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Putting 100,000 Officers on the Street: A Survey-Based Assessment of the Federal COPS Program

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Abstract

Passed in 1994, the federal Community Oriented Policing Services (COPS) program was intended to promote community policing and add 100,000 officers to the nation's communities through grants for hiring officers and civilians and acquiring technology. As part of a larger, multi-year study of COPS, this paper examines the progress of COPS towards the latter goal using results from a telephone survey conducted with a nationally representative sample of police agencies in the summer of 2000. Results suggest that grantees will keep most hiring and civilian positions after their grants expire and that productivity gains from technology grants, while variable, will be close on average to those forecast when the grants were awarded. Overall, we estimate that COPS will add 98,000 officers to the nation's communities on a temporary basis between 1994 and 2005, within a likely range of 93,400 to 102,700 officers. However, these officers will not all be available for service at any one point in time. After post-grant attrition of officer and civilian positions, we estimate that the permanent, or at least indefinite, impact of COPS post-2005 will be 82,000 officers, within a likely range of 69,100 to 92,200 officers. New officers will account for 60%-65% of the temporary COPS effect and 55%-60% of the permanent COPS effect, while productivity increases (measured in officer equivalents) stemming from technology grants and, to a lesser extent, civilian grants will account for the remainder.

1. INTRODUCTION

Perhaps one of the most ambitious crime control policies of recent years has been the federal Community Oriented Policing Services (COPS) program. Passed as part of the *Violent Crime Control and Law Enforcement Act of 1994* (i.e., the 1994 Crime Act), a primary goal of the COPS program has been to add 100,000 police officers to the nation's communities through grants for the hiring of officers and civilians and the acquisition of technology. This paper presents results from the final wave of a multi-year process evaluation of the implementation of COPS (for overviews of earlier results, see Roth and Ryan 2000a,b). Based on telephone interviews conducted in the summer of 2000 with a nationally representative sample of police agencies, we examine the short and long-term effects of COPS on levels of policing in the United States. More specifically, we investigate two key issues. First, how many officers has COPS added to America's police agencies? Second, how much of this increase has been short-term and how much will continue on a permanent, or at least indefinite, basis after the expiration of COPS grants?[1]

In the subsequent sections of the report, we first describe the COPS program and the findings from earlier waves of this evaluation. We then present updated estimates of the impact of COPS on policing levels in America based on the year 2000 data. We conclude by discussing remaining questions and avenues for further inquiry.

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[1] Another major objective of COPS has been to encourage the adoption of community policing by American police agencies. A separate report is forthcoming on the impact of COPS on styles of policing in America.

2. THE COPS PROGRAM

Title I of the 1994 Crime Act allocated nearly $9 billion dollars to the COPS program. In fulfillment of a campaign promise made by President Bill Clinton, one of the primary goals of this legislation was to increase the level of policing in the United States by 100,000 officers through grants to state and local law enforcement agencies. Federal authorities sought to achieve this goal through two means.

The first was a series of grant programs for hiring new officers. These grants have generally funded up to 75% of the salary and fringe benefits of new officers for 3 years. At the outset of the COPS program, grants were awarded on the condition that grantees make a "good faith" effort to retain COPS-funded officers after the expiration of the grants.[2] Beginning in April 1998, applicants were required to submit a written retention plan with their applications. Finally, in August 1998, program administrators in the federal Office of Community Oriented Policing Services (the COPS Office), the agency responsible for administering the COPS program, developed a more specific criterion for the retention requirement by requiring grantees to retain COPS officers for at least one full budget cycle after the one in which the grant expires.

COPS-funded positions are meant to supplement, and not supplant, preexisting officer positions. In other words, a grantee is not to use COPS funds to replace local funds the grantee would have otherwise used for law enforcement. For instance, grantees should not use COPS funds to replace losses from normal year-to-year attrition. Nor should grantees cut existing positions to retain COPS-funded officers. To illustrate, if an agency with a budgeted force of 100 officers receives a COPS grant for 5 officers, then the agency is expected to maintain a force of 105 officers for the life of the 3 year grant plus one full budget cycle (which will generally be 1 year) following the budget cycle in which the grant expires. If, for example, the agency loses three officers after receiving the grant, the COPS Office expects the agency to replace those officers as well as retain the 5 COPS officers for the required period.

The second means by which COPS has sought to increase police strength is the Making Officer Redeployment Effective (MORE) program.   MORE grants provide funds for grantees to hire civilians and purchase technology. The rationale for these grants is that utilization of new technologies and greater use of civilian support staff will increase the productivity of existing officers, permitting them to spend more time in the field. Grantee agencies can thereby increase the presence of officers in the field without actually hiring new officers. During its first year, MORE also provided funding for officer overtime.

MORE grantees have utilized COPS funding to acquire a variety of technologies, most commonly mobile computers for installation in cars and desktop computers for general and administrative purposes (Roth et al. 2000). Grantees have also used MORE funds to obtain automated booking/arraignment systems, telephone reporting systems, computer aided dispatch systems, and miscellaneous technologies like geographic mapping systems. Civilian employees hired with MORE funds have served as, among other things, administrative/clerical workers,

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[2] Applicants were also required to match the COPS funds with at least 25% of program costs and to submit acceptable strategies for implementing community policing in their jurisdictions.

dispatchers, property room managers, specialists (e.g., crime analysts, grant managers), and community policing workers (e.g., volunteer coordinators, social workers).

Redeployed time that officers spend in the field as a result of MORE grants is counted in terms of full time officer equivalents (FTEs). Each FTE is equivalent to 1,824 hours, which is the federal estimate of the average time that a police officer works each year, exclusive of overtime. Hence, every 1,824 hours of officer time an agency saves each year through MORE funding is counted as the equivalent of having another officer on the force.

In some instances, counting time saved is a relatively straightforward calculation. For instance, a civilian may take over administrative duties performed by a uniformed officer so that the officer can be redeployed to fieldwork, resulting in a one-to-one FTE calculation. In other instances, counting time saved from MORE grants is more complex. This may occur with civilian or technology grants, but it is particularly true for technology awards. To illustrate how time saved from a technology grant might be calculated, consider a hypothetical example in which an agency purchases laptop computers and report writing software to reduce the amount of time that officers spend writing reports. If the agency's officers write 28,763 reports per year and the technology is estimated to save officers 20 minutes per report, then the grant will save 575,260 minutes, or 9,587 hours, per year. Under the federal formula, this amounts to 9,587 / 1,824 = 5.3 FTEs of time saved per year, which is assumed to be devoted to community policing.[3]

However, neither grantees nor the COPS Office has had much data to guide projections of time saved. Since approximately the second year of MORE (1996), the COPS Office has based counts of awarded FTEs on the number of officers that grantees could hire for the same amount of federal grant money. Accordingly, MORE applicants must show – or, perhaps more accurately, project on plausible grounds – that they can achieve productivity increases with their MORE grants that will match or exceed (in FTEs) the number of officers that they could hire with the same funding.

The first COPS hiring grants were awarded following the passage of the Crime Act in late 1994. The COPS Office began awarding MORE grants in 1995. In May 1999, the White House announced that COPS had reached the milestone of funding 100,000 officers. Approximately 60% of the first 100,000 officers had been funded through hiring grants, while the remaining 40% were FTEs funded with MORE awards (Koper and Roth 2000).

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[3] This example was taken from instructional training materials provided by the COPS Office.

3. THE NATIONAL COPS EVALUATION: PRIOR RESULTS

In 1995, the National Institute of Justice awarded a grant to the Urban Institute to study the impact of COPS on policing in America. The study, which has employed nationwide telephone surveys, site visits, and case studies, has focused largely on discerning COPS' effects on the level and style of policing. At the heart of the evaluation has been a series of telephone interviews with a nationally representative sample of police agencies, stratified by agency size and COPS program status (including both COPS grantees and agencies without COPS grants). Nearly 1,500 agencies were interviewed in the first wave of the survey in the fall of 1996. Subsequent surveys were conducted with subsets of these agencies (as well as some newly sampled agencies) in 1997 and 1998. A series of prior reports presented results based on data gathered through 1998 (for summaries, see Roth and Ryan 2000a,b). In the synopsis below, we focus on prior results pertaining to the effect of COPS on levels of policing.

Relying primarily upon 1998 survey results, supplemented by some national time series analysis of police employment data, Koper and Roth (2000) estimated the impact of COPS on levels of policing through 1998 and made preliminary projections of the eventual impact of all COPS awards made through May 1999, the point at which the White House announced that 100,000 officers had been funded, including both the officers funded with hiring grants and the MORE-funded productivity increases. Koper and Roth projected that COPS hiring grants had added between 36,300 and 37,500 officers to the nation's police forces by the end of 1998 and that MORE grants had resulted in the redeployment of an additional 9,100 to 10,900 FTEs to field duties.

In projecting longer-term effects, the most important issues are whether grantees will retain COPS-funded officer and civilian positions after their grants expire and they are no longer obligated to keep the positions (post-grant retention of officer and civilian positions are governed by the same guidelines) and whether MORE grantees will achieve their full projected productivity increases after they have implemented all new technology.

Koper and Roth estimated that grantees would retain 64 to 91 officer positions for every 100 awarded. Other positions would be cut or retained only through cuts in non-COPS positions in the agencies. However, very few hiring grantees had expired grants at the time of the 1998 survey; consequently, these estimates were based on agencies' expectations rather than their experiences. Further, post-grant retention requirements were still somewhat vague during most of the survey period (summer of 1998). Finally, Koper and Roth had to make assumptions about the number of positions likely to be cut by agencies expecting to lose COPS positions.

With respect to MORE grants, Koper and Roth projected that grantees would eventually increase productivity by 58 to 72 FTEs for every 100 FTEs awarded. Hence, it appeared that agencies would fail to achieve all of their projected productivity gains. Indeed, Roth et al. (2000) illuminated many of the difficulties that MORE agencies were experiencing with technology implementation, as well as the uncertainties involved in projecting time saved. Moreover, the lower bound estimate of 58 FTEs redeployed for every 100 awarded was based on agencies having more experience with MORE implementation, suggesting that the lower bound

estimate could prove to be more accurate. However, relatively few agencies had fully
implemented MORE grants at that time, so these estimates were also based largely on future
expectations. Further, the MORE estimates were subject to wide sampling variation, introducing
further uncertainty into the projections of future productivity gains.

Notwithstanding these limitations, Koper and Roth estimated that, overall, the first
100,000 officers awarded through COPS would result in at least the temporary hiring of 60,900
officers and the redeployment of between 23,800 and 28,500 FTEs between 1995 and 2003,
though these officers and FTEs would not all be available during any given year due to the
differential timing of grant awards, implementation, and grant expirations. On a year by year
basis, projections suggested that COPS grants would have their maximum effect in the year
2001, when between approximately 69,000 and 84,600 COPS-funded officers and FTEs would
be in service. After the expiration of all hiring and civilian grants (and all subsequent post-grant
attrition of positions), Koper and Roth estimated that the long-term effect of COPS would be
between 62,700 and 83,900 officers and FTEs, a level that would be reached in the year 2003.

4. UPDATED ESTIMATES OF THE IMPACT OF COPS

4.1.   Methodological Overview

This paper updates the earlier results of the national COPS evaluation using data from telephone interviews conducted during the summer of 2000 with a nationally representative sample of nearly 1,300 police agencies, all of which had participated in the first COPS evaluation survey that was conducted in 1996. Based on these data, we present new estimates of COPS' short and long-term impacts on staffing and productivity growth in grantee agencies.

To briefly describe the sample (a more detailed description is provided in Appendix A; also see Roth et al. 2000, pp. 275-287), project staff preparing for the first COPS evaluation survey in 1996 utilized multiple data sources to compile a list of nearly 21,000 COPS-eligible police agencies of all types (i.e., county and municipal police, state police, Sheriffs' agencies, and other categories like university and tribal police) existing at that time.[4] Project staff stratified the agencies by COPS program status and jurisdiction size as shown in Table 1. The COPS program strata consisted of FAST/AHEAD grantees (an early hiring grant program that operated from late 1994 to late 1995), Universal Hiring Program (UHP) grantees (a subsequent hiring grant program established in late 1995), MORE grantees, and agencies not funded through COPS. Jurisdictions were classified as small or large based on whether they included fewer than 50,000 persons, a stratification point that was chosen based largely on administrative distinctions established for early COPS grants (see Appendix A).

Project staff selected 2,098 of these agencies, sampling disproportionately from among COPS grantees and large agencies. During the fall of 1996, interviewers from the National Opinion Research Center (NORC) completed telephone interviews with police chiefs or their designees from 1,471 of these agencies. Response rates for this first survey ranged from 75% to 99% for the COPS grantee cells and from 61% to 67% for the non-grantee cells. In order to create national estimates or other estimates combining agencies across cells (e.g., analyses of all COPS grantees), project staff developed a weighting scheme for the data to both account for agencies' differential selection probabilities and adjust for non-response (see Appendix A).

For the final COPS evaluation survey in the summer of 2000 (June-August), NORC interviewers sought to re-interview the 1,471 police agencies that participated in the 1996 survey. Interviews were completed with representatives from 1,270 of these agencies. Response rates ranged from 83% to 91% across the sample cells, producing an overall rate of over 85%. Table 1 shows the number of agencies interviewed from each cell during the summer 2000 survey. Note again that the program strata in Table 1 refer to COPS status as of early 1996; by 2000, for example, 40% of the non-COPS agencies sampled in 1996 had COPS grants, and a small percentage (3%) of 1996 COPS grantees had withdrawn from their grants. Further details

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[4] Virtually any general law enforcement agency is eligible for COPS funding. Ineligible agencies include, among others, Sheriffs' agencies that conduct only jail operations, substations of larger, eligible police agencies (e.g., substations of state police agencies), and regulatory agencies with administrative enforcement authority only. See Roth et al. (2000, pp. 275-287) for further details.

of the survey design and sample are provided in Appendix A. As we describe below, different sections of the survey were administered to different subgroups of agencies.

In the following subsections, we present separate estimates of the effects of COPS hiring and MORE grants and then project the overall impact of COPS on levels of policing. Based on the sample design, we present estimates separately for small agencies (i.e., those serving jurisdictions with fewer than 50,000 people) and large agencies (i.e., those serving jurisdictions with 50,000 or more people). All figures in the tables (and substantive findings reported in the main text) are weighted as appropriate when the estimates involve agencies from multiple cells.

As a cautionary note, the sample design described above was created to serve a variety of purposes: comparing characteristics of COPS and non-COPS agencies; conducting separate analyses of small and large jurisdictions; and performing separate analyses of COPS hiring and MORE grantees (see Roth et al. 2000). However, the design has some drawbacks for the analyses presented in this paper. Some analyses are based on smaller subsamples of agencies (from one or more cells) that meet certain criteria that could not be built into the research design a priori (e.g., agencies with expired hiring grants or MORE civilian grants as of 2000, agencies with fully implemented MORE-funded technology as of 2000), and any given sample cell may contain agencies that vary substantially with respect to measures like officers and FTEs awarded. These factors lessen the precision of the estimates, contributing to wider confidence intervals, particularly in some of the MORE analyses.

4.2.   Hiring Grants

Interviewers administered questions about retention of COPS funded officers to 638 agencies that were sampled from among year 1995 COPS hiring grantees (i.e., the FAST/AHEAD and Universal Hiring Program strata). These agencies were chosen because they were among the earliest COPS grantees and, consequently, were more likely to have expired grants than were later cohorts of hiring grantees. However, the survey questions pertained to all hiring grants these agencies received from 1994 through 1999.

Interviewers inquired about both current retention of positions funded with expired COPS grants and expected retention of positions still covered by either COPS funding or COPS retention requirements. Expired positions were defined as those that had been expired for more than one full budget cycle and were thus eligible to be cut under COPS program requirements. Such positions can be thought of as "programmatically expired" positions. Note that our focus is on the retention of positions, irrespective of the individual officers filling those positions, and the survey questions were framed in this manner.

Based on data provided by the COPS Office (prior to the survey) and additional information obtained from the respondents, interviewers determined the number of officer positions awarded to each agency from 1994 through 1999, the number of these positions for which COPS funding had expired, and the number of COPS positions that had programmatically

expired.[5] Interviewers determined the latter item by asking how many expired COPS positions were funded with grants that expired prior to the start date of the last full budget cycle, a date that was calculated based on information that respondents had provided earlier in the survey.

Having determined the number of programmatically expired positions, interviewers asked respondents to report the number of these positions that were currently part of the agency's base budget, the number that were funded through another type of grant (this was very rare), and the number that were no longer funded. Interviewers then asked how many of the programmatically expired positions on the base budget had been retained by cutting or using vacancies in non-COPS positions. This question was intended to provide a better estimate of the extent to which COPS grants have elevated grantees' staffing over baseline levels. In our calculations, we counted COPS positions as retained only if they had been retained without cutting or using vacancies in non-COPS positions. If, for instance, an agency with five expired COPS positions reported keeping three of the COPS positions through cuts in non-COPS positions, then we considered the agency to have retained only two of the five additional positions originally funded through COPS.

After inquiring about programmatically expired positions, interviewers then asked about future plans for the retention of non-programmatically expired positions (calculated as the total number of positions awarded minus the programmatically expired positions). Respondents were asked to estimate both the total number of non-expired positions that would be retained on the base budget following programmatic expiration and the number that would be retained on the base budget by cutting or using vacancies in other positions (we again calculated retention rates in the manner described above).[6] In order to investigate the expected longevity of staffing increases funded by COPS, respondents were also asked how long they expected their agencies to keep the retained COPS positions, choosing from the alternatives of one year or less, more than one year but less than five years, and five years or more.[7] [8]

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[5] We determined the total number of positions awarded from COPS Office databases. In a relatively small fraction of cases (11%), respondents reported numbers of awarded positions that differed from those in the COPS Office database, so we used the numbers reported by respondents (project staff examined discrepancies between COPS Office records and respondents' reports in depth for the 1996 COPS survey and found that they were most commonly due to circumstances in which the respondents were not aware of recently reported grants, agencies had not yet accepted new grants, or agencies had withdrawn from grants between the time project staff received the COPS Office data and the time of the interviews). Information on grant expiration dates was not completely up to date in the COPS Office data that we obtained prior to the survey, so we relied more heavily on respondents' reports for this information. To help respondents in providing this and other information, a letter was sent to the agencies prior to the survey asking for their cooperation and informing them of the nature of the issues that would be discussed.

[6] The wording of the questionnaire stressed retention after programmatic expiration so as to avoid asking respondents to report whether their agencies had or would violate COPS program retention requirements.

[7] Interviewers asked respondents to provide specific numbers for the hiring grant questions. If respondents could not provide specific numbers to particular questions, they were asked to approximate the figure on a five-point scale with the following categories: none, some but less than half, half, more than half but not all, or all. These responses were operationalized as zero, 25%, 50%, 75%, and 100%, respectively. However, few respondents found it necessary to use these categorizations.

Turning to the results, half of the weighted sample of agencies had at least one programmatically expired position.[9] To estimate the proportion of programmatically expired COPS positions that grantees have retained, we estimated the mean number of expired positions awarded to the agencies with expired positions and the mean number of expired positions retained by these agencies. We then used the ratio of the mean number of positions retained to the mean number expired as our estimate of the proportion of positions retained. The point estimates and 90% confidence bounds[10] for the estimates (converted to percentages) are presented in Table 2 (tables begin on p. 32). As shown in rows one and four of Table 2, both large and small agencies have retained approximately 80% of their expired positions, with 90% confidence bounds ranging from 63% to 91% for large agencies and from 70% to 86% for small agencies.[11]

We estimated short and long-term expected retention rates for non-expired positions in the same manner. Rows two and five of Table 2 show initial retention rates expected for non-expired COPS positions, while rows 3 and 6 show longer-term retention rates (defined as retention for 5 or more years) projected for these positions.

A few generalizations emerge from inspection of the results in Table 2. First, retention rates, both observed and expected, are comparable for small and large agencies. As noted above, current retention of expired positions is virtually identical among small and large agencies. The greatest difference between the groups is for expected long-term (i.e., 5 year) retention of non-expired positions. Large agencies expect to keep 76% of their positions for 5 or more years, while small agencies expect to maintain only 66% of their positions for this length of time.[12] Nonetheless, this difference is not statistically significant (as shown by the overlap in the confidence intervals for these estimates), so we cannot conclude clearly that long-term retention rates will be lower among small agencies.

A second generalization is that future retention patterns are expected to be comparable to current patterns, particularly for large agencies. This is true even for long-term retention rates, a finding that shows grantees expect to keep most of their retained positions for a long-term period. For example, large agencies expect to retain 78 of every 100 non-expired positions, and they expect to keep 76 of these positions for five or more years. Again, there are indications that long-term retention rates may decline notably for small agencies (perhaps dropping to 66% from

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[8] Missing data rates were less than 5% for the various items determining numbers of expired and non-expired positions and current and future retention of positions (this was also true for the civilian hiring and retention items discussed in the next section). If a respondent could not answer the current or future retention items, we set the respective items to zero for the respondent's agency (i.e., we assumed no retention unless the respondent provided an affirmative indication of retention).

[9] Overall, 374 of the 638 agencies (63% weighted) had positions whose funding had expired. However, only 277 of these agencies had programmatically expired positions as defined earlier.

[10] See Appendix B for the methodology used to estimate variances and construct these confidence bounds.

[11] In related analyses with these data, Koper and Moore (2001a, pp. 56-58) reported that about 11% of large agencies and 20% of small agencies with programmatically expired positions had cut some or all of these positions (weighted figures). About half of the agencies that cut positions did so due to fiscal constraints. Crime trends and political turnover were cited by relatively few agencies (0% and 10.5%, respectively).

[12] Note that some small agencies (about 6% in our sample of small agencies with expired grants) received additional funding from the COPS Office to assist them with officer retention, which may help explain why short-term retention rates appear more comparable between small and large agencies than do projected long-term retention rates.

the current rate of 79%), but this expected difference is not quite statistically significant, thus precluding a definitive determination. Even if the point estimates prove accurate, small agencies will still keep a large majority of their retained positions for a long-term period.

4.3.   MORE Civilian Grants

Interviewers administered questions about the implementation of MORE grants to all sampled agencies having MORE grants for civilians or technology, regardless of program or agency size strata. Therefore, the MORE respondents are representative of all grantees receiving MORE grants from 1995 through 1999.[13] Interviewers questioned the agencies about all civilian and technology awards received as of the survey date. They did not inquire about the implementation of MORE grants for officer overtime since those grants were awarded during only the first year of MORE.

Respondents from agencies that had received MORE grants for civilian staff answered a series of questions regarding current and future retention of civilian positions that paralleled those described in the hiring analyses.[14] Using these data, we estimated civilian retention rates in the same manner as described in the hiring analyses. As shown in Table 3, the samples available for these analyses were small, and some of the estimates were subject to substantial sampling variability.   This was particularly true for the projections of future retention rates among small agencies (we experimented with two ways of constructing the confidence intervals for these particular projections, both of which produced very wide bounds).

As of the summer of 2000, average retention rates for programmatically expired civilian positions were nearly identical among small and large agencies (77% and 80%, respectively). There are some indications that these rates will diverge in the future, dropping to 65% for small agencies (61% long-term) and actually improving to 91% for large agencies (83% long-term), but these projected changes are not statistically significant. At any rate, the results suggest that most MORE-funded civilian positions have been and will continue to be retained following the expiration of their MORE grants, though this could change among small grantees. Further, most of the retained civilians will be retained for a long-term period.

4.4.   MORE Technology Grants

Agencies that indicated having MORE technology grants were asked a series of questions regarding the types of technology they had acquired (e.g., mobile computers, computer aided

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[13] COPS Office records were used to identify all MORE grantees in the sample (1% of the respondents from these agencies disagreed or were unaware that their agencies had MORE funding). We chose to administer the MORE questions to all sampled MORE grantees rather than just those in the MORE 1995 stratum due to changes over time in how the COPS Office calculates FTEs. As noted earlier, the COPS Office determines FTE awards based on the number of officers that a grantee could hire with the same funding. However, COPS Office staff did not begin this practice until approximately 1996. FTE awards for grants made in 1995 were based more heavily on applicants' projections of productivity gains. Consequently, the ratio of redeployed to awarded FTEs for the class of 1995 MORE grantees may not be indicative of that for later MORE grantees. To mitigate this bias, we elected to extend the MORE analysis to all MORE grantees in our sample.

[14] Counts of awarded and programmatically expired civilian positions were based solely on respondents' reports. In part, this is because COPS Office records count civilian awards in terms of FTEs expected, which typically differs from the exact number of civilians to be hired.

dispatch systems, etc.) and whether each of those technologies was fully implemented.[15] After reviewing these issues, interviewers asked the respondents to provide an estimate of the sum total of FTEs their agencies had redeployed (if any) with all fully implemented technology. Where applicable, interviewers then asked how much additional redeployment the agencies expected in total when all the remaining technology was fully operational.[16]

For technology grantees, we sought to estimate the ratio of the mean number of FTEs redeployed (or expected to be redeployed) to the mean number of FTEs awarded. As discussed previously, COPS Office staff base the official count of FTEs awarded to a MORE grantee on the number of officers that the grantee could hire with the same funding. In reality, the number of FTEs redeployed by the grantee may turn out to be less or greater than the number awarded.

Indeed, we found that reported (or expected) FTE gains often differed substantially, in both directions, from FTE awards. Some of these discrepancies were very large, perhaps suggesting that some respondents were misinformed about grant awards and/or redeployments or that our copy of the COPS Office technology awards database (from which we obtained counts of awarded FTEs) was, in some instances, outdated by the time of the survey (data entry error is, of course, another possibility).[17] For example, an agency with a grant for 10 FTEs might have reported redeployment of 90 FTEs. Conversely, an agency with a grant for 90 FTEs might have reported redeployment of only 10 FTEs. These discrepancies contributed to particularly wide confidence intervals in preliminary analyses. We were able to improve the estimates somewhat by calculating the discrepancies between redeployed and awarded FTEs and removing approximately 5% of the cases having the largest discrepancies, taking these agencies in even numbers from both ends of the distribution (i.e., we removed agencies having large discrepancies in both directions). We did this for each set of analyses presented below.

The overall estimates reflecting both productivity gains achieved as of the survey date and any additional gains expected in the future are shown in the first and fourth rows of Table 4. On average, small MORE grantees expect to realize productivity gains equivalent to 93% of awarded FTEs (90% confidence bounds 66% to 119%) by the time all of their MORE-funded equipment is operational. Similarly, large grantees expect to improve productivity by 92% of awarded FTEs on average (90% confidence bounds 81% to 104%) when all equipment is operational.

Because a significant share of agencies had not yet implemented all of their MORE-funded technology, we also conducted a separate examination of just those agencies reporting that all new equipment was fully operational.[18] Studying the productivity gains of fully operational agencies provides a validity check of sorts on the realism of the projections made by

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[15] If respondents asked for clarification of the meaning of fully complete implementation, interviewers instructed them that this meant the technology was operational and in the hands of all or nearly all end users, being used to do all the things planned when the agency applied for the grant.

[16] For the redeployment questions, respondents were asked to express time saved in terms of FTEs. Some respondents could not provide FTE counts but did provide estimates of the number of hours saved annually, which were converted into FTEs. Approximately 7% of small technology grantees and 9% of large technology grantees could not provide redeployment estimates.

[17] Prior to analysis, however, we excluded a small percentage (6%) of agencies that reported having technology grants because their awards did not appear in our COPS Office database.

[18] Many MORE grantees have multiple awards made at different points over time, and this explains in part why many technology recipients have not yet fully implemented all of their awarded equipment.

agencies that had not fully implemented their technology. As noted earlier, moreover, results from the last wave of the COPS evaluation suggested that agencies with greater implementation experience were more pessimistic about productivity gains. Nonetheless, as of summer 2000, agencies with fully implemented technology reported larger productivity gains on average than those expected by the full sample of grantees (see the second and fifth rows of Table 4), though these differences were not statistically significant. Small agencies with fully operational technology reported productivity gains averaging 118% of their awarded FTEs, while their large agency counterparts reported productivity gains averaging 103% of awarded FTEs.

As a final validity check on the results, we examined just those agencies that reported having all technology fully operational and also reported having a measurement system in place to capture time saved due to MORE-funded equipment (see the third and sixth rows of Table 4). MORE grantees are required to develop tracking systems to measure productivity gains as soon as possible after their technology is implemented. About 46% of the small agencies with fully implemented technology and 38% of corresponding large agencies did not yet have measurement systems in place. However, those agencies that did have such systems in place reported average productivity gains equal to or greater than those reported by all agencies with fully operational technology.

The higher redeployment estimates for the advanced technology recipients provide some tentative indications that advanced grantees, including those measuring time saved through more careful means, may be achieving productivity gains greater than those expected by other technology recipients. This could suggest that grantees become better at utilizing equipment and assessing productivity gains as they gain more experience with the equipment. Agencies that have not fully implemented their new technologies, in contrast, might be less informed or more pessimistic about their potential productivity gains.[19] We may also speculate that fully operational agencies tend to be those agencies that are more skilled at utilizing technology in an effective manner. What does seem clear, at any rate, is that more experienced technology grantees are not pessimistic about productivity gains relative to other agencies, and this lends further credence to the redeployment projections for the full sample.

This conclusion stands in contrast to findings from the previous wave of the COPS evaluation, which was based on survey responses in 1998. The differing results may be due in part to the facts that the subsample of "experienced" agencies examined in the prior survey was fairly small, and not all of those agencies had fully implemented their MORE grants. As grantees have gained experience with MORE-funded equipment, they may have become better at utilizing the equipment and assessing productivity gains.

The change may also reflect post-1998 COPS Office training and technical assistance on measuring productivity increases. If, for example, mobile computers in squad cars reduce the time for a license plate check and officers use the saved time to check more licenses, training materials instruct the agencies to count the saved time as time available for redeployment to community policing. Indeed, a growing experience base, enhanced by COPS Office training seminars, may also explain why the overall redeployment estimates (92%-93%) are higher than

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[19] An additional indication of this is that small agencies with no fully operational technology expected average productivity gains of only 57% of awarded FTEs (90% confidence bounds 21% to 94%). This tendency was less pronounced, however, among large grantees.

those from the last wave of the COPS evaluation (71% - 73%), though this differential could also reflect sampling variation.

Considering that the average redeployment estimates are very close to the awarded values, one might question whether grantees were simply reporting that they had realized or will realize productivity gains equivalent to those projected in their MORE applications. If true, we would expect most agencies to report actual or expected productivity gains equal to or greater than the FTEs awarded to them. However, the large confidence intervals around many of these estimates suggest that this was not the case. Among large agencies with fully implemented technology, for example, 50% reported fewer FTEs redeployed than awarded, 46% reported more FTEs redeployed than awarded, and only 4% reported equal FTEs redeployed and awarded. The agencies falling short of their redeployment targets did so by an average of 63%. And for small agencies overall (including agencies at varying stages of implementation), the correlation between projected redeployments and awarded FTEs was a modest 0.33, even after removing the agencies with excessive discrepancies between their projected redeployments and awarded FTEs. Hence, there appears to be notable variation in grantees' experiences with MORE-funded technology; many agencies are falling short of their FTE targets and many are exceeding their targets.

4.5.   The Overall Impact of COPS on U.S. Policing Levels

In May 1999, the White House announced that the COPS Office had reached the milestone of funding 100,000 officers. Approximately one year later, the total number of officers funded stood at 100,448 according to COPS Office records. As shown in Table 5, approximately 61,000 of these officers were funded through hiring grants, while the remaining officers were FTEs of productivity increases funded through MORE grants. Note that the COPS Office counts civilian awards in terms of FTEs rather than employees; consequently, the civilian numbers in Table 5 reflect FTEs stemming from civilian grants and not the actual numbers of civilians awarded and retained by grantees. Over 80% of the FTEs funded through MORE were funded with technology grants. Small and large grantees received hiring grants in fairly equal numbers, but large agencies received nearly 80% of the FTEs funded through MORE.

Table 5 presents our estimates of the "temporary" (i.e., short-term) and "permanent" (i.e., long-term) impacts of COPS on the level of policing in the United States. (For simplicity, we will refer hereafter to officers and FTEs collectively as "officers"). The temporary estimates correspond to the approximate time period of 1995-2005, and the permanent estimates correspond to years after 2005. We assume that all hiring grants for officers and civilians awarded by the spring of 2000 will programmatically expire during or before the year 2006.[20] Further, we assume that all equipment funded with MORE grants awarded through the spring of 2000 will be fully implemented by the year 2005, a time frame which we selected based on an analysis of implementation times associated with fully operational mobile and desktop computers.

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[20] This assumption is based on our finding that about half of our weighted sample of agencies that received hiring grants in 1995 still did not have any programmatically expired positions approximately 5 years later in the summer of 2000.

For the temporary estimates, we assume that all officer and civilian positions awarded to COPS grantees will be (or have been) filled for at least a temporary period (we offer some supporting evidence for this in the next section). The technology estimates are based on the overall projections (point estimates and confidence bounds) of current and future productivity gains reported by all technology recipients. Finally, we incorporated MORE overtime awards into our estimates of temporary impacts.

Overall, we project that COPS grants awarded through the spring of 2000 will produce a temporary expansion of approximately 97,953 officers between 1995 and 2005 (see the bottom three rows of Table 5). Factoring in sampling variation, our lower and upper bound estimates range from 93,419 to 102,680 officers. Accordingly, COPS will come very close to, and may surpass, the goal of putting 100,000 officers on the street, at least on a temporary basis. Due, however, to the differential timing of grant awards (and, hence, the differential timing of their implementation and expiration), there will not be any one point in time at which all of these officers will be available for service. In this respect, COPS will be akin to an "open house" event in which the total number of visitors is greater than the number present at any one point in time. In the prior wave of the COPS evaluation, Koper and Roth (2000) illustrated this point by constructing a projection model that approximated the annual effects of COPS between the years 1995 and 2003. Based on survey data collected in 1998, they estimated that COPS would result in the temporary addition of 84,700 to 89,400 officers between 1995 and 2003 but that the maximum number of officers available during any one year would be 69,000 to 84,600 officers projected to be available in 2001. Although more recent developments suggest that some assumptions built into that model were overly simplistic, it serves as rough illustration of the "open house" phenomenon.[21]

Our updated estimates of COPS' permanent (i.e., post-2005) impacts are adjusted to reflect the expected loss of some officer and civilian positions after they expire. To produce these estimates, we applied the estimated retention rates and confidence intervals for expired grants in Tables 2 and 3 to all hiring and civilian positions awarded prior to 1996.[22] We used the estimated retention rates and confidence intervals for non-expired positions in Tables 2 and 3 to estimate the number of officer and civilian positions awarded after 1995 that will be retained after expiration (we used the estimates of initial post-grant retention rather than the 5-year estimates since the latter are arguably more speculative).

The estimates in the far right column of Table 5 suggest that after all officer and civilian hiring grants have expired and all technology has been implemented, the permanent, or at least indefinite, impact of COPS will be 82,036 officers, within a likely range of 69,133 to 92,246.

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[21] The Koper and Roth (2000) projection model assumed, for example, that COPS hiring positions expired and attrition began four years after positions were awarded. More recently, we have learned that it is not uncommon for hiring grantees to obtain no-cost extensions on their grants (indeed, as noted earlier, a substantial number of 1995 COPS hiring grantees in our sample still did not have programmatically expired positions by the summer of 2000). Because of this and other complications, we have not updated the annual estimates of COPS effects, opting instead to highlight temporary and permanent impacts over broader periods.

[22] The civilian retention estimates in Table 3 correspond to the fraction of civilian positions that have been or will be retained. To create the civilian redeployment estimates in Table 5, we assumed that grantees have or will retain civilian-related FTEs at the same rate as civilian positions. Note that our estimation method precludes the possibility that civilian awards generate more redeployed than awarded FTEs, thereby potentially introducing some downward bias into the estimates of redeployment stemming from civilian grants.

Note, however, that some of these officers could be lost in the longer term (i.e., 5 or more years after expiration – see Tables 2 and 3). These estimates are higher than but similar to Koper and Roth's (2000) earlier estimates of COPS' residual effect (62,700-83,900 FTEs). Therefore, it seems that the first 100,000 officers awarded by COPS will not create a lasting increase of 100,000 officers, falling short of this level by somewhere between roughly 8% and 30%. With additional funding, however, COPS may yet create a lasting increase of 100,000 officers.[23] Between 55% and 60% of the permanent impact of COPS will stem from hiring grants for sworn officers. Technology grants will account for over a third of COPS' permanent impact. Finally, large agencies will hold about two-thirds of COPS-funded officers retained in the long run.

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[23] The COPS Office had funded approximately 113,800 officers and FTEs by the fall of 2002.

5. DISCUSSION

What sorts of cautionary notes might we raise about these results, and what sorts of questions might we raise for subsequent research on the legacy of COPS? Let us first consider our estimates of the impacts of officer and civilian hiring grants. These estimates would seem to pass the most basic test of face validity – during the life of the COPS program, sworn and civilian staff in police agencies nationwide have grown by amounts that exceed the numbers awarded by COPS. To illustrate, local and state law enforcement agencies grew by 95,940 officers between 1993 and 1999 (Hickman and Reaves 2001; Reaves 1996), a number that surpasses the nearly 50,000 officers awarded by COPS from 1994 through 1998.[24] Similarly, civilian staff grew by nearly 65,000 persons during this same period, while COPS awards for civilians numbered about 5,900 FTEs.[25]

What is not entirely clear, however, is how much of both the temporary and permanent increases in staffing projected from COPS would have occurred in the absence of COPS. We may never know this with certainty. Yet, when asked if COPS had caused growth, stemmed decline, or had no effect on the size of their agencies, virtually all of the hiring grantees reported that COPS had an impact.[26]

Providing more definitive evidence on this question will most likely require time series approaches to complement the survey-based approach utilized in this study. At this point, such evidence is very sparse. Earlier research by the authors (Koper and Roth 2000) examined the very short-term effects of early COPS hiring awards using a multiple time series analysis with data on police agencies throughout the nation. Controlling for a number of influences on police staffing, results indicated that for every 100 COPS officers awarded in year t, police forces increased by about 73 officers in year t+1, but the study did not examine the effects of those grants in subsequent years. A simple univariate analysis of national, annual police officer counts from 1975 through 1998 found that the national count of police officers in 1998 was 32,526 to 39,617 greater than would have been predicted based on, respectively, historical trends for the 1984-1993 and 1975-1993 periods (Davis et al. 2000).[27] These estimates were broadly consistent with our earlier survey-based estimate that COPS hiring grants added between 36,300 and 37,500 officers to the nation's police forces as of 1998 (Koper and Roth 2000), thus arguably providing some support for the validity of the survey-based approach utilized in this study.

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[24] The 1993 and 1999 figures for state and local officers exclude officers serving in special jurisdictional areas (e.g., parks), but the COPS figure does include officers awarded to such jurisdictions (this serves to strengthen the point made in the text).

[25] The COPS civilian FTE figure does not correspond to the exact number of civilian employees funded by COPS. Yet even if the COPS Office counted each civilian as only 0.5 FTEs (a figure lower than the norm, based on our examination of COPS Offices databases), this would still amount to less than 12,000 civilian employees.

[26] Among the agencies reporting that COPS had an impact on staffing, the vast majority reported that COPS caused new growth or accelerated pre-COPS growth.

[27] That study also suggested that the impact of COPS might have been as small as 6,231 officers, based on the pre-existing trend for just the 1989-1993 period. We regard this estimate as less credible because it is based on a substantially shorter time span and because the large, nationwide crime drop that began around 1993 may have caused the post-1993 staffing trend to deviate from the 1989-1993 trend in the absence of COPS.

Perhaps further supporting evidence comes from a related analysis with the survey data presented here (Koper and Moore 2001b). That study, which incorporated all COPS hiring grantees (regardless of sample strata) and agencies without COPS hiring grants, examined police officers' perceptions of factors causing recent changes in the size of their agencies. Police in both growing and shrinking agencies, large and small, rated the availability of grant money as the first or second most important factor affecting changes in the size of their agencies. The importance of grant money to both growing and declining agencies suggests that COPS has been a leading factor both facilitating growth and slowing reductions in police strength since the mid-1990s, though we should temper this conclusion by noting that the study did not distinguish between the effects of COPS grants and other federal and state hiring grants available during the study period.

The large role that MORE technology grants have played in raising policing levels is also likely to spur further debate and research, particularly in light of the fact that increases in MORE productivity projections between the previous wave of our evaluation and the present wave have boosted our overall estimate of COPS' impact. Although critics of the COPS program tend to be skeptical or dismissive of the impact of MORE grants on policing levels (e.g., see Davis et al. 2000), these grants may have at least a few advantages relative to hiring grants: FTEs added through MORE grants are based entirely on officer time in the field, and attrition of FTEs begin only as technology becomes obsolete, not shortly after the grants expire.

But are the estimates of productivity gains realistic? As noted earlier, neither MORE grantees nor the COPS Office had much experience to guide them in projecting productivity gains from new technology at the outset of the COPS program. The cost effectiveness criterion developed by the COPS Office, which requires grantees to gain one FTE per $25,000 or less, is an essentially arbitrary criterion with no empirical basis. As we have noted elsewhere (Roth et al. 2000b), some of the limited data available from careful studies of technology implementation raise questions about the realism of this requirement.

To illustrate, mobile computers represent one of the technologies most commonly awarded to MORE grantees (Roth et al. 2000b). Mobile computers are intended to save officer time by automating report writing (which is supposed to reduce the time involved in writing reports by, for example, making it easier for officers to make corrections) and permitting officers to transmit reports from the field without returning to the police station. Yet a recent study in Cincinnati suggested that mobile computers save time at a maximum rate of only 1.6 FTEs per $100,000 (Frank, Brandl, and Watkins 1997). Further, one might argue that some of the time savings projected from mobile computers could be gained alternatively through the revision of operating procedures. Perhaps, for example, officers could write paper reports in the field and bring all reports back to the station once or twice during their shifts, thereby eliminating multiple trips to the station.

To provide other examples, do mobile computers really save appreciable amounts of time by enabling officers to run license tag checks on their own? Does email capability actually save officer time, or does it lead to more time spent writing notes and less time conducting activities in the field? And can the sometimes small and scattered increments of time saved from various types of MORE-funded technology be measured accurately and utilized in meaningful ways?

These types of questions apply generally to police utilization of information technology. Investigating them more thoroughly will undoubtedly require detailed, field-based studies in a variety of settings to complement the national overview provided by our survey-based data. Corroborating evidence from such studies would certainly strengthen our confidence in the estimates presented here. As discussed previously, nonetheless, the substantial mix of agencies over and under-achieving relative to their awarded FTEs lends some credence to our survey estimates (i.e., by suggesting that grantees are not simply reporting productivity gains equal to their awarded FTEs), as do the experiences reported by agencies with completely implemented technology and more explicit systems for measuring time saved.

Taking the redeployment estimates at face value, they generally support the efficacy of adopting new technology to maximize police productivity, a finding that could be fortuitous in view of recent accounts suggesting a shortage of qualified recruits in law enforcement (Koper and Moore 2001c; Law Enforcement News 2000). Yet given the variable success of MORE technology grantees, police administrators desiring to improve productivity through technology should be committed to measuring and evaluating officer redeployment. Practitioners will also need further information about factors that facilitate the successful application of technology. For example, how does the success of technology utilization depend upon the type of technology employed and other characteristics of the agency, technology service provider, and/or community? Analysts could perhaps employ a mix of survey and field-based methods to further investigate these issues.

Finally, we have focused on COPS and policing levels in this paper. There are, of course, additional issues that will shape the legacy of COPS. How has COPS influenced the style of American policing (e.g., see Roehl et al. 2000; Moore et al. 2000)? What types of benefits other than time savings have grantees derived from COPS-funded technology (e.g., see Roth et al. 2000b)? And has COPS reduced crime? The latter question will be of paramount interest to researchers, policymakers, and citizens. Before answering that question, however, it is first necessary to assess the implementation of COPS. The findings of this study suggest that though COPS may not create a lasting increase of 100,000 officers, it will most probably leave a residual of 69,000 to 92,000 additional officers in America's communities – a change which is likely to have long-standing reverberations for police administration and crime control.

TABLES

Table 1.   Agencies Surveyed for Year 2000 COPS Survey, By COPS Program Status (as of April 1996) and Jurisdiction Size (n=1,270)*

Population Group	Agencies Not Funded Through COPS	COPS FAST/AHEAD Hiring Program Grantees	COPS Universal Hiring Program Grantees	COPS MORE Technology, Civilian, and Overtime Grantees	Total
Jurisdiction of less than 50,000	146	199	183	189	717
Jurisdiction of 50,000 or more	147	187	132	201	667
Total	293	386	315	390	1384

* The numbers sum across the cells to 1,384 rather than 1,270 because some agencies are counted more than once due to participation in multiple COPS grant programs. See Appendix A for further details of the survey design.

Table-1

Table 2. Retention of Officer Positions Funded With COPS Hiring Grants: Experiences with Programmatically Expired Positions and Future Expectations for Positions Not Programmatically Expired. Estimates and 90% Confidence Bounds (in Percentages).*

Agency Size and Status (Sample Size)**	% Expired Positions Retained (90% Confidence Bounds)	% Non-Expired Positions Expected to Be Retained (90% Confidence Bounds)	% Non-Expired Positions Expected to be Retained 5 or More Years (90% Confidence Bounds)*
Small agencies with expired positions (n=161)	79% (70% <= p <= 86%)		
Small agencies with non-expired positions (n=285)***		73% (65% <= p <= 80%)	
Small agencies with non-expired positions (n=285)***			66% (57% <= p <= 72%)
Large agencies with expired positions (n=116)	81% (63% <= p <= 91%)		
Large agencies with non-expired positions (n=238)		78% (64% <= p <= 86%)	
Large agencies with non-expired positions (n=238)			76% (61% <= p <= 85%)

* Confidence bounds were calculated for log(1-p) where p is the proportion of officers retained. This was done to ensure that the upper bound of the confidence intervals did not exceed 1 (see Appendix B). Due to the estimation method, the confidence bounds are not symmetrical.

** Groups are not mutually exclusive (i.e., a given agency may have had both expired and non-expired positions).

*** One agency was removed from analysis due to an outlier value that inflated the confidence intervals substantially.

Table-2

Table 3. *Retention of Civilian Positions Funded With COPS MORE Grants: Experiences with Programmatically Expired Positions and Future Expectations for Positions Not Programmatically Expired. Estimates and 90% Confidence Bounds (in Percentages).**

Agency Size and Status (Sample Size)**	% Expired Positions Retained (90% Confidence Bounds)	% Non-Expired Positions Expected to Be Retained (90% Confidence Bounds)	% Non-Expired Positions Expected to be Retained for 5 or More Years (90% Confidence Bounds)*
Small agencies with expired positions (n=40)	80% (62% <= p <= 90%)		
Small agencies with non-expired positions (n=31)		65% (24% <= p <= 84%) *(38% <= p <= 92%)****	
Small agencies with non-expired positions (n=31)			61% (20% <= p <= 81%) *(33% <= p <= 89%)****
Large agencies with expired positions (n=49)	77% (58% <= p <= 87 %)		
Large agencies with non-expired positions (n=60)		91% (77% <= p <= 96%)	
Large agencies with non-expired positions (n=60)			83% (56% <= p <= 93%)

* Unless otherwise noted, confidence bounds were calculated for log(1-p), where p is the proportion of civilians retained. This was done to ensure that the upper bound of the confidence intervals did not exceed 1 (see Appendix B). Due to the estimation method, the confidence bounds are not symmetrical.

** Groups are not mutually exclusive (i.e., a given agency may have had both expired and non-expired positions).

*** Alternative confidence bounds based on the variance of p, where p is the proportion of civilians retained (see Appendix B). We experimented with this method because the estimate of p was substantially below 1, lessening the probability that the upper bound of the confidence interval would exceed 1.

Table-3

Table 4.   Productivity Gains from MORE Technology Grants: Redeployments from Operational Technology and Expected Redeployments from Non-Operational Technology. Estimates and 90% Confidence Bounds (Expressed as Percentages).

Agency Size and Status	Achieved and/or Expected Productivity Gains, Expressed as % of Awarded FTEs (90% Confidence Bounds)*
All small agencies (n=168)	93% (66% <= r <= 119%)
Small agencies with all technology fully operational (n=95)	118% (81% <= r <= 155%)
Small agencies with all technology fully operational and systems for measuring time saved (n=51)	119% (91% <= r <= 146%)
All large agencies (n=223)	92% (81% <= r <= 104%)
Large agencies with all technology fully operational (n=82)	103% (79% <= r <= 126%)
Large agencies with all technology fully operational and systems for measuring time saved (n=51)	110% (79% <= r <= 140%)

* Confidence bounds are based on the variance of r, where r is the ratio of the mean number of FTEs redeployed (or expected to be redeployed) to the mean number of awarded FTEs (see Appendix B). All estimates exclude approximately 2.5% of cases having the largest excesses of redeployed over awarded FTEs and approximately 2.5% of cases having the largest excesses of awarded over redeployed FTEs.

Table 5.   Projected Temporary and Permanent Expansions of U.S. Policing Levels Due to COPS Grants Awarded Through April 2000.

Grant Type and Agency Size	Awarded Officers-FTEs*	Temporary (1995-2005) Officer-FTE Expansion (Lower-Upper Bound Ests.)**	Permanent (Post-2005) Officer-FTE Expansion (Lower-Upper Bound Ests.)**
Hiring Grants	61,349	61,349 (N/A)	47,057 (39,836-51,835)
Small	29,422.5	29,422.5 (N/A)	21,910 (19,484-23,970)
Large	31,926.5	31,926.5 (N/A)	25,147 (20,352-27,865)
MORE Civilians	6,563	6,563 (N/A)	5,495 (4,347-6,200)
Small	1,717	1,717 (N/A)	1,131 (677-1,577)
Large	4,846	4,846 (N/A)	4,364 (3,670-4,623)
MORE Technology	31,979	29,484 (24,950-34,211)	29,484 (24,950-34,211)
Small	6,348	5,903 (4,189-7,554)	5,903 (4,189-7,554)
Large	25,631	23,581 (20,761-26,657)	23,581 (20,761-26,657)
MORE Overtime	557	557	N/A
Small	181	181	N/A
Large	376	376	N/A
Total COPS	100,448	97,953 (93,419-102,680)	82,036 (69,133-92,246)
Small	37,668.5	37,223.5 (35,509.5-38,874.5)	28,944 (24,350-33,101)
Large	62,779.5	60,729.5 (57,909.5-63,805.5)	53,092 (44,783-59,145)

* Part-time officers were counted as 0.5 officers. Civilian counts represent FTEs associated with grants for civilians rather than counts of civilian employees.
** Lower and upper bound projections are based on the application of estimates and confidence intervals in tables 2-4 to the universe of officers and FTEs awarded to small and large agencies.

APPENDIX A.
THE NATIONAL COPS SURVEY

Overview of the COPS-Police Hiring and Retention Survey Sample

From June through August of 2000, interviewers from the National Opinion Research Center (NORC) conducted telephone interviews with a nationally representative sample of 1,270 police agencies. Each interview was conducted with the chief of police or a representative designated by the chief of police. Project staff selected and interviewed these agencies initially in 1996 as part of the Urban Institute's (UI) national evaluation of the COPS program. Project staff re-interviewed these agencies during the summer of 2000 for an updated study of the COPS program.

Key characteristics of the sample are presented in tables A.1 through A.3. The sample is stratified by jurisdiction size and COPS funding status and program type as of 1996 (the development of the survey design is discussed below). Large agencies are categorized as those serving jurisdictions of 50,000 or more persons (see Table A.1). The remaining agencies constitute the small agency group. COPS grantees and large agencies were sampled disproportionately due to, respectively, the survey's role in the ongoing UI evaluation of the COPS program and the disproportionate concentration of the nation's police officers in large jurisdictions. The data were weighted to provide national estimates. The breakdown of COPS grantee status shown in Table A.2 represents the agencies' grant status as of year 2000. By that time, 86% of the agencies were COPS grantees; 59% of the agencies had been funded with COPS hiring grants.[28]

As shown in Table A.3, the majority of the agencies are municipal or county police agencies. Sheriffs' agencies are the next most common agency type. State police and other miscellaneous agencies account for less than 10 percent of the sample.

Table A.1.   Jurisdiction Size of Sample Agencies (n=1,270)

Size	Average Number of Officers	% of Sample	% of Weighted Sample
Large: population of 50,000 or more	361.4	43.5	5.0
Small: population less than 50,000	23.6	56.5	95.0

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[28] Some agencies changed COPS funding status from 1996 through 2000. In 1996, 293 of the agencies in the sample (23%) were not funded through the COPS program. By 2000, 175 of these agencies (14% of the sample) still did not have COPS funding. Only 2.8% of the agencies changed from being grantees in 1996 to non-grantees by 2000.

Table A.2. COPS Grantee Status of Sample Agencies (n=1,270)

	% of Sample	% of Weighted Sample
COPS Grantee	86.2	62.5
Hiring Grantee	*59.2*	*54.0*
No COPS Grants	13.8	37.5

Table A.3. Agency Types of Sample Agencies (n=1,270)*

	% of sample	% of weighted sample
Municipal / County	80.1	78.3
Sheriff	13.1	13.1
University or School Police	2.8	4.6
State Police	1.4	1.0
Other**	2.5	2.7

* Percentages may not add to 100 due to rounding.

** "Other" agencies include transit police, public housing police, park police, tribal police, and other miscellaneous agency types.

Development of the Sample Design

The sample design is based on that developed in 1996 for the UI evaluation of the federal COPS program. To create the 1996 sample, UI staff utilized records from the federal Office of Community Oriented Policing Services (the COPS Office), the Uniform Crime Reports, and the National Crime Information Center to develop a national list of nearly 21,000 law enforcement agencies eligible for COPS funding. These agencies were stratified according to COPS grant status and jurisdiction size as follows (see Table A.4).

Table A.4. Sampling Frame by Funding/Program Status and Population Category For 1996 COPS Survey*

Population Group	Agencies Not Funded Through COPS	COPS FAST-AHEAD Grantees	COPS UHP Grantees	COPS MORE Grantees	Total
Less than 50,000	8,373	5,845	1,186	1,136	16,540
50,000 or more	267	546	159	349	1,321
Missing	4,208			79	4,287
Total	12,848	6,391	1,345	1,564	22,148

* Some agencies are counted more than once due to participation in multiple COPS grant programs.

The FAST/AHEAD and Universal Hiring Program (UHP) strata refer to different COPS hiring grant programs. The MORE stratum corresponds to agencies which were funded to acquire technology or civilians and/or to pay overtime for additional patrol.[29]

UI staff sampled over 2,000 of these agencies for a first-wave interview in the fall of 1996. The designed sampling fractions are shown below (Table A.5). Based on substantive and statistical considerations, project staff sampled disproportionately from among COPS grantees and large agencies. Nonetheless, the sample is a nationally representative sample weighted to produce national estimates.

Table A.5. *Designed Sampling Fraction By Funding-Program Status and Population Category for 1996 COPS Survey*

Population Group	Agencies Not Funded Through COPS	COPS FAST/AHEAD Grantees	COPS UHP Grantees	COPS MORE Grantees	Total
Less than 50,000	0.013	0.048	0.236	0.248	0.057
50,000 or more	1.0	0.498	1.0	0.777	0.734
Missing	0.044				0.044
Total	0.044	0.086	0.326	0.354	0.095

Table A.6 presents the response rates for the 1996 COPS survey.

Table A.6. *Survey Response Rates By Funding-Program Status and Population Category (In Percentages) For 1996 COPS Survey*

Population Group	Agencies Not Funded Through COPS	COPS FAST/AHEAD Grantees	COPS UHP Grantees	COPS MORE Grantees	Total
Less than 50,000	61	84	78	75	77
50,000 or more	67	78	99	84	80
Missing	61				61
Total	64	81	85	79	77

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[29] The size stratification point of 50,000 residents was based in part on administrative distinctions established for early COPS grants. In late 1994, the COPS Office established the Funding Accelerated for Small Towns (FAST) program for agencies serving populations of 50,000 or less. The program had simplified application procedures to speed processing. At the same time, the COPS Office established the Accelerated Hiring, Education, and Deployment (AHEAD) program, which had more stringent application procedures, for agencies serving larger jurisdictions. These early programs were later replaced by the Universal Hiring Program (UHP), which applies to agencies of all sizes.

For the summer 2000 COPS survey, we sought to re-interview the 1,471 agencies that participated in the 1996 survey. Telephone interviewers from the National Opinion Research Center (NORC) completed interviews with 1,270, or 86%, of the target agencies. Table A.7 presents the response rates by stratum. Interviewers achieved a response rate of 83% or higher for each cell. Note that the response rates were calculated after making the following adjustments to the sample. Based on work subsequent to the 1996 survey, we collapsed the non-COPS agencies with missing population into the small non-COPS group for the summer 2000 survey. In addition, a small number of agencies were dropped from the sample for miscellaneous reasons such as agency dissolution, change in COPS eligibility status, and selection for pre-testing of the survey instrument. Note also that because some agencies had multiple grants as of 1996 and were thus eligible to be sampled more than once, the interview numbers sum across the cells to 1,384 rather than to 1,270, the actual number interviewed (i.e., some agencies are counted more than once in Table A.7).

Table A.7. Completed Interviews and Response Rates (In Parentheses) By Funding-Program Status and Population Category For 2000 COPS-H&R Survey*

Population Group	Agencies Not Funded Through COPS	COPS FAST/AHEAD Grantees	COPS UHP Grantees	COPS MORE Grantees	Total
Less than 50,000	146	199	183	189	717
	(.830)	(.865)	(.851)	(.896)	(.862)
50,000 or more	147	187	132	201	667
	(.855)	(.886)	(.880)	(.910)	(.885)
Total	293	386	315	390	1384
	(.842)	(.875)	(.863)	(.903)	(.873)

* Some agencies are counted more than once due to participation in multiple COPS grant programs

UI staff developed a weighting scheme for the 1996 survey to account for the agencies' differential probabilities of selection into the sample, adjusting for non-response and aligning the weighted distribution of agencies in the sample with the distribution of agencies in the U.S. population of police agencies. Because the survey response rates for the summer 2000 survey were high and did not differ significantly across strata, we retained this weighting scheme for the summer 2000 survey analyses.

In the simplest case, each agency in the same grant program and population category has the same weight. If j is the index for grant program and k is the index for population category, then the weight, W_{jk}, for a particular grant program and population category is

$$W_{jk} = U_{jk} / S_{jk}$$

where U_{jk} is the number of agencies in the population and S_{jk} is the number of agencies with completed interviews in the sample. If, however, an agency received funding for multiple grants, then the agency had a selection probability and sample weight for each program. For multi-program agencies, therefore, the weight is the average of the agency's program weights (i.e., the arithmetic average probability of being selected into the sample). For further details of the original survey design and weighting scheme, see *National Evaluation of the COPS Program: Title I of the 1994 Crime Act* by Roth et al. (pp. 275-287).

APPENDIX B.
VARIANCES AND CONFIDENCE INTERVALS FOR ESTIMATED RATIOS AND PROPORTIONS[30]

This appendix describes the methodology used to computer variances and construct confidence intervals for the proportion and ratio measures estimated in this paper. If θ is the population ratio to be estimated, then the sample estimate of this ratio is:

$$\hat{\theta} = \frac{\overline{K}}{\overline{M}}$$

where K-bar is the mean of the variable K and M-bar is the mean of the variable M. For example, K might represent officers hired or FTEs redeployed and M might represent officers or FTEs awarded. If **K** must be less than or equal to **M**, θ is proportion and only values between 0 and 1 are plausible (e.g., the proportion of awarded officers that have been hired).

Estimates for Proportions Less Than 0.4.

If θ is a proportion and the sample estimate was less than 0.4, we computed the variances and confidence intervals based on the log of θ. This ensured that the lower bound of the confidence interval did not fall below zero.

$$Var\left[\log(\hat{\theta})\right] = \frac{Var\left[\overline{K}\right]}{\left(\overline{K}\right)^2} + \frac{Var\left[\overline{M}\right]}{\left(\overline{M}\right)^2} - 2\frac{Cov\left[\overline{K},\overline{M}\right]}{\left(\overline{K}\right)\left(\overline{M}\right)}$$

In terms of the variance and covariance of the *variables* (K and M) instead of the variances and covariance of the *means* of K and M, the formula is:

$$Var\left[\log(\hat{\theta})\right] = \left(\frac{Var[K]}{\left(\overline{K}\right)^2} + \frac{Var[M]}{\left(\overline{M}\right)^2} - 2\frac{Cov[K,M]}{\left(\overline{K}\right)\left(\overline{M}\right)}\right)\left(\frac{1}{N}\right)$$

Confidence bounds for θ based on $\log(\theta)$

Let $100(1 - \alpha)$ be the confidence level (e.g. 95 %, 90 %) and α be the probability of type 1 error. Then $\Phi^{-1}[1 - \alpha/2]$ is the critical value for the confidence interval and is the inverse of the normal cumulative distribution function.

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[30] This appendix was written by John Marcotte and edited by Christopher Koper.

Lower bound:

$$\hat{\theta}_{lower} = \left(\hat{\theta}\right)\exp\left[-\left(\sqrt{Var\left[\log\left(\hat{\theta}\right)\right]}\right)\Phi^{-1}[1-\alpha/2]\right]$$

Upper bound

$$\hat{\theta}_{upper} = \left(\hat{\theta}\right)\exp\left[\left(\sqrt{Var\left[\log\left(\hat{\theta}\right)\right]}\right)\Phi^{-1}[1-\alpha/2]\right]$$

Estimates for Proportions Greater Than 0.6.

If θ is a proportion and the sample estimate was greater than 0.6, we calculated the variances and confidence intervals based on the log of **(1 − θ)**. This ensured that the upper confidence bound for θ did not exceed one.

$$Var\left[\log(1-\hat{\theta})\right] = \frac{Var\left[\overline{M-K}\right]}{\left(\overline{M-K}\right)^2} + \frac{Var\left[\overline{M}\right]}{\left(\overline{M}\right)^2} - 2\frac{Cov\left[\overline{M-K},\overline{M}\right]}{\left(\overline{M-K}\right)\left(\overline{M}\right)}$$

In terms of the variance and covariance of the *variables* (K and M) instead of the variances and covariance of the *means* of K and M, the formula is:

$$Var\left[\log(1-\hat{\theta})\right] = \left(\frac{Var[M-K]}{\left(\overline{M-K}\right)^2} + \frac{Var[M]}{\left(\overline{M}\right)^2} - 2\frac{Cov[M-K,M]}{\left(\overline{M-K}\right)\left(\overline{M}\right)}\right)\left(\frac{1}{N}\right)$$

Confidence bounds for θ based on log(1−θ)

Let $100(1 - \alpha)$ be the confidence level (e.g. 95 %, 90 %) and α be the probability of type 1 error. Then $\Phi^{-1}[1 - \alpha/2]$ is the critical value for the confidence interval and is the inverse of the normal cumulative distribution function

Lower bound:

$$\hat{\theta}_{lower} = 1 - \left(\left(1-\hat{\theta}\right)\exp\left[\left(\sqrt{Var\left[\log\left(1-\hat{\theta}\right)\right]}\right)\Phi^{-1}[1-\alpha/2]\right]\right)$$

Upper bound

$$\hat{\theta}_{upper} = 1 - \left(\left(1-\hat{\theta}\right)\exp\left[-\left(\sqrt{Var\left[\log\left(1-\hat{\theta}\right)\right]}\right)\Phi^{-1}[1-\alpha/2]\right]\right)$$

Estimates for Ratio Measures

If θ is not a proportion (e.g., the ratio of redeployed to awarded FTEs) or if the sample estimate of θ fell between 0.4 and 0.6, we calculated the variance and confidence intervals based on the variance of θ.

$$Var\left[\hat{\theta}\right] = \left(\frac{Var\left[\overline{K}\right]}{\left(\overline{K}\right)^2} + \frac{Var\left[\overline{M}\right]}{\left(\overline{M}\right)^2} - 2\frac{Cov\left[\overline{K},\overline{M}\right]}{\left(\overline{K}\right)\left(\overline{M}\right)} \right) \left(\hat{\theta}\right)^2$$

In terms of the variance and covariance of the *variables* (K and M) instead of the variances and covariance of the *means* of K and M, the formula is:

$$Var\left[\hat{\theta}\right] = \left(\frac{Var\left[K\right]}{\left(\overline{K}\right)^2} + \frac{Var\left[M\right]}{\left(\overline{M}\right)^2} - 2\frac{Cov\left[K,M\right]}{\left(\overline{K}\right)\left(\overline{M}\right)} \right) \left(\frac{1}{N}\right) \left(\hat{\theta}\right)^2$$

Confidence bounds for θ based on θ

Let $100(1 - \alpha)$ be the confidence level (e.g. 95 %, 90 %) and α be the probability of type 1 error. Then $\Phi^{-1}[1 - \alpha/2]$ is the critical value for the confidence interval and is the inverse of the normal cumulative distribution function

Lower bound:

$$\hat{\theta}_{lower} = \hat{\theta} - \left(\sqrt{Var\left[\hat{\theta}\right]} \right) \Phi^{-1}[1 - \alpha/2]$$

Upper bound:

$$\hat{\theta}_{upper} = \hat{\theta} + \left(\sqrt{Var\left[\hat{\theta}\right]} \right) \Phi^{-1}[1 - \alpha/2]$$

Complex Sampling Adjustment

If the analysis involved the use of a stratified sample (i.e., weighted data), we adjusted the variance formula for complex sampling (this was necessary for the hiring analyses with large agencies). The design effect (**deff**) or **A** factor was multiplied times each variance estimate.

$$A = deff = \frac{\overline{W^2}}{\left(\overline{W}\right)^2}$$

The design effect is the ratio of the mean of the squared-weight to the square of the mean weight. In this case, the design effect (deff) is always greater than or equal to 1.0.

The design adjusted variances:

$$Var\left[\log(\hat{\theta})\right](deff) = Var\left[\log(\hat{\theta})\right]\left(\frac{\overline{W^2}}{\left(\overline{W}\right)^2}\right)$$

$$Var\left[\log(1-\hat{\theta})\right](deff) = Var\left[\log(1-\hat{\theta})\right]\left(\frac{\overline{W^2}}{\left(\overline{W}\right)^2}\right)$$

$$Var\left[\hat{\theta}\right](deff) = Var\left[\hat{\theta}\right]\left(\frac{\overline{W^2}}{\left(\overline{W}\right)^2}\right)$$

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