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ISSUES IN POLICING

# Hidden in Plain Sight

## What Cost-of-Crime Research Can Tell Us About Investing in Police

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In developing funding policies in any area of social concern, policymakers must identify policies that yield the greatest benefits, given finite resources. These decisions become even more difficult as policymakers confront multiple seemingly plausible solutions and numerous stakeholders with vested interests in promoting their own ideas. Such decisions are even harder in the current fiscal environment, in which finite resources are further constrained and the competition for funding is even more severe. In such environments, policymakers need objective measures of the costs and benefits of different policies so they have a sound basis on which to allocate resources.

One such area of concern is crime control policy, an area in which numerous stakeholders promote different policies. Law enforcement interest groups and victims' rights advocates call for more police, expanded prisons, and longer sentences to control crime. Other stakeholders see a primary role for such prevention and intervention activities as police youth leagues, alternative courts, and drug treatment programs. Faced with a myriad of policy options, policymakers often end up allocating expenditures to crime control initiatives without a clear indication of the likely return they can expect from such investments. Recent budget shortfalls in many localities have only heightened the need for better information on the value of public investments in controlling crime, as policymakers grapple with difficult decisions about which programs to support during periods of fiscal austerity.

One of the most common crime control investments made by state and local governments is police personnel spending. For policymakers to properly assess the value of police personnel relative to other crime control options, they need to be able to conduct a reasonable cost/benefit analysis of police manpower. Such an analysis, in turn, requires sound evidence about crime costs and police effectiveness in reducing crime. The good news is that such evidence is in "plain sight"; the bad news is that it tends to be "hidden" within the social-science literature in academically oriented journal articles. Although academic researchers have made substantial advances in recent years in estimating the cost of crime and the effectiveness of police, much of this research is underutilized by the policymaking community, both because research insights are too difficult for policymakers to process in present forms and because insights from disparate studies are not synthesized in ways useful for policymakers.

## Objective

This paper summarizes existing high-quality academic research on the cost of crime and the effectiveness of police in preventing crime. It serves as a bridge to help policymakers understand what the current social-science literature can tell them about the value of investments in police. As such, it translates what is in the social-science literature, providing nontechnical descriptions that highlight the approaches and limitations of existing studies. It then demonstrates a method for comparing the costs of police personnel with the expected benefits generated by those police in terms of reduced crime; it does so by using two real-world proposals—one involving force expansion and one involving force reduction—to illustrate the process.

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## Approaches for Estimating the Cost of Crime

To measure the value of policies that affect crime rates, we first need to have some measure of the costs incurred as a result of crime. Given that we are particularly interested in policies designed to deter crime, our focus is on costs that are *avoided* when crime is prevented. While it is commonly understood that some crime costs are borne by offenders and victims, it is equally important to consider costs borne by society at large. That is because crime does not take place in a vacuum but, rather, affects everyone within the neighborhoods and communities where it occurs.

**The accounting approach attempts to identify all the individual costs associated with crime that individuals and society bear and place a dollar value on those costs.**

In particular, social scientists typically differentiate between the *tangible* and *intangible* costs of crime. Tangible costs involve direct financial costs to individuals, businesses, or government from out-of-pocket expenditures or lost productivity. They include such costs as property loss, medical treatment, and lost productivity for victims; crime-prevention expenditures by businesses; and expenditures for offender adjudication and incarceration by government entities. These costs can typically be measured using accounting or other expenditure data.

Intangible costs involve lost quality of life resulting from fear of crime or the psychological effects of victimization. Not surprisingly, intangible costs are inherently more difficult to measure because they are intangible. However, they are important to capture because they can, in some cases, represent a substantial component of the total cost of a particular crime. For example, the monetary costs of medical treatment for sexual-assault victims are likely small relative to the significant psychological and mental-health impacts of victimization. Failing to account for intangible costs would lead researchers and policymakers to an underestimate of the costs of this crime.

In this section, we describe recent studies that use three different approaches to estimate the costs of crime. Although the three approaches rely on different assumptions and empirical methods, they all yield cost-of-crime estimates that suggest substantial social benefits to crime reduction. After describing the studies, we construct a summary of cost estimates that we use later when we present the cost/benefit analyses.

## What Approaches Are Used to Estimate the Cost of Crime?

Since the 1980s, numerous studies have attempted to assign a dollar-cost value to a "typical" crime for use in cost/benefit calculations.[1] In doing so, researchers have adopted three primary approaches to measuring such costs: accounting-based methods, contingent valuation, and hedonic valuation. We discuss each briefly in this section.

### Approach 1: Accounting-Based Methods

The accounting approach attempts to identify all the individual costs associated with crime that individuals and society bear and place a dollar value on those costs. For example, robberies result in prevention expenditures (such as installing lighting or buying personal defense products), property loss to victims, expenditures on medical treatment for injuries, pain and suffering of victims, and costs for investigating, adjudicating, and incarcerating offenders. An accounting-based study would attempt to collect data on each of these cost components to arrive at a cost value—or cost range—for an average robbery.

The most influential and highly cited cost-of-crime study is Miller, Cohen, and Wiersema (1996), which calculates the victim-related costs per crime using the accounting approach. This study combined insights from a number of past studies examining components of the cost of crime—many of which were conducted by those authors—that, taken together, provide a careful and comprehensive portrait of crime costs. Data for the study were drawn from numerous sources. Property-loss costs were estimated using victim loss reports in the National Crime Victimization Survey (NCVS) along with data on insurance-claim processing costs. Medical cost figures were derived by combining data from victim reports, detailed hospital administrative records that report the costs of treating various types of injuries, and workers' compensation data on fatal incidents. Data on mental-health treatment and first-responder investigative costs were obtained from surveys and published administrative cost data. Productivity losses were estimated from NCVS data and wage data. Intangible costs were estimated using data on wage premiums for occupational risk and jury awards for pain and suffering to crime and burn victims. Many of the data sources and basic approaches in Miller, Cohen, and Wiersema (1996) have been used by other cost-of-crime studies.

Miller and his colleagues estimate victim-related costs of a typical homicide of about $3 million in

[1] Many complexities that we do not discuss here must be addressed in crime cost estimation, such as diversity across crime incidents, choice of time frame, distinguishing between average and marginal costs, victims versus victimization, and accounting for perpetrator utility. Cohen, Miller, and Rossman (1994) and Cohen (2005) provide more-comprehensive discussions of these issues.

1993 dollars, while a typical robbery costs $8,000 and a typical vehicle-theft attempt $3,700. For violent crimes, most of the costs come from intangible losses, while property-crime costs derive primarily from actual property losses.

Miller and his colleagues focus only on victim costs and, thus, understate the value of crime prevention from a social standpoint. In particular, their cost figures fail to incorporate many costs borne by nonvictims, such as general fear incurred from crime and disorder or incarceration costs. Additionally, this study is somewhat dated, drawing from data sources that are, in some cases, now more than 20 years old.

Later studies have attempted to draw from more-current data sources and expand the types of crimes included in the accounting study. Notable among these is Rajkumar and French (1997), which includes accounting-based cost estimates for some public-order crimes and more-comprehensive estimates of criminal justice system costs derived from government-agency budget data and Uniform Crime Report (UCR) and NCVS data. French, McCollister, and Reznik (2004) expand on the basic approach of Rajkumar and French (1997) and incorporate newer data sources, including more-recent jury-award data and data from the National Incident-Based Reporting System (NIBRS), which provides more-detailed information about individual crime incidents and associated property losses. This study provides a valuable update to earlier accounting-based studies.[2] Cohen and Piquero (2009) also update the cost estimates from Miller, Cohen, and Wiersema (1996) to include criminal justice system costs, lost offender productivity, and a wider range of crimes.

## Approach 2: Contingent Valuation

An alternative to the accounting approach is to elicit information about individual willingness to pay for crime reduction using survey questions. This approach, known to researchers as *contingent valuation*, is widely used to estimate the value of nonmarket goods, such as environmental quality (Mitchell and Carson, 1989). Respondents are typically asked whether they would support a hypothetical referendum in which they fund a program providing specific benefits in exchange for tax increases of a given amount.[3] By varying the amount of the tax in the question, researchers can statistically estimate people's average willingness to pay for the program. Willingness-to-pay estimates provide a monetary value of the benefits of crime reduction or, alternatively, a measure of the costs of crime, because individuals should be willing to pay amounts to reduce crime that are equal to their perceived disutility for crime (i.e., their perceived sense of the adverse or harmful effects of crime).

The major advantage of contingent valuation is that it captures overall willingness to pay for a program and, thus, encompasses both tangible and intangible costs. Relative to the accounting method, contingent valuation is likely to better capture some intangible costs that are difficult to objectively quantify, such as fear of crime in general or loss of use of community spaces because of crime. Given that the intangible costs of crime may be substantially larger than the tangible costs, properly capturing intangible costs is critical if we want to properly assess the social value of crime control. Because typical surveys also ask about respondent demographics, contingent-valuation studies also allow researchers to identify differences in the willingness to pay across different subpopulations.

However, the contingent-valuation approach is not without limitations. For example, respondents may have poorly defined preferences for surveyed goods, particularly if they have limited experience with such goods (Ready, Whitehead, and Blomquist, 1995).[4] Responses to contingent-valuation surveys can also exhibit *hypothetical bias*, which arises when individuals *overstate* their willingness to pay for a program or good because they are not actually paying for the program or good. By comparing survey responses with and without actual payments, researchers have demonstrated that hypothetically expressed willingness to pay is sometimes several times greater than actual willingness to pay (Harrison and Rutström, 2008). Although some methods have been developed to counter hypothetical bias (Cummings and Taylor, 1999), we still do not know how much this potential problem affects contingent-valuation studies of crime.

**The contingent-valuation approach surveys individuals about their willingness to pay for crime reduction.**

[2] For conducting cost/benefit analysis of programs that increase enforcement, studies such as French, McCollister, and Reznik (2004) likely modestly overstate the benefits from reducing crime, because these cost numbers incorporate some criminal justice system costs. The benefits of a policy that reduces crime by increasing enforcement are not the total costs of the crime avoided including enforcement costs; rather, they are the costs actually averted by the policy, which are total costs net enforcement costs. As a practical matter, because enforcement costs represent a fairly small fraction of the total costs of crime (Donohue, 2009), this adjustment is unlikely to have an important effect on the present analysis.

[3] Although not all contingent-valuation studies use hypothetical referenda, this approach has become predominant because it was recommended in a high-profile study of best practices in contingent valuation that was sponsored by the National Oceanic and Atmospheric Administration (Arrow et al., 1993).

[4] For example, many people might consider programs that affect robbery and burglary to be roughly equivalent because they fail to recognize that robbery involves the use of force while burglary does not.

In a widely cited contingent-valuation study of crime prevention, Cohen, Rust, Steen, and Tidd (2004) surveyed a nationally representative sample of 1,300 adults and asked questions about willingness to pay for hypothetical programs that reduced specific crimes in their community by 10 percent. Most respondents reported willingness-to-pay estimates of $100–$150 for each program, yielding estimates of $8.5 million to $11 million in social benefit per averted murder, $185,000–$313,000 per averted sexual assault, $57,000–$86,000 per averted serious assault, and $21,000–$30,000 per averted burglary in year-2000 dollars. Willingness-to-pay estimates were higher among blacks, younger individuals, and wealthier individuals.

The study's estimates of the cost of crime are substantially higher than estimates obtained using accounting approaches, which is to be expected because contingent valuation likely better captures intangible costs, thus providing a more comprehensive cost measure. Moreover, while the social benefit of roughly $10 million for preventing a homicide is large, it is not that different from the $7 million representative figure for the "value of life" that can be derived from observing individual decisions about the assumption of risk (Viscusi, 2008). Value-of-life figures are widely used by federal and state governments to make regulatory decisions regarding safety and environmental quality. The high estimated benefits of crime control reported in Cohen et al. (2004) are consistent with other published contingent-valuation studies that focus on more–narrowly defined crime categories. Ludwig and Cook (2001), for example, find, using a nationally representative survey, that respondents are willing to pay approximately $1.2 million per injury to avert gun-related assaults. In a contingent-valuation survey of residents in the United Kingdom, Atkinson, Healey, and Mourato (2005) place the cost of an assault resulting in serious injury at £36,000 (or about $52,000).

**The hedonic-valuation approach measures value like the contingent-valuation approach but is based on actual market transactions rather than survey questions.**

### Approach 3: Hedonic Valuation

Not surprisingly, individuals will be less willing to buy homes in neighborhoods with less desirable characteristics. In a competitive housing market, house prices will adjust downward to reflect lower demand for housing in such neighborhoods. Using this intuition, researchers have attempted to estimate the relationship between local neighborhood characteristics, including crime, and housing prices, to measure the value of those neighborhood amenities. This approach is known as *hedonic valuation*.

The advantages of the hedonic approach are twofold. As with contingent valuation, individuals should be willing to pay up to value of the utility they derive from a community characteristic to secure housing with that characteristic, allowing hedonic estimates to capture the full tangible and intangible benefits of a particular amenity. Also, because hedonic valuation is based on actual market transactions, it is not subject to hypothetical bias, as is the case with survey-based willingness-to-pay estimates.

One weakness of the hedonic approach is that it is limited in its ability to provide estimates of the costs of specific types of crime because places with high incidence of one type of crime, such as robberies, tend to have high rates of other crimes, such as murder. Moreover, this approach can only estimate costs for crimes directly linked to neighborhoods; as a result, it cannot provide valuations of some crimes, such as identity theft, domestic crimes, and travel-related crime. A more significant drawback of hedonic valuation as applied to crime control is that it is generally difficult to statistically separate the effects of crime rates on housing prices from other neighborhood characteristics that tend to co-occur with high crime, such as poverty or low-performing schools. Hedonic models must control for all outside factors that influence both crime and housing prices to generate accurate estimates of the cost of crime. However, many such outside factors, such as the existence of racial tensions in a community, cannot be easily measured and are therefore difficult to control.

Because existing hedonic studies of crime have yet to overcome this methodological problem, we do not focus on crime cost estimates from hedonic studies in the discussion that follows. However, most studies, such as Thaler (1978) and Blomquist, Berger, and Hoehn (1988), are consistent with alternative approaches in demonstrating a substantial cost of crime. One recent paper that convincingly isolates the effects of crime risk from other neighborhood factors, Linden and Rockoff (2008), estimates a cost of $600,000 to $2.5 million per sexual assault based on housing-price changes associated with the movement of convicted sex offenders. This value is actually much higher than the cost values obtained using other methods but may reflect costs beyond those related solely to crime victimization.[5]

## What Do Representative Studies Tell Us About the Cost of Crime?

To conduct cost/benefit analyses of policing programs, we require crime cost estimates. We construct

[5] In particular, beyond the elevated risk of victimization that results from residing near a convicted sex offender, individuals may obtain displeasure from knowing that offenders can observe them even if they are never victimized.

such estimates here based on the literature surveyed in the previous section.

Table 1 summarizes the cost estimates from three high-quality studies of the cost of crime: two using accounting-based methods and one using contingent valuation. The crimes reported in the table are Part I crimes, the crimes the FBI combines to produce its annual crime index.[6] Nonindex crimes include such crimes as nonaggravated assault, forgery and counterfeiting, vandalism, and prostitution. Considering such nonindex crimes is important, and we discuss this issue later.

Dollar values from the original studies have been adjusted where necessary to year-2007 dollars. As shown, homicides are substantially more costly than other types of crimes, with an average cost of more than $8 million per homicide. Data from Cohen and Piquero (2009) and Miller, Cohen, and Wiersema (1996), who further decompose the costs of homicide, suggest that roughly 60 percent of homicide costs represent lost quality of life for victims, 30 percent reflect lost victim productivity, 6 percent are criminal justice system costs, 3 percent represent lost offender productivity, and 1 percent represent victims' medical expenditures and property losses. Accounting-based estimates of the cost of homicide are large because homicide eliminates an entire future stream of income, while contingent-valuation (willingness-to-pay) estimates are large because individuals generally are willing to trade appreciable amounts of wealth for modest changes in the risk of fatality. Costs are also high for crimes that inflict substantial psychological costs on victims, such as rape or robbery. Although typically much more prevalent, property crimes are much less costly than violent crimes. The final bolded and shaded column in Table 1 provides an average cost for the crimes discussed across the studies.

It is apparent from the table that there is no single number representing the cost of crime, and, although these studies use some of the best cost estimation methodologies currently available, it is important to recognize that there is considerable uncertainty about each of the estimates in the table. For rape and assault, for example, the latter studies obtain per-crime costs that are substantially above those reported in Miller, Cohen, and Wiersema (1996) and Cohen and Piquero (2009). In fact, Cohen et al. (2004) report the highest costs per crime for each crime type except assault, but this is to be expected, given that this study examines willingness to pay, a more inclusive cost concept.

It is clear from these numbers that the total social costs of crime are large, certainly much more than simply the costs of enforcement. Additionally, the fact that estimated costs are quite large when we look

**As measured by any of these approaches, the total social costs of crime are much more than simply the costs of enforcement.**

**Table 1**
**Cost-of-Crime Estimates from Three Studies**

| | Accounting-Based Methods | | Contingent-Valuation Method | |
|---|---|---|---|---|
| Index Crime Type | Cohen and Piquero (2009)[a] | French, McCollister, and Reznik (2004) | Cohen, Rust, et al. (2004) | Average |
| Homicide | 5,000,000 | 9,339,330 | 11,608,317 | 8,649,216 |
| Rape | 150,000 | 219,973 | 283,626 | 217,866 |
| Robbery | 23,000 | 51,117 | 127,715[b] | 67,277 |
| Serious assault | 55,000 | 122,943 | 83,771 | 87,238 |
| Burglary | 5,000 | 4,370 | 29,918 | 13,096 |
| Larceny | 2,800 | 1,478 | N/A | 2,139 |
| Motor-vehicle theft | 9,000 | 9,158 | N/A | 9,079 |

NOTE: Figures are in 2007 dollars. N/A = a crime type that was not examined in the given study.
[a] This study is based on the highly cited study by Miller, Cohen, and Wiersema (1996) but updates the cost estimates to include criminal justice costs and lost offender productivity.
[b] Cohen et al. (2004) focus on armed robbery, while other studies and the UCR program focus on robbery more generally, which includes less severe forms of robbery. Cohen and Piquero (2009) separately calculate cost estimates for both armed robbery and robbery and find the cost of a typical armed robbery to be 2.2 times the cost of a typical robbery. We thus adjust the Cohen et al. (2004) number by dividing it by 2.2 to approximate the cost of a generic robbery.

[6] Arson is also a Part I crime but has typically been excluded from cost-of-crime studies due to its rarity.

across several different methodologies for calculating costs gives us greater confidence that the actual social costs of crime are substantial.

While the total social costs of crime are large, it is important to understand how large they are relative to other measures—to make them less abstract and more concrete. One way to give context to these numbers is to compare the annual cost of crime in a locality to other objective economic measures, such as the gross municipal product (GMP), which measures the value of goods and services produced in a jurisdiction in a given year. Table 2 calculates the aggregate annual cost of major crime relative to GMP for the localities serviced by several large U.S. police departments in 2006.

The table uses the average cost reported across the three studies (the final column of Table 1) for these calculations, along with each department's published crime statistics and output data collected by the Bureau of Economic Analysis (2009).[7] In other words, we took annual department crime statistics broken out by the categories in Table 1 and multiplied the counts of crimes in each category by the average costs for such crimes derived in the final column of Table 1. For the Chicago Police Department, for example, this approach yields an annual cost of crime of $8.29 billion in 2006 dollars.

**For violent crimes, most of costs are intangible, whereas almost all costs for burglary, larceny, and motor-vehicle theft are tangible costs.**

As the table shows, annual crime costs in these cities and counties represent 1–6 percent of GMP. For example, for the Chicago Police Department, $8.29 billion represents 5.7 percent of the city's GMP of $144.6 billion. The 1- to 6-percent fraction across the localities and departments, while substantial, does not seem implausibly large. Estimated crime costs exceeded $1 billion annually in each of the six jurisdictions.

Beyond looking at aggregate crime costs, it seems natural to consider cost components and the distribution of costs among victims, the government, and society at large. Unfortunately, there are important methodological differences in the studies that make it difficult to compare cost components across studies. The contingent-valuation approach of Cohen et al. (2004), for example, does not identify cost components at all, but only permits calculations of total costs.

Among the studies that differentiate tangible and intangible costs, one empirical regularity that does emerge despite methodological differences is a much larger role of intangible costs for violent crimes. Table 3 reports the share of total costs represented by tangible and intangible costs in two of the studies described. As shown by the shading in the table, for violent crimes, most of costs are intangible, whereas

**Table 2**
**Crime Costs Compared to Economic Output in Several Jurisdictions**

| Locality | Law Enforcement Agency | Crime Costs, 2006 (2006 $ billions) | GMP, 2006 (2006 $ billions) | Crime Costs as Percentage of Total Output |
|---|---|---|---|---|
| Chicago | Chicago Police Department | 8.29 | 144.6 | 5.7 |
| Dallas | Dallas Police Department | 3.37 | 69.5 | 4.8 |
| Houston | Houston Police Department | 5.66 | 133.4 | 4.2 |
| Los Angeles | LAPD | 6.35 | 202.2 | 3.1 |
| Los Angeles County | Los Angeles County Sheriff's Department | 2.03 | 131.3 | 1.5 |
| Miami-Dade County | Miami-Dade Police Department | 1.75 | 109.0 | 1.6 |

[7] As discussed further later, these cost figures are likely to, if anything, understate the total cost of crime, because they exclude crimes other than index crimes and do not adjust for underreporting. GMP estimates cover metropolitan statistical areas (MSAs) as opposed to individual municipalities. We estimated the gross product for individual jurisdictions by multiplying the gross product of the encompassing MSA by the share of the MSA population represented by the service population of the department. These figures have been adjusted for cost differences across cities using wage data from the 2007 Occupational Employment Statistics published by the Bureau of Labor Statistics.

**Table 3**
**Percentage of Tangible and Intangible Costs by Crime Type for Two Studies**

| | Miller, Cohen, and Wiersema (1996) | | French, McCollister, and Reznik (2004) | |
|---|---|---|---|---|
| Crime Type | Tangible | Intangible | Tangible | Intangible |
| Homicide | 34 | 66 | 13 | 87 |
| Rape | 6 | 94 | 13 | 87 |
| Serious assault | 20 | 80 | 16 | 84 |
| Robbery | 29 | 71 | 43 | 57 |
| Burglary | 79 | 21 | 91 | 9 |
| Larceny | 100 | 0 | 99 | 1 |
| Motor-vehicle theft | 92 | 8 | 98 | 2 |

almost all costs for burglary, larceny, and motor-vehicle theft are tangible costs. Intangible costs as measured in these studies are borne primarily by victims, suggesting that the majority of violent-crime costs accrue to victims. Moreover, focusing solely on tangible costs is likely to lead us to undervalue crime control policies that primarily affect violent crime.

From a policy perspective, it may also be relevant to understand the portion of total crime costs that is paid by the government. Unfortunately, existing evidence on this point is relatively limited. Miller, Cohen, and Wiersema (1996) estimate that victims bear 77 percent of the tangible costs associated with violent crimes, with taxpayers covering an additional 14 percent and employers covering the remainder. Rajkumar and French (1997) calculate that criminal justice system costs, which are clearly borne by the government, represent 33 percent of tangible costs for aggravated assault; 52 percent for robbery; 70 percent for burglary; 79 percent for larceny; and 59 percent for motor-vehicle theft. Similarly, in a study prepared for the state of Washington, Aos et al. (2001) estimate a taxpayer criminal justice cost of $255,088 per murder, $92,705 per robbery, and $56,790 per serious assault. However, we lack evidence on the governmental share of many other cost components. For example, medical treatment can represent an appreciable cost for some crimes, but information on the share of victim treatment costs paid for through private versus government-based sources (such as Medicaid) remains limited. Moreover, some government expenditures that may have a crime control element, such as expenses for fences or public lighting, are not included in typical cost-of-crime studies.

## Evidence on the Relationship Between Crime and Police

To conduct cost/benefit evaluations that properly assess the value of police personnel investments, we need to know the social cost of particular crimes, which we examined in the previous section. We also need to know how investments in police will affect crime.

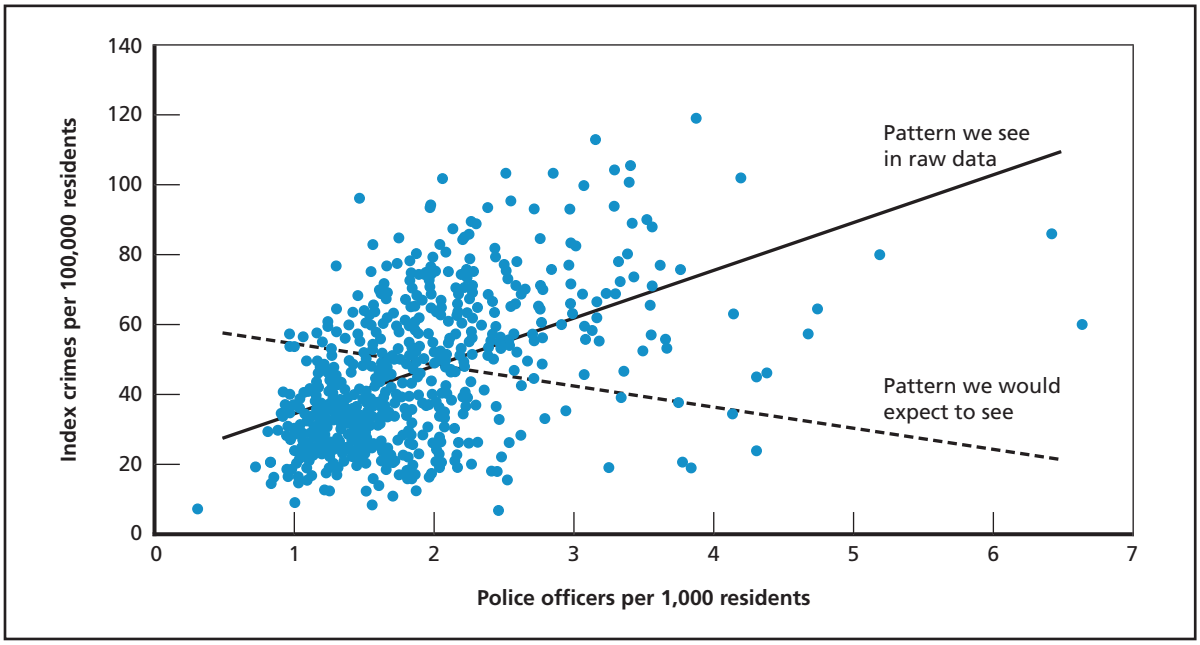
In this section, we review research studies that demonstrate how changing the number of police personnel affects crime. Research literature on the effectiveness of police has advanced considerably in recent years, with the highest-quality recent studies providing consistent evidence that police reduce crime. We start by illustrating what happens if we take a naïve approach to assessing the impact of police on crime. We then describe studies that overcome the limitations of the naïve approach and their findings. We end by using the results from those studies to arrive at a set of summary numbers—as we did in the previous section—that we can use later when we illustrate cost/benefit analyses.

## What Happens If We Take a Naïve Approach to Looking at the Effect of Police on Crime?

One way to examine the relationship between police staffing levels and crime across cities is to plot crime rates in a set of U.S. cities against the number of police in those same cities. That yields a scatterplot in which each dot represents the number of police in a city relative to the city's crime rate. Looking at how dots scatter across the two axes helps us determine whether there is a relationship between the two indicators being measured.

The figure represents an example of this exercise. It plots the Federal Bureau of Investigation (FBI) index crime rate in 2007 against the per-capita number of police; each dot represents one of a sample of 623 U.S. cities with population greater than 50,000. We would expect to find that adding police would reduce crime, which means that the dots should cluster along the dotted line shown in the figure. Instead, when we look at the raw data, we find that they

**Relationship Between Police Force Size and Crime in Large U.S. Cities, 2007**




**Increases in the number of police exert a statistically significant and practically important effect on several categories of crime.**

cluster along the solid line in the figure—a result that would indicate that crime is *higher* in areas with more police officers. To a naïve observer, the figure might suggest that police cause crime. In actuality, we expect that police reduce crime (that the clustering is indeed along the dotted line) but that there is a positive correlation between crime and police because of other factors, known as *confounding factors*. For example, police forces are generally larger in urban areas, and crime is also higher in urban areas. Additionally, political leaders may increase police force size in response to rising crime, a situation in which the causal chain runs from crime toward policing instead of from policing toward crime.

This exercise shows that failure to control for confounding factors may lead us to incorrectly assess the relationship between police staffing levels and crime levels. As a result, statistical studies designed to measure the effect of police on crime typically attempt to control for such factors. However, these studies must confront the fact that many important control variables, such as gang networks or the nature of local drug markets, may be difficult to observe and that the nature of the feedback from crime to police may be poorly understood. The inability to cleanly separate the effect of one variable—in this case, police personnel—from other factors that affect the outcome of interest is known as the *identification problem*. In the context of policing studies, this problem was articulated in a well-known study by the National Academy of Sciences on the estimation of the deterrent effects of sanctions (Fisher and Nagin, 1978).[8] In the next section, we focus on several recent studies that provide more-credible estimates of the effect of police staffing levels on crime because they adopt research approaches explicitly designed to overcome the identification problem.

## What Approaches Are Used to Estimate the Effect of Police on Crime?

From a research standpoint, the ideal way to measure the effect of police on crime would be to mimic the randomized-control methodology used in clinical trials and randomly assign additional officers to work in particular cities or areas within a city. By examining how crime rates change across areas with different numbers of officers, one might measure the causal effects of officers on crime. Random assignment would guarantee that the areas with many officers would have similar characteristics, on average, to areas with few officers, permitting us to isolate the effects of police from other confounding factors.

As a practical matter, however, random assignment of police is generally unrealistic for many reasons, including the fact that directing additional

[8] Summarizing existing research to that point, Fisher and Nagin stated, "Without identification, estimation is logically impossible. Researchers who have employed simultaneous equation techniques to study the deterrent effect of sanctions on crime have failed to recognize fully the importance of this issue. The restrictions that the[y] (implicitly or explicitly) use to gain apparent identification have little theoretical or empirical basis" (p. 396).

officers to areas with no obvious need is likely to be inefficient.[9]

To identify "random" variation in personnel levels that can be used to overcome the identification problem, researchers have instead attempted to isolate factors that affect police staffing levels but that are otherwise unrelated to crime rates. These analyses, because they attempt to mimic the random assignment of pure experiments, are known as *quasi-experimental studies*. In the remainder of this section, we describe several quasi-experimental studies that measure the effects of police on crime. Although a large number of correlational studies perform comparisons like those in the figure and find a positive or zero impact of police on crime, these higher-quality studies consistently demonstrate that police reduce crime. Most of the studies described in this section focus on the effects of changes in the number of sworn or patrol personnel, as opposed to overall department staffing levels.

### Approach 1: Hiring Programs

Evans and Owens (2007) estimate the effects of police on crime in the United States using a large national hiring program, the Community Oriented Policing Services (COPS) program. COPS was a federal initiative that provided funding to state and local law enforcement agencies to hire additional officers. Drawing from FBI UCR data tracking crime rates and police staffing levels across 2,074 U.S. cities over an 11-year period, Evans and Owens first demonstrate that the size of COPS grants was unrelated to preexisting trends in crime or police hiring, suggesting that grant receipt was random with respect to expected future crime rates. They next show that grant receipt had a positive effect on police force size and then use the changes in force size that occurred in different localities because of COPS grants to estimate the effects of police on crime. Evans and Owens find that increases in the number of police exert a statistically significant and practically important effect on several categories of crime, including burglary, robbery, auto theft, and assault. On average, they find that a 1-percent increase in the size of the police force decreased property crime rates by 0.25 percent and violent crime rates by 1 percent. Their findings were replicated in a study using similar methods conducted by the U.S. Government Accountability Office (2005).[10]

### Approach 2: Election Cycles

Levitt (1997) observes that police are more likely to be hired during mayoral and gubernatorial election years as incumbents attempt to demonstrate to voters that they are tough on crime. Because the timing of elections across different cities is determined legislatively and is likely not directly related to crime rates, elections provide a source of plausibly random variation in police force levels. Drawing from a panel of 122 large cities observed from 1975 through 1995, Levitt (2002) demonstrates that increases in the size of the police force are associated with statistically significant reductions in violent and property crime, with a 10-percent increase in the number of police generating a roughly 5-percent decrease in crime.[11]

**Increases in the size of the police force are associated with statistically significant reductions in violent and property crime.**

### Approach 3: Reallocations in Response to Terrorist Threats

Police officials may temporarily increase officer manpower on the street if they have information that a terrorist attack is more likely in a particular location or time period. However, the timing of terrorist threats is unlikely to be directly related to underlying patterns of street crime.[12] Di Tella and Schargrodsky (2004) examine vehicle thefts in areas surrounding Jewish and Muslim institutions in Buenos Aires, which received additional protection following a bombing of a major Jewish center in 1994, and demonstrate that a tripling of patrol officers decreased theft by 75 percent. Klick and Tabarrok (2005) examine patterns of crime in Washington, D.C., associated with changes in the terror alert level, which leads to heightened activity by the D.C. police, particularly in the National Mall area. They demonstrate that crime decreases by 6 percent on high-alert dates and

[9] One exception is the Kansas City Preventive Patrol study (Kelling et al., 1974), an influential study conducted by the Police Foundation in which different patrolling approaches were randomly assigned to beats within an area of the city. This study found no reductions in crime in areas patrolled by more officers, leading many scholars to conclude that increasing police staffing levels does not affect crime. However, because the operational behaviors of officers were carefully regulated during the experiment, the results of this experiment are best understood as demonstrating the effects of a particular approach to policing—namely, vehicle-based patrols—as opposed to the effects of additional police per se. Moreover, some scholars have argued that police altered their behavior in response to participation in the experiment (Larson, 1975), a phenomenon known as the *experimenter demand effect*, which would limit the applicability of these findings to other settings.

[10] Other studies using different methods, such as Zhao, Scheider, and Thurman (2002), also find that COPS grants reduced crime. One recent contrary study is Worrall and Kovandzic (2007). However, this study looks at a much narrower set of cities and measures COPS grants using dollars per local resident, making it unable to capture the impact of the grants on force size.

[11] McCrary (2002) subsequently noted a computer programming error in the original paper by Levitt that led to an overstatement of the statistical precision of the results. Levitt (2002) provides revised estimates based on similar logic to that in the original paper but with improved precision.

[12] Obviously, this assumption would fail if terrorist threats were aimed at major events, such as holidays or sporting events. However, none of the studies described examines this type of situation.

that these decreases are concentrated among auto and other thefts near the National Mall. Draca, Machin, and Witt (2008) examine crime patterns in London following the July 2005 bus bombings, which led to a substantial reallocation of officers to the central city for a six-week period; they find that a 10-percent increase in police staffing levels generates a 3-percent reduction in crime.

A drawback of studies focusing on personnel reallocations because of terrorist threats is that such threats may induce the general public to avoid the areas with heightened police presence, thereby reducing the size of the population at risk and, thus, mechanically reducing crime. Although most studies attempt to account for such changes using measures of general activity (such as public-transit ridership), such controls are imperfect proxies for crime exposure. Additionally, given that these studies focus on particular time periods and departments, how readily they generalize to other police departments is unclear. At the same time, all three studies provide very similar estimated effects of police, which is notable given that they consider different countries and contexts.

### Approach 4: Timing of Police Personnel Changes

Corman and Mocan (2000) use monthly data from New York City covering a 27-year period to estimate a statistical model explaining crime levels as a function of past arrests, drug use, poverty, and police force size. They empirically demonstrate that the requirement to train new officers implies that police staffing levels respond to changes in the crime rate with a lag of about six months, meaning that it is possible in high-frequency data to disentangle the effect of police on crime from the effect of crime on police, by differentiating short-run and long-run effects. Increases in the police force are associated with decreases in both burglary and robbery, with a 10-percent increase in personnel generating a 4- to 5-percent reduction in each crime.

**Estimates are most useful for projecting the effects of small to modest changes in the number of police and may be less informative about large changes in force size.**

## How Much Do Additional Police Reduce Crime?

As we did earlier, we combine results from several studies to develop estimates of the expected decrease in crime that would occur if we increase the police force by 1 percent in a typical department. Table 4 reports the effect estimates by crime category for the multiple published studies described in the previous section. Although effect estimates vary from study to study, the general message is that, once the identification problem is adequately addressed, increases in police staffing levels do generate measurable decreases in crime. The final column (bolded and shaded) combines information across studies by averaging the effects estimates using a process known as meta-analysis.[13] In our cost/benefit calculations, we use the combined impact estimates as our baseline measures of the effects of police on crime. For example, the 0.927 combined impact reported for homicide means that, in a typical department, we expect that a 1-percent increase in the number of sworn officers would decrease the number of homicides in that department's patrol area by 0.927 percent. Although the combined impact is negative for rape and larceny, these values are not statistically significantly different from zero. Given that we cannot confidently claim from existing studies that adding police will have a nonzero effect on rape and larceny, we further adopt the conservative assumption that police have no impact on rates of rape or larceny when we do our cost/benefit analyses later.

When evaluating specific policy proposals, it is important to remember that these statistical estimates of the effectiveness of police are designed to assess the effects of modest variations in police force size while holding other social factors constant at their observed levels. This means that these estimates are most useful for projecting the effects of small to modest changes in the number of police and may be less informative about large changes in force size, such as a 50-percent decrease in the number of officers. Moreover, the applicability of these estimates to any particular city will depend on the similarity between that city and those examined in these studies. Evans and Owens (2007) and Levitt (1997, 2002) focus on a broad cross-section of large to medium-sized U.S. cities and thus are likely to capture effects for a typical U.S. city. The other studies focus on particular large metropolitan departments. Because we lack credible city-specific estimates of the effectiveness of police, in order to do cost/benefit calculations, we must generically apply these estimates to specific cities. Yet, clearly, in actuality, there will be variation across cities in police effectiveness.

## Cost/Benefit Calculations for Investments in Police Personnel

With estimates of the effectiveness of police and

[13] Statisticians have developed the formal methodology of meta-analysis for combining estimates across different studies into a single effect estimate. Among other factors, meta-analysis takes into account the fact that studies differ in the precision with which they are able to estimate effect sizes. The combined estimates reported here are obtained through a meta-analysis with inverse variance weighting.

**Table 4**
**Percentage Change in Crime Generated by a 1-Percent Increase in Police Personnel Levels**

| | Election-Cycle Approach | Hiring Approach | Timing Approach | Reallocation Approach | | |
|---|---|---|---|---|---|---|
| Index Crime Type | Levitt (2002) | Evans and Owens (2007) | Corman and Mocan (2000) | Klick and Tabarrok (2005) | Di Tella and Schargrodsky (2004) | Combined Impact |
| Homicide | –0.914* | –0.84* | –1.385 | N/A | N/A | –0.927* |
| Rape | –0.034 | –0.42 | N/A | N/A | N/A | –0.170 |
| Robbery | –0.452* | –1.34* | –0.526* | N/A | N/A | –0.592* |
| Serious assault | 0.397 | –0.96* | –0.288 | N/A | N/A | –0.292* |
| Burglary | –0.195 | –0.59* | –0.419* | –0.30* | N/A | –0.404* |
| Larceny | –0.135 | –0.08 | N/A | NS | N/A | –0.103 |
| Vehicle theft | –1.698* | –0.85* | –0.452 | –0.86* | –0.33* | –0.440* |

NOTE: * = statistically significant estimate. NS = estimate that is not significant; no numeric estimate reported. N/A = a crime type that was not examined in the given study.

cost of crime in hand, we are prepared to conduct simple cost/benefit analyses of policy proposals aimed at increasing or decreasing the number of police personnel. In this section, we outline the calculations required for a cost/benefit analysis and provide several examples, drawing from actual policies implemented in localities in the United States. In particular, we look at one example in Los Angeles, California, and another in Toledo, Ohio. We first discuss how to perform basic cost/benefit analyses before turning to the two example analyses themselves. Finally, we consider sensitivity analyses and alternatives to the basic analysis, using the Los Angeles example for illustration.

## How to Conduct Basic Cost/Benefit Analyses of Police Hiring

The cost/benefit analyses use the data from Tables 1 and 4. Our estimates of the effectiveness of police are expressed in *elasticity* terms, which means that they relate percentage changes in the size of the police force to percentage changes in crime.[14] To evaluate a particular policy proposal, we must first calculate the percentage change in personnel that would result from the proposal. This calculation may require information about the current size of the force. We then multiply the percentage change in force size with the appropriate elasticity value from Table 4 for each crime type to calculate the expected percentage change in crime resulting from the force size adjustment. Using information about current crime levels in the location of interest, we then calculate the absolute number of each type of crime that would be expected because of the policy change, by multiplying the percentage change by the number of crimes for each crime type. Information on current crime levels can be drawn from FBI UCR data or department statistical reports.

We next multiply the expected impact on the absolute number of crimes by the cost per crime from Table 1 to assign a monetary value to the change in crime associated with the new policy. Summing across all crime types provides an estimate of the aggregate social benefit (cost) of the policy in terms of reduced (increased) crime. Comparing that benefit with the monetary cost of the policy allows us to assess whether the policy passes a cost/benefit test.

## Example Cost/Benefit Calculations

### Los Angeles Police Department Hiring

A centerpiece of Los Angeles Mayor Antonio Villaraigosa's municipal agenda has been a push since 2005 to increase the size of the LAPD by 1,000 sworn officers, growing the force by approximately 10 percent from the existing force of more than 9,000 sworn officers over a five-year period. The police expansion was expected to cost $125 million to $150 million annu-

[14] Elasticities are commonly used among economists because they are often thought to better approximate actual empirical relationships between inputs and outputs than absolute measures. Two consequences of assuming a constant elasticity relationship between police and crime are worth noting. First, this assumption implies that we would never predict that crime could be completely eliminated by adding police officers. Furthermore, adding police will result in diminishing returns in reducing crime; in other words, as the police force grows large and crime decreases, achieving an increase in force size of a given percentage requires hiring more police and yields a smaller absolute reduction in crime. Both of these implications seem intuitively reasonable.

**Table 5**
**Crime-Reduction Benefits of a 10-Percent Increase in the Number of Police Personnel in Los Angeles**

| Index Crime Type | Average Yearly Number of Crimes, 2005–2007 | Projected Crimes Averted from 10% Increase in Police | Cost Per Crime ($) | Projected Cost Savings ($ millions) |
|---|---|---|---|---|
| Homicide | 453 | 42 | 8,649,216 | 363.27 |
| Rape | 951 | 0 | 217,866 | 0.00 |
| Robbery | 13,743 | 814 | 67,277 | 54.76 |
| Serious assault | 14,169 | 414 | 87,238 | 36.12 |
| Burglary | 20,462 | 827 | 13,096 | 10.83 |
| Larceny | 59,704 | 0 | 2,139 | 0.00 |
| Motor-vehicle theft | 24,872 | 1,094 | 9,079 | 9.93 |
| **Aggregate cost savings ($ millions)** | | | | **474.91** |

ally, with the funds for the expansion coming from a phased increase in trash-collection fees.[15]

Table 5 calculates the expected annual benefits of the 10-percent increase in the police force in terms of reduced crime. The first column presents the annual average citywide counts of index crimes derived from LAPD statistics covering the first several years of the hiring push. The next column projects the number of crimes that would be averted by a 10-percent increase in police by multiplying the average number of actual crimes by ten times the elasticity estimates in Table 4. For example, to get the savings from averted homicides (row 1), we take 453 homicides per year (obtained from crime statistical reports from Los Angeles) and multiply them by 0.00927 (the effect of police on homicide from Table 4 converted from a percentage to a decimal) and then by 10 (10-percent increase in the number of officers), which equals the 42 homicides averted. We then multiply those 42 homicides averted by $8,649,216 (the cost per homicide from Table 1), which equals $367.27 million saved.

Multiplying by the average cost per crime and summing across crime types yields the net benefit of the policy in terms of reduced crime costs. The annual benefit of this policy is projected to be $475 million, three to four times the projected $125 million to $150 million cost of the hiring program. Thus, the investment in additional police appears quite favorable from a cost/benefit standpoint. Recall also, as noted in the previous section, because we were unable to derive statistically significant elasticity estimates for rape and larceny, we make the conservative assumption that none of these crimes are averted by additional police, although there might in actuality be crime reductions and associated cost savings.

The fact that benefits are much larger than costs is important in this example because of the considerable uncertainty surrounding the cost and effectiveness estimates. Even if the studies described substantially overstate the costs of crime or the effectiveness of police, investments in police still appear favorable. For example, if the true costs of crime were only half as much as those in the cited studies or police were only half as effective as the best research studies suggest, hiring more police in Los Angeles would still look like a fairly attractive investment. Additionally, although these estimates may be overstatements, it is equally possible that they understate the effects of police or the cost of crime, in which case the social returns to investments in police personnel would be even higher than what is suggested by these calculations.

## Police Force Reductions in Toledo, Ohio

In the wake of a substantial municipal budget shortfall, the Toledo Police Department was forced to lay off 75 officers on May 1, 2009, to generate approximately $6 million in annualized cost savings for the city.[16] Relative to Toledo's initial force strength of 616 officers, this reduction represented a 12-percent reduction in the size of the force. Because this example involves a reduction in force size, the relevant cost/benefit calculation compares the cost savings generated

[15] We rely on the original cost projections for the program in the analysis that follows. Several other sources roughly corroborate these original cost estimates. For example, a 2008 report by the Los Angeles City controller reviewing trash fee revenues and expenditures estimated that $47.6 million in trash fee revenues had been spent between September 2006 and July 2008 to hire 366 officers, a cost of $129,000 per officer (Chick, 2008). Moreover, the LAPD's operating budget in 2006 was $1.2 billion, suggesting that a 10-percent expansion would cost roughly $120 million, a number in line with the original cost estimates.

[16] Some of the police originally dismissed have been hired back through a variety of state and federal grants.

by the force reduction to the social costs of additional crime expected because of diminished enforcement. In other words, instead of looking at the number of crimes averted and the benefits of reduced crime (as in the LAPD example), we are looking at the number of additional crimes committed and their costs.

Table 6 presents an estimate of the expected crime costs of this force reduction. The process used to derive the aggregate costs is the same as the one just described to calculate aggregate saving for the LAPD proposal. The costs of the police force reduction in terms of additional crimes ($32 million) are several times higher than the $6 million saved by the city, indicating that this policy fails a cost/benefit test. Obviously, the majority of crime costs are not borne by the city, so it is likely that the force reduction will improve the city's fiscal condition. However, from a larger societal standpoint, the policy appears detrimental. Moreover, the large disparity between costs and benefits suggests that force reduction would have net costs to society even under much more conservative cost assumptions. For example, excluding any effect of the force reduction on homicides still leaves costs that are about twice as large as fiscal benefits.

## Calculations for Other Cities

In a general sense, the cost/benefit calculus depends on the distribution of crimes within a particular city and the expected cost of hiring more police. Localities with smaller police forces or lower costs per officer will tend to fare better in these calculations because they can achieve a given percentage change in force size with lower expenditures. Policing investment in cities with large numbers of high-cost crimes, such as homicide, will also appear better because there are significant gains from crime reduction in such settings.

Departments also vary in the cost of police personnel because of differences in such factors as pay and equipment and training costs. In the Los Angeles and Toledo examples just given, the cost estimates are based on budget proposals that projected the costs or savings associated with the change in the size of the police force. An alternative simple method for calculating costs of a particular policy is to divide the annual budget of the police department by the anticipated percentage change in the number of officers, as a rough estimate of the expected cost. One advantage of this approach is that it essentially incorporates the cost of training, equipment, and support personnel into the cost calculations, since these are included in the overall budget numbers. As a general principle, cost calculations should include not only officer pay but also the costs of such other factors as equipment or administrative personnel that are necessary for officers to work effectively.

Subject to the caveats noted previously about the generalizability of the cost and effectiveness estimates, the approach illustrated in the two examples can be applied to any locality for which there are available data on crime counts, current police staffing levels, and the cost of hiring or separating additional officers. To illustrate this idea, Table 7 estimates the expected crime control benefits of hiring an additional officer in several large U.S. police departments. These calculations are based on actual staffing levels and crime patterns in each city in 2007, the latest year of available UCR data, and assume that each city is similar to the average city in terms of its cost per crime and police effectiveness.[17]

**Table 6**
**Additional Crime Costs from a 12-Percent Reduction in the Number of Police Personnel in Toledo**

| Index Crime Type | Number of Crimes, 2008 | Projected Additional Crimes from 12% Decrease in Police | Cost Per Crime ($) | Projected Additional Costs ($ millions) |
|---|---|---|---|---|
| Murder | 18 | 2 | 8,649,216 | 17.30 |
| Rape | 132 | 0 | 217,866 | 0.00 |
| Robbery | 1,383 | 82 | 67,277 | 5.52 |
| Serious assault | 2,088 | 61 | 87,238 | 5.32 |
| Burglary | 6,522 | 263 | 13,096 | 3.44 |
| Larceny | 10,671 | 0 | 2,139 | 0.00 |
| Motor-vehicle theft | 447 | 20 | 9,079 | 0.18 |
| **Aggregate costs ($ millions)** | | | | **31.76** |

[17] As in Table 2, we do adjust for general cost differences across localities, using a wage index.

**Table 7**
**Expected Crime-Reduction Benefits from Hiring an Additional Officer in Several Large Departments**

| Police Department | Expected Benefits of Hiring an Additional Officer ($) |
|---|---|
| Chicago | 391,655 |
| Dallas | 673,316 |
| Houston | 797,816 |
| Los Angeles | 482,966 |
| Los Angeles County Sheriff | 151,369 |
| Miami-Dade | 304,561 |

Expected crime-reduction benefits of additional sworn personnel are considerable in all six of the localities. Predicted benefits exceed $150,000 in each of the departments, while, for Dallas and Houston, annual expected benefits per officer are more than $600,000. The particularly large benefits in Dallas and Houston reflect the fact that these cities have the higher crime levels of large urban centers but departments that are fairly small relative to their service population. The calculations in Table 7 suggest that police personnel investments have substantial social returns.

## How Sensitive Are the Cost/Benefit Analysis Results to Different Numerical Inputs?

These two examples of cost/benefit analysis perform a single cost/benefit calculation using average values for the cost of crime and effectiveness of police and specific information about personnel and crime in a particular location: the values in the bolded final columns of Tables 1 and 4. However, there is uncertainty surrounding the true cost of crime and effectiveness of police arising from limitations of the data sources and statistical models in the cited studies. An alternative method for conducting the cost/benefit analysis is to present a range of possible cost/benefit calculations under varying assumptions about the costs of crime and effectiveness of police—in other words, not just the average estimates. One advantage of this approach is that it indicates the extent to which the conclusion that a particular investment is worthwhile is sensitive to the choice of cost and effectiveness values. Another way to think about this is that it tells us how "robust" the findings are—if we use different but still reasonable numbers, do the benefits diminish significantly or even disappear?

To illustrate sensitivity analysis, we return to the LAPD case and examine the sensitivity of the conclusion that the 10-percent expansion of the police force in Los Angeles passes a cost/benefit test. In this example, we consider a variety of alternative assumptions about the cost of crime and effectiveness of police. We first consider whether our conclusions vary according to whether we use cost or effectiveness numbers drawn from particular studies. In particular, we consider (A) using the average cost across studies, as in the two examples (the baseline here); (B) using the cost estimates from Cohen and Piquero (2009), which are the lowest cost estimates across the three studies; (C) using the cost estimates from Cohen, Rust, et al. (2004); and (D) using the cost estimates from French, McCollister, and Reznik (2004).

We similarly consider cost/benefit calculations drawn from each of the individual studies of police effectiveness. In particular, we consider (1) using the average elasticity across studies, as in the two examples (again, the baseline); (2) using the lowest elasticity estimate across the five cited studies for each crime type; (3) using the highest elasticity across studies for each crime type; (4) using the elasticity estimates from Levitt (2002); (5) using the elasticity estimates from Evans and Owens (2007); (6) using the elasticity estimates from Corman and Mocan (2000); and (7) using the average elasticity but assuming that additional police do reduce rape and larceny—the opposite of the assumption we made in the original analyses.[18]

To facilitate comparison of the different cost and effectiveness scenarios, we present our estimates in a grid format in Table 8. Cost scenarios are consistent across columns, and effectiveness scenarios are consistent across rows, using the A–D and 1–7 labeling just described. To facilitate interpretation of these estimates, we have highlighted benefit estimates above $175 million in green, indicating that program costs are likely to exceed benefits in these scenarios. Scenarios predicting benefits below $100 million would be colored red, indicating that the program is

[18] For studies that did not estimate a particular cost or elasticity value (such as vehicle theft costs in Cohen, Rust, et al. [2004] and the larceny elasticity in Corman and Mocan [2000]), we used the average value from other studies in our calculations.

**Table 8**
**Projected Benefits of Los Angeles Police Department Expansion Using Alternative Cost/Effectiveness Estimates**

| | | Cost Scenario | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| Effectiveness Scenario | | Average | Cohen and Piquero (2009) | Cohen, Rust, et al. (2004) | French, McCollister, and Reznik (2004) |
| 1 | Average | **474.9** | 264.9 | 660.7 | 498.3 |
| 2 | Low | 383.6 | 213.7 | 540.4 | 396.4 |
| 3 | High | 839.4 | 474.2 | 1,151.9 | 891.3 |
| 4 | Levitt (2002) | 396.1 | 231.3 | 564.9 | 390.9 |
| 5 | Evans and Owens (2007) | 607.7 | 332.4 | 847.2 | 642.1 |
| 6 | Corman and Mocan (2000) | 577.5 | 321.9 | 823.1 | 587.1 |
| 7 | Average with rape and larceny | 479.6 | 268.2 | 683.3 | 666.6 |

NOTE: Reported values represent projected crime-reduction benefits of a 10-percent increase in the size of the LAPD. Data are in millions of 2007 dollars.

unlikely to pass a cost/benefit test. Yellow scenarios would include benefit estimates in the range of $100 million to $175 million, which approximates the predicted costs of the program. Each table entry reports the aggregate estimated benefit of the hiring program under a particular combined cost/effectiveness scenario. The table thus reports the results of 24 separate calculations like those in the Los Angeles example. This original example is shown in the bolded and heavily boxed cell—cell A1—with an estimated benefit of $474.9 million reported in Table 5. Each estimate in the other cells employs different numerical assumptions. For example, the entry in cell B5 of $332.4 million indicates that using the crime cost numbers from Cohen and Piquero (2009) and estimates of police effectiveness contained in Evans and Owens (2007), a 10-percent increase in police personnel in Los Angeles is predicted to generate a $332 million in annual social benefits from reduced crime, versus $474.9 million in the average case.

As the consistent green highlighting in Table 8 indicates, regardless of which study's numbers are used for crime cost or police effectiveness, the benefits of the LAPD expansion are likely to outweigh costs—that is, pass a cost/benefit test. Benefit estimates range from $214 million to $1.4 billion across scenarios. Benefits of this program outweigh costs even when assuming that police effectiveness and crime costs lie at the lower margin of published estimates. Thus, in the sensitivity analysis, the earlier conclusions based on average values are found to be robust.

## Expanding the Cost/Benefit Calculations

Beyond simply determining whether the cost/benefit results are sensitive to varying the choice of studies used in constructing the estimates, we can also expand the cost/benefit analysis to determine how the cost/benefit calculations change as we adopt narrower or more-expansive concepts of which crimes and which costs to include. As such, the approach can be modified to accommodate a broad range of alternative assumptions that might be held by policymakers.

**The cost/benefit analysis could incorporate additional costs (such as the social cost of use of force) and benefits (such as increased traffic safety).**

Our original analysis made numerous simplifying assumptions that could be relaxed in the cost/benefit analysis. For example, our analysis focuses on the effects of police on crime control, but police may generate benefits and costs in other areas that are not included in these calculations. On the benefit side, it seems likely that law enforcement increases traffic safety, a potentially significant benefit, given the high cost of traffic accidents in the United States.[19] Unfortunately, there are few estimates of the effects of police on traffic safety that credibly control for other confounding factors. Police may also generate substantial but hard-to-value benefits in public emergencies, such as natural disasters. Then again, some police activities, such as actions involving excessive use of force or racial profiling, may generate social costs. The cost/benefit analysis could be expanded to incorporate some of these additional costs and ben-

[19] Estimates by the National Safety Council (2007) peg the total cost of traffic accidents in the United States at $250 billion per year.

efits, although, admittedly, devising reliable estimates of some of these other cost and benefit components would be difficult.

Also, in the original calculation, we consider only FBI index crimes, which are the crimes for which we have the best available information about the costs and the deterrent effect of policing. Clearly, police are likely to deter other types of crimes, and failing to account for these effects would, in general, lead us to understate the benefits of police. We note, however, that the proper notion of costs in the case of "victimless" crimes, such as drug possession or prostitution, is debatable, and the costs of excluded crimes seem likely to be modest relative to the costs of the index crimes.

Moreover, the original calculations consider reported crime only. Since, almost by definition, unreported crime is unobservable to researchers, studies that estimate the effectiveness of police do so for reported crime. To maintain comparability with the effectiveness studies, we have included only reported crime in our cost/benefit calculations. However, the benefits of police are likely to be substantially higher than is implied by the basic estimates if police deter unreported crime at the same rate as they deter reported crime. Alternatively, it may be that the relationship between police staffing levels and unreported crime is different from the relationship between staffing levels and reported crime; we lack empirical evidence on this point.[20]

**Researchers typically prefer cost estimates that include both tangible and intangible costs, despite the challenges of measuring the latter.**

In addition, these estimates consider only the effects of generic increases in the size of the police force and thus do not account for the possibility that not only the absolute number but also the composition of personnel changes may affect crime.[21] For example, adding detectives may have different effects than adding patrol officers, as might adding management versus front-line personnel. Because evidence on the relative effects of different types of police personnel on crime is fairly scarce, we do not explore this issue here. However, a more comprehensive benefit/cost analysis might consider alternative strategies for deploying personnel investments and calculate a benefit/cost ratio for each potential strategy.

To illustrate how the cost/benefit calculations can be modified to incorporate alternative assumptions, we return to the Los Angeles example. We consider several cost/benefit scenarios in Table 9. For each scenario, we separately calculate benefits of the program under average, low, and high estimates of police effectiveness. For comparison purposes, the original averages from the baseline analysis reported in Table 6 are included in cells A1, A2, and A3 of Table 9, which are bolded and boxed.

Each cell reports the outcome of a cost/benefit calculation that uses a particular set of assumptions regarding the correct set of costs or crimes to include in the calculation. For simplicity, our basic analysis uses national-level average crime costs that are unadjusted for the fact that prices and costs vary from locality to locality. Because wage losses represent an important component of crime costs, in column B, we examine how costs change as we adjust for the fact that wages are generally higher in Los Angeles than in the nation as a whole, suggesting that crime costs in Los Angeles are likely to be higher. As Table 9 demonstrates, adjusting in this manner increases the benefit/cost ratio of the LAPD expansion in all three effectiveness scenarios relative to the average cases.

Some policymakers have argued that only tangible costs of crime should be counted, partly out of a belief that tangible cost measures are more reliable. Column C recalculates the benefits of this policy, including only tangible costs. We note, however, that limiting the analysis to solely tangible costs requires fairly unrealistic assumptions about the nature of crime costs. For example, Miller, Cohen, and Wiersema (1996) calculate that a typical sexual assault or episode of child abuse, respectively, generates tangible costs to victims of $7,300 and $11,400; these values seem improbably low. Moreover, because individuals, such as neighbors or witnesses, who are not direct crime victims typically do not sustain monetary costs, analyses incorporating only tangible costs, in effect, assume that such individuals are not affected by neighborhood crime. In actuality, most policymakers would probably agree that such individuals are harmed by crime. Finally, the notion that only economic or tangible costs count is contradicted by the fact that juries in thousands of civil cases have chosen to award crime victims general monetary damages, presumably reflecting their belief that losses to victims go beyond simple economic damages. Because such inconsistencies arise when we measure crime costs solely using tangible costs, researchers typically prefer cost estimates that include both tangible and intangible costs, despite the challenges of measuring intangible costs.

Alternatively, some may argue that assigning a high social cost to homicides is inappropriate because homicide victims themselves are often gang members or criminals. Putting aside discussions of the valid-

[20] Levitt (1998) also demonstrates that willingness to report crime may be correlated with the size of the department.

[21] Indeed, Garicano and Heaton (2010) demonstrate that particular types of personnel investments, such as the use of educated personnel and specialized units, are associated with larger crime reductions under certain conditions.

**Table 9**
**Projected Benefits of Los Angeles Police Department Expansion Under Alternative Crime Cost Assumptions**

| Effectiveness Scenario | | Cost Scenario | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H |
| | | Average | Cost of Living | Tangible Only | No Homicide | Reporting Adjustment | Other Crimes | Tangible Only, Reporting and Cost-of-Living Adjustment, and Other Crimes | No Homicide, Reporting and Cost-of-Living Adjustment, and Other Crimes |
| 1 | Average | 474.9 | 516.9 | 101.6 | 111.6 | 543.3 | 491.6 | 141.5 | 214.3 |
| 2 | Low | 383.6 | 417.6 | 79.4 | 54.5 | 412.2 | 392.0 | 101.3 | 95.2 |
| 3 | High | 839.4 | 913.8 | 200.9 | 296.7 | 1016.5 | 847.8 | 288.2 | 530.1 |

NOTE: Reported values represent projected crime-reduction benefits of a 10-percent increase in the size of the LAPD. Data are in millions of 2007 dollars.

ity of that viewpoint, we can examine how such an assumption might change our findings by recalculating the benefits of the program under the fairly extreme assumption that additional homicides entail zero social cost (column D).

After excluding intangible costs or homicide costs, whether the police expansion passes a cost/benefit test varies according to modeling assumptions about police effectiveness. Under optimistic effectiveness scenarios, the policy still passes a cost/benefit test, but it fails under more-pessimistic projections.

As noted already, the baseline analysis considers only effects on reported crime, while additional police may affect both reported and unreported crime. Column E replicates the calculations under the assumption that police have the same effect on unreported crime as they do on reported crime. Crime-reporting rates are drawn from Rand (2008), which computes them from the NCVS.[22] Accounting for unreported crime raises the estimated benefits of the policy by 15–20 percent.

Column F attempts to account for the possibility that police also reduce crime other than Part I index crimes, as discussed earlier. We impute the incidence of nonindex crimes based on the number of index crimes[23] and estimate the costs of nonindex crimes based on cost estimates from Rajkumar and French (1997); French, McCollister, and Reznik (2004); and Cohen and Piquero (2009).[24] Because high-quality studies of police effectiveness do not provide estimates of the impacts of police on nonindex crimes, we assume elasticities of –0.2, –0.1, and –0.3 for the average, low, and high effectiveness scenarios for these crimes. We view these as conservative elasticity assumptions, although the true effects of police on Part II crimes remain unknown. As Table 9 demonstrates, adjusting for other crimes increases the estimated benefits of the policy by between $8 million and $16 million These calculations suggest that, although Part II crimes are relatively common, they account for a fairly small fraction of the overall benefits of crime reduction, because the costs of these crimes are low.

The prior examples consider only modest departures from the basic assumptions about costs and effectiveness used in the original Los Angeles example in Table 5. Obviously, more-complicated permutations could also be considered. For example, columns G and H of Table 9 exclude intangible costs or homicide costs but allow for effects of police on unreported crime and non–Part I crimes and adjust for cost-of-living differences. These estimates essentially combine the approaches of columns B, C, E, and F and columns B, D, E, and F. Columns G and

**Although Part II crimes are relatively common, they account for a fairly small fraction of the overall benefits of crime reduction, because the costs of these crimes are low.**

[22] Adjusting for reporting increases the estimated benefits of crime reduction—for example, if the cost per actual robbery is $67,200 and the robbery-reporting rate is 65.6 percent, then the total crime cost per reported robbery is $102,400. An obvious limitation of this simple approach is the fact that victims may be less likely to report crimes when they are less severe, in which case unreported crimes are probably less costly than reported crimes.

[23] In particular, national crime estimates for 2007 produced by the FBI indicate that there are approximately 2.3 other violent crimes per Part I (index) violent crime (primarily assaults), 0.5 other property crimes per Part I property crime (primarily fraud and vandalism), and 4.4 public-order crimes per Part I crime.

[24] Cohen and Piquero (2009) estimate the cost of a simple assault to be $11,000 per offense. Reported costs of Part II property crimes are $150–$800 in Rajkumar and French (1997); roughly $500 in French, McCollister, and Reznik (2004); and $1,000–$3,500 in Cohen and Piquero (2009). Rajkumar and French (1997) report costs of $10–$50 per public-order offense, while Cohen and Piquero (2009) report costs of $500. We assume the costs of a typical Part II violent, property, and public-order offense to be $11,000, $750, and $100, respectively.

H suggest that the LAPD expansion might be attractive from a benefit/cost standpoint even to those who believe that only tangible costs matter or that homicides should be completely excluded from cost calculations. Unfortunately, considering all possible combinations of the scenarios discussed here would substantially increase the complexity of the calculations, but, at a minimum, these examples demonstrate that alternative assumptions can be readily incorporated into the basic benefit/cost framework.

**The cost/benefit framework described and illustrated in this paper provides flexibility to accommodate the viewpoints of stakeholders who may hold widely varying views about the most-appropriate methods for assessing crime costs and police effectiveness.**

Overall, we see in Table 9 that conclusions can vary depending on the cost and effectiveness assumptions. Many scenarios pass the cost/benefit test (green), a few likely fail it (red), and some are in between. Benefits range from a low of about $54 million to a high of a little over $1 billion, again measured relative to the cost of implementing the 10-percent increase in police in Los Angeles of $125 million to $150 million.

The general approach illustrated here can be applied to policy proposals involving police personnel investments in other cities. Although we have provided some examples of alternative cost and effectiveness assumptions, clearly, the particular scenarios considered could be adjusted to meet local needs. For example, cities with substantial numbers of Part II crimes might wish to consider refined assumptions about the costs generated by these crimes, or cities evaluating investments designed to increase the availability of officers in high-traffic public spaces may find the effectiveness estimates from Klick and Tabarrok (2005) to be most applicable.

## Concluding Thoughts

Many state and local governments are facing significant fiscal challenges, forcing policymakers to confront difficult trade-offs as they consider how to allocate scarce resources across numerous worthy initiatives. To achieve their policy priorities, it will become increasingly important for policymakers to concentrate resources on programs that can clearly demonstrate that they improve their constituents' quality of life. To identify such programs, cost/benefit analysis can be a powerful tool for objectively adjudicating the merits of particular programs. On the surface, all such programs *aim* to improve quality of life, but whether they actually achieve—or will achieve—what they aim for is another question.

Cost/benefit analysis of crime control programs makes sense because there are many competing and seemingly worthy ways to address crime. Unfortunately, widespread utilization of cost/benefit analysis in the area of crime control has been hampered by a paucity of research evaluations of many programs and difficulties in translating research studies into products that make sense to policymakers. The latter problem has been particularly confounding because high-quality research studies exist but are often buried in journals that are the focus of academics rather than policymakers—"hidden in plain sight." As a result, these studies often do not make it to policymakers or, when they do, do so in a form that is not readily understandable.

Fortunately, in the area of police hiring, a growing body of high-quality research provides the ingredients necessary for us to conduct credible and *transparent* cost/benefit assessments. While sophisticated, this research is built on assumptions and approaches that can be clearly understood by policymakers. Moreover, the cost/benefit framework described and illustrated in this paper provides flexibility to accommodate the viewpoints of stakeholders who may hold widely varying views about the most-appropriate methods for assessing crime costs and police effectiveness.

In this paper, we showed how the results in the literature on the costs of crime and the effects of police hiring are "hidden in plain sight" and can be used as inputs into fairly straightforward cost/benefit analyses. Applying that cost/benefit framework to several real-world police hiring and firing scenarios demonstrates that investments in police personnel generate net social benefits. In the case of police hiring in Los Angeles, this conclusion persists across a wide range of alternative modeling assumptions, which shows that the results are robust. More broadly, for a number of large cities, we estimate returns on investments in additional police in terms of reduced crime that are likely to be appreciably above hiring costs. We also showed how the approach could be expanded to accommodate alternative views regarding which crimes and which costs are properly included in the cost/benefit calculations.

Finally, although this study considers police hiring in isolation, one might also draw from studies of other potential crime control policies (e.g., more prisons, alternative courts, rehabilitation programs) to compare returns across crime control alternatives (Greenwood et al., 1998; Welsh, Farrington, and Sherman, 2001). Although some progress has been made on this front, many challenges remain (Rubin et al., 2006). At a minimum, as policymakers consider budget priorities for coming years, it is important to recognize that returns on investments in police personnel are likely to be substantial. ■

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## About This Paper

This genesis of this occasional paper was a January 2009 request from a member of the Los Angeles City Council that the RAND Corporation participate in a panel discussing crime and poverty in the city and prepare testimony on the cost of crime in Los Angeles. Included on the panel was then–Deputy Chief Charlie Beck of the Los Angeles Police Department (LAPD), who believed that the presentation material would be of interest to others in the law-enforcement community, many of whom have limited exposure to social-science research on the cost of crime and policing-related returns on investment. He encouraged RAND to find opportunities for broader dissemination. At the gracious invitation of Chuck Wexler of the Police Executive Research Forum (PERF), RAND presented an expanded version of its remarks later that month at a PERF-convened summit on how the economic crisis has affected law-enforcement agencies.

This occasional paper provides a more detailed treatment of the material covered in those two presentations, summarizing the existing high-quality academic research on the cost of crime and the effectiveness of police in preventing crime. Its purpose is to familiarize policymakers and practitioners with current research on these issues and demonstrate how this research can be used to better understand the returns to investments in police. It demonstrates a method for comparing the costs of hiring new police with the expected benefits generated by those police in terms of reduced crime. It should be of interest to policymakers and practitioners who are concerned about understanding the value of expenditures on police personnel.

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## The RAND Center on Quality Policing

This research was conducted under the auspices of the Center on Quality Policing (CQP), part of the Safety and Justice Program within RAND Infrastructure, Safety, and Environment (ISE). The center's mission is to help guide the efforts of police agencies to improve the efficiency, effectiveness, and fairness of their operations. The center's research and analysis focus on force planning (e.g., recruitment, retention, and training), performance measurement, cost-effective best practices, and use of technology, as well as issues in police-community relations.

The mission of ISE is to improve the development, operation, use, and protection of society's essential physical assets and natural resources and to enhance the related social assets of safety and security of individuals in transit and in their workplaces and communities. Safety and Justice Program research addresses occupational safety, transportation safety, food safety, and public safety—including violence, policing, corrections, substance abuse, and public integrity.

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