



# **MEASURING THE COSTS AND BENEFITS ASSOCIATED WITH VEHICLE PURSUIT POLICIES IN ROANOKE CITY AND ROANOKE COUNTY, VA**

*Prepared by the Policing Project at New York University School of Law*

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## About the Policing Project

We partner with communities and police to promote public safety through transparency, equity and democratic engagement. Our work focuses on front-end, or democratic, accountability—meaning the public has a voice in setting transparent, ethical, and effective policing policies and practices before the police or government act. The goal is to achieve public safety in a manner that is equitable, non-discriminatory, and respectful of public values.

For more information, visit [www.PolicingProject.org](http://www.PolicingProject.org).

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# Executive Summary

Whenever a motorist refuses to pull over—or flees in the course of a vehicle stop—a police officer must make a decision as to whether to pursue. Although a vehicle pursuit increases the likelihood of apprehending the suspect (and potentially preventing the person from committing further crimes), it also puts both officers and other drivers and pedestrians at serious risk of injury or death and can result in damage to both public and private property. In light of these concerns, a number of policing agencies restrict pursuits in various ways. Many others, however, encourage officers to chase any car that flees.

To assess the costs and benefits of adopting more restrictive vehicle pursuit policies, the Policing Project partnered with two neighboring Virginia policing agencies: the Roanoke City Police Department (“City”) and the Roanoke County Police Department (“County”). The City and County pursuit policies evolved differently over time. This study compares how outcomes changed in the two jurisdictions before and after their policies went into effect.

Prior to 2013, the County operated under a discretionary vehicle pursuit policy that left pursuit decisions up to individual officers. On December 15, 2013, the County adopted a restrictive vehicle pursuit policy matrix that limited the circumstances under which officers may engage in a pursuit (and prohibited pursuits outright if the person fleeing had only committed a minor infraction).

The City followed a different policy trajectory. Between 2012 and 2014, the City operated under a discretionary vehicle pursuit policy. On March 10, 2014, the City adopted a more restrictive vehicle pursuit policy that directed officers to abstain from pursuits over non-hazardous traffic infractions. On February 10, 2016, the City then added further restrictions to their vehicle pursuit policy directing that pursuits over non-violent property felonies and misdemeanors could only be initiated under low-risk conditions. On January 20, 2017, the City removed these additional restrictions and returned to their more permissive March 10, 2014 policy directive.

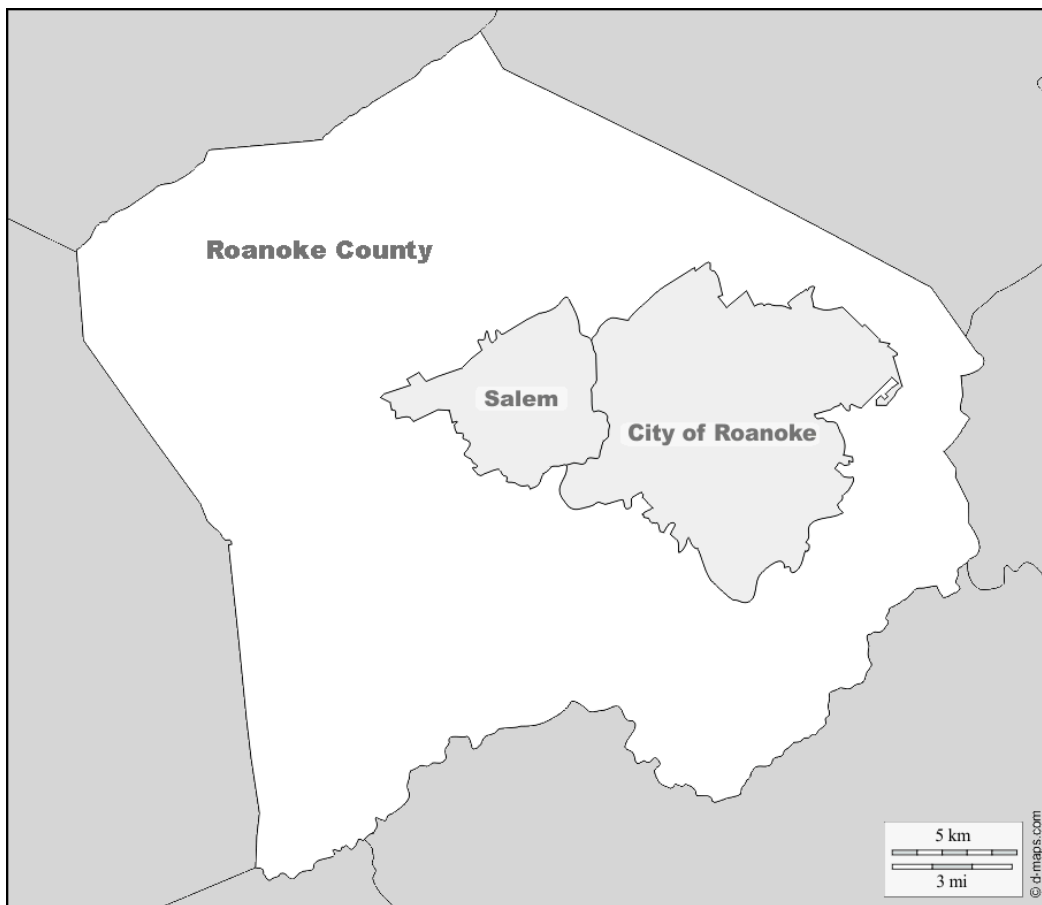
Our study finds that the Roanoke County Police Department’s decision to adopt a more restrictive vehicle pursuit policy reduced the costs associated with pursuits. Vehicle pursuits became shorter, and thus safer, under the more restrictive policy, decreasing from 5.2 to 2.9 minutes on average.

We find a potential expected savings of approximately \$1,400 per year to the County by avoiding future injury and loss of life under a more restrictive pursuit policy.

In the City, the adoption of the most restrictive policy did not lead to shorter pursuits, but it did drastically reduce the number of pursuits, especially for traffic related offenses. The increase in pursuit duration in the City likely reflects a change in pursuit composition away from traffic offenses and towards other more serious offenses, which are more prevalent in the City. These findings suggest that restrictive vehicle pursuit policies have distinct effects depending on the local context.

In neither case was there evidence that the reduced likelihood of pursuit caused an increase in criminal activity. In both cases, arrest rates declined by approximately 2 percent under more restrictive pursuit policies, mostly reflecting fewer arrests for less serious offenses, such as drug offenses. This suggests the police were freed to attend to more serious matters.

*Image 1: Map of Roanoke County and two independent cities, Salem and the City of Roanoke*



# Potential Benefits and Costs

A vehicle pursuit begins when a vehicle fails to stop after a police officer has indicated for it to pull over. Pursuits can happen for any number of reasons, but the most common reason is for a traffic-related offense.<sup>1</sup> A seminal study of Dade County pursuits found that approximately 55 percent of pursuits were traffic-related, 28 percent felony-related, and 16 percent in response to “be on the lookout” dispatches.<sup>2</sup> In any pursuit scenario, an officer must weigh the benefits of apprehending the offender against the costs from accidents, injuries, and fatalities.

Prior to the 1970s, police vehicle pursuits largely were unregulated; the decision to pursue or not was left up to individual officers’ discretion.<sup>3</sup> Then, an influential report by Physicians for Automotive Safety highlighted the costs associated with this lack of regulation—20 percent of all pursuits resulted in death, 50 percent in serious injury, and 70 percent in an accident.<sup>4</sup> Despite a later study by the California Highway Patrol that found a much lower incidence of accidents (with but one in three pursuits resulting in crashes<sup>5</sup>), many policing agencies began instituting more restrictive vehicle pursuit policies to reduce the collateral damages and liability concerns associated with pursuits.

Restrictive pursuit policies are intended to help officers make more measured decisions during high pressure situations—such as by reminding officers to consider the density of street intersections, weather, or severity of crime when deciding whether a pursuit is appropriate. These types of policies have become more prevalent across the United States. A 2007 Law Enforcement Management and Administration survey found that of 2,859 policing agencies, roughly 67 percent had a restrictive pursuit policy.<sup>6</sup> Evidence suggests that more restrictive policies reduce the number of pursuits police

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<sup>1</sup> Alpert, G. P., & Dunham, R. G. (1989). Policing Hot Pursuits: The Discovery of Aleatory Elements. *Journal of Criminal Law and Criminology*, 80(2), 521–539. | Nugent, H., Connors, E., McEwen, J. T., & Mayo, L. (1990). *Restrictive Policies for High Speed Police Pursuits* (NCJRS No. 122025). US Department of Justice. | Hoffman, G., & Mazerolle, P. (2005). Police Pursuits in Queensland: Research, Review, and Reform. *Policing: An International Journal of Police Strategy and Management*, 28(3), 530–545.

<sup>2</sup> Alpert, G. P., & Dunham, R. G. (1989). Policing Hot Pursuits: The Discovery of Aleatory Elements. *Journal of Criminal Law and Criminology*, 80(2), 521–539.

<sup>3</sup> Walker, S., & Archbold, C. (2013). *The New World of Police Accountability* (Second). Sage.

<sup>4</sup> Physician for Automotive Safety. (1968). Rapid Pursuits by the Police: Causes, Hazards, Consequences: A National Pattern is Evident. Physicians for Automotive Safety

<sup>5</sup> Operational Planning Section. (1983). *California Highway Patrol Pursuit Study*.

<sup>6</sup> Lum, C., & Fachner, G. (2008). Police Pursuit in an Age of Innovation and Reform: The IACP Police Pursuit Database Final Report. International Association of Chiefs of Police.

initiate, the incidence of accident or injury, and may reduce rates of excessive police force by limiting adrenaline-driven interactions with the public.<sup>7</sup> One study found that after a restrictive policy was implemented in Dade County, the number of pursuits declined by 82 percent, and the percent of officers who engaged in pursuits over “low risk” traffic violations was cut in half.<sup>8</sup>

In addition to physical safety benefits, structuring and confining officers’ discretion by developing more restrictive pursuit policies—such as by providing officers with a matrix that slows down and guides their decision-making process—may reduce racially biased pursuits. Evidence suggests that snap decisions contribute to bias in policing: A laboratory experiment found that race shaped police officers’ perceptions of weapon possession more heavily in fast response situations as compared to slow response situations.<sup>9</sup> Similarly, in the case of fast paced pursuits, officers can be susceptible to associate automatically Black drivers with more negative stereotypes than white drivers because of “identity traps”—defined as “universal psychological tendencies that can produce racial injustice or detriment for a group”—thus contributing to racially disparate vehicle pursuits.”<sup>10</sup>

More restrictive policies, however, may introduce potential costs to the police and public. Terminating a pursuit may result in lower clearance rates by reducing the likelihood of apprehending suspects or increasing the length of time to make an arrest. This means suspects remain at large longer and may commit further crimes. Furthermore, if the public is aware that their local policing agency has policies that discourage pursuits, then drivers may be emboldened to flee the police or commit repeat offenses. This, in turn, could limit an officer’s ability to deter crime. Roanoke City Police Department Chief Jones and members of his agency raised this exact concern with our research team. According to Jones, residents who had frequent contact with the police had learned of their February 10, 2016 policy change discouraging pursuits and had increased the rate at which they fled from police encounters. He said this served as a motivating factor in the City’s decision to revert to a more discretionary policy in 2017.

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7 Alpert, G. P. (1997). *Police Pursuit: Policies and Training* (Research in Brief NCJ 164831). <https://www.ncjrs.gov/pdffiles/164831.pdf>. | Alpert, G. P., Kenney, D. J., & Dunham, R. G. (1997). Police Pursuits and the Use of Force: Recognizing and Managing “The Pucker Factor”—A Research Note. *Justice Quarterly*, 14(2), 371–386. | Becknell, C., Mays, G. L., & Giever, D. M. (1999). Policy Restrictiveness and Police Pursuits. *Policing: An International Journal of Police Strategy and Management*, 22(1), 93–110. | Crew, R., Kessler, D., & Fridell, L. (1994). Changing Hot Pursuit Policy: An Empirical Assessment of the Impact of Pursuit Behavior. *Evaluation Review*, 18(6), 678–688.

<sup>8</sup> Alpert, G. P. (1997). *Police Pursuit: Policies and Training* (Research in Brief NCJ 164831). <https://www.ncjrs.gov/pdffiles/164831.pdf>

<sup>9</sup> Payne, K. (2006). Weapon Bias: Split-Second Decisions and Unintended Stereotyping. *Current Directions in Psychological Science*, 15(6), 287–291.

<sup>10</sup> Goff, P. (2016). Identity Traps: How to Think about Race & Policing. *Behavioral Science & Policy*, 2, 10–22.

# Key Research Questions

What are the aggregate costs and benefits of reducing officer discretion through more restrictive pursuit policies? Upon whom do these costs and benefits fall?

## Institutional Context

Our study took place in Roanoke City and Roanoke County, Virginia. Under the guidance of new chiefs, the police departments in these neighboring jurisdictions adopted policies that either reduced or increased the amount of discretion that officers had in initiating pursuits. Below we provide institutional characteristics for each agency.

### Roanoke County

The Roanoke County Police Department (County) employs 140 full time sworn officers, serving a population of 92,376 over an area of 251 square miles. The ratio of sworn officers to population—1.6 officers per 1,000 residents—is smaller than the national average of roughly 2.1 officers per 1,000 residents. There are nine intermediate supervisors (Commanders) and 14 first-line supervisors (Sergeants), and the agency maintains a fleet of 108 marked and 40 unmarked vehicles.

Prior to December 15, 2013, the County operated under a pursuit policy allowing considerable discretion to patrol officers. The policy identified a list of factors that officers should consider when deciding whether to initiate or terminate a pursuit, but ultimately these decisions were left to individual officers. Chief Howard Hall engaged with key stakeholders—including officers, driving instructors, and policymakers—to hear different perspectives about pursuits and safety. With substantial buy-in from the agency, a new pursuit policy was adopted on December 15, 2013, mirroring that of the Baltimore County Police Department, where Chief Hall had previously served as a Captain. The new policy, which remains in effect, includes a decision-making matrix relating the seriousness of the offense to situational risk factors. **Figure 1** shows how the matrix works. There are three threshold-risk levels—low, moderate, and high—that help guide an officer's pursuit decision. These risk levels are assessed across a number of different offense categories, such as violent felonies, property felonies, misdemeanors, and other minor infractions. The goal of the matrix is to help decision-makers balance the need for a pursuit with the safety risks it can pose.

Figure 1. Pursuit Matrix Introduced in Roanoke County

<b>PURSUIT DECISION-MAKING MATRIX</b>			
<b>Degree of Seriousness</b>	<b>Decision Threshold--Risk Levels</b>		
	<b>Low</b>	<b>Moderate</b>	<b>High</b>
<b>Violent Felony-- Imminent Threat</b>	May pursue: continue to assess risks	May pursue: continue to assess risks	May pursue: Continue to assess risks.
<b>Felony--Violent</b>	May pursue: continue to assess risks	May pursue: continue to assess risks	May pursue: discontinue if risks exceed known threat to public safety if capture is delayed
<b>Felony--Property</b>	May pursue: continue to assess risks	May pursue: continue to assess risks	DISCONTINUE OR DO NOT PURSUE
<b>Misdemeanors</b>	May pursue: continue to assess risks	DISCONTINUE OR DO NOT PURSUE	DISCONTINUE OR DO NOT PURSUE
<b>Minor Infractions</b>	*May pursue: For a period that allows the determination of whether other factors are present.	DO NOT PURSUE	DO NOT PURSUE

**Image note:** This matrix is part of Roanoke County Police Department's emergency vehicle operation directive 10.3.8. It was provided to the Policing Project by Roanoke County Police Department.

The policy manual goes on to describe in detail high, moderate, and low risk factors. Below is a complete list of factors.

### High risk factors

- High density of intersecting streets (e.g., business district).
- Poor weather, slippery streets, low visibility.
- Blind curves, intersections, and narrow roads.
- Numerous pedestrians.
- Heavy, congested traffic.
- Speeds twice the posted limit, or greater than 80 mph.



- Unmarked vehicles, or non-patrol vehicles involved in the pursuit.
- Extremely hazardous maneuvers by the violator (e.g., driving against oncoming traffic, running red lights).
- Pursuing officer is excited and not in full control of emotions.
- Numerous pursuit vehicles involved, above authorized number.
- No supervisor monitoring the pursuit.
- Special circumstances (e.g., a school district).

### **Moderate risk factors**

- Unmarked vehicles involved in the pursuit.
- Moderate density of intersecting streets (e.g., a residential area).
- Light pedestrian traffic.
- Moderate traffic, little congestion.
- Speeds 20 mph greater than the posted limit.
- Pursuing officer is generally calm with emotions under control.
- Some hazardous but not extreme maneuvers by the violator (e.g., crossing the center line to pass vehicles, sudden lane changes).
- Supervisor is involved or provides effective oversight.
- Authorized number of departmental vehicles involved in the pursuit.
- Leaving the territorial limits of Roanoke County.

### **Low risk factors**

- Only marked patrol vehicles involved.
- Pursuit takes place on a straight road, good surface, clear visibility.
- Low density of intersecting streets.
- Few or no pedestrians.
- Clear, calm weather.
- No hazardous maneuvers by the violator.
- Speeds at less than 20 mph over the speed limit.
- Supervisor is involved or provides effective oversight.
- Authorized number of departmental vehicles involved in the pursuit.
- Officer calm and in full control.

## **Roanoke City**

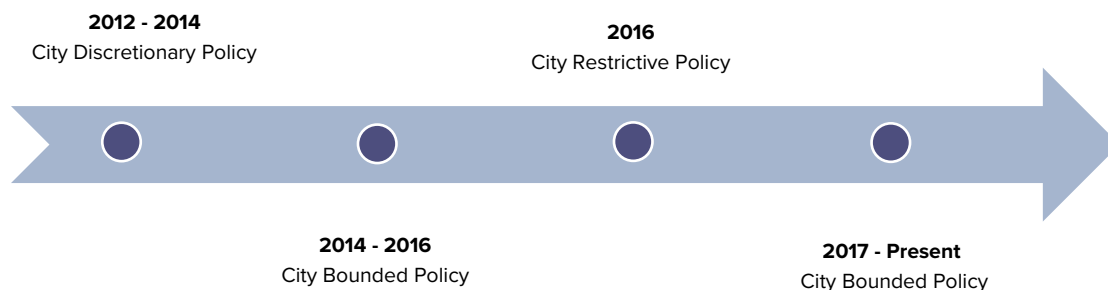
The Roanoke City Police Department (RCPD) employs 260 full time sworn officers, serving an estimated population of 99,897 people over 43 square miles. The ratio of sworn officers to population—2.6 officers per 1,000 residents—is comparable to the national average officer to population ratio of roughly 2.1 officers per 1,000 residents. There are 15 intermediate supervisors

(Lieutenants) and 29 first-line supervisors (Sergeants), and the agency maintains a fleet of approximately 130 marked vehicles and 38 unmarked vehicles.

Roanoke City underwent a number of policy changes regarding vehicle pursuits. We identified four distinct policy periods and three distinct policies.

1. **March 12, 2012 - March 9, 2014 (*Discretionary*):** RCPD's pursuit policy emphasized an officer's judgment about the benefits of a pursuit based on the immediate circumstances. Similar to the pursuit policy in Roanoke County prior to 2013, this policy identified a list of factors that officers should consider when deciding whether to initiate or terminate a pursuit, but ultimately these decisions were left to the discretion of the patrol officer.
2. **March 10, 2014 - February 9, 2016 (*Bounded*):** RCPD issued a new vehicular pursuit policy that bounded officer discretion. It directed officers to abstain from pursuits over non-hazardous traffic infractions.
3. **February 10, 2016 - January 19, 2017 (*Restrictive*):** RCPD added further restrictions around pursuits. Pursuits after non-violent, property felonies could be initiated only under low- or moderate-risk conditions. Pursuits after non-violent property misdemeanors could be initiated under low-risk conditions only. Suspects fleeing after violent felonies or misdemeanors could be pursued in moderate or high-risk conditions.
4. **January 20, 2017 - Present (*Bounded*):** RCPD returned to their 2014 bounded policy for non-hazardous traffic infractions. The prior restrictions on pursuits pertaining to non-violent, property felonies and misdemeanors were removed. The incoming Chief, Tim Jones, was concerned that the more restrictive policy had led to an increase in suspect flight, particularly by repeat offenders who were aware of the policy restrictions.

**Figure 3. Timeline of Vehicle Pursuit Policy Changes in Roanoke City**



# Data & Study Design

We examined the costs and benefits associated with adopting more and less restrictive pursuit policies using several data sources. First, we obtained vehicle pursuit and accident records from the Roanoke County and City Police Departments. Second, we supplemented these records with data on the exact location and time of fatal accidents from the U.S. Department of Transportation Fatal Accident Reporting System (FARS). These data include information on any pedestrians that were killed during police pursuits that were not included in the police car accident reports. Third, we used the state-wide National Incident Based Reporting Statistics (NIBRS) data to compare arrests and crime rates in Roanoke City and County compared to similar Virginia policing agencies. The NIBRS data allowed us to evaluate the potential costs of more restrictive policies regarding deterrence effects and length of time to make an arrest, both of which were specifically raised by the Roanoke City Police Department.

In **Table 1**, we list out all the potential costs and benefits of restricting officer discretion in pursuits and the data we used to measure them. Some of the measures were hard to express in dollar figures, but we attempted to translate any effects into impacts on crime, for which well-established cost estimates exist. We compare how outcomes changed in the two jurisdictions before and after the different policies went into effect.

**Table 1. Potential Costs and Benefits of Restricting Officer Discretion in Pursuits and Measurement**

Costs	Measurement	Benefits	Measurement
Longer time to clear offenses – suspects at large	Time to arrest and probability of arrest from National Incident Based Reporting Statistics (NIBRS)	Reduced fatality risk for passengers, pedestrians, and officers	Police incident reports of pursuit length and speed, age of passengers, survivor benefits
Public perception of officer ineffectiveness	Reported Offenses in National Incident Based Reporting Statistics (NIBRS)	Reduction in racial disparities regarding location of pursuits stemming from officer discretion	Police incident reports linked to Census data on pursuit location

Our study design is limited by sample size. Pursuits are relatively infrequent events, even in agencies that have discretionary policies<sup>11</sup>. Both Roanoke City and County agencies are mid-sized (260 and 140 officers, respectively), and thus engage in far fewer pursuits than departments in major cities.

At the same time, the fact that the two jurisdictions both made changes to their pursuit policies—and generally have shown considerable interest in the issue—presented us with a unique opportunity to evaluate the practice, and to come up with strategies that later could be used in a larger agency, which we discuss in the recommendations section of this report.

## Main Findings

Below we present findings for both Roanoke County and Roanoke City across each of their distinct policy periods. As a reminder, Roanoke County adopted two pursuit policies between January 2007 and December 2019: “discretionary” and “restrictive.” Roanoke City adopted three types of pursuit policies between March 2012 and January 2017: “discretionary,” “bounded,” and “restrictive,” and then returned to “bounded.” The tables below separate out results by location and policy.

### Reasons for Vehicle Stops that Preceded Pursuits

Police officers have the authority to engage in vehicle pursuits when any driver suspected of having committed a crime or traffic violation fails to stop the vehicle and pull over. This means that every pursuit is preceded by a *stop*. We first present data on the number and reasons for stops that preceded pursuits under each policy. The following analysis is not based on *all* stops made by the County and City police, rather only on stops that preceded a vehicle pursuit.

Conditional on a pursuit taking place, we find that restricting officer discretion through more restrictive pursuit policies primarily reduces the frequency with which officers engage in stops for *moving violations*. **Table 2** presents both raw numbers of stops and the percentage of total stops by reason to account for the time periods during which each policy was enacted. This table helps us understand common reasons for vehicle pursuit stops and any changes that occurred under different policy periods. In Roanoke City, traffic related offenses comprised over 54 percent of all

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<sup>11</sup> Lum, C., & Fachner, G. (2008). Police Pursuit in an Age of Innovation and Reform: The IACP Police Pursuit Database Final Report. International Association of Chiefs of Police.

stops under the “discretionary” period, 50 percent under the “bounded” period, but only 22 percent under the “restrictive” period. Roanoke County did not experience similar changes in their traffic stop patterns; however, they did experience a sharp decline in moving violations related to DUIs. DUIs constituted over 56 percent of pursuits under the “discretionary” period in Roanoke County, but only 35 percent of pursuits under the “restrictive” period.

Under the “restrictive” policy in Roanoke City, the vast majority of stops (56 percent) were initiated for “other” reasons beyond DUIs, traffic offenses, violent crime, and property crime. This is an increase from the “discretionary” (40 percent) and “bounded” policies (38 percent). “Other” reasons can include drug activities and warrants, but primarily constitute offenses that were not recorded by the pursuing officer.

**Table 2. Changes in Vehicle Pursuit Stop Reasons Under Each Pursuit Policy**

**Panel A. Roanoke County**

Stop Reason	“Discretionary” (Jan. 2007 - Dec. 2013)		“Restrictive” (Dec. 2013 - Dec 2019)	
	Total Stops	% of Total	Total Stops	% of Total
DUI	63	> 56%	22	> 35%
Traffic	17	> 15%	<10	< 16%
Violent	<10	< 9%	<10	< 16%
Property	13	> 12%	11	> 17%
Other	<10	< 9%	<10	< 16%

**Panel B. Roanoke City**

Stop Reason	“Discretionary” (Mar. 2012- Mar. 2014)		“Bounded” (Mar. 2014 - Feb. 2016 and Jan. 2017 - Oct 2019)		“Restrictive” (Feb. 2016 - Jan. 2017)	
	Total Stops	% of Total	Total Stops	% of Total	Total Stops	% of Total
DUI	0	0%	< 10	< 2%	0	0%
Traffic	93	> 54%	220	> 50%	<10	< 22%
Violent	0	0%	12	> 3%	0	0%
Property	< 10	< 6%	34	> 8%	<10	< 22 %
Other	68	> 40%	168	> 38%	25	> 56%

## Pursuit Duration

We next measure the average duration (in minutes) of pursuits under each policy. Pursuit duration is an outcome of interest because the risk of injury typically increases the longer a pursuit lasts.<sup>12</sup>

**Table 3** presents the average duration of all pursuits, as well as those that officers and supervisors terminated (or did not).

In Roanoke County, pursuits under the “restrictive” policy tended to be objectively safer than under the “discretionary” period because they were shorter—generally, the longer a pursuit goes on the greater risk it poses to passengers and pedestrians. The average duration of pursuits decreased from 5.2 minutes under the discretionary policy to 2.9 minutes under the restrictive period. This decrease appears to be driven in large part by supervisors and officers terminating pursuits faster under the restrictive policy than under the discretionary policy. The average terminated pursuit duration declined from 6.2 minutes to 2.5 minutes. This change suggests that the decision matrix provides critical information to help quickly terminate pursuits that fall outside the policy criteria.

In contrast, Roanoke City in-policy and out-of-policy pursuits were longer under the “bounded” and “restrictive” policies than under the “discretionary” policy. The average duration of all pursuits increased from 2.8 minutes to 6.3 minutes. This seems mostly to be driven by an increase in the duration of non-terminated pursuits (2.7 to 7.3 minutes).

**Table 3. Average Duration of Pursuit (in Minutes)**

**Panel A. Roanoke County**

	“Discretionary” (Jan. 2007 - Dec. 2013)	“Restrictive” (Dec. 2013 - Dec 2019)
All Pursuits	5.2	2.9
Terminated	6.2	2.5
Not Terminated	5	3.5
In-Policy	5.2	3.5
Out-of-Policy	-	2.3

<sup>12</sup> Wade, L. M. (2015). High-Risk Pursuit Classification: A Categorical Analysis of Variables From Georgia Police Pursuits. *Criminal Justice Policy Review*, 26(3), 278–292.

**Panel B. Roanoke City**

	“Discretionary” (Mar. 2012 - Mar. 2014)	“Bounded” (Mar. 2014 - Feb. 2016 and Jan. 2017 - Oct 2019)	“Restrictive” (Feb. 2016 - Jan. 2017)
All Pursuits	2.8	3.3	6.3
Terminated	2.9	3.3	2.6
Not Terminated	2.7	3.3	7.3
In-Policy	2.8	3.2	5.9
Out-of-Policy	2.8	3.7	8.0

## Racial Composition of Pursuit Location

Next, we examined whether more restrictive pursuit policies resulted in fewer pursuits in neighborhoods that have more Black or Hispanic residents; communities that already are disproportionately impacted by the police in many cities across the US. Much of the research on police and race comes from metro areas like New York and Chicago; areas that are highly residentially segregated with dissimilarity indices of over 0.75.<sup>13</sup> Metro areas like Roanoke—which are smaller, more rural, and less residentially segregated<sup>14</sup>—often are overlooked by policing scholars. Understanding the magnitude of any differential impact of pursuit policy changes across racial groups in Roanoke helps broaden our understanding of race and policing beyond major urban areas. Geocoding each pursuit initiation address and merging census block group level data allowed us to consider how the policy directives affected the racial distribution of social costs associated with high-speed pursuits.

The adoption of a restrictive matrix was associated with Roanoke County officers being less likely to engage in pursuits, and more likely to terminate pursuits that did occur, in places where more of the residents were Black, although in the context of Roanoke County these still are majority white areas. This change in the concentration of pursuit locations directly affects the distribution of social

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<sup>13</sup> Dissimilarity indices are a common academic measurement of segregation, which range from 0 (perfect integration) to 1 (perfect segregation).

“Residential Segregation Data for U.S. Metro Areas.” *from* Vock, Daniel C., Charles, J.B., Maciag, Mike. (2019). “Segregated in the Heartland: An Investigative Series.” *Governing*. <https://www.governing.com/archive/residential-racial-segregation-metro-areas.html>

<sup>14</sup> Roanoke Metro Area has a dissimilarity index of 0.53. “Residential Segregation Data for U.S. Metro Areas.” *from* Vock, Daniel C., Charles, J.B., Maciag, Mike. (2019). “Segregated in the Heartland: An Investigative Series.” *Governing*. <https://www.governing.com/archive/residential-racial-segregation-metro-areas.html>

costs, as it results in less risk to passengers and pedestrians in areas with a higher percentage of Black residents. **Table 4** indicates that in the “discretionary” period, pursuits began in places where, on average, 10.7 percent of all residents were Black, whereas in the “restrictive” period pursuits began in places where, on average, 6.1 percent of all residents were Black (t-statistic=1.958). This means that the marginal pursuit discouraged by the policy directive was more likely to occur in a neighborhood where more of the residents were Black. We did not find similar patterns in areas with more Hispanic residents.

Similar restrictions on City officers did not produce the same shifts in the racial composition of pursuit locations in Roanoke City. In fact, the share of pursuits under the “restrictive” policy that took place in areas with more Black residents actually increased from the “discretionary” period. Though, the fact that we find out-of-policy pursuits occurred in places with larger Black populations suggests that the policy may have reduced the social costs of pursuits in these neighborhoods if officers had adhered to it as written.

**Table 4. Percent Black and Hispanic of Census Block Group Where Pursuit was Initiated**

**Panel A. Roanoke County**

	“Discretionary” (Jan. 2007 - Dec. 2013)	“Restrictive” (Dec. 2013 - Dec 2019)
<b>Percent Black</b>		
All Pursuits	10.7	6.1
Terminated	14.9	4.9
Not Terminated	9.6	8.2
In-Policy	10.8	6.3
Out-of-Policy	-	6.1
<b>Percent Hispanic</b>		
All Pursuits	4.11	4.84
Terminated	2.55	5.47
Not Terminated	4.71	3.97
In-Policy	4.21	3.57
Out-of-Policy	-	7.05



**Panel B. Roanoke City**

	“Discretionary” (Mar. 2012 - Mar. 2014)	“Bounded” (Mar. 2014 - Feb. 2016 and Jan. 2017 - Oct 2019)	“Restrictive” (Feb. 2016 - Jan. 2017)
<b>Percent Black</b>			
All Pursuits	46.0	46.1	54.2
Terminated	49.8	44.7	24.3
Not Terminated	44.1	47.1	61.4
In-Policy	43.9	46.4	51.9
Out-of-Policy	54.9	44.8	72.3
<b>Percent Hispanic</b>			
All Pursuits	5.96	5.50	4.83
Terminated	5.63	5.74	1.35
Not Terminated	6.13	5.33	5.67
In-Policy	6.29	5.17	5.39
Out-of-Policy	4.58	6.87	0.37

## Passenger, Pedestrian, and Officer Expected Costs

To take into account the physical costs associated with pursuits, next we estimate the external cost of an officer’s decision to pursue a fleeing suspect based on the expected, probabilistic, fatality risk for the driver, passengers, and officers and the probabilistic risk of a fatal pedestrian accident. The equations to calculate average pedestrian, passenger, and officer risk are described in the footnote below.<sup>15</sup> The calculations in **Table 5** represent the average pedestrian, passenger, and officer risk associated with all pursuits across different policies.

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<sup>15</sup> Using the recorded distance traveled in the pursuit and average speed by the officer as an estimate of the distance traveled and speed of the pursued vehicle, we calculated the expected passenger cost: *Accidents per Mile Traveled x Miles Traveled x P(Fatality in Accident | Average Speed)\*E(Value of Statistical Life of Passengers)*

We also calculated the cost imposed on pedestrians as follows: *Number of Pedestrian Accidents per Vehicle Mile Traveled x Miles Traveled x P(Fatality in Accident | Average Speed)\*E(Value of Pedestrian)*

Lastly, we calculated the cost imposed on officers as follows: *Accidents per Mile Traveled x Miles Traveled x P(Fatality in Accident | Average Speed)\*E(Value of Statistical Life of Passengers + \$200,000 in combined local and state survivor benefits)*

**Table 5. Expected Risk to Passengers, Pedestrians, and Officers**

**Panel A. Roanoke County**

	“Discretionary” (Jan. 2007 - Dec. 2013)	“Restrictive” (Dec. 2013 - Dec 2019)
Average Expected Passenger Risk	\$55.50	\$24.00
Average Expected Pedestrian Risk	\$61.50	\$30.00
Average Expected Officer Risk	\$85.63	\$41.78
Average Expected Overall Costs	\$202.63	\$95.78
Total Pursuits	109	48
Total Expected Costs	\$22,087	\$4,597
Total Expected Costs / Year	\$1,841	\$383

**Panel B. Roanoke City**

	“Discretionary” (Mar. 2012 - Mar. 2014)	“Bounded” (Mar. 2014 - Feb. 2016 and Jan. 2017 - Oct 2019)	“Restrictive” (Feb. 2016 - Jan. 2017)
Average Expected Passenger Risk	\$13.53	\$16.43	\$15.81
Average Expected Pedestrian Risk	\$19.16	\$22.43	\$32.72
Average Expected Officer Risk	\$14.75	\$17.08	\$23.74
Average Expected Overall Costs	\$47.44	\$55.93	\$72.27
Total Pursuits	167	437	40
Total Expected Costs	\$7,922	\$24,441	\$2,891
Total Expected Costs / Year	\$660	\$2,037	\$241

**Table Notes:** Comparisons across the City and County are complicated by the way the data sets are structured. In the County, the pursuit data captures information on the fleeing vehicle (82 percent of which have one person in them). In the City, the pursuit data captures information on the police vehicle which typically contains two officers. All dollar estimates are in 2021 dollars.

Across Roanoke City and County, we find a reduction in expected costs under the most “restrictive” policy, though the magnitude of the reduction is much larger for the County. In the County, the number of total pursuits fell by more than half and the average expected passenger, pedestrian, and officer risks similarly fell. We find that total expected costs decreased from \$22,087 to \$4,597 as the enacted policy became more restrictive. These total costs translate to approximately \$1,400 less in external costs imposed by the Roanoke County Department per year. In the City, we find that the total number of pursuits declined by more than half under the “restrictive” period, but the average

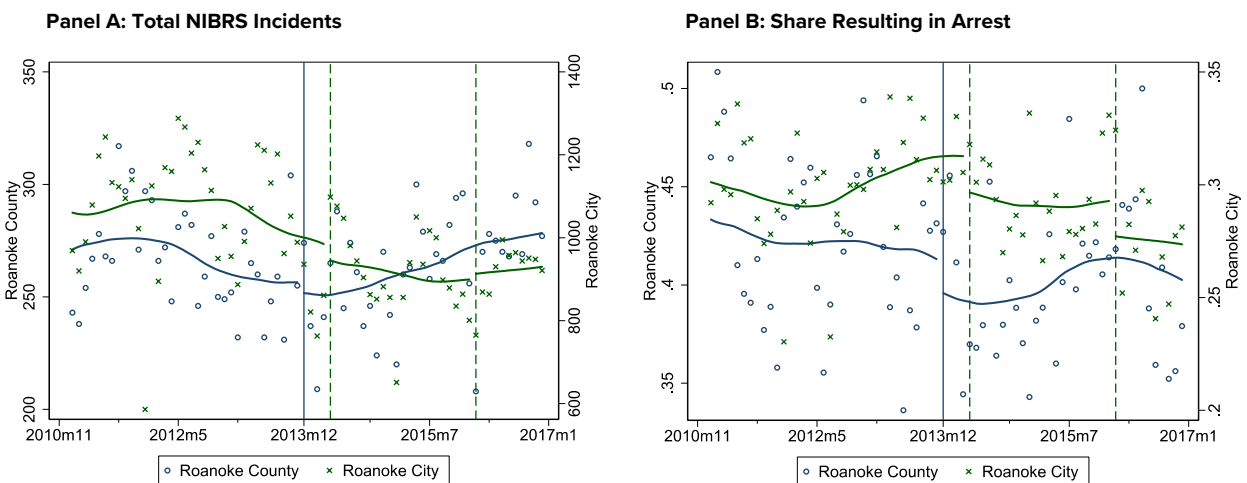
annual external cost of pursuits only decreased by about \$400 from under the “discretionary” period to the most restrictive policy.

## Crime and Arrest Rates

In this section, we present analyses of crime reports from the National Incident Based Reporting System (NIBRS) to test whether the adoption of vehicle pursuit policies affected criminal activity or arrests in the County and City. Examining overall criminal activity is useful as perceptions of changes in police conduct may impact a range of pursuit-worthy and non-pursuit-worthy illegal behavior.

The overall level of criminal activity did not seem to respond to the adoption of vehicle pursuit policies in the County or City. **Figure 7, Panel A** shows the total number of criminal incidents recorded in NIBRS for County (navy) and City (green). Scatter plots record the monthly sum of incidents, and smooth local polynomial lines show a moving average over time. The solid vertical line represents the date that the County adopted their “restrictive policy,” and the dashed vertical lines represent the dates that the City adopted their “bounded policy” and “restrictive policy,” respectively. The fact that criminal activity did not change in response to the policy shifts is consistent with the observation in the literature that without high visibility, policy changes generally induce a limited general deterrent response in the population.

**Figure 7. Total NIBRS Incidents and Share Resulting in Arrest in Roanoke County and City**

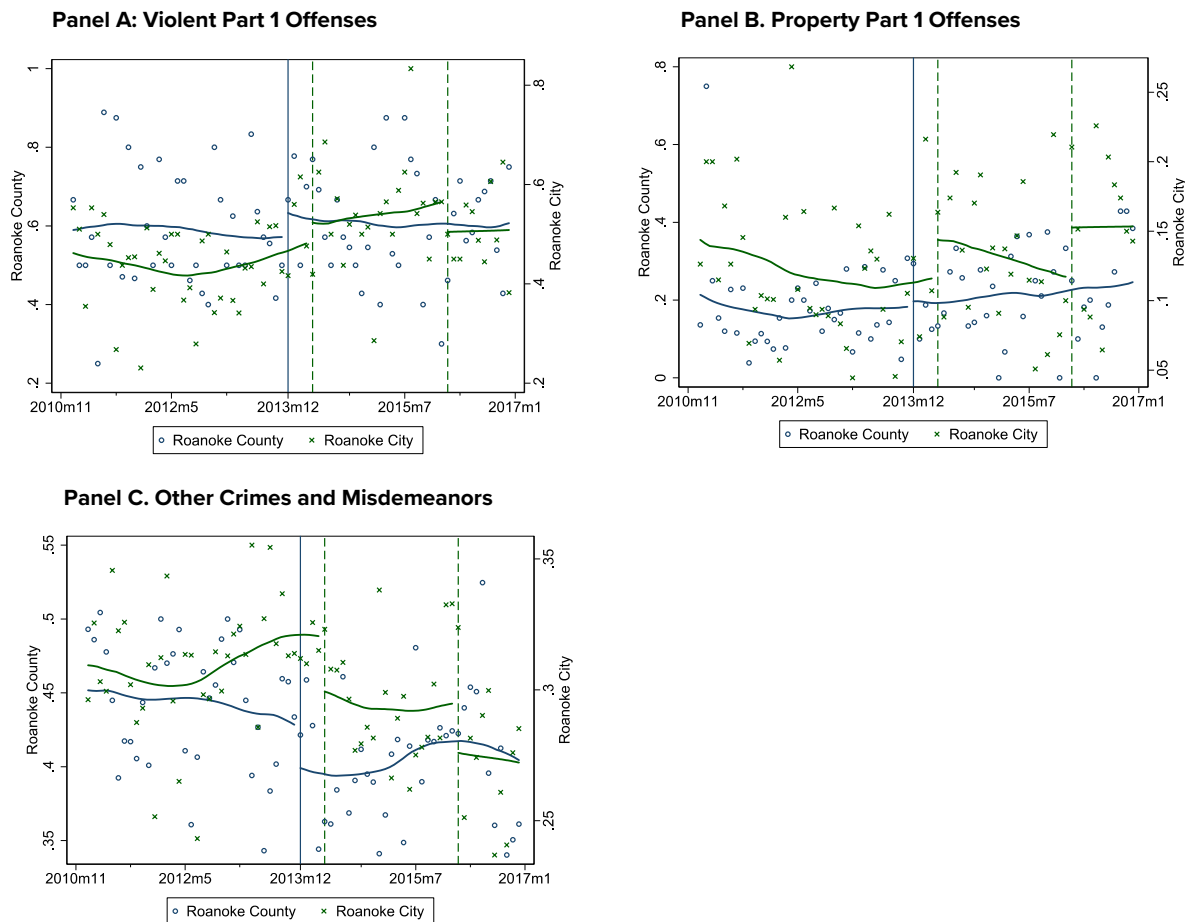


We find some evidence that restricting police pursuits may have reduced the ability of police to secure arrests conditional on a crime occurring. **Figure 7, Panel B** examines whether arrest rates

changed in response to the pursuit policies. In the case of the County, there is a roughly 2 percentage point decline in arrest rates immediately following the adoption of the restrictive pursuit policy. Similarly, in the City both the bounded pursuit policy and the restrictive pursuit policy both coincide with declines in arrest rates around 2 percentage points.

Because the pursuit policies specifically sought to limit police discretion for low-risk offenses, we additionally consider arrest rates by offense type in the NIBRS data to see if the declines in arrest rates are limited to just these types of criminal activity. **Figure 8, Panels A-C** show the changes in arrest rates for the County and the City for: (a) violent part 1 offenses (e.g., aggravated assault, murder, robbery, forcible sex assault), (b) property part 1 offenses (e.g., motor vehicle theft, larceny, burglary, arson), and (c) all other crimes and misdemeanors.

**Figure 8. Arrest Rate by Offense Type in Roanoke County and City**



**Figure Notes:** Violent part 1 offenses include aggravated assault, murder, robbery, forcible sex assault. Property Part 1 offenses include motor vehicle theft, larceny, burglary, and arson.

We find that the declines in arrest rates in both the County and City primarily are concentrated in non-Part 1 offenses, which includes both less serious offenses and DUIs. In Roanoke County, this finding is consistent with the reduction in the fraction of pursuits that were initiated because of suspected DUIs. Declines in less serious non-Part 1 offenses, apart from DUIs, are consistent with the aim of the vehicle pursuit policies to limit officer discretion for pursuing low risk offenses, as they are potentially the least costly offenses to go unpursued and un-arrested.

We also observe an increase in arrest rates for both Part 1 Violent and Part 1 Property offenses, which suggests that restrictive pursuit policies help law enforcement focus their energy and resources on more serious criminal activity that generally is more costly to society. The shift in composition of arrests towards more serious offenses is consistent with a social welfare improving policy that discourages net cost arrests while still deterring serious criminal activity. Our results suggest that constraining police discretion through policy directives enhances the overall effectiveness and productivity of the police.

## Conclusion

In sum, the adoption of a more restrictive policy by the Roanoke County Police Department led to shorter and safer pursuits. In the City, the adoption of the most restrictive policy did not lead to shorter pursuits, but it did drastically reduce the number of pursuits, especially for traffic related offenses. The increase in pursuit duration in the City likely reflects a change in pursuit composition away from traffic offenses and towards other more serious offenses, which are more prevalent in the City. These findings suggest that restrictive vehicle pursuit policies have distinct effects depending on the local context.

Our analyses indicate that restrictive vehicle pursuit policies still allow for crime deterrence, while also reducing the frequency of low-level arrests. Although some worry that constraining officer discretion will embolden criminal activity, in neither place was there evidence that the reduced likelihood of pursuit caused an increase in criminal activity. Moreover, these policies have the potential to increase the overall effectiveness of the police by minimizing low-level, socially costly arrests.