



# Assessing benefits, costs, and disparate racial impacts of confrontational proactive policing

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**Effective policing in a democratic society must balance the sometime conflicting objectives of public safety and community trust. This paper uses a formal model of optimal policing to explore how society might reasonably resolve the tension between these two objectives as well as evaluate disparate racial impacts. We do so by considering the social benefits and costs of confrontational types of proactive policing, such as stop, question, and frisk. Three features of the optimum that are particularly relevant to policy choices are explored: (i) the cost of enforcement against the innocent, (ii) the baseline level of crime rate without confrontational enforcement, and (iii) differences across demographic groups in the optimal rate of enforcement.**

policing | criminal justice policy | social welfare | deterrence

These are tumultuous times for policing in America. Deadly use of force by the police in large and small cities across the United States has led to protests, riots, and heated debates. Public criticism of policing, however, goes well beyond use of deadly force. The longstanding controversy over the New York Police Department's widespread use of the stop, question, and frisk (SQF) tactic during the administration of Mayor Bloomberg is reflective of a broader set of public concerns about police use of confrontational tactics that may intrude into the lives of innocent citizens, even as they may be effective in preventing crime.\* In response, President Obama convened the Task Force on 21st Century Policing to make recommendations for the reform of policing in the United States, specifically by improving trust in the police.

After more than two decades of nationwide decline in crime rates, recent upticks in violent crime in Baltimore, St. Louis, Chicago, and elsewhere are now turning public attention to another key objective of policing—public safety. Although it is too early to know whether the United States is entering a new period of rising crime rates, the recent upswing in violent crime reopens a recurring question about the role of policing in a democratic society. How can police prevent crime and keep citizens safe without sacrificing community trust? Both objectives—public safety and community trust—form the bedrock of effective policing in a democratic society. However, as Lum and Nagin (1) observe,

In difficult times, however, discourse often focuses on one objective with the other receding into the background. [In the recent past], the focus [has been] on citizens' confidence in and trust of the police. At other times, especially when crime is on the rise or the threat of terrorism looms, the emphasis is on public safety. But both objectives are fundamental.

There are many possible explanations for why public discourse on the objectives of confidence and trust in the police and public safety does not keep both in focus. One is suggested in the prior quote—recent high-visibility events may draw attention to one of two objectives, whether it be illegal use of lethal force by the police or a marked increase in violent crime. Another is what psychologists call “motivated reasoning” or “confirmation bias” (2, 3), in which individuals for whom one objective is particularly important discount the validity of arguments that place weight on

the other objective. Either way, it is our position that both objectives should be considered when designing and implementing public policy on the use of police in a democratic society.

This paper uses a formal model of optimal policing to explore how society might reasonably resolve the tension between public safety and community trust. We do so by considering the social benefits and costs of confrontational types of proactive policing, such as SQF. We think that it is important that society evaluate tactics, such as SQF, by assessing their benefit in crime reduction, the cost of their intrusion on the privacy of innocent persons, and their disparate impact on racial and other groups.

Our focus on the costs incurred by innocent persons and disparate impacts across racial groups is prompted by our perception that these two issues are related to one another and central to the recent controversy about confrontational policing tactics. These issues have motivated a distinct empirical research literature on racial profiling by police in traffic stops for the purpose of identifying drug dealers and other offenders (for example, refs. 4–6). Being stopped as a suspected drug dealer on the pretext of a traffic violation and being the target of a confrontational police tactic, such as SQF, are noxious experiences, particularly when the subject of the treatment is innocent (7). The targets of confrontational policing tactics have disproportionately been blacks and other racial minorities. The literature on racial profiling has sought to determine the extent to which observed racial disparities in confrontational policing reflect racial discrimination rather than racial differences in crime rates. A related legal literature examines the constitutional constraints

## Significance

**Criminal justice policy is susceptible to controversy. Crime and policies to prevent it are inextricably tied to divergent beliefs among citizens about right and wrong, the protection of person and property, and the legacy of ill treatment of racial minorities by agents of the criminal justice system. This paper studies a model that helps to address one aspect of crime prevention policy, the use of confrontational proactive policing methods. These methods may have social benefits in crime reduction but costs in intrusion on the rights and privacy of innocent persons. The paper provides a structure for weighing these benefits and costs dispassionately, aiming to honor and achieve the sometime conflicting objectives of crime control policy in a democratic society.**

Author contributions: C.F.M. and D.S.N. designed research, performed research, analyzed data, and wrote the paper.

Reviewers: P.N., University of Cambridge; and S.R., University of California, Berkeley.

The authors declare no conflict of interest.

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This article contains supporting information online at [www.pnas.org/lookup/suppl/doi:10.1073/pnas.1707215114/-DCSupplemental](http://www.pnas.org/lookup/suppl/doi:10.1073/pnas.1707215114/-DCSupplemental).

\*SQF, also called “Terry Stops” after the 1968 Supreme Court decision *Terry v. Ohio*, provides police with the authority to SQF individuals on a “reasonable suspicion” that they may commit a crime or are in process of doing so.

on policing practice, mostly as it relates to the Fourth Amendment restrictions on “unreasonable searches and seizures” and the Equal Protection Clause (8).

Our concern is not detection of discrimination or constitutionally prohibited use of confrontational policing tactics. Instead, we seek to shed light on the difficult social choice problem that confrontational policing raises, even in the absence of discrimination or other illegalities attending their use. We explore this problem by laying out and describing the solution of a model of optimal policing adapted from earlier works by Manski (9, 10). The adaptation is designed to explore the tradeoff between the social benefits and costs of confrontational proactive policing tactics. We then use the New York City experience with SQF and the recent upsurge in homicides in Chicago as lenses for exploring the policy implications of the model. Although we focus on policing in the United States, we also discuss policing in democratic society more broadly.

### Model

Police serve diverse social functions—notably crime control, traffic safety, responding to emergencies, and helping persons in distress. We focus on the crime control function.

The model on which we base our discussion is developed in *SI Text*. The model supposes that the objective of proactive policing policy is to optimize a welfare function that recognizes both the social costs and benefits of proactive policing. Here, we describe a simple special case of the model that transparently highlights key features of the optimal solution.

We begin by defining what we mean by “proactive policing” for the purposes of this analysis. In general, the term proactive policing connotes efforts by the police to actively prevent crime. Police may prevent crime by many means. One is by arresting persons who have already committed crimes. Their arrest may deter others from committing crimes. If incarceration is a consequence of the arrest, it may also prevent crime by incapacitation of offenders.

A second prevention mechanism involves police presence. A would-be robber of a liquor store will likely be deterred if a police car is idling outside. More generally, knowledge that police may be nearby may deter crime.

Still, a third mechanism by which police may prevent crime is by interacting directly with citizens. Some forms of interaction are benign or even socially beneficial (for example, communication with business owners about how they might better secure their property). Others, however, are confrontational and result in social costs. SQF, also called stop and search in Great Britain and Western Europe, is an example of such a policing tactic. Another is so-called “broken windows” policing, in which police crack down on disorder by dispersing lingering groups in public places, arresting individuals, or issuing summons for minor legal infractions. Broken windows policing is predicated on the controversial theory that disorderly places are a breeding ground for more serious crime, particularly involving violence.

For purposes of this analysis, we focus on forms of proactive policing that use confrontational tactics having social cost. Our model expresses a central tension: increasing the intensity of a confrontational tactic yields more benefit in crime reduction but also, a higher cost of intrusiveness. Society’s problem is to choose a level of intensity that appropriately recognizes this benefit and cost.

The delicate issue of disparate racial impacts may arise if crime rates in the absence of confrontational tactics vary with race. Then, a policy that strives to optimize social welfare may be implemented without racial animus but nonetheless, generates disparities in the intensity with which confrontational tactics are directed at innocent persons of different races.

To introduce the model, we consider proactive policing aiming to deter a specific type of crime in a specific neighborhood. Let

$D_i$  denote demographic group  $i$  (e.g., black men ages 18–24 y old). Let  $w$  denote background characteristics, such as the state of the economy, that affect the crime rate of members of  $D_i$  in the absence of proactive policing. We abstract from the reality that criminally involved individuals may commit multiple crimes of different types in different places. We instead assume that individuals either commit a single crime per year or none in their neighborhoods. These simplifying assumptions have no bearing on our key points, but we do not downplay their potential importance to operational policing. Model extensions relaxing these assumptions are discussed in *Conclusion*.

Let  $\rho(D_i, w)$  denote the fraction of persons in group  $D_i$  who would commit a crime in background setting  $w$  in the absence of proactive policing. We measure the intensity of proactivity directed at  $D_i$  by the probability that a member of  $D_i$  is the target of proactive enforcement activity. We denote this probability by  $t_i$  and assume that it is equal across all members of  $D_i$ . We assume, for simplicity, that, if a would-be offender is the target of proactive enforcement, crime is always foiled and that the individual is brought into custody. We also assume that crimes are not foiled in the absence of proactive enforcement. The model can be extended to allow for imperfect policing, in which proactive enforcement does not always succeed, and reactive policing, in which crimes are foiled without proactive tactics.

The model developed in *SI Text* assumes that proactive policing deters crime. That is, the crime rate in group  $D_i$  decreases as the intensity  $t_i$  of proactive policing increases.<sup>†</sup> The model does not assume a particular relationship between the crime rate and intensity of policing. The simple special case of the model considered here assumes that the proportion of individuals in group  $D_i$  who commit a crime declines linearly as  $t_i$  increases. Thus, we assume that the crime rate in group  $D_i$  in setting  $w$  with proactive policing intensity  $t_i$  is  $\rho(D_i, w) \cdot (1 - t_i)$ .

The social cost function assumes that society seeks to minimize the sum of three components: (i) the cost of successful crimes, (ii) the cost of punishing apprehended offenders, and (iii) the cost of proactive enforcement directed at innocent persons. Under the assumption of linear deterrence, the specific form of the social cost function to be minimized for each group  $D_i$  is

$$a \cdot \rho(D_i, w) \cdot (1 - t_i)^2 + b \cdot \rho(D_i, w) \cdot (1 - t_i) \cdot t_i + c \cdot [1 - \rho(D_i, w) \cdot (1 - t_i)] \cdot t_i. \quad [1]$$

The terms of Eq. 1 express the three components of the social cost function when the policing intensity is  $t_i$ . The first term gives the cost of successful crime. The crime rate in group  $D_i$  under policing intensity  $t_i$  is  $\rho(D_i, w) \cdot (1 - t_i)$ , and the fraction of crimes that are not foiled is  $(1 - t_i)$ . Hence,  $\rho(D_i, w) \cdot (1 - t_i)^2$  is the rate of successful crimes. The constant  $a > 0$  denotes the cost of each successful crime.

The second term gives the cost of apprehending offenders. The crime rate under policing intensity  $t_i$  is  $\rho(D_i, w) \cdot (1 - t_i)$ , and the fraction of crimes that are foiled is  $t_i$ . Hence,  $\rho(D_i, w) \cdot (1 - t_i) \cdot t_i$  is the rate of foiled crimes. The constant  $b > 0$  denotes the cost of apprehending and punishing the offender in each foiled crime.

The third term gives the cost of subjecting innocent persons to enforcement. The fraction of innocents in group  $D_i$  under policing intensity  $t_i$  is  $1 - \rho(D_i, w) \cdot (1 - t_i)$ . The fraction of these persons who are the subject of proactive enforcement is  $t_i$ . Hence,  $[1 - \rho(D_i, w) \cdot (1 - t_i)] \cdot t_i$  is the rate at which innocents are

<sup>†</sup>Some might argue that confrontational proactive policing tactics are counterproductive in preventing crime [for example, the exchange between Nagin and Telep (11) and Tyler (12) on this issue]. Although the long-term influence of confrontational policing tactics is unknown, below we summarize evidence of their shorter-term crime prevention effectiveness.

the subject of enforcement. The constant  $c > 0$  denotes the social cost of enforcement directed at innocent persons.

*SI Text* shows how the optimal value of  $t_i$  depends on the values of the cost parameters ( $a, b, c$ ). Suppose that  $a - b + c > 0$ , which we think the most salient case in practice. This condition means that the combined social costs of a successful crime and subjecting an innocent person to enforcement are larger than the cost of apprehending an offender. Then, the optimal intensity equals zero for some parameter values (no proactive policing), equals one for other values (comprehensive proactive policing), and takes a value between zero and one otherwise. Specifically, the optimal intensity is

$$t^*(D_i, w) = \frac{(2a - b) \cdot \rho(D_i, w) + c(\rho(D_i, w) - 1)}{2(a - b + c)\rho(D_i, w)} \quad [2]$$

if the expression on the right-hand side is between zero and one. Optimal intensity is zero if this expression is negative and one if the expression exceeds one.

### Policy Implications

Inspection of Eq. 2 shows three features of the optimum that we think are particularly relevant to policy choice.

- i) The optimal intensity of enforcement decreases as  $c$ , the cost of enforcement borne by innocent persons, increases. Thus, the more intrusive proactive policing is, the lower the optimal intensity of enforcement.
- ii) The optimal intensity of enforcement increases with the value of  $\rho(D_i, w)$ , the base crime rate with no proactive policing. Thus, a high level of proactive enforcement may be optimal in a high-crime rate environment but may not be optimal in a low-crime rate environment.
- iii) The optimal intensity of proactive enforcement is group-dependent. For some groups with low base crime rates (for example, the elderly), it may be zero. For other groups with high base crime rates (for example, young men), a high intensity may be optimal.

The discussion below expands on these three features in the modern American context.

**Policy Choice and the Cost of Proactive Enforcement on Innocents.** To the best of our knowledge, there are no estimates of the value of  $c$  measured in dollar equivalents for proactive policing methods, such as SQF. However, the controversy surrounding the widespread use of SQF in New York City suggests that this cost is high. It is hard for even the most skilled police officer to avoid the indignity that attends stopping an innocent citizen, questioning that individual about their criminal intent, and physically searching the individual, only to then allow the citizen to continue on their way.

Thus, one lesson of our model is that the social costs of a tactic are important to policy judgment about whether, how much, and under what circumstances that tactic should be used. This conclusion may seem obvious once stated, but it seems often to be lost in heated debates about policing tactics. If an alternative to SQF was available that imposed smaller enforcement costs, particularly as they relate to those born by the innocent, but was comparably effective in preventing crime, that alternative should be preferred. Such alternatives might include problem-solving policing tactics, in which police work with citizens, community leaders, or regulators to reduce crime by devising ways for citizens to better secure their property, change the physical environment to reduce criminal opportunities, or work with regulators to pressure owners of problem businesses or residences to make changes that reduce crime at those places. Ref. 13 has a summary of the effectiveness of problem-oriented policing and other policing tactics.

To be sure, these crime prevention strategies have costs of their own and may be differentially effective in preventing crime. However, all else equal, policing tactics that do not impose costs on the innocent are preferred. More generally, this conclusion is a reminder that the desirability of a specific policing tactic should not be considered in isolation. The tactic should be considered compared with alternative feasible approaches to addressing a crime problem.

**Policy Choice and the Baseline Crime Rate.** Consider next the policy implications of the conclusion that the optimal intensity of proactive enforcement is an increasing function of  $\rho(D_i, w)$ . Consequently, optimal proactive enforcement at one time or place may not be optimal at another time or place because of changes or differences in  $\rho(D_i, w)$ .

**The Chicago experience.** A contemporary example of a possibly changing  $\rho(D_i, w)$  has occurred in Chicago. In 2016, Chicago's homicides increased by 54% over the level in 2015. The increase was concentrated in a small number of poor, largely black neighborhoods.

Differing accounts have been offered for the increase (14). One is that intergang retaliatory violence disrupted what once had been a comparatively low-violence equilibrium. If the transition to the higher-violence regime results in the crime prevention benefits of more intense proactive policing outweighing the cost of enforcement against perpetrators and innocent citizens, the optimal response of the Chicago police should be an increase in their use of confrontational proactive tactics.

The optimality of such a response is supported by a review of studies of the effectiveness of heightened pedestrian and vehicle stops in high-violence places conducted by Koper and Mayo-Wilson (15). That review concludes that such SQF stops reduce gun violence by as much as 49%. In this regard, Lum and Nagin (1) observe that

...aggressive policing [like SQF] should target serious crime problems ... Unlike zero tolerance approaches that use arrest for minor offenses indiscriminately, these tactics were specifically tailored to mitigate opportunities for firearms carrying in crime hotspots and [have been] found to have positive effects.

Alternative accounts of the reason for the homicide increase in Chicago provide a different perspective on the optimal response. In 2014, a Chicago police officer shot and killed Laquan McDonald. A video recording of the event, released in 2015, suggested that McDonald posed no threat to the officer or bystanders. Its release provoked widespread protests and ultimately, the firing of then Chicago Police Chief Garry McCarthy.

These alternative accounts argue that the upsurge in violence was the result of Chicago police radically reducing their presence in the neighborhoods where violence increased most (14). The specifics of how the police might have reduced their presence are unclear. To the degree that reduced presence involved a large reduction in confrontational tactics, the model suggests that, at least, a partial return to prior levels might be appropriate. However, to the degree that the upsurge was caused by a reduction in police presence even involving nonconfrontational tactics, the model suggests more strongly that the use of those tactics should be returned to prior levels, because they impose no costs on the innocent.

**The national experience.** Another example of a changing level of  $\rho(D_i, w)$  occurred at a far more sustained and macrolevel than the recent upsurge in violence in Chicago. Beginning in the early 1990s, crime rates in the United States began a steady decline that continued nationwide until 2015. Over the period 1991–2014, the index crime rate, including its violent crime component, declined by about 50%. The reasons for the crime drop in the United States have been heavily studied. Although there is no consensus explanation, there is a consensus that forces far



beyond the activities of the criminal justice system, let alone the intensity of proactive policing, were at work (16–18). In this regard, we note that Canada experienced a similarly large decline in crime over this period, but its criminal justice policies were very different from those in the United States (18).

The lesson of Chicago that the optimal level of proactivity depends on  $\rho(D_i, w)$  also applies to the level of the nation. The nationwide crime drop suggests that the optimal level of proactive policing nationwide was likely changing over this time period. High-intensity levels that might have been optimal in the early 1990s might no longer be optimal in the present low-crime environment, even if the recent uptick in crime represents a reversal of the decades-long trend of declining crime rates. Stated differently, the optimal level of proactivity depends on the level of, not the trend in,  $\rho(D_i, w)$ .

**The New York experience.** We specifically explore this observation in the context of New York City, because unlike for the nation as whole, this city is one locale for which there are good data on the intensity of use of one form of proactive policing—SQF. Even these data, however, pertain only to the 2000s. Although in the 2000s, the crime drop moderated in the rest of the United States, it continued unabated in New York City, falling 56% from 2000 to 2015.

How much higher would the New York City crime rate have been without the use of SQF? The literature on the crime prevention impact of the widespread use of SQF is small. Rosenfeld and Fornango (19) find no statistically significant effect. The work by Weisburd et al. (20) is perhaps the most thorough analysis of these data. Although ref. 20 reports a statistically significant preventive effect of SQF, its magnitude is modest. They estimate that the 685,000 SQF stops conducted in 2011, the peak year of its use, reduced the New York City crime rate by 2%.

Recently departed New York Police Department Chief William Bratton (21) has argued: “You cannot police without [SQFs]. If you did not have it, you’d have anarchy.” This is a sweeping argument. Our model provides perspective on circumstances where Bratton’s argument does and does not apply, with due recognition that its specific wording is perhaps laden with intentional hyperbole. Even with the large crime drop in New York City, the city still has high-violence neighborhoods where intensive use of SQF may be warranted.

That possibility, however, still leaves open the question of whether the widespread use of SQF beginning in the early 2000s through 2011 could be justified in terms of the cost–benefit calculation imbedded in our model. For those who are skeptical of the crime prevention effectiveness of SQF compared with other policing tactics that do not impose large costs on the innocent, our conclusion remains the same as for Chicago—the shift in policy of greatly curtailing use of SQF that began post-2011 was socially optimal. For those who take the position that there is a nonnegligible crime prevention effect of the widespread use of SQF, weighing the costs and benefits is required.

Although we will not attempt to estimate those cost and benefits, we reiterate an earlier point that the incremental benefits of proactivity depend on  $\rho(D_i, w)$ . Thus, a conclusion that the sharply curtailed use of SQF in New York City is socially optimal at this time does not imply that the policy would have been optimal in prior years when crime rates were higher. If we extrapolate the estimate by Weisburd et al. (20) that SQF reduced crime by 2% in 2011, that benefit in terms of crimes averted per capita would have been 56% larger in 2000 and 220% larger in 1991 when crime rates were correspondingly higher than in 2011 by these respective percentages. These larger savings in early years may well have formed the basis for higher levels of proactivity than can be presently justified as socially optimal.

**The Disparate Impacts of Optimal Proactive Policing.** Although a majority of Americans (56%) have a “great deal/quite a lot” of

confidence in the police (22), differences across races are large. For whites, the percentage is 59%, whereas for blacks, it is 37%. Even larger differences emerge when asked about personal treatment when stopped by the police on the street: 77.6% of whites judged that “police behaved properly,” whereas for blacks, the percentage was only 37.7%.

Many factors may account for the persistent differences across races in their confidence in the police and their perception of fair treatment at the hands of the police. One is the well-documented history of police mistreatment of disadvantaged minorities, particularly blacks. However, it is likely more than history. Large racial differences continue across racial groups in the rate at which they are stopped, ticketed, and searched (23).

The New York Police Department’s use of SQF in 2002–2013 is a case in point. According to a report by the New York Civil Liberties Union (24), over this period, nearly 5 million stops were made, and in 88.1% of such instances, no arrest was made or summons was issued. The report refers to these as “innocent” stops. The report documents large differences across demographic groups in their experience of innocent stops. Men, who account for about one-half of the New York City population, were the targets of nearly 4 million or 93.1% of the innocent stops. Individuals ages 14–25 y old, who account for about 15% of the city’s population, experienced more than one-half of the innocent stops. Blacks, who account for just over one-fifth of the population, accounted for 54.3% of the innocent stops. Disproportionality was particularly pronounced for individuals having all of these risk characteristics. Over the period 2003–2013, black men ages 14–24 y old were stopped nearly 1.2 million times, almost one-quarter of all stops, but they composed only 1.9% of the city’s population.

**Using relative and attributable risk to measure disparate impact.** These large differences across demographic groups in SQF stop rates provide a useful perspective on what epidemiologists call “relative” and “attributable” risk. Fig. 1 measures relative risk, which has been the standard statistic used to measure disparate racial impacts (25). Fig. 1 reports the ratio of the black to white innocent stop rate for men of specified ages. Over the period 2004–2015 for men of ages 25–34 y old, blacks were stopped at a rate that was 6 to nearly 10 times higher than that for whites. For the 18 to 24 y-old age group, the ratio varied between four and six.<sup>‡</sup>

Fig. 2 reports attributable risk, which has not typically been used to measure racial impacts. This risk is the difference in the rates between two groups: in this case, the innocent stop rate of blacks minus the rate of whites for men of ages 18–24 and 25–34 y old. Observe that the time patterns in Fig. 2 are quite different from those in Fig. 1. In both age groups, attributable risk rose fairly steadily from 2004 to 2011 and thereafter, began a sharp decline.

Why was relative risk much more time stable than attributable risk? The reason is that, over this timeframe, there were huge changes in the number of SQFs conducted. From 2002 to 2011, the number grew from 97,296 to 685,724 (24) and thereafter sharply declined to 22,939 in 2015. The relative risk statistic does not vary with the scale of a phenomenon, but attributable risk varies directly with scale.

To illustrate, consider two scenarios. In one, the mean numbers of times that young black and white males are stopped per year are 1 and 0.1, respectively, close to the actual rates in 2011. In the other, the mean stop rates are 0.03 and 0.003 stops per year, respectively, close to the actual rates in 2015. The relative risk in both scenarios is 10. The attributable risk is 0.9 in the first scenario and 0.027 in the second.

<sup>‡</sup>Figs. 1 and 2 were created with data made available by the New York Civil Liberties Union that, in turn, was provided to them by the New York City Police Department. The black rates combine individuals designated as “black” or “black Hispanic,” and the white rates include individuals designated as “white.” All other designations, including “white Hispanics,” were excluded from the analysis. The y-axis in Fig. 1 is unitless and in Fig. 2 is the rate per 1000 persons.

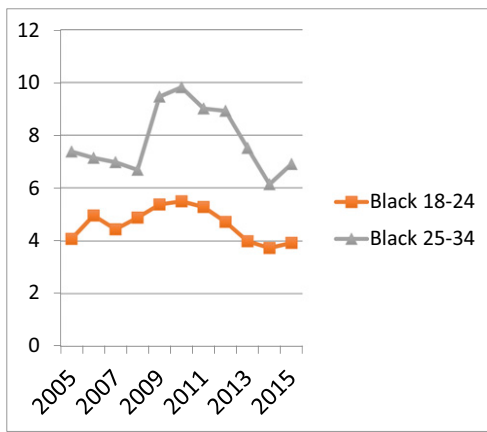


Fig. 1. Relative risk of innocent stop.

Figs. 1 and 2 offer contrasting portraits of the change over time in the disparate racial impact of SQF. Which portrait is more relevant to societal evaluation of SQF? Our model implies that attributable risk, not relative risk, is the appropriate metric for measuring disparate racial impacts of confrontational tactics, such as SQF, on innocent persons. As noted in the Introduction, being questioned and frisked, often in an aggressive manner, is a noxious experience and should be recognized as such in an accounting of its costs and benefits. What matters is how much more frequently innocent blacks are subjected to the tactic than innocent whites, not the ratio of group experiences. Analogous arguments for focusing on attributable rather than relative risk have previously been made in the epidemiology literature in the context of health risks (for example, refs. 26 and 27).

**Disparate benefits and costs of SQF.** The large demographic differences in stops rates also have important implications for distributional impacts of the optimal solution as defined by Eq. 2. As a reminder, the quantity  $\rho(D_i, w)(1 - t_i)$  in that equation is the probability that a member of  $D_i$  commits a crime. It does not specify whether the victim is a member of  $D_i$ . Thus, there may be spillover benefits of reduced victimization risks across groups, whereby the reduced offending of one group may avert victimization in another group. An optimal solution across all demographic groups thus may result in winning and losing groups in the sense that the net benefits of reduced victimization minus enforcement cost experienced by that group are positive for some groups and negative for other groups. We cannot show that such cross-group distributional consequences are substantial, but given the large differences in stop rates across demographic group, the likelihood of material distributional consequences is high. For example, it is hard to imagine a plausible scenario in which older white women, who as a group, experienced negligible rates of SQF, were not net beneficiaries in terms of the social welfare function that we specify. More generally, older people and whites were likely net beneficiaries.

There may also be material within-group distributional impacts because of within-group heterogeneity in victimization vulnerability. For example, those involved in drug dealing or who are gang members are at higher risk of victimization (28). Thus, individuals within  $D_i$  who do not engage in such activities and more generally avoid circumstances that increase victimization risk may benefit less from the optimal enforcement rate but still suffer the costs of searches of the innocent that attend that policy. Consider, for example, black men ages 18–24 y old who, in 2011 (the peak year of SQF), experienced an innocent stop rate of 0.8 per capita, nearly one per person. With such a high innocent stop rate, the likelihood is high that many young black men who did not engage in behaviors that heighten victimization risk were net losers, even if the policy was overall socially optimal.

### An International Perspective on Confrontational Proactive Policing.

We have framed our discussion of confrontational proactive policing in the context of recent events in the United States. Our model and its conclusions, however, apply to policy choices that police in all modern democracies must address. For example, they apply to the controversy surrounding the increased use of the British counterpart of SQF, stop and search, in response to a sharp uptick in knife attacks in London.

The following excerpts from a May 20, 2017 article in a major British newspaper, *The Guardian*, echo the controversy about confrontational policing in the United States (29).

London’s most senior police officer [Cressida Dick] has been urged to rethink her support for stop and search as race relations experts warn that an increase in its use will further alienate communities and make it harder to tackle the knife crime epidemic in London. . .

On Thursday, speaking to families in south London, Dick described the level of knife crime as outrageous and said most Londoners supported increased stop and search powers. “If police carrying stop and search can help to stop [knife crime] then the vast majority of people will be very supportive.”

Simon Woolley, a former commissioner for race on the Equality and Human Rights Commission, said: “I would implore Cressida Dick to rethink this because if she stops every black person and every young person she would reduce knife crime—but at what price?”

Although specifics differ between the United Kingdom and the United States—knife vs. gun violence and the absence of highly publicized lethal violence by the police—the concerns are strikingly similar: the need to balance public safety with the costs of aggressive police action against individuals with no criminal intentions and disproportionate targeting of disadvantaged minorities. These same controversies are also playing out in Western Europe as police forces there confront the threat of terrorism. Thus, the model that we lay out transcends the borders of the United States and applies more broadly to policing in democratic society. Tradeoffs must be made, as the above quote of Simon Woolley expressly acknowledges. Woolley has a clear opinion about the policy that tradeoff supports. Other would disagree, one of whom seems to be Metropolitan Police Commissioner Dick. Either way, the tradeoffs should be openly addressed and debated, not ignored.

### Conclusion

Criminal justice policy is susceptible to controversy. Crime and policies to prevent it are inextricably tied to deeply felt but often divergent beliefs among citizens about right and wrong, the protection of person and property, and the legacy of ill treatment of racial minorities by agents of the criminal justice system. The aim of this paper was to pose and study a model that we think

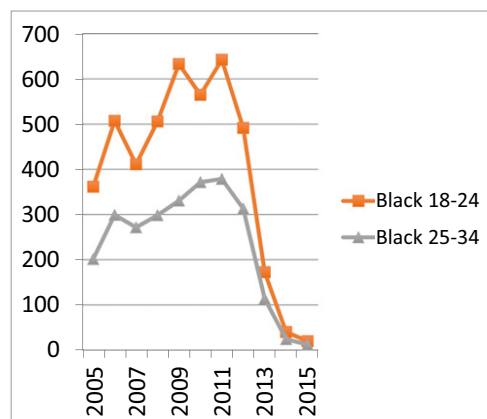


Fig. 2. Attributable risk of innocent stop.

helps to address one specific aspect of crime prevention policy: the use of confrontational proactive policing methods. These methods may have social benefits in crime reduction but costs in intrusion on the rights and privacy of innocent persons. Our goal was to provide a structure for weighing these benefits and costs dispassionately. In our view, weighing of benefits and costs is the best way to both honor and achieve the sometime conflicting objectives of crime control policy in a democratic society.

The model studied here was intended to be simple enough to make our key points in a transparent manner. Nevertheless, several extensions of the model would make it more useful for policy analysis. The model idealized by considering in isolation a specific type of crime in a specific neighborhood. Operational policing must contend with the reality that multiple types of crime may occur in multiple places, with potential interactions across crime types and locations.

The broken windows theory of policing posits an interaction between minor and major crimes, predicting that police activities that seek to reduce minor crime will also lessen the prevalence of major crimes. This prediction exemplifies a broader point that enforcement actions directed at one type of crime may affect the incidence of other types of crime, either increasing incidence via substitution (e.g., a robbery enforcement crackdown may increase burglary) or decreasing it as in the supposition of broken windows policing.

The spatial strategy of “hotspots” policing, which focuses police resources on discrete locations in high-crime neighborhoods, relies on a supposition that criminals will not be able to fully counteract the strategy by moving their activities to other locations. It would be useful to extend the model to enable evaluation of broken windows and hotspots policing. It would also be useful to extend it to recognize that innocent members of the

population may be victimized by multiple types of crime and may be subjected to intrusive policing in multiple locations.

Beyond generalizing the model, an essential task that must be performed to enable it to inform choice of policing policy is to assign or at least bound the values of three key cost parameters ( $a$ ,  $b$ ,  $c$ ) or better yet, the parameters of an extended model that considers multiple crime types and locations. Research on the cost of crime has sought to measure in commensurate terms the cost to society of crimes of various types, expressed in parameter  $a$  of our model [for example, the work by Sherman et al. (30)]. Dominguez and Raphael (31) review the literature. However, this review article and several commentaries published with it in the journal *Criminology and Public Policy* call attention to multiple conceptual and practical difficulties in measuring the cost of crime.

There also has been research seeking to measure the cost of apprehending and punishing perpetrators of crime, expressed in parameter  $b$  (ref. 32 has a review of this literature as it pertains to serious crime). Less attention has been given to quantifying the cost of apprehension and punishment for the types of minor crimes and ordinance violations that are the focus of broken windows policing. A small but growing literature suggests that the cost in terms of disruption to the lives of the targets of such enforcement actions (e.g., pretrial detention, lost employment) may be considerable (33).

To our knowledge, there are no existing estimates of the third key cost parameter  $c$ , the cost of enforcement actions against the innocent. Estimation of this parameter will require careful consideration of relevant aspects of the cost of enforcement actions against the innocent and development of methodology for assigning values to those aspects.

**ACKNOWLEDGMENTS.** We thank Steven Durlauf, Rachel Harmon, Brian Kovak, Steve Mastroski, and John Pepper for helpful comments.

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# Supporting Information

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## SI Text

Confrontational proactive policing tactics, such as SQF, generate tension between social welfare and individual utility. Police decisions to stop and search persons may benefit society by reducing crime. However, they may impose costs on the persons subjected to the tactic. The costs imposed on individuals may be of social concern, particularly when innocent persons are targeted.

To go beyond generalities, we pose and study a model of optimal proactive policing that recognizes the benefits and costs of the tactic. We then specialize to the linear case discussed in the text.

**The model.** The setup is the same as in the works by Manski (9, 10) and in the text but with some differences in notation. Let there exist a large population of potential offenders—formally, the population is an uncountable probability space  $(J, \Omega, P)$  with  $P(j) = 0, j \in J$ . Each member of this population decides whether to commit an offense, considering the probability that he will be stopped and searched. Let  $t \in [0, 1]$  denote the probability with which a person is searched. Let  $y_j(t) = 1$  if person  $j$  chooses to commit an offense when the search probability is  $t$ , with  $y_j(t) = 0$  otherwise.

The usual presumption is that search deters crime. Hence, treatment response is monotone decreasing in  $t$ . One may envision a threshold-crossing model, in which  $y_j(t) = 1$  if  $t < \tau_j$  and  $y_j(t) = 0$  if  $t > \tau_j$ , where  $\tau_j$  is a person-specific threshold.

The planning problem is to choose the probabilities with which persons are searched. Let person  $j$  have observable fixed covariates  $x_j \in X$ , with  $X$  being a finite space of covariate values. It is important to the analysis that the planner use only fixed covariates to determine search rates. If search rates vary with malleable covariates, persons may choose to manipulate their covariate values to lower the probability of search. We permit no such manipulation of covariates.

We assume that it is legal to search differentially among persons with different values of  $x$ —if not, then redefine  $x$  to be those fixed covariates that the planner can observe and legally use. The planner can a priori distinguish persons with different observed covariates, but he cannot distinguish among persons with the same covariates. Hence, a feasible search rule is a function  $t(\cdot): X \rightarrow [0, 1]$  that assigns a homogeneous search rate to all persons with the same value of  $x$  but possibly different search rates to persons with different covariates.

Search is ex ante in the sense that offenders who are searched are caught before they execute the crime. We assume that all searched offenders are apprehended. Nonsearched offenders are not apprehended.

Let  $p(t, x) \equiv P\{y(t) = 1|x\}$  be the offense function, giving the fraction of persons with covariates  $x$  who commit an offense when their search rate is  $t$ . Under search rule  $t(\cdot)$ , the offense rate among persons with covariates  $x$  is  $p[t(x), x] = P\{y[t(x)] = 1|x\}$ .

The planner wants to minimize a social cost function with three additive components. These components are (i) the social cost caused by a completed offense, (ii) the cost of searching and punishing an offender who is apprehended, and (iii) the cost of searching an innocent person. Let these cost components be  $a > 0$ ,  $b > 0$ , and  $c > 0$ , respectively. Let  $P(x)$  be the fraction of the population with covariate value  $x$ . The social cost of search rule  $t(\cdot)$  is

$$S[t(\cdot)] = \sum_{x \in X} P(x) \{ a \cdot p[t(x), x] \cdot [1 - t(x)] + b \cdot p[t(x), x] \cdot t(x) + c \{ 1 - p[t(x), x] \} \cdot t(x) \}. \quad [\text{S1}]$$

Consider the first term on the right-hand side. For each  $x \in X$ ,  $p[t(x), x]$  is the probability that a person with covariates  $x$  commits an offense, and  $1 - t(x)$  is the probability that such a person is not searched; hence, the product  $p[t(x), x] \cdot [1 - t(x)]$  is the probability that a person with covariates  $x$  commits an offense that causes social harm. The positive constant  $a$  is the magnitude of the harm caused by an offense. Summing across the covariate distribution  $P(x)$  yields the aggregate social cost because of harm caused by completed offenses.

Next, consider the second term. The product  $p[t(x), x] \cdot t(x)$  is the probability that a person with covariates  $x$  commits an offense but is apprehended. The constant  $b$  is the social cost of searching and punishing an offender. Again, summing across  $P(x)$  gives the aggregate social cost of punishing apprehended offenders.

The third term gives the aggregate cost of performing searches on innocent persons. The constant  $c$  is the cost of performing a search on an innocent. The term  $\{ 1 - p[t(x), x] \} \cdot t(x)$  states the fraction of persons in group  $x$  who are searched and innocent.

The planner wants to solve the problem  $\min_{t(x) \in [0, 1], x \in X} S[t(\cdot)]$ . This problem is separable in  $x$ . Thus, for each  $x \in X$ , the planner solves the problem

$$\min_{t \in [0, 1]} a \cdot p(t, x) \cdot (1 - t) + b \cdot p(t, x) \cdot t + c \cdot [1 - p(t, x)] \cdot t. \quad [\text{S2}]$$

Let  $t^*(x)$  solve problem [S2]. If the offense function varies with  $x$ , optimal search in general yields search rates that vary with  $x$ . **Special case of no deterrence.** Let  $\rho(x) \equiv p(0, x)$  denote the offense rate for persons with covariates  $x$  when their search rate is 0. Search has no deterrent effect if  $p(t, x) = \rho(x)$ ,  $t \in [0, 1]$ . Then, problem [S2] is

$$\min_{t \in [0, 1]} a \cdot \rho(x) \cdot (1 - t) + b \cdot \rho(x) \cdot t + c \cdot [1 - \rho(x)] \cdot t. \quad [\text{S3}]$$

The optimal search rate is

$$t^*(x) = 0 \text{ if } c \geq \frac{[(a - b) \cdot \rho(x)]}{[1 - \rho(x)]}, \\ = 1 \text{ if } c \leq \frac{[(a - b) \cdot \rho(x)]}{[1 - \rho(x)]}. \quad [\text{S4}]$$

Thus, the optimal search rate is either zero or one. The optimal rate is zero if  $a \leq b$ . When  $a > b$ , the optimal rate may be zero or one. **Special case of linear deterrence.** Search deters linearly if  $p(t, x) = \rho(x) \cdot (1 - t)$ ,  $t \in [0, 1]$ . In terms of the threshold-crossing model, linear deterrence means that a fraction of  $1 - \rho(x)$  of persons with covariates  $x$  has negative thresholds and hence, does not commit an offense, even when the search rate is 0. The remaining fraction  $\rho(x)$  has thresholds distributed uniformly on the interval  $[0, 1]$ .

With linear deterrence, the problem [S2] is

$$\min_{t \in [0, 1]} a \cdot \rho(x) \cdot (1-t)^2 + b \cdot \rho(x) \cdot (1-t) \cdot t + c \cdot [1 - \rho(x)(1-t)] \cdot t.$$

[S5]

The first-order condition for the extremum of the quadratic function in  $t$  on the right-hand side is

$$0 = 2a \cdot \rho(x) \cdot t - 2a \cdot \rho(x) + b \cdot \rho(x) - 2b \cdot \rho(x) \cdot t + c \cdot [1 - \rho(x)] + 2c \cdot \rho(x) \cdot t = 2(a - b + c) \cdot \rho(x) \cdot t - (2a - b) \cdot \rho(x) + c \cdot [1 - \rho(x)].$$

[S6]

When  $a - b + c = 0$ , the objective function is linear. The optimal search rate is 0 if  $c \geq [(2a - b) \cdot \rho(x)] / [1 - \rho(x)]$  and 1 if  $c \leq [(2a - b) \cdot \rho(x)] / [1 - \rho(x)]$ .

When  $a - b + c \neq 0$ , the objective function is quadratic with global extremum at

$$t^*(x) = \frac{(2a - b + c) \cdot \rho(x) - c}{2(a - b + c) \cdot \rho(x)}. \quad [S7]$$

The extremum is the global maximum if  $a - b + c < 0$  and minimum if  $a - b + c > 0$ . If it is the maximum, the optimal search rate is 1 if  $t^*(x) \leq 0$ , 0 if  $t^*(x) \geq 1$ , and either 0 or 1 if  $t^*(x) \in (0, 1)$ . If it is the minimum, the optimal search rate is 0 if  $t^*(x) \leq 0$ , 1 if  $t^*(x) \geq 1$ , and  $t^*(x)$  if  $t^*(x) \in (0, 1)$ .

Eq. S7 is the same as Eq. 2 but with two differences in notation. Whereas the text uses the symbol  $w$  to signify the background environment within which crimes occur, here,  $w$  is suppressed to make the presentation more concise. Whereas the text uses the symbol  $D_i$  to signify an observable demographic group that may be used by the police to target search, here, the more abstract symbol  $x$  is used, again to make the presentation more concise.