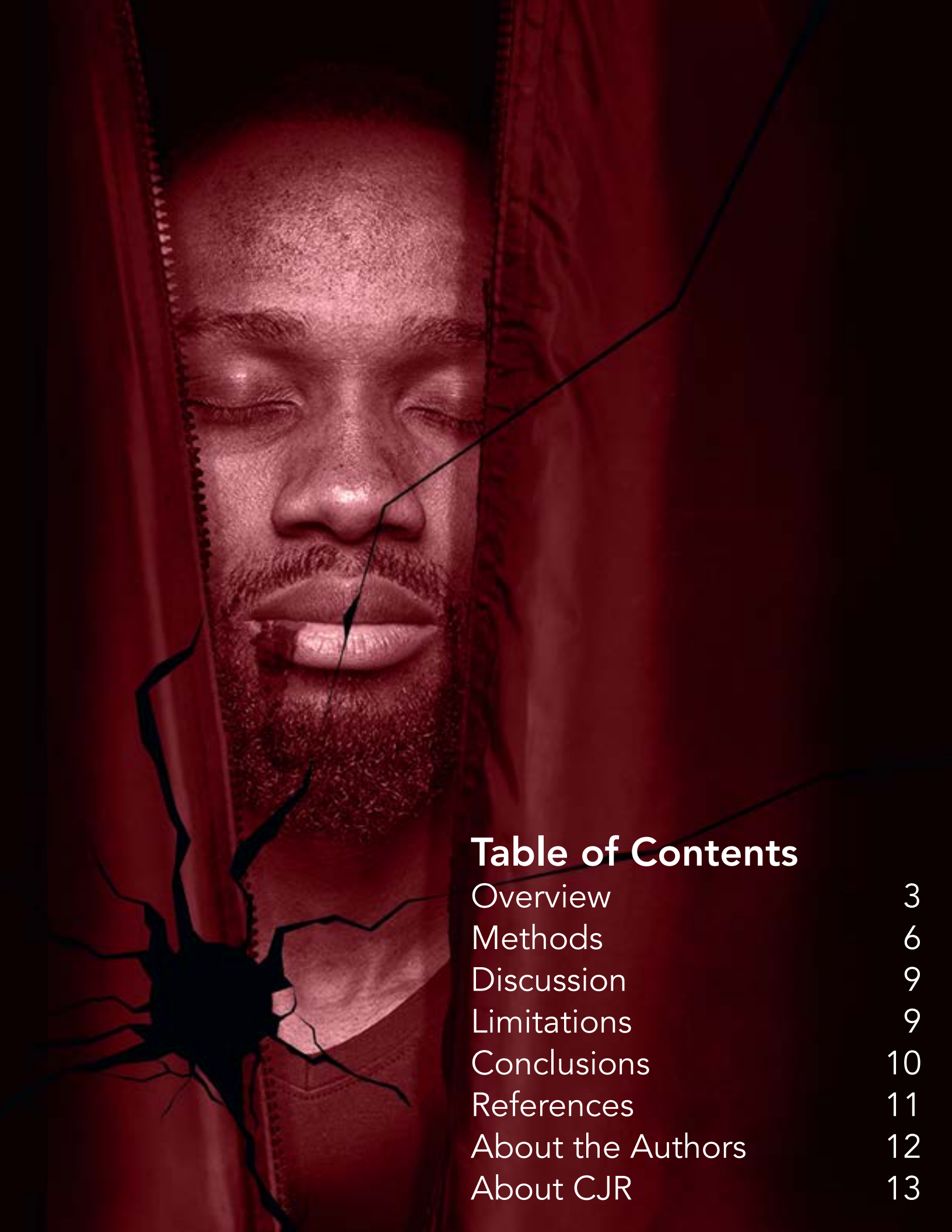




A TIME SERIES ANALYSIS OF  
**OFFICER-INVOLVED  
SHOOTINGS**





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## Overview

Recent decades have seen widespread calls for policies that will reduce police shootings. It is possible that shooting of both armed and unarmed suspects may be reduced with increased police training, crisis management, and transparency. However, at present, we have comparatively little data on effectiveness. The current study sought to examine whether new police policies developed during April 2021 in Houston were correlated with police shootings. A time series analysis suggested that policies geared toward increased police transparency had a small but important correlation with reduced police shootings of suspects. As such, these policies may have a positive impact on overall police shootings in an urban environment.

Keywords: Police shootings; Transparency; Public Policy, Public Safety



## Introduction

Police use of force has been a topic of debate for decades. While some argue that police use of force is necessary to maintain law and order, others believe that it leads to unnecessary harm and trauma. Use of force interventions are actions taken by law enforcement to reduce or prevent the use of force in situations where it is unnecessary or unjustified (Livingston, 1997). These interventions can take many forms, including changes in training, policies, and procedures. For example, some interventions teach de-escalation and nonlethal tactics such as using tasers and pepper spray (Garrett & Stoughton, 2017). Success in use of force interventions has been measured by various means, including reduction of excessive force incidents, improved community relations, and increased officer accountability (Hickman et al., 2008). The success of use of force interventions is a topic of ongoing research and debate, but there is evidence to suggest that these interventions can be effective in reducing the overall level of violence in society (Rogers, et al., 2019; Florence et al., 2011).

There have been several recent high-profile cases of police violence that have sparked protests and calls for reform. These cases have highlighted the need for law enforcement officials to be properly trained in the use of force and for there to be greater transparency and accountability in cases where force is used. The success of police violence interventions may depend on the willingness of law enforcement officials to adopt these reforms and to work with the communities they serve to build trust and understanding. While there is no single solution to reducing police violence, research has shown that certain interventions can be effective in promoting safer and more equitable interactions between police and the public.



For example, the use of police violence interventions can help to reduce the risk of injury to both police officers and suspects. A study conducted by the U.S. Department of Justice found that the use of tasers by police officers resulted in fewer injuries to both police officers and suspects (National Institute of Justice, 2019). Police violence interventions have also been successful in reducing the use of lethal force (Fridell & Lim, 2016).

Another successful intervention is community policing, which involves building partnerships between police officers and community members to address crime and disorder. Community policing is based on the idea that police officers are not just enforcers of the law but also members of the community who can work with residents to solve problems and prevent crime. Research has shown that community policing can lead to improved trust between police and community members, increased feelings of safety, and reductions in crime (Weisburd et al., 2003).

One of the most effective police violence interventions is the use of body-worn cameras (BWCs). These cameras are worn by officers during their interactions with the public and record both audio and video footage of the encounter. Research has shown that the use of BWCs can reduce the use of force by police officers and improve community relations (Maskaly et al., 2017). A meta-analysis of 70 studies found that the use of BWCs reduced police use of force by an average of 22%, and complaints against police were reduced by an average of 30% (White, 2020). A randomized controlled trial conducted in Rialto, California, also found that the use of BWCs led to a significant reduction in use-of-force incidents and citizen complaints against police officers (Ariel et al., 2016). The study concluded that BWCs were an effective tool in improving police-citizen interactions and reducing excessive use of force. These findings suggest that BWCs can help reduce the use of excessive force by police and improve public trust in law enforcement.

**30.6**  
MEDIAN AGE

**93.4**  
MALE

**54.5**  
BLACK

**28.2**  
HISPANIC

**CITIZENS INVOLVED IN SHOOTINGS**

## Methods

### Time Series Variables

This analysis examines the time series relationship between two variables. The first of these is the collection of Houston policies from a large police department in the southern United States, to increase police transparency, accountability and improve public safety, which was announced on April 29, 2021. As such, the time series was coded for months before and after this announcement.

The second data series involved the number of police shootings of suspects per month from January 2005 through February 2023. This data was compiled by large police department in the southern United States and is made accessible on their public website monthly. It is worth noting that this compiles all police shootings in which an officer discharged their firearm in the capacity of their duties within the Houston Police Department's jurisdiction but does not specifically differentiate those that were justified versus unjustified.

### Time Series Analysis

Raw correlations between societal variables can be misleading as correlations can represent other factors that influence police shootings. This can be rectified by accounting for time trends that may naturally occur as an "ecological fallacy." We used analyses as suggested by Schroder and Dixon (2022), which can examine whether data trends predict each other at time lags when controlling for ecological fallacy patterns.

## Results

Table 1 provides a demographic breakdown of officers and citizens involved in police shootings in Houston. The mean age of officers involved in shootings was 37.1 Most (96.8%) were male and ethnicity was diverse and roughly representative of the population of Houston. For citizens, mean age was 30.6. Once again, most (93.4%) were male, though black (54.5%) and Hispanic (28.2%) citizens were overrepresented compared to white (14.9%) or Asian (2.6%). Most involved citizens were armed, though 21.2% were not. Most involved citizens were adults (92.1%).

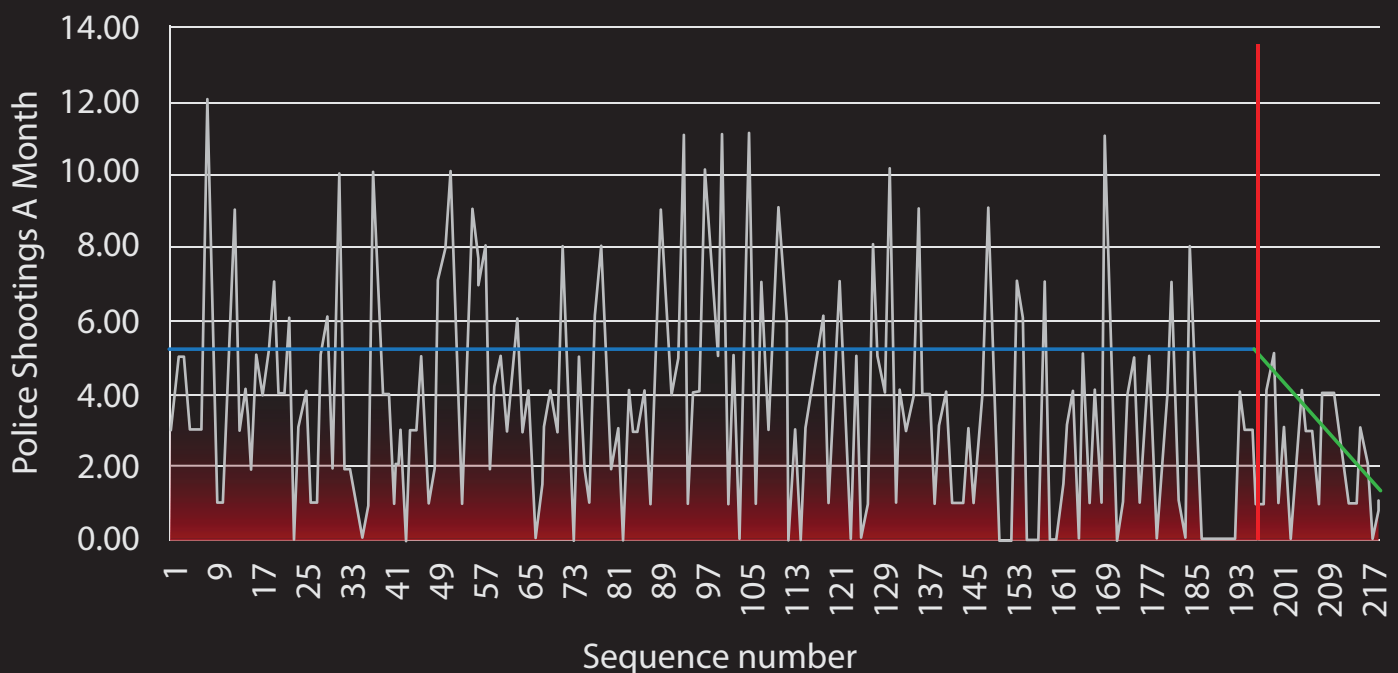
**Table 1: Demographic and situational profile of police officers and citizens involved in police shootings (2005-2020)**

	All Entries in OIS		All Entries in OIS		
	n = 705	%	n = 705	%	
<b>Officers</b>			<b>Citizens</b>		
Mean Age (SD)	37.1	[8.6]	Mean Age [SD]	30.6[10.9]	
Missing		8	Missing	138	
<b>Sex</b>			<b>Sex</b>		
Male	676	(96.8)	Male	539(93.4)	
Female	22	(3.2)	Female	32 (5.5)	
Missing	7		Other	6 (1.0)	
			Missing	128	
<b>Race</b>			<b>Race</b>		
White	321	(46.0)	White	92(14.9)	
Hispanic	224	(32.1)	Hispanic	174(28.2)	
Black	126	(18.1)	Black	336(54.4)	
Asian/Other	27	(3.9)	Asian/Other	16 (2.6)	
Missing	0		Missing	87	
<b>Injuries</b>			<b>Injuries</b>		
None	657	(94.1)	None	217(33.4)	
Wounded	40	(5.7)	Wounded	245(37.8)	
Killed	1	(0.1)	Killed	184(28.4)	
Missing	7		Other	3 (0.5)	
			Missing	56	
<b>Duty Status</b>			<b>Juvenile</b>		
On Duty	566	(81.1)	No	442(92.1)	
Off Duty	132	(18.9)	Yes	38 (7.9)	
Missing	7		Missing	225	
<b>Call Type</b>			<b>Weapon</b>		
Emergency Call	199	(42.6)	Firearm	347(52.9)	
Warrant	141	(30.2)	None	139(21.2)	
Other	95	(20.3)	Other	91(13.9)	
Traffic Stop	32	(6.9)	Vehicle	63 (9.6)	
Missing	238		Physical Force	16 (2.4)	
			Missing	49	

The raw Pearson  $r$  correlation between the Houston policy change and police shootings was  $-.148$ , indicating a small but important relationship between the policy change and reduced police shootings. However, as indicated, it is possible that this correlation may be due to time trends. Thus, we constructed time series for each variable.

The police shootings data series revealed a stable trend in the first time interval of the data that could lead to a false correlation. Though quite small and only just significant ( $p = .05$ ), we used pre-whitening to account for this trend. Our time series findings suggest that the Houston policy was associated with reduced police shootings concurrently ( $r = -.185$ ) and out to 10 month-to-month intervals ( $r = -.107$ ) after the implementation of the policy before becoming less significant. Because of the unusual nature of the binary policy variable, we conducted a sensitivity analysis with time series using both the raw policy and raw police shooting data in combination, but our results were largely similar, suggesting that a time series of policy change related to reduced police shootings is robust. This effect can be seen in Figure 1, where the implementation of the policy as indicated by the red line is followed by an overall reduced variance and mean decline in police shootings.

**Figure 1: Police Shootings Before and After the Implementation of the Houston Policy**



Note: Blue represents the trend before the implementation of the policy. The vertical red line marks the date of the policy announcement. The green line represents the trend following the policy announcement.



# Discussion

Reducing fatal police encounters, whether involving justified or unjustified shootings, is a worthy goal. In recent years, police departments have enacted various policies to reduce police shootings. Our study examined the practical implications of one such transparency policy in Houston and found that it had a small but important relationship to reduced police shootings.

Police shootings are complex and relate to multiple factors, including violent crime rates and the amount of police contact in an area. Police departments may not be able to control all these variables, but they (and policymakers) can control policies related to training and transparency. The current study adds to the evidence base that such policies are worthy of pursuing and may lead to reductions in police shootings. Even if effect sizes are relatively small, these numbers translate to individual civilians who may be spared police violence and even death.

Our results suggest that policies that increase police transparency and accountability may be correlated with reduced police shootings. Measures such as hiring police with better education (college degrees), improving crisis intervention training, and limiting the power of police unions to obstruct transparency and accountability can also have a positive impact. Such policies are not mutually exclusive with other policies such as those that increase police training, lead to recruitment of better officer trainees, or relate to community policing (Crowl, 2017).

Our study examined the practical impact of one such transparency policy in Houston and found that it had a small but important relationship with reduced police shootings. In other words, though policies focused on transparency and accountability are one part of a larger puzzle, they may help to reduce police shootings.

# Limitations

Although this study on police shootings in Houston provides valuable insights into the patterns and trends of such incidents, there are several limitations that must be considered when interpreting the findings. First, while we adjusted for autocorrelations in our data, our analyses only demonstrate correlations, and causal attributions cannot be made. Additionally, the use of a binary before/after data point in time series is not ideal as it does not capture the nuances and complexities of the police shooting incidents. Furthermore, our current analyses do not control for other variables that may influence police shootings, such as the race and ethnicity of the suspect or the police officer involved and the specific circumstances of each incident. Finally, the study only includes data from Houston. As such, the findings may not be generalizable to other cities or regions.

Moreover, the data used in this study were collected from official police reports, which may not accurately reflect the circumstances surrounding each shooting incident. These limitations highlight the need for further research in this area to fully understand the factors that contribute to police shootings and develop effective policies focused on prevention.



## Conclusion

Our study suggests that policies promoting the use of non-lethal force can help reduce police shootings, and the Houston Police Department's decision to make their data available is an important step towards greater transparency and accountability. However, it is important to recognize that the effectiveness of these policies may depend on different factors in other locations, and local evaluations of police policies and outcomes are crucial in identifying effective strategies for reducing police shootings.

As Houston has demonstrated, police departments must implement evidence-based policies and procedures that promote non-lethal force in situations where deadly force is not necessary. Additionally, it is crucial for police departments to work towards ensuring that their use of force is fair and unbiased, regardless of race or gender.

By continuing to study the effectiveness of different policies and procedures, we work towards creating a more just and equitable policing system. Through collaboration between law enforcement agencies, community members, and policymakers, policies can be developed that prioritize public safety, accountability, and transparency while building a future that serves community needs.

We hope that our findings will be useful for future efforts to democratize police practices while maintaining public safety. Examining the unique nuances of individual departments, evidence-based policies and procedures can be developed that will ultimately lead to a safer and more equitable society. It is critical that law enforcement agencies prioritize transparency, accountability, and collaboration with community members, advocates, and universities to build trust and foster positive relationships with the communities they serve.

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The Center for Justice Research (CJR), housed in Texas Southern University's Barbara Jordan - Mickey Leland School of Public Affairs, provides culturally-responsive solutions to mass incarceration. The Center's initiatives are situated on four pillars: Research and Data, Policy Advocacy, Researcher Development and Strategic Engagement. CJR's efforts move theory to practice, advise key stakeholders, and diversifies the justice research space. Founded in 2018, CJR was initially funded as a research initiative born out of a partnership between the Thurgood Marshall College Fund, Charles Koch Foundation, and Koch Industries to explore the removal of barriers to opportunities in historically under-resourced communities. From the beginning, CJR has worked on projects supported by the Department of Justice, National Science Foundation, National Hockey League, National Collaborative on Gun Violence Research, Chevron, and the Houston Endowment. The supporters of CJR all share a deeply rooted interest in dismantling mass incarceration, maintaining public safety and creating a procedurally just criminal justice system. Because of our partnerships, CJR has the unique opportunity to investigate problems and provide solutions for the complexities of the criminal justice system. Through these relationships, the Center's researchers turn data into culturally-sensitive solutions for professionals, policymakers, and advocates. Sources of the Center's funding and our projects are outlined in greater detail on the website.

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