Latino suspects were slightly more likely to have a CED used on them than Anglo suspects. This latter relationship was relatively modest City-wide and present in a significant manner in only one City Council District.

When the population was restricted to incidents involving Anglo officers (see Tables 7A, 7B, and 7C), African American suspects were significantly more likely to be subject to a CED shock than Anglo suspects. Latino suspects were very marginally more likely to have a CED used on them than Anglo suspects, and African American suspects were marginally more likely to be subject to a CED shock than Latino suspects. Both of these latter results were not especially strong, with the former noteworthy City-wide but not at the City Council District level (except in one district) while the latter is not noteworthy at the City-wide level, but was strong and significant in four City Council Districts (see Table 8).

The main conclusion from the analysis above was that African American suspects were significantly more likely to be subject to a CED shock than Anglo and Latino suspects. However, this greater probability of having a CED used on them was only the case when the officer was Anglo or Latino. The results also demonstrate that Latinos were marginally more likely to be subject to a CED shock than Anglos (though only when the officer is Anglo or Latino). This observation is substantially less robust than that regarding African American suspects.

As mentioned earlier, ***the lack of adequate suspect data*** (height/weight/size; criminal history) required that we treat the above results with considerable skepticism. It is very likely that our models suffered from omitted variable bias and that if proper controls regarding the suspect characteristics were included, many of the significant results we identified would vanish.[23]

Suspect and Officer Component

The results suggest that African American officers were significantly less likely to use a CED on suspects than both Anglo and Latino Officers (see Tables 10A, 10B, and 10C). This result was significant City-wide as well as in four of the nine City Council Districts for Anglos and four of the nine City Council Districts for Latinos. Anglo, and Latino Officers were equally likely to use a CED on suspects (see Table 11).

This result is present City-wide as well as in all City Council Districts. Male and female officers were equally likely to use a CED on suspects (see Table 12).

TABLE 10a. CED USE IN HOUSTON, AFRICAN AMERICAN OFFICERS

COMPARISON OFFICER GROUP	THE LIKELIHOOD THAT A CED IS USED WHEN AN AFRICAN AMERICAN IS THE OFFICER COMPARED TO:					
AN ANGLO OFFICER	Much Lower	Much Lower	Much Lower	Much Lower	Equal	Equal
A LATINO OFFICER	Much Lower	Much Lower	Much Lower	Much Lower	Equal	Lower
ANALYSIS POPULATION	Full	Male Suspects	Female Suspects	African American Suspects	Anglo Suspects	Latino Suspects

[23] In a separate analysis we also controlled for the number of years an officer had been on the force, utilizing a variety of functional forms. By including this additional variable/set of variables to control for years on the force, we reduced the overall analysis population by approximately one-fifth (due to the lack of data for officer years on the force for many cases). Furthermore, analysis controlling for years on the force provided general conclusions similar to those presented here (although in a few specific instances, some sub-conclusions were altered slightly, although this was also in part due to the reduction in the number of overall cases analyzed). As a result of the above factors, we did not include the analysis that incorporated the years in service control set here (the results of this analysis can be obtained from the authors upon request).

TABLE 10b. CED USE IN HOUSTON, LATINO OFFICERS

COMPARISON OFFICER GROUP	THE LIKELIHOOD THAT A CED IS USED WHEN A LATINO IS THE OFFICER COMPARED TO:					
AN AFRICAN AMERICAN OFFICER	Much Higher	Much Higher	Much Higher	Much Higher	Equal	Higher
AN ANGLO OFFICER	Equal	Equal	Equal	Equal	Equal	Equal
ANALYSIS POPULATION	Full	Male Suspects	Female Suspects	African American Suspects	Anglo Suspects	Latino Suspects

TABLE 10c. CED USE IN HOUSTON, ANGLO OFFICERS

COMPARISON OFFICER GROUP	THE LIKELIHOOD THAT A CED IS USED WHEN AN ANGLO IS THE OFFICER COMPARED TO:					
AN AFRICAN AMERICAN OFFICER	Much Higher	Much Higher	Much Higher	Much Higher	Equal	Equal
A LATINO OFFICER	Equal	Equal	Equal	Equal	Equal	Equal
ANALYSIS POPULATION	Full	Male Suspects	Female Suspects	African American Suspects	Anglo Suspects	Latino Suspects

TABLE 11. LIKELIHOOD AN OFFICER OF THE GROUP IN COLUMN A WILL BE INVOLVED IN A CED DEPLOYMENT COMPARED TO AN OFFICER OF THE GROUP IN COLUMN B: FULL POPULATION AND INVOLVING SUSPECTS BY RACE/ETHNICITY

ANALYSIS	OFFICER	OFFICER	COUNCIL DISTRICT								
POPULATION	COLUMN A	COLUMN B	A	B	C	D	E	F	G	H	I
FULL (i.e. All Suspects)	AFRICAN AMERICAN	ANGLO									
	AFRICAN AMERICAN	LATINO									
	ANGLO	LATINO									
AFRICAN AMERICAN SUSPECTS	AFRICAN AMERICAN	ANGLO									
	AFRICAN AMERICAN	LATINO									
	ANGLO	LATINO									
ANGLO SUSPECTS	AFRICAN AMERICAN	ANGLO									
	AFRICAN AMERICAN	LATINO									
	ANGLO	LATINO									
LATINO SUSPECTS	AFRICAN AMERICAN	ANGLO									
	AFRICAN AMERICAN	LATINO									
	ANGLO	LATINO									

GREEN = Much Lower Likelihood
BLUE = Lower Likelihood
Blank = Equal Likelihood
ORANGE = Higher Likelihood

TABLE 12. CED USE IN HOUSTON, FEMALE OFFICERS

COMPARISON OFFICER GROUP	THE LIKELIHOOD THAT A CED IS USED WHEN A FEMALE IS THE OFFICER COMPARED TO:					
A MALE OFFICER	Equal	Equal	Equal	Equal	Equal	Equal
ANALYSIS POPULATION	Full	Male Suspects	Female Suspects	African American Suspects	Anglo Suspects	Latino Suspects

When the analysis was restricted to African American suspects (see Tables 10A, 10B, and 10C), we noted that both Anglo and Latino Officers were significantly more likely to use a CED on suspects than African American Officers. This finding was present City-wide as well as in six Districts (Anglo versus African American Officers) and four City Council Districts (Latino versus African American Officers) (see Table 11). There were no differences in the probability of CED usage among Anglo and Latino Officers.

If the analysis was restricted to Latino suspects, we noted virtually no differences among the officers. Anglo, Latino and African American Officers were equally likely to use a CED on Latino suspects. The only observation, and it is relatively modest, is that Latino Officers were more likely to use a CED on suspects than African American Officers (but this is a weak finding City-wide and is significant only in two City Council Districts) (see Table 11).

The analysis also considered Anglo suspects. Differences were not identified among the African American, Anglo, and Latino Officers in terms of their probability of using a CED on a suspect. This observation holds up in all of the City Council Districts, with one very minor exception.

Unlike the case for the Suspect data analysis, where the specter of omitted variable bias required considerable caution in interpreting the results, here we had no such concerns. Given the quasi-experimental nature of our analysis (similar context, with only officer race/ethnicity varying), we were quite confident that these results would withstand any addition of omitted variables. These results made clear that among the officers, there were virtually no differences in terms of the probability of using their CED when the suspect was an Anglo or Latino (with the minor exception that Latino Officers were slightly more likely to use a CED on Latino suspects than African American Officers. In two Districts, Anglo Officers were less likely than Latino Officers to use their CED when the suspect is a Latino). When the suspect was an African American, African American Officers were significantly less likely to employ their CED than Anglo or Latino Officers (who were equally likely to utilize their CED).

A final note on sample sensitivity is merited when discussing the Council District level analysis provided in Tables 8 and 11. **While this analysis is important in that it allows us to control for one key contextual variable (i.e., the geographic location of the officer-suspect interaction), the relatively small number of CED cases per district limits the accuracy of the results.**

Geographic Component: Council Districts

Two City Council Districts stood apart from the rest when CED deployment was statistically analyzed. CED use in Districts D and H was significantly greater than all other Districts with the exception of District B. District B had a CED use that was significantly greater than Districts F and G. Other significant differences did not exist.

Given the finding that African American suspects were significantly more likely to be subject to a CED deployment than Anglo and Latino suspects, these results were not particularly surprising. However, of some interest was the greater use of CEDs in District D compared to District B (as both have comparable racial and socioeconomic demographics). It was not immediately clear why District H had a high CED usage or why District I, with similar demographics to District H, did not have a similar number of CED deployments.

If we focus on the three City Council Districts with the highest CED probabilities (D, H, and B), we noted the following three sets of relationships (see Tables 8 and 11).

In terms of the suspect data (see Table 8), in District H, African American suspects were significantly more likely to be the subject of a CED use than either Anglo or Latino suspects. This observation was driven primarily by the greater tendency of a CED to be used on an African American suspect when the officer was an Anglo. There were no significant differences present when the officer was an African American or Latino.

In City Council Districts B and D, African American suspects were more likely to have a CED used on them than Anglo suspects, but not Latino suspects. This significant relationship was driven in part by the greater tendency of CED use when the suspect was an African American and when the officer was a Latino.

For the officer data (see Table 11), we noted that in City Council Districts H and B that African American Officers were less likely to deploy their CEDs than Anglo and Latino Officers. This result was driven primarily by the much lower tendency of these African American Officers to use the CED than their Anglo and Latino counterparts when the suspect was an African American. In District D however, we did not observe any racial/ethnic differences among the officers in CED use. There was a minor exception when the suspect was an African American. African American Officers were noticeably less likely to use a CED than Latino Officers.

Overall, there appears to be some behavioral differences in City Council District D (e.g., those HPD divisions that were dominant in these Districts) that were worthy of future investigation.

Summary

The absence of adequate data on suspect and officer characteristics limits the inferences that can be made from the results of our suspect data analysis. Nonetheless, the results do highlight several *relationships* between suspect race/ethnicity and CED use that merit further scrutiny. The stronger research design and data utilized for the officer data analysis allows us to draw inferences with much greater confidence. Lastly, while the Council District cross-sectional analysis allows us to control for important contextual factors, it is crucial to remember that the number of CED events in most of the nine Council Districts is sufficiently small so as to warrant caution in our interpretation of the Council District analysis results.

As mentioned previously, given the data limitations, considerable caution must be exercised in the interpretation of the suspect related results. The data analysis above however allowed three observations:

- African American suspects were significantly more likely to have the CED used on them than Anglo and Latino suspects.
- African American Officers were significantly less likely to use their CED than Anglo and Latino Officers. The explanation for this observation was most likely hinges on a complex set of factors related to the way in which the suspect interacted/responded to the officer and in which the officer interacted/responded to the suspect.
- Latino suspects were somewhat more likely to be subjected to a CED deployment than Anglo suspects. This difference was modest, and driven primarily by the greater tendency of Latino Officers to utilize their CED when a suspect was Latino, compared to when the suspect was an Anglo.

Recommendation: Diverse Patrol Experiment

It is clear that a complex set of factors has yet to be investigated. Among these variables are measures (to be developed) that capture the threat that officers face, the general context in which the CED incident occurs, as well as the relation between an officer's productivity, arrest history, and their use of CEDs. In order to obtain a more thorough and complete understanding of the dynamics of these new variables, it would be advisable to conduct a series of natural experiments. These natural experiments would be designed to evaluate, for example, the role of officer and suspect race and ethnicity in the probability that a CED incident occurs.

Injury Analysis

The analysis of the injuries to HPD Officers was conducted from workers' compensation claims data. Time series intervention analysis was used where applicable. Recall that the variables examined (see tables 2a and 2b) included the following:

- Physical altercation (variable name: Altercation)
- Foot pursuit that ends in physical altercation (variable name: Pursuit)
- Total amount of physical altercations (variable name: Total Comp)
- Cost due to physical altercation (variable name: Altercation$)
- Cost due to foot pursuit that ends in physical altercation (variable name: Pursuit$)
- Total cost of physical altercations (variable name: Total$)
- Lost days due to physical altercation (variable name: Altercation Days Lost)
- Lost days due to foot pursuit that ends in physical altercation (variable name: Foot Days Lost)
- Lost time due to physical altercation (variable name: Altercation Lost Time) which is equivalent to the number of filed claims.
- Lost time due to foot pursuit that ends in physical altercation (variable name: Foot Lost Time) which is equivalent to the number of filed claims.
- Total amount of lost days due to physical altercations (variable name: Total Days Lost)
- Total amount of lost time due to physical altercations (variable name: Total Lost Time) which is equivalent to the number of filed claims.

Andrews Test Results

The results are summarized in Table 13, and Figures 7 and 8. There were two variables that shifted (structural breaks). The cost due to physical alternation (Altercation$) had a shift) in July 2002 (p-value < .01) and the total cost of physical altercations (Total$) had a break in April 2003 (p-value < .01).

TABLE 13. ANDREWS TESTS FOR STRUCTURAL BREAKS IN INJURY DATA: JANUARY 2000 TO JUNE 2007

Model	Maximum Test Statistic	Month of Maximum	Trimming
Altercation	0.966	June 2006	25%
Altercation$	14.08*	July 2003	25%
Pursuit	3.825	March 2002	25%
Pursuit$	5.58	October 2004	25%
Total Comp	2.97	May 2003	25%
Total$	20.95*	April 2003	25%
Foot Days Lost	5.60	October 2004	25%
Foot Lost Time	2.05	January 2003	25%
Altercation Days Lost	3.45	August 2002	25%
Altercation Lost Time	4.75	August 2004	25%
Total Days Lost	4.44	August 2002	25%
Total Lost Time	2.23	May 2005	25%

Notes: N = 90 months.

The Chi-squared critical value for testing for a break in a single parameter with 25 percent trimming is 11.48 at the 1% level (*). (See Andrews 1993, Table 1).

FIGURE 7

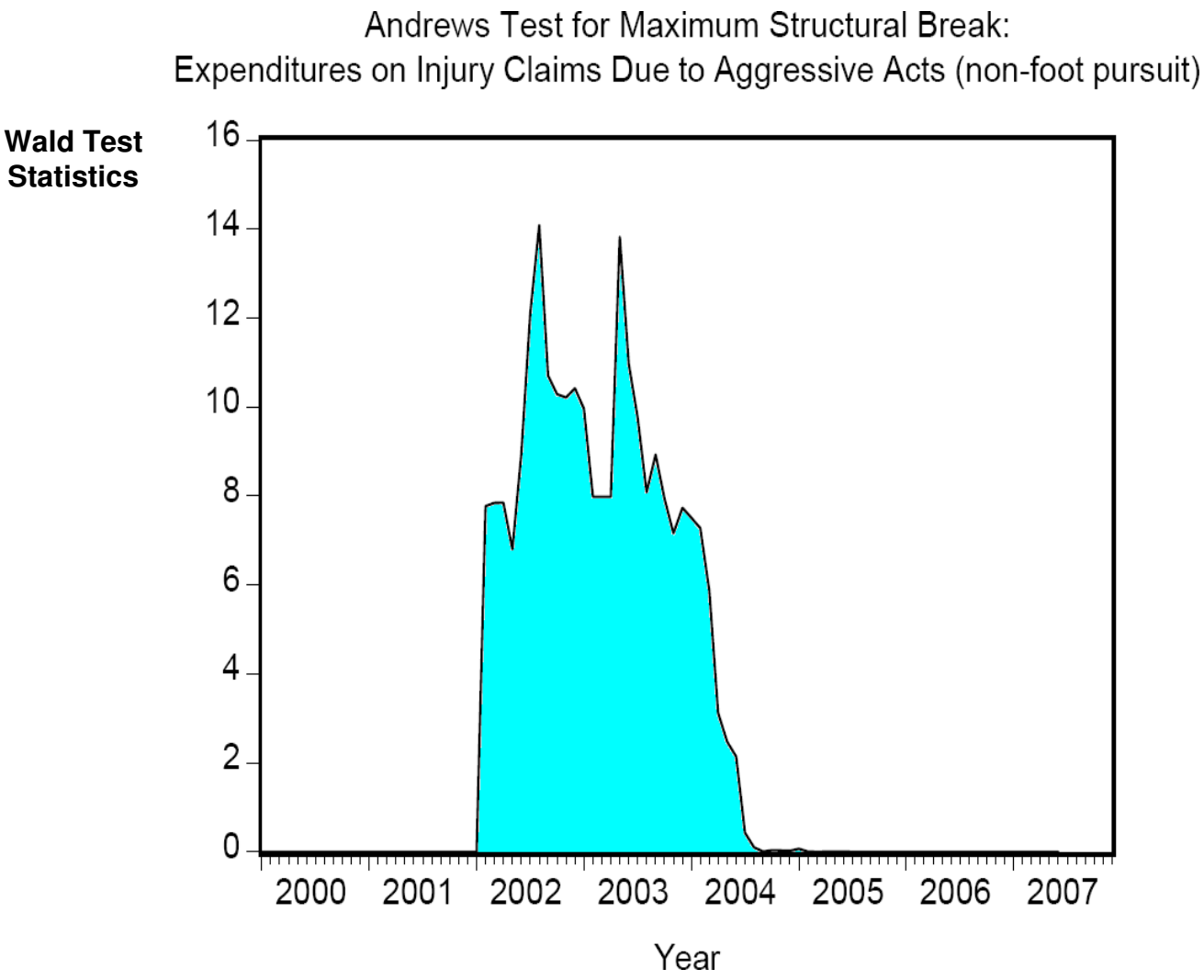
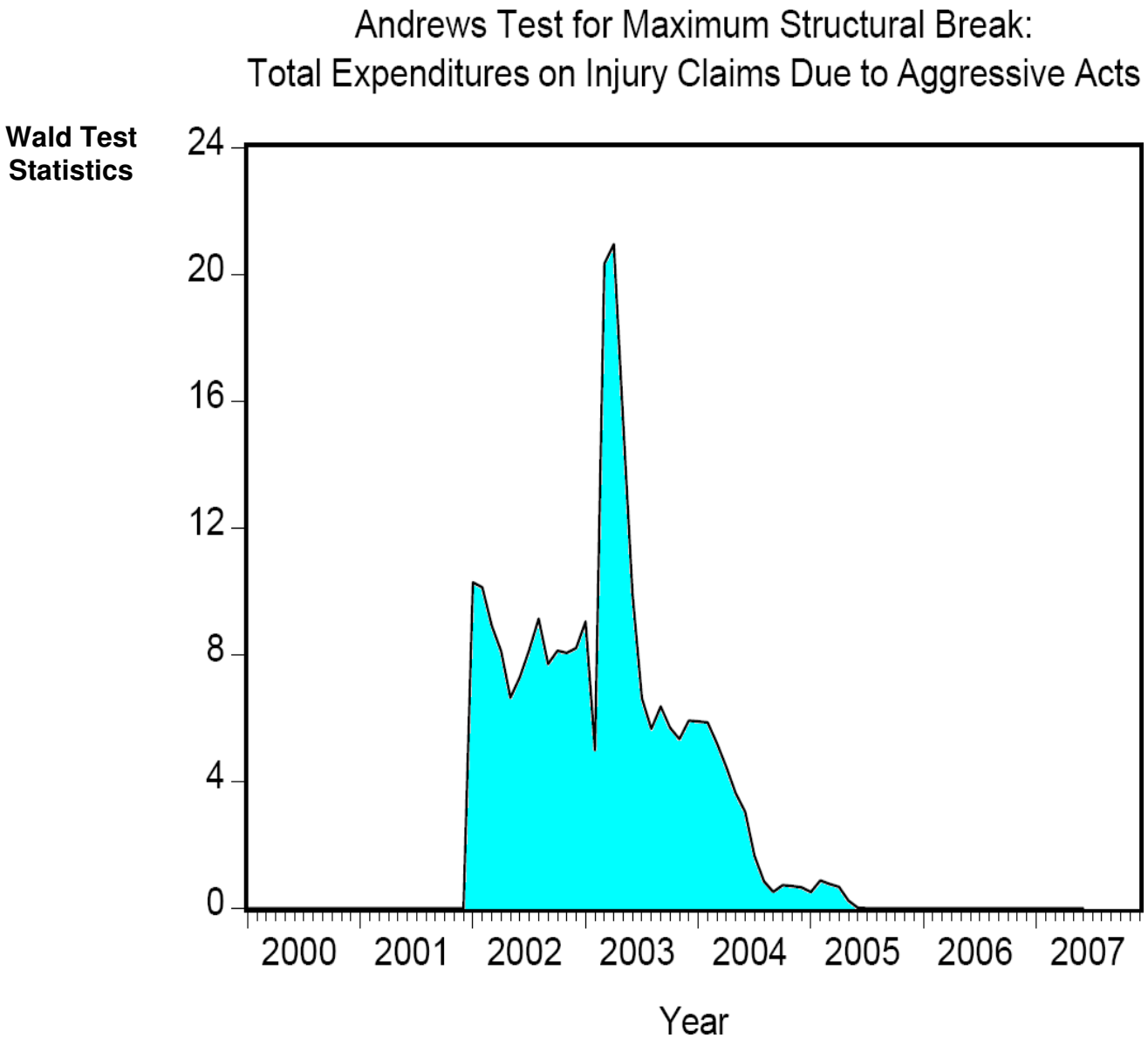

Andrews Test for Maximum Structural Break:
Expenditures on Injury Claims Due to Aggressive Acts (non-foot pursuit)
Wald Test Statistics
16
14
12
10
8
6
4
2
0
2000
2001
2002
2003
2004
2005
2006
2007
Year

FIGURE 8


Andrews Test for Maximum Structural Break:
Total Expenditures on Injury Claims Due to Aggressive Acts
Wald Test Statistics
24
20
16
12
8
4
0
2000
2001
2002
2003
2004
2005
2006
2007
Year

The Rolling Paired t-test Results

The rolling paired t-test (summarized in Table 14) results indicated that initial shifts occurred in Altercation$ (April 2004); foot pursuits that ended in physical altercations (Pursuit-January 2003); the total amount of physical altercations (Total Comp-July 2004); Total$ (May 2003) (see Figure 9); and the total amount of lost days due to physical altercations (Total Days Lost-July 2005) (see Figure 10).

In addition, shifts occurred for the following variables on January 2002: lost days and lost time due to physical altercations (Pursuit$, Foot Lost Time, Altercation Lost Time, and Total Lost Time).

TABLE 14. ROLLING PAIRED t-tests FOR STRUCTURAL BREAKS IN INJURY DATA: JANUARY 2000 TO JUNE 2007

Model	t-statistic (maximum)	Month of Maximum	Initial Effect	Cumulative
Altercation	1.36	May 2003	NA	NA
Altercation$	2.65**	August 2004	NA	NA
Pursuit	3.56**	July 2005	NA	NA
Pursuit$	3.15*	July 2005	NA	NA
Total Comp	3.07**	July 2005	(2.63)	(3.24)
Total$	3.53**	September 2004	($38,081)	($50,774)
Foot Days Lost	1.98*	July 2005	NA	NA
Foot Lost Time	2.94**	December 2003	NA	NA
Altercation Days Lost	1.48	August 2004	NA	NA
Altercation Lost Time	2.84**	September 2002	NA	NA
Total Days Lost	2.21*	July 2005	NA	NA
Total Lost Time	3.51**	August 2003	NA	NA

Notes: N = 90 months. * indicates $p < .05$, ** indicates $p < .01$.

FIGURE 9

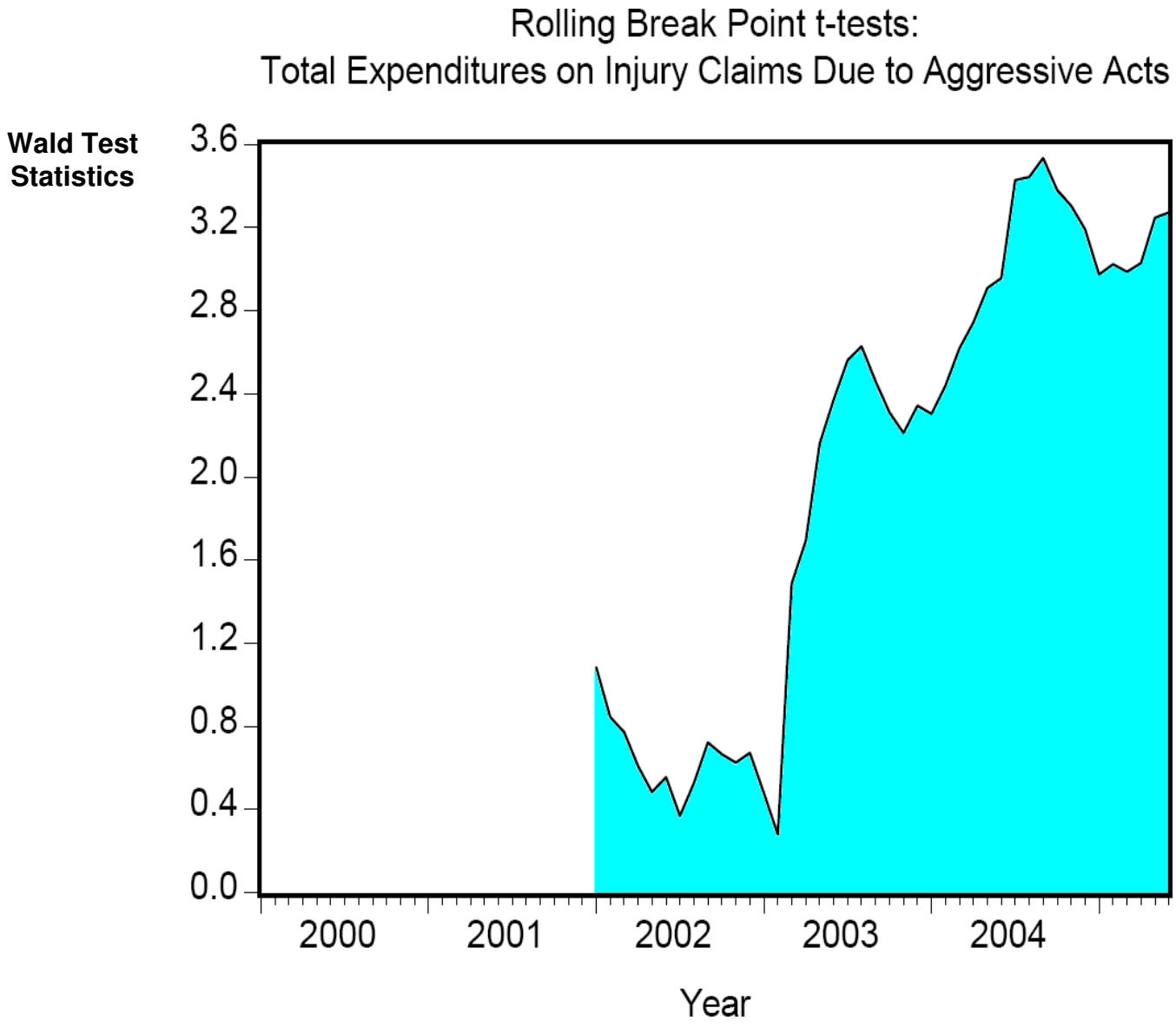
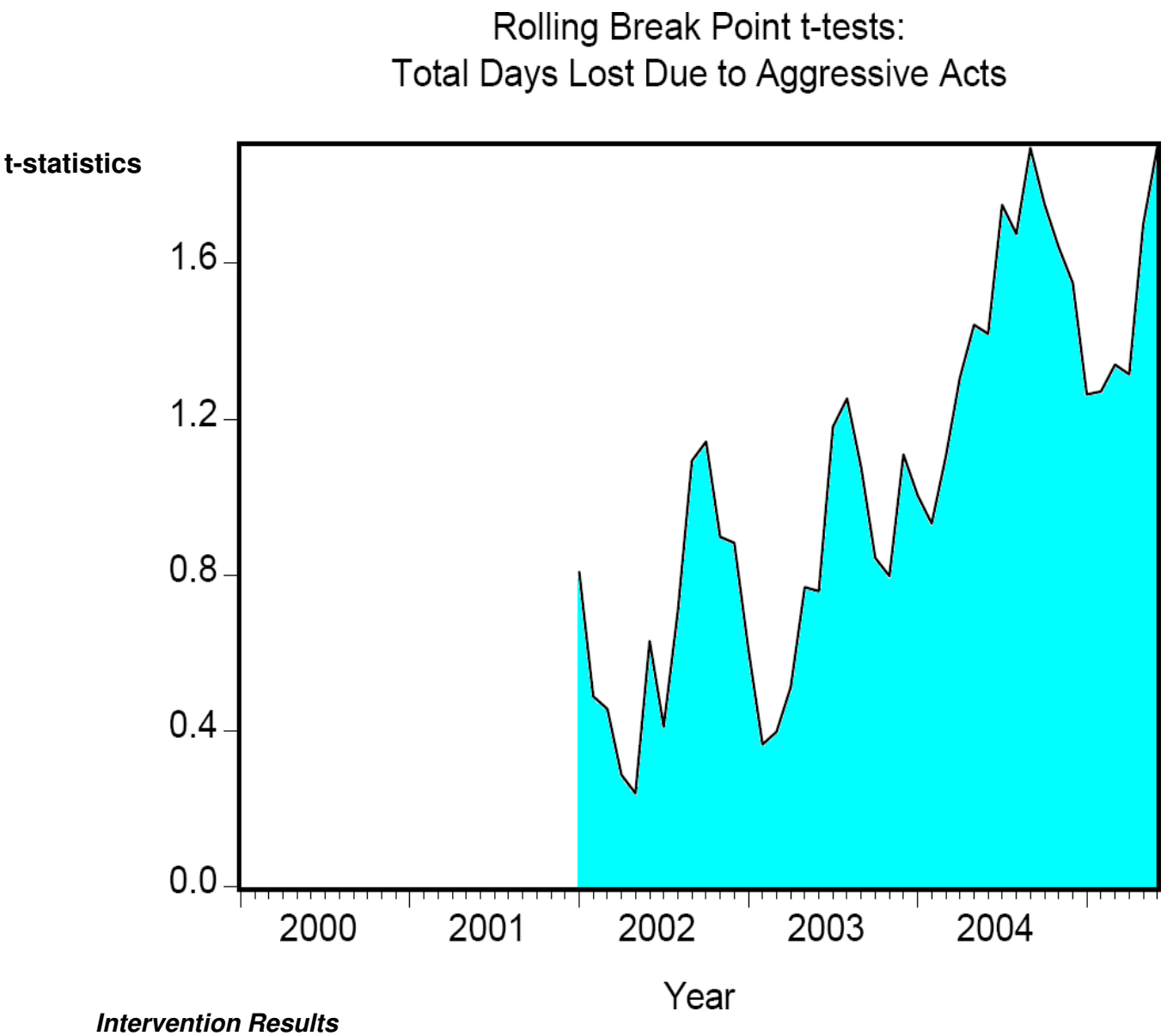

Rolling Break Point t-tests:
Total Expenditures on Injury Claims Due to Aggressive Acts
Wald Test Statistics
3.6
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
2000
2001
2002
2003
2004
Year

FIGURE 10



Intervention Results

The intervention analysis for using the dates for the Andrews test indicated no effect. However, the rolling paired dates resulted in the following cumulative policy effects for particular variables.

As reported in Table 14, the variables where a cumulative effect occurs were Total Comp and Total$. In the case of Total Comp, there was a drop in the level of monthly claims (starting in July 2004) to -2.63 and that over time dropped to -3.24. The reduction in the intercept was approximately 18% (3.24/18.27). For Total$ the initial reduction in the level, starting in May 2003 was $38,081 which accumulates to a reduction of $50,774. This equals a total expenditure of 49% ($50,774/$102,635).

Summary

The results on injury analysis indicated there have been shifts in a variety of injury indicators. There have been substantial reductions in the number of compensation claims as well as the total expenditures. These reductions began prior to the institution of the CED policy and have continued through the scope period. While the CED policy cannot be the initial cause for the change and the scope period with CED capability is short, with the passage of time, it will be possible to see the full statistical effect of the CED policy.

Substitution Analysis

Here we present the results of the HPD discharge of firearms for the period January 2000 to June 2007. Recall that our analysis for weapon substitution effects includes the following variables:

- Discharge of firearms that was an accident (variable name: Accident)
- Discharge of firearms that resulted in a citizen's death (variable name: Citizen Death)
- Discharge of firearms that resulted in a citizen's injury (variable name: Citizen Injury)
- Discharge of firearms that resulted in a citizen's death and injury (variable name: Citizen Death/Injury)
- Discharge of firearms that resulted in an officer's death (variable name: Officer Death)
- Discharge of firearms that resulted in an officer's injury (variable name: Officer Injury)
- Discharge of firearms that resulted in an officer's death and injury (variable name: Officer Death/Injury)
- Discharge of firearms that resulted in property damage (variable name: Property Damage)
- Discharge of firearms - total from categories above (variable name: Total/No Animal).

Andrews Test Results

The results are summarized in Table 15. For the Andrews test, the only variable that showed a shift was citizen's death. As Table 14 indicates, the break in the series occurs in September 2004 (p-value < .01).

TABLE 15. ANDREWS TESTS FOR STRUCTURAL BREAKS IN SUBSTITUTION DATA: JANUARY 2000 TO JUNE 2007

Model	Maximum Test Statistic	Month of Maximum	Trimming
Accident	3.60	January 2003	37.5%
Citizen Death	11.97*	September 2004	25%
Citizen Injury	0.76	February 2003	25%
Citizen Death Injury	6.10	September 2004	25%
Officer Death	NA	NA	NA
Officer Death Injury	NA	NA	NA
Property Damage	NA	NA	NA
Total/No Animal	3.10	December 2004	25%

Notes: N = 90 months.

The Chi-squared critical value for testing for a break in a single parameter with 25 percent trimming is 11.48 at the 1% level (*). (See Andrews 1993, Table 1).

The Rolling Paired t-test Results

As reported in Table 16, the variables with shifts using this test were: the discharge of firearms that was an accident (Accident-January 2002), the discharge of firearms that resulted in a citizen's death (Citizen Death-August 2002), the discharge of firearms that resulted in an officer's death (Officer Death-January 2002), and the total number of events (Total-November 2003).

TABLE 16. ROLLING t-tests FOR STRUCTURAL BREAKS IN SUBSTITUTION DATA: JANUARY 2000 TO JUNE 2007

Model	t-statistic (maximum)	Month of Maximum	Initial Effect	Cumulative
Accident	4.77**	September 2003	-.50	---
Citizen Death	2.39*	January 2005	.31	---
Citizen Injury	1.46	November 2003	NA	NA
Citizen Death Injury	1.29	June 2005	NA	NA
Officer Death	2.38*	August 2002	NA	NA
Officer Death Injury	1.67	October 2002	NA	NA
Property Damage	3.24**	December 2004	NA	NA
Total/No Animal	2.10*	January 2004	NA	NA

Notes: N = 90 months. * indicates $p < .05$, ** indicates $p < .01$.

Intervention Results

There was no evidence of persistence in any of these variables. However, it was possible to find evidence of initial effects. The Accident variable showed a drop in its mean of -.50. This constituted a reduction of 59% (-.50/.85). On the other hand, there was evidence of an increase in the level of Citizen Death, an increase from .42 to .73 or 74%.

Summary

As with the injury analysis, we noted that shifts or structural breaks in the data occurred prior to the introduction of the CED policy. This was not entirely surprising since the only data available that could be associated with weapons pertains to firearms. Note also that the CED policy has been in existence for such a short duration. Over a period of time, it will be possible to see the full statistical effect of the CED policy. A more direct test for substitution effects would involve the use of batons or flashlights, which are more readily associated with the intermediate weapon status a CED possesses. These tests, along with the addition of an extended time period would improve the overall research design.

Complaint Analysis

Between December 2004 and June 2007, there were 55 complaints filed against HPD Officers where CEDs were mentioned in the complaint. A reading of these complaints (see Table 4 for a summary) indicated the following:

Gender Breakdown

- Of the 59 officers noted in the 55 complaints, 97% of the complaints were leveled at male officers while 3% of the complaints were directed at female officers.
- 76% of the complaints were made by males and 24% were made by females.

Racial Breakdown of Officers (59)

- 27 or 46% of the complaints were directed at Anglo Officers
- 20 or 34% of the complaints were directed at African American Officers
- 9 or 15% of the complaints were directed at Latino Officers
- 3 or 5% complaints were directed at Asian Officers

Racial Breakdown of Complainants (51)

- 7 or 14% of the complaints were made by an Anglo
- 36 or 71% of the complaints were made by an African American
- 7 or 13% of the complaints were made by a Latino
- 1 or 2% of the complaints were made by an Asian

Racial/Gender Breakdown of Officers and Complainants

- Of the 23 complaints leveled at Anglo male Officers, 3 were made by Anglo males, 14 by African American males, 2 by African American females, 2 by Latino males, and 2 by Latino females.
- Of the 14 complaints leveled at African American male Officers, 1 was made by an Anglo male, 8 by African American males, 1 by a Latino male, 1 by an Anglo female, and 3 by African American females.
- Of the 9 recorded complaints leveled at Latino male Officers, 2 were made by Anglo males, 1 by an Asian female, 4 by African American males, 1 by an African American female, and 1 by a Latino female.
- The 3 complaints leveled at Asian male Officers were made by 1 African American male, 1 African American female, and 1 Asian female.
- The 2 complaints leveled at African American female Officers were made by 1 African American male and 1 African American female.

Disposition of the Complaints

Of the 55 complaints noted in HPD documentation, 3 were sustained and 9 were not. In the remaining cases investigated, the following outcomes occurred: the officer was exonerated (13); there was no evidence or insufficient evidence to prove the incident occurred (1); the complaint was never formalized (2); the CED was not the focus of the complaint and the investigation found the CED usage appropriate (12); and the allegation was false or not factual (11).

Four cases remained open.

Summary

In summary, this statistical analysis identified racial and gender differences in the breakdown of both officers and complainants involved with the use of CEDs. Anglo and African American male Officers had the most complaints filed against them. In particular, the mode (most frequent category) was Anglo Officers that had a complaint filed by an African American complainant.

DATA MANAGEMENT

The process for collecting the data raised some important issues that affected the analysis. The research team found the personnel of HPD to be fully cooperative in all requests for information. However, there were delays in acquiring and assembling the data as the data collection process was underway. Much of the delay was attributed to an outdated database system so it is important to keep in mind that HPD's planned transition to a new system should alleviate some of the problems.

For example, HPD fielded approximately 1.4 million calls for service/incident reports that were recorded in multiple databases during the Scope period. Approximately 48% of the 1.4 million electronic police call for service/incident reports did not contain suspect information (e.g., the incident was reported after the suspects had long left the scene of the incident, no suspect was involved in the incident, and/or no information on the suspect was collected). The addition of key explanatory variables (suspect race/ethnicity, Uniform Crime Report (UCR) code, zip code of incident location, City Council District of incident location) resulted in the exclusion of approximately 110,000 cases while the lack of officer data for an incident led to the exclusion of approximately 50,000 additional cases. This left the Audit Team with a final analysis population of approximately 570,000 merged records (the Analysis Population).

The original electronic data was of poor quality, incomplete, inconsistent, and retrieval was difficult. The physical size (weight, height) of the suspect was often not recorded in either the electronic or hardcopy reports and if it was we noted that the majority of the suspects were 175 pounds. Included in the approximately 700,000 calls for service/incident reports were 1,284 incidents where a CED was deployed. Only 951 (75%) of the 1,284 CED deployments could be statistically analyzed primarily because of the data merging challenges. In summary, the Audit Team reviewed all 1,284 of the hardcopy CED calls for service/incident reports; however, they could not include CED incidents that were lost during the electronic data merges without biasing the results of the analysis.

There appeared to be two organizational barriers to data management at HPD. The current data management process was fragmented or de-centralized. Rather than storing data in one central location with the use of common software and universally defined units of analysis, there was more than one sub-organization that had its own method of data management. Data management knowledge was concentrated in too few individuals.

The lack of coordination among the various data management units within HPD combined with insufficient knowledge diversification within each unit results in the following process and delivery:

- Due to incompatible and sometimes outdated software, HPD analysts must frequently engage in inefficient data acquisition practices (i.e., open and close various programs and manually write data outcomes).
- Those who ask for data (such as the Audit Team) are faced with delays in data merges, including further requests for clarification due to coding error, coding ambiguity, and missing data from the original source.
- Several HPD call for service/incident databases were developed in COBOL, a seldom used computer language in modern systems. As a result HPD is at risk of inadequate staffing resources in the event of staff turnover. COBOL is a computer language that is generally neither mandated nor offered in current college curriculums.

The impairment of process and delivery is compounded by the additional factor that HPD appears to be understaffed in the data management area. In addition to requests for data, particularly large data requests such as this, there are daily requests that are a function of Open Records requirements.

Summary

The impairment of process and delivery was compounded by the additional factor that HPD appeared to be understaffed in the data management area. In addition to requests for data, particularly large data requests such as the ones for this CED audit, there were numerous Open Records requests.

The current structure for data management is organizationally deficient and under-staffed. This combination of factors may produce inefficiencies in data transmission, increases in measurement and coding errors, and an overall inability to create a template for connecting disparate pieces of information to support overall HPD Management processes. The implications are even more severe however, if there are efforts to increase situational awareness for HPD officers that require data in real time.

Recommendation: An Audit on Data Management Processes

To end delays in data dissemination and to provide a process to enhance the forthcoming modernization in data management, we believe a process audit is imperative. The current structure for data management at HPD seriously impairs efficient data processing and data acquisition. The audit would seek to merge efficient processes, remove impediments to efficient processing, and combine these methods with the new data processing capabilities that are now being constructed.

CONCLUSION

Before summarizing the statistical conclusions, it bears repeating that this study faced some important data limitations. The limitations meant that a variety of alternative explanations have yet to be evaluated and important statistical controls have not been included. The fact that the CED policy has been in existence for such a brief period means the passage of time could lead to new results and conclusions.

With these caveats in mind we provide some summary thoughts. In regard to *incidence*, the results from the CED analysis suggest that certain combinations of officer and suspect characteristics resulted in an increased probability of CED utilization. Depending on how the race of the officer and the race of the suspect were paired, it was possible to see significant increases and decreases in the rate of CED utilization. Although these City level results were robust to numerous statistical controls, it was important to note that we observed interesting deviations from these general patterns when we conducted our analysis at the City Council District level. The results for *injuries* and *substitution* indicated that nearly all statistically discernible changes occurred prior to the implementation of the CED policy. We also noted that the data for injuries and substitution had little persistence in their behavior. The effects of policy changes for the most part occurred quickly.

The *complaint* analysis indicated that complaints in which a CED was mentioned did have a distinctive racial and gender propensity. More males and African Americans filed complaints. The mode (most frequent category) of HPD officers receiving complaints were Anglo males. We also noted that few complaints have been sustained.

A final observation centers on *data management*. Despite cooperation by HPD in providing the data, we found that there were delays that can be traced to organizational rigidity and a general lack of staffing.

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