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Evidence-Based Security Practices

Video Surveillance and Security

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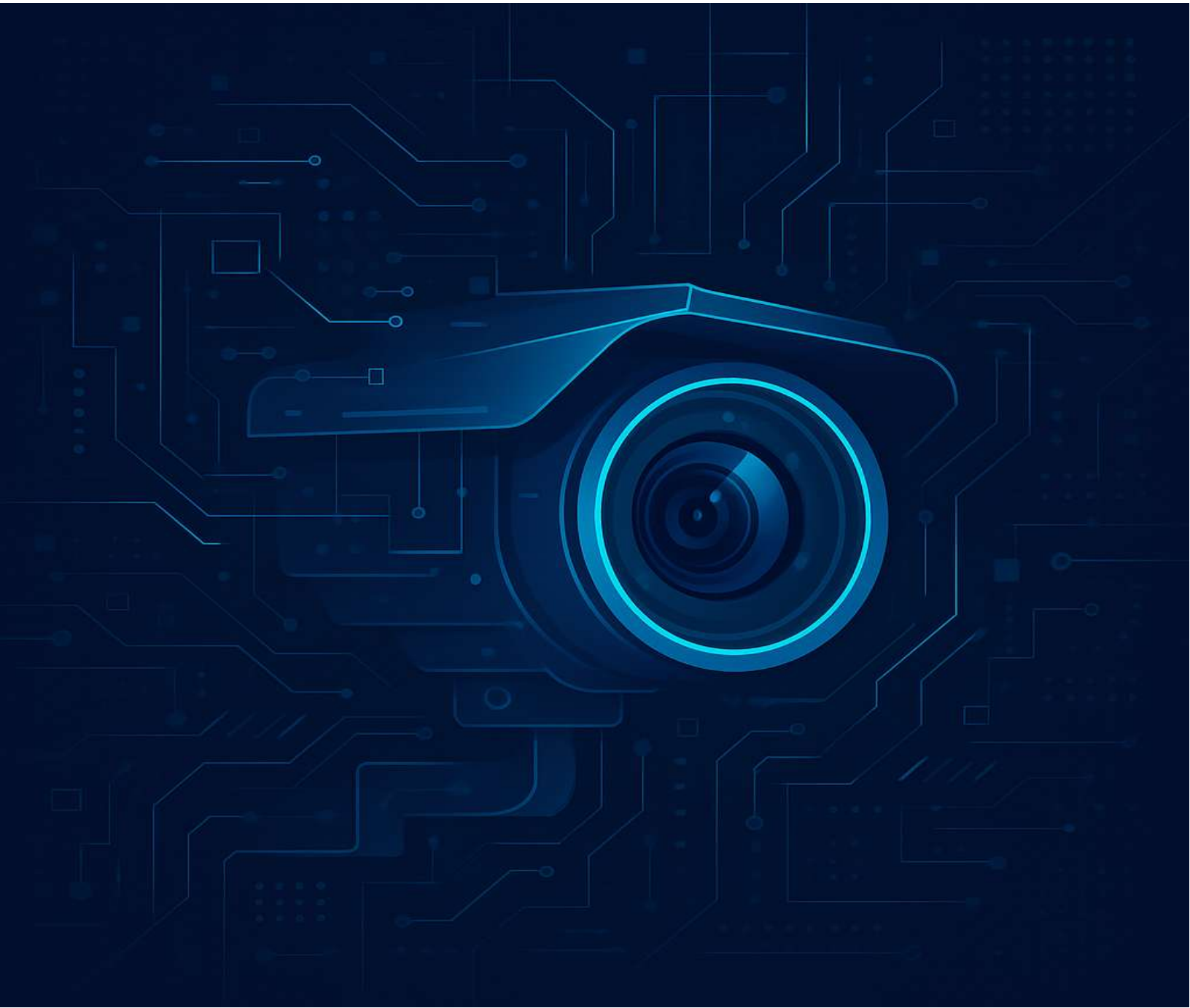

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Karim H. Vellani, CPP, CSC
Chair, Evidence-Based Security Practices Committee

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INTRODUCTION

This report examines the effectiveness of closed-circuit television (CCTV) video surveillance cameras in various contexts.[1] The overall goal is to provide security professionals in the private sector with evidence-based observations to inform their video surveillance operations. The report reviews empirical research findings on pertinent research conducted in private settings, CCTV's role in general crime prevention and case clearance, topics of potentially heightened importance in the private sector, such as fear of crime and cost-benefit analysis, and the emerging use of computer vision technology in surveillance systems. Key takeaways include:

- Both security professionals and members of the public tend to view CCTV favorably.
- Offenders typically do not consider the presence of CCTV as a serious threat and use simple techniques to evade detection by cameras.
- Experiments of CCTV in retail environments show positive effects on product shrinkage, but the effects can diminish over time.
- The overall body of research shows CCTV has a modest, but significant, impact on crime. The largest effects are on drug crime followed by vehicle crime and property crime. Overall, CCTV does not significantly impact violent crime.

[1] I recognize that the term "CCTV" is now considered outdated, and that security professionals more commonly refer to this technology as "video surveillance." The phrase "Closed Circuit Television" accurately described earlier surveillance systems, which were the focus of much of the initial research. However, modern systems rely on server- and cloud-based video streaming and storage, features that are fundamentally at odds with the idea of a "closed circuit." La Vigne et al. (2011, p.1) pointed out this contradiction over 14 years ago, yet the term "CCTV" has remained prevalent in academic literature (old habits die hard!). For this reason, the term "CCTV" is used throughout this report to reflect its continued use in scholarly sources.

- The effect of CCTV on crime prevention is highly contextual, influenced by land usage, crime type, monitoring type, and integration with proactive crime prevention methods.
- The effect of CCTV on offender apprehension is mixed, with video surveillance systems on private railway networks generally having more success than systems in public places.
- Operational impediments commonly introduce “surveillance barriers” into CCTV programs, which causes CCTV operators to rarely detect crime and generate enforcement activity.
- Research on CCTV’s effect on fear of crime is not well developed and suffers from several conceptual and methodological shortcomings.
- Cost-benefit analyses have found that CCTV can be cost effective, offsetting expenses associated with installing and maintaining systems when significant crime reductions are generated. However, this is not always the case and varies depending on how crime costs are calculated.
- Advancements in computer vison technology (CVT) allow for the detection of weapons and other images of interest in CCTV footage. However, research has yet to measure how CVT impacts public safety outcomes.

The remainder of this report discusses these findings in more detail.

CCTV IMPACT AND PRIVATE ACTORS

Most research on CCTV in private settings focuses on the perceptions of motivated offenders and security professionals. Surveys and interviews with security professionals and prospective business patrons highlight the balance between preventing crime and minimizing inconvenience to the legitimate customer base. Byrd et al. (2025) conducted a survey of over 1600 U.S. adults recruited though the Amazon Mechanical Turk (MTurk) platform to measure their perceptions of security features and how their increased implementation would impact their attendance at various commercial facilities. Specific to CCTV, over 78% of respondents were familiar with the technology and most reported the presence of CCTV would either not change or increase their current willingness to attend each of the mentioned venues: concert halls, convention centers, shopping malls, or sports stadiums. These results echo research finding that the public is generally supportive of CCTV. For example, a nationally representative survey of Swedish citizens found 90% held positive or quite positive views of CCTV, 72% wanted more CCTV cameras in the country, and only 16% either fully or partially agreed that CCTV cameras in public places violated their privacy (Lahtinen, 2019).

Through semi-structured interviews with nearly 400 store and shopping mall managers in Istanbul, Turkey, Özaşçılar (2022) found that CCTV and electronic tags were the most common shoplifting prevention methods used. Managers were significantly more likely to favor the use of CCTV if they reported shoplifting substantially harms profitability, reported shoplifting by employees as a serious problem, or managed shopping malls (rather than stores). In a later survey of college students in Istanbul, Özaşçılar (2025) found that of four crime prevention

measures CCTV ranked second (to target hardening) in perceived effectiveness. Respondents who say they were unlikely to shoplift, would personally reporting shoplifting, and would feel guilty if they shoplifted were more likely to report that CCTV was effective at deterring shoplifting.

A study by Lasky et al. (2017) measured shoplifter perceptions of CCTV during the criminal act. Lasky et al. (2017) conducted qualitative interviews with active shoplifters who "shoplifted" at cooperating retail stores[2] while wearing an eye tracking device. After the shoplifting events, researchers interviewed participants about their decision making, watching the eye-tracking video as the participant narrated their decision-making during the theft. While participants commonly reported that CCTV heightened their sense of risk, they nonetheless stole merchandise in view of cameras. Respondents overwhelmingly reported their belief that cameras were not actively monitored and/or dummy cameras as the reason why they disregard CCTV presence when shoplifting. Respondents further reported that they concealed merchandise in blind spots to protect against their assumptions about CCTV being inaccurate.

Offender perceptions of CCTV in retail environments largely reflects general attitudes observed in other research settings. During interviews with prisoners in the United Kingdom

[2] Four stores of two nationally known chain retailers cooperated in the study. The research team spent two 8-10 hours at each location with the shoplifters. Security personal and managers were aware of the study, with the remaining employees uninformed. Management agreed not to arrest or to prosecute any participants for stealing merchandise while they were participating in the research. All stolen merchandise was later returned to the store.

and Australia, respectively, both Gill & Loveday (2003) and Willis et al. (2017) found that offenders commonly did not consider surveillance cameras as a serious threat. However, while most offenders did not worry about CCTV in planning their offenses, prisoners previously caught or convicted with CCTV footage were significantly more likely to report that surveillance cameras increase the likelihood of apprehension. This demonstrates that deterrence effects may be at least partially related to the successful detection and apprehension of offenders via CCTV.

A number of empirical evaluations provide more direct evidence on the role of private actors in CCTV prevention strategies. Beck & Willis (1999) conducted what the author believes to be the first test of CCTV's prevention effects in a retail setting. Fifteen chain stores in the U.K. were outfitted with one of three types of CCTV systems, which ranged from moving cameras (e.g., pan, tilt, zoom) actively monitored by staff and equipped with public viewing monitors to dummy cameras alongside public viewing monitors with no recording capacity. All three CCTV system types experienced initial reductions in shrinkage (e.g., loss of inventory). However, at the 6-month mark, stores with high-level CCTV systems experienced shrinkage increases while stock loss continued to decrease for the other CCTV system types. Beck & Willis (1999) concluded that CCTV can generate short-term decreases in crime, but that effects can diminish over time.

Hayes & Downs (2011) conducted a randomized experiment to analyze how CCTV contributes to retail theft prevention. The analysis focused on three crime prevention interventions: in-

aisle CCTV public view monitors, in-aisle CCTV domes, and polycarbonate protective safe boxes. The three interventions were hypothesized to situationally deter individuals by temporarily "overloading" them by creating immediate feelings of concern, confusion, or fear. Given that the interventions did not involve locking up items and providing access only through employee assistance—which can negatively impact sales—they may deliver overloading effects without compromising profitability. Seventy stores were randomly assigned to receive one of the three interventions or to serve as a control location (i.e., none of the interventions was implemented). Hayes & Downs (2011) found that shrinkage of high-risk products was significantly lower during the post-intervention period than the pre-intervention period for each of the three crime prevention solutions, with shrinkage decreasing by between 27% and 61% in experimental stores compared to the control stores. No significant effects were observed for intervention type, meaning that the in-aisle CCTV public view monitors, in-aisle CCTV domes, and polycarbonate protective safe boxes generated similar levels of shrinkage reduction.

Two studies analyzed the effect of security cameras installed within taxis on taxi driver homicide rates across large U.S. cities (Chaumont Menéndez et al., 2014; Chaumont Menéndez et al., 2013). These studies leveraged the introduction of legislation that licensed security cameras or bullet resistant partitions in taxi cabs at various points between 1996 and 2010. Taxi driver homicide rates (per 1,000 licensed taxis) were calculated differently across studies. Menéndez et al. (2013) collected news clippings of taxi driver homicides in each city while Menéndez et al. (2014) identified tix driver homicides from crime reports provided by

police departments. Both studies found that cities mandating security cameras in taxis experienced lower taxi driver homicide rates than cities that do no mandate security cameras. There was no difference between cities with and without bullet-resistant partition mandates, indicating that CCTV more effectively prevented driver homicides than in-vehicle partitions.

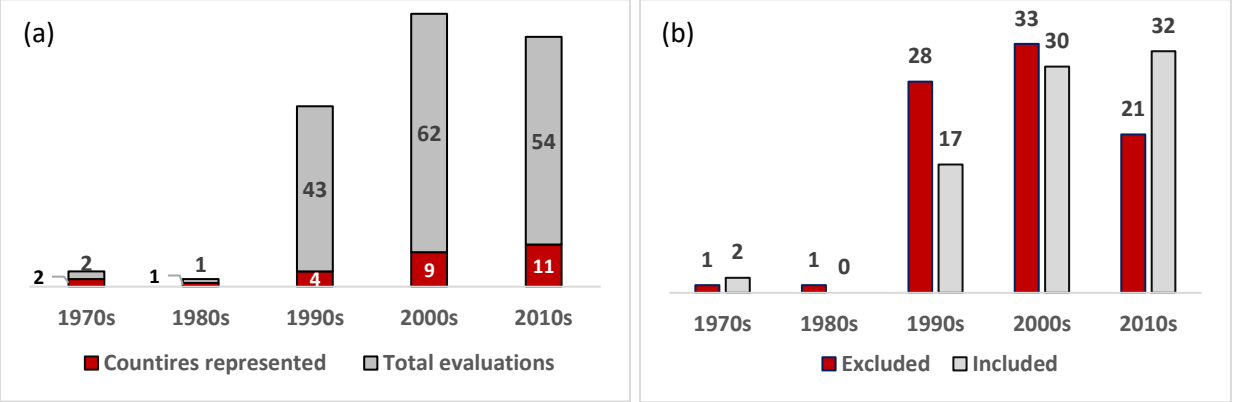
Welsh et al. (2020) conducted a more general analysis of the role of private actors in public CCTV systems. Welsh et al. (2020) incorporated the primary list of CCTV evaluation studies compiled as part of Piza et al.'s (2019) systematic review and meta-analysis (discussed in more detail in the next section). Welsh et al. (2020) reviewed each of the 76 evaluation studies included in the meta-analysis to determine the personnel in charge of carrying out the surveillance functions: sworn police officers, civilian security personnel, or a combination of police officers and civilian security personnel. The largest effects were observed for the civilian security schemes, with a crime reduction of 18% in treatment compared to control areas. The police and mixed police/civilian society schemes generated 7% and 14% crime reductions, respectively. However, it should be noted that there was a high level of variation across civilian security operators in the studies. For example, the civilian security operators working alongside police officers in Newark (Piza, 2018) were hired, trained, and supervised directly by the Newark Police Department. The Burnley CCTV (Armitage et al., 1999) scheme used retired British Legion personnel hired directly by the local authority who monitored cameras from a separate facility, with the police having no authority over the CCTV operators.

CCTV IMPACT AND CRIME CONTROL

Crime Prevention

The scientific knowledge on CCTV's crime control effects has steadily increased over the years. To my knowledge, Musheno et al. (1978) is the earliest evaluation study of CCTV's crime prevention effects. The decades since have witnessed a profound growth of research, beginning in the 1990s. The number of countries that served as CCTV study sites also rapidly expanded, increasing from 2 to 11 between the 1970s and 2010s (see Figure 1a). The general quality of CCTV evaluation research markedly improved over this time frame. Over 62% of evaluation studies published in the 1990s were deemed too methodologically weak for inclusion in a systematic review of CCTV effect, with the percentage of excluded studies reducing to under 40% in the 2010s (see Figure 1b).

Figure 1. (a) Frequency of CCTV crime prevention evaluations, by decade and country (adapted from Thomas et al., 2022) and (b) count of studies included and excluded from CCTV systematic review by decade (adapted from Reid et al., forthcoming).



The field has developed enough for three separate systematic reviews on CCTV's crime prevention effects to be completed (Piza et al., 2019; Welsh & Farrington, 2002, 2009). The most recent systematic review (Piza et al., 2019) identified 161 evaluation studies of CCTV's

crime prevention effect. Eighty studies fit the criteria for inclusion: 1) CCTV was the primary focus of the intervention; 2) the evaluation used an outcome measure of crime; 3) the research design involved, at a minimum, before-and-after measures of crime in treatment and comparable control areas, and; 4) both treatment and control areas experienced at least 20 crimes during the preintervention period. 76 studies provided the necessary data to be included in a statistical meta-analysis.

Piza et al.'s (2019) meta-analysis found that across the overall pool of studies crime decreased in CCTV treatment areas by about 13% as compared to control areas. Piza et al. (2019) observed the greatest effects of CCTV on drug crime (~20%) followed by 14% reductions for both vehicle crime and property crime. No significant effects were observed for violent crime. However, sub-analyses point to some important contextual factors. Strategic considerations influence the effect of CCTV. Systems incorporating active monitoring practices were associated with a significant crime reduction of approximately 15% while passively monitored systems did not generate any significant effects. Systems incorporating multiple complementary interventions alongside CCTV were associated with a significant 34% reduction in crime with no significant effects observed for schemes deploying no or a single complementary intervention. CCTV effect was also related to geographic setting. The largest crime prevention effects (37%) were observed in car parks. CCTV schemes deployed in residential areas also generated significant crime reductions of approximately 12%. This is noteworthy, given the prior reviews did not observe any significant effects in residential areas (Welsh & Farrington, 2002, 2009).

To my knowledge, 12 CCTV evaluations using case control designs (a requirement of determining causality) have appeared following the publication of Piza et al. (2019) (See Appendix: Research Summary Table). Four of the 6 studies finding significant crime reductions reported the deployment of additional interventions alongside CCTV. Directed police patrols featured prominently in three of these studies (Gerell, 2021; Gómez et al., 2021; Munyo & Rossi, 2020) with improved lighting and signage featured in the other (Circo & McGarrell, 2021). Interestingly, studies reporting other surveillance technologies—license plate readers and gunshot detectors—as the sole complementary interventions did not find any significant crime reductions (Lai et al., 2019; Robin et al., 2021). This finding suggests that technology's ability to be a "force multiplier" may not lead to crime reduction as often as proponents anticipate.

The updated research further communicates CCTV's effect in parking areas. Detroit's Project Greenlight deployed CCTV both inside and outside of targeted businesses, which were mostly locations with designated parking lots (liquor stores, gas stations, and convenience stores). The positive effects measured during the first-year of the intervention (Circo & McGarrell, 2021) can be seen as further support for CCTV's effect in motor vehicle parking areas. Project Greenlight expanded from 87 to 623 business locations (Circo et al., 2023), with many non-commercial locations (churches, community centers, etc.) added to the program.[3] A follow-

[3] The nature of Project Greenlight businesses was learned from personal communication with Giovanni Circo, April 18, 2025.

up evaluation found that the expanded program increased property crime reporting at some locations while having no significant impact on violence or disorder. Most of the crime prevention impact of Project Greenlight was driven by the locations that joined early in the program (Circo et al., 2023).

The expansion of the Project Greenlight target areas may have stretched resources too thinly for the benefits of video surveillance to be sustained, which has been observed elsewhere. For example, Piza et al. (2014b) found that each camera installation phase in Newark, NJ—which expanded from 14 cameras to 146 cameras over 4 years—was associated with up to a 47% reduction in proactive surveillance activity. In short, Newark's CCTV system grew too large for camera operators to effectively monitor, which mitigated the types of opportunities for directed police response that prior research identifies as an important component of successful CCTV operations. While I am unaware of any empirical research on the optimal camera-to-operator ratio, the Newark CCTV directed patrol experiment—which generated a significant reduction of violent crime and disorder—adjusted the Newark Police Department's camera-to-operator ratio downward from 73:1 to 33:1 during the intervention. Future research should more directly explore the relationship between surveillance system size, the number of operators actively monitoring video feeds, and crime reduction.

Piza et al. (2019) reported an average duration of 17 months for evaluation follow-up periods (i.e., the time after CCTV camera deployment), with the longest follow-up period 60 months (Griffths, 2003). Seven of the eleven recent CCTV studies incorporated follow-up periods

greater than 17 months with three finding significant crime reductions (Gómez et al., 2021; Jang et al., 2018; Piza et al., 2025). The only long-term study finding a significant reduction of crime other than motor-vehicle crimes (Gómez et al., 2021) reported GPS-assisted directed patrols, strategic police centers, and community alarm buttons (e.g., publicly installed devices that enable citizens to activate an alarm and directly alert police or security of an emergency) being deployed alongside CCTV, further highlighting the importance of complementary interventions.

Offender Apprehension

A literature on CCTV's effects on offender apprehension and case clearance has emerged over the prior decade. Piza et al. (2014b) found in-progress crimes in Newark, NJ detected and reported by CCTV resulted in on-scene enforcement at a significantly higher rate than crimes reported by citizen calls for service (33.1% vs. 17.1%). CCTV maintained its heightened enforcement rate over calls for service (11% vs. 4%) when enforcement was restricted to the arrest of the offender (rather than also including citations and suspect record checks). A follow-up randomized experiment in Newark, NJ found that offender apprehension can be further enhanced when directed motor vehicle patrols are paired with active CCTV monitoring (Piza et al., 2015). The experimental strategy generated an average of 5.8 enforcement actions per week. Over the preceding 52 weeks, Newark's CCTV system generated less than 1 enforcement action per week (Piza et al., 2015).

Several additional studies have analyzed CCTV's role in retroactive investigations. Pertinent to the topic of security private settings, several studies have focused on the effect of CCTV in

railway environments. Robb et al. (2015) and Sharp (2016) measured the correlation between multiple solvability factors and the clearance of metal theft and pickpocketing incidents, respectively, investigated by the British Transport Police. Both studies found that CCTV was significantly correlated with case clearance, though the relative magnitude differed. CCTV's effect size was lower than all but 4 of the 14 significant solvability factors in (Robb et al., 2015) but had the third highest effect size of 29 significant solvability factors in (Sharp, 2016).

Positive effects in railroad environment have also been detected in quasi-experiments. Ashby (2017) found that CCTV provided video evidence of crime occurring on the British Railway network in 45% cases, with investigators judging video footage as useful in 65% of these cases. Ashby (2017) found that having useful CCTV evidence increased the likelihood of case clearance in the overall sample from approximately 20% to 50%. The largest effects were observed for robbery, with CCTV evidence increasing the clearance rate from 8.9% to 55.7%. Morgan & Dowling (2019) evaluated the effect of CCTV on crime investigations on a rail network in New South Wales, Australia. Clearance rates of cases involving CCTV evidence were 18% higher than control cases. Effects were particularly pronounced for property damage and theft/burglary, with CCTV associated with case clearance increases of 64% and 71%, respectively.

CCTV effect on case clearance through offender apprehension in public settings is more mixed. Robin et al. (2021) found that case clearance was 14% higher at CCTV-covered intersection than matched control intersections in Milwaukee, WI. The largest effect was

observed for “Class B Offenses—which included disorderly conduct, drunkenness, driving under the influence, loitering, and trespassing—with case clearance rates 25% higher in CCTV intersections than controls. Circo et al. (2020) found that Project Greenlight-related incidents were significantly more likely to be closed by arrest than the control group incidents, with differences most pronounced for carjacking incidents (38.2% in the treatment group vs. 18.7% in the control group). In Manchester, NH, Bottema & Barter (2024) found that video evidence was significantly associated with closure by arrest for overall gun crimes, nonfatal shootings, and shots fired incidents.

Paine (2012) found the preservation of CCTV footage at crimes scenes was unrelated to burglary clearance in Thames Valley, UK. Gerell's (2021) analysis of CCTV in deprived areas of Gothenburg, Sweden found clearance rates for both property crime and violent crime were not significantly different in CCTV and control areas. Jung & Wheeler (2023) found that CCTV cameras in Dallas, TX increased case clearance rates within 500 feet of camera locations. However, the clearance rate increase was entirely driven by theft, with no other crime types significantly impacted by CCTV. Thomas' (2023) evaluation in Fayetteville, NC found disorder crimes were the only crime type for which CCTV significantly increased the likelihood of case closure.

CCTV OPERATOR PERFORMANCE

Most CCTV research focuses on the technology's impact on crime control outcomes, such as crime reduction or case clearance. While important to consider, an exclusive focus on outcomes overlooks the human factors involved in successful CCTV programs (Salvemini et al., 2015). Understanding CCTV operator functions—and how these activities translate to enforcement actions in the field—is critical in developing effective video surveillance programs.

A somewhat surprising, but consistent, research findings is CCTV operator surveillance activity is rare. For example, Ditton & Short (1999) found that operator activity led to only one arrest per 967 hours of monitoring in two Scottish cities while Sarno et al. (1999) reported that a London CCTV unit provided police with footage of crime incidents only 8 times over a 12-month period. Piza et al. (2014a) reported 17.9% of Newark, NJ's CCTV detected no criminal events and 55.5% generated no enforcement actions over their first year in operation. While the overall system initially generated an average of 26.84 detections and 9.47 enforcement actions when 11 cameras were in place, a weekly average of only 2.11 detections and 1.22 enforcement actions occurred after the system expanded to 146 cameras (Piza et al., 2014b). Over 592 hours in a CCTV control room, Norris & Armstrong (1999) documented 888 targeted surveillances—an observation of an individual or group of individuals lasting one minute or longer—for a rate of 1.5 targeted surveillances per hour of monitoring. Norris & McCahill (2006) found targeted surveillances occurred once every 4 hours across four CCTV systems in Great Britain.

Low levels of surveillance activity can be explained by the presence of “surveillance barriers” common in CCTV programs, specifically the processes by which incidents detected by CCTV are typically reported to police. This process negates any benefits offered by CCTV’s real-time discovery of crime or its precursors and can result in low levels of surveillance activity. For example, Gill & Spriggs (2005) reported an incident where a camera operator generated an assignment in the computer-aided dispatch system after witnessing an assault. After nearly 30 minutes, police still had not responded. Lomell (2004) reported that CCTV operators in Oslo stopped reporting street-level drug transactions due to the police emphasizing the apprehension of drug traffickers rather than the disruption of street-level markets. Norris & McCahill (2006) documented a CCTV operator not reporting a shoplifting incident due to his belief that there was not enough staff on duty for a swift response. Norris & Armstrong (1999) reported several instances where operators did not bother reporting relatively low-prioritized incidents of prostitution and domestic disturbances to the police. Similarly, Piza et al. (2017) reported that more than half of Newark, NJ’s camera operators noted long dispatch queue times when explaining their decision to not report street-level infractions preceding serious violent crime incidents.

CCTV operators must determine whether observed behavior provides reasonable suspicion or probable cause necessary for police deployment, a discretionary process that parallels the decision-making of dispatchers given the remote proximity from the crime scene. Heebels & Van Aalst (2020) argued that in addition to relying on established rules and protocols to

determine suspicion, CCTV operators also make decisions based on their own proactive monitoring style. One operator expressed that they like to use the cameras as if they are walking on the sidewalk themselves, another operator opted to use a 'bird's eye view,' some operators gave each camera equal attention, others utilized known crime 'hot spots,' or some operators simply zoomed in on groups of people that possessed certain demographics, like a group of young boys (Heebels & Van Aalst, 2020). This indicates that there were several strategies when searching for criminal activity that appear to be dictated by the individual operator as opposed to a uniform protocol.

Piza & Moton (2023) analyzed CCTV operator activity data collected during the Newark CCTV Directed Patrol Experiment (Piza et al., 2015). A total of 237 individual targeted surveillances were documented during the 11-week experiment. Probable cause or reasonable suspicion was observed by operators during 104 (46.22%) surveillances, with 72 of these incidents reported to police patrol units. Targeted surveillances of known suspects were nearly 8 minutes longer than surveillances of persons unknown to the CCTV operators, over 9-mintues longer when visible obstructions partially blocked the camera feed, and over 16 minutes longer when instances of probable cause or reasonable suspicion were observed. Instances of probable cause or reasonable suspicion were nearly 4 times more likely to be observed in commercial areas, 43% more likely to occur when the CCTV operator was female, and over twice as likely to occur when the CCTV operator had a supervisory rank (i.e., sergeant or above). Probable cause and reasonable suspicion were 11% less like to be reported when groups rather than individuals were perpetrators, nearly 4-times more likely when occurring

in a commercial area, over 4-times more likely when associated with a visible obstruction, and over twice as likely when the CCTV operator was female.

Research in retail settings suggest that CCTV operators may not always enjoy high levels of discretion. In their study of CCTV activity in 9 stores of a major UK food retailer, Loveday & Gill (2004) found that operators were given specifics tasks to undertake during 87% of shifts. In 47% of shifts, the mandated tasks were completely unrelated to camera monitoring, such as CCTV system tape management and undertaking the role of security officer in the store. However, during shifts where operators actively monitored for potentially criminal activity, a person's behavior (e.g., walking faster than normal, frequently looking over their shoulder, looking directly at cameras, etc.) was the most commonly reported cause for suspicion (55% of incidents) followed by a person's body language, a person's appearance (particularly being a young male), and notification by other operators of the surveillance operation (each reported in 34% of incidents). This indicates that the types of situational factors that activity CCTV operators monitoring public settings are also influential in private settings.

FEAR OF CRIME

Fear for personal safety can lead people to avoid certain areas and generally restrict their movement, even in situations where reported crime levels are generally low (Abraham et al., 2025). Because of this, CCTV can help promote the increased use of public places by reassuring citizens and decreasing fear of victimization (Gill & Spriggs, 2005). Unfortunately, the research literature is less developed for research on CCTV's effect on fear of crime as compared to other safety outcomes. This limitation may be especially impactful for the private sector, given the potential importance of fear of crime in these settings. A reduction of fear may translate into an increase in customer patronage and staff confidence, which can boost profits and a business's general reputation. Given prior research shows the public is generally receptive to video surveillance in private spaces (Byrd et al., 2025; Özaşçılar, 2025), the reduction of fear though CCTV has the potential to bring positive change with low potential for generating negative public perception.

A systematic review of the literature on CCTV and fear of crime was recently conducted by Tykesson (2025). Tykesson (2025) noted that three previous reviews of fear of crime included some studies focused on CCTV (Lorenc et al., 2014; Phillips, 1999; Ratcliffe & Rosenthal, 2001). Lorenc et al. (2014) reviewed six studies, with two finding an increase in fear of crime, two finding a decrease, one presenting mixed findings, and one finding no significant change. Phillips (1999) reviewed eight studies, with six reporting fear of crime reductions though most results did not achieve statistical significance. Ratcliffe & Rosenthal (2001) reviewed 11 studies in which fear of crime was a secondary concern, with most changes not statistically

significant. However, the implications for CCTV are unclear, given that none of these reviews was focused solely on CCTV,.

Motivated by this gap in the literature, Tykesson (2025) aimed to catalog the current state of the literature on CCTV and fear of crime. Tykesson (2025) argues that CCTV research typically pays little attention to how fear of crime should be defined and measured. While feelings of general safety and behavior changes are different phenomenon, research tends to treat these concepts interchangeably when designing survey questions. This reflects the larger fear of crime literature, as little attention has also been paid towards how to design surveys to best maximize the validity and reliability of survey items (Hart et al., 2022).

Tykesson (2025) applied five inclusion criteria for the systematic review: 1) CCTV was measured independently of other interventions, 2) the evaluation used an outcome measure of fear of crime, 3) the evaluation measured experience of fear or change of behavior (rather than general attitudes towards CCTV or anticipation of CCTV effects), 4) the research design involved a pre- and post-test, and 5) the evaluation focused on a distinct study area. Unlike the systematic review on crime prevention (Piza et al., 2019), a comparable control condition was not included as an inclusion criterion owing to the scarcity of studies that deployed surveys in both treatment and control areas (Tykesson, 2025).

Fifteen studies fit Tykesson's (2025) review criteria. Studies were published between 1978 and 2019. The most common study settings were in Britian (n=6) followed by Sweden (n=4). Sample size ranged from 130 to 8,760 (pre- and post-period combined). Seven studies showed that CCTV led to a reduction in fear of crime, two showed increases in fear of crime, with the remaining six showing mixed, marginal, or no effects. However, in most studies effect varied across specific survey items, meaning that some inconclusive results were present in most cases. Furthermore, only five studies included a control area or control groups. As a result, the sample of evaluation studies on a whole cannot determine causality. Tykesson (2025) concluded that future CCTV research on fear of crime should more consistently use questions that measure direct experience with fear, incorporate comparable control conditions, and generate larger sample sizes.

COSTS AND BENEFITS

Cost-benefits analysis has emerged as a key component of evidence-based crime prevention due to its ability to help practitioners choose between competing interventions or conduct investment analysis to generate portfolio of complementary evidence-based practices (Aos, 2015; Cohen, 2023). Cost effectiveness is especially important for security professionals who must justify budget requests to their organization's leadership. Cost-benefit analysis requires monetizing two components of an intervention: inputs, the expenditures associated with implementing a program or practice, and outcomes, the consequences of an intervention (e.g., crime reduction). A rich body of research has estimated crime costs across different participants (e.g., the criminal justice system or crime victims) with costs commonly classified as being tangible (e.g., cost of arrest and imprisonment, cost of replacing stolen goods, etc.) or intangible (e.g., cost of pain and suffering, fear of future victimization, etc.) (Wickramasekera et al., 2015) To my knowledge, four cost-benefit analyses of CCTV interventions have been conducted to date.

Gill & Spriggs (2005) included a cost-benefit analysis in their national evaluation of 14 CCTV schemes in the United Kingdom. Gill & Spriggs (2005) used estimates generated by Brand & Price (2000) to measure the monetary cost of crime. CCTV intervention inputs were measured from agency documents, with equipment the largest expense accounting for an average of 78% of expenditures across the CCTV schemes. Of the four CCTV schemes to experience a significant crime reduction, two showed evidence of cost-effectiveness, with every £1 spent on CCTV generating £1.24 and £1.27 in savings, respectively. Conversely, the other two

schemes were cost prohibitive, with every £1 spent generating only £0.67 and £0.42 in savings, respectively.

La Vigne et al. (2011) conducted cost-benefit analyses of CCTV in Baltimore and Chicago. In both cities, benefits achieved from crime reductions exceeded the upfront and maintenances costs of CCTV, though results were sensitive to how crime costs were calculated. In Chicago, every $1 spent on the CCTV system generated $4.30 in savings when both crime and victim costs were considered, and $2.81 in savings when only crime costs were considered. Lesser cost-savings were observed in Baltimore, with every $1 spent on CCTV generating $1.49 in benefits when both crime and victim costs were considered and $1.06 in savings when only tangible costs were included. The tangible-cost findings reflect, in the words of La Vigne and colleagues (2011, p. 22), “a more relevant ratio from a local financing perspective, as any victimization cost savings that might be attributed to the camera system are not transferred to governments’ budgets.”

Piza et al. (2016) conducted a cost-benefit analysis of the Newark CCTV Directed Patrol Strategy (Piza et al., 2015). Piza et al. (2016) calculated costs of crime two ways: 1) including all tangible societal and criminal justice system costs, and 2) including only criminal justice system costs. Results indicate that every $1 spent on Directed Patrol Strategy outputs generated between $19.36 and $31.62 in savings considering the achieved crime reduction. Cost-effectiveness reduced when costs of the preexisting CCTV system were accounted for (between $1.63 and $2.04). Overall, the analysis of Piza et al. (2016) suggest that a strategy

pairing directed patrol with active CCTV monitoring is cost-effective for agencies with existing (and previously paid for) CCTV systems, but less so for agencies needing to first invest in CCTV.

Most recently, Matczak et al. (2023b) conducted a cost-benefit analysis of a CCTV system in Poznan, Poland. They analyzed whether the cost of the CCTV system installation and operation were offset by the reduction of car burglary/theft, car damage, and robbery. The installation of Poznan's CCTV system cost over $2.2M with technical maintenance and employee salaries costing over $226K and $1.1M, respectively. Focusing on the one-year period following the CCTV system installation, Matczak et al. (2023b) found that the overall CCTV system was cost ineffective in Poznan; the cost of the CCTV system was not offset by cost savings generated by a crime reduction. When breaking the system into eight treatment areas, the CCTV cameras were cost effective in only one area.

Applying lessons from this research to the private sector raises some critical questions. Contrary to monetizing the "full spectrum of harms" that is typical in cost-benefit analysis (Kleiman et al., 2014) private entities should think closely about the outputs that are most relevant to their operations. To be clear, some intangible costs may be directly relevant to private sector operations. Fear of victimization and general client perceptions of safety can impact revenues by reducing visits to a business or increase negative online reviews. Conversely, security measures such as CCTV may increase patron intentions to visit a business by improving perceptions of safety (Byrd et al., 2025). "Tangible" costs of crime

reported in prior research may not directly translate to the private sector, as they focus on public criminal justice entities. Since these cost do not impact the budgets of private entities, they may be less informative in that context. In short, when determining whether CCTV makes fiscal sense for their precise situation, private entities should take careful stock of the necessary surveillance expenditures and determine whether crime reduction would practically offset costs. This will help businesses determine their particular investment risk (Aos, 2015).

COMPUTER VISION TECHNOLOGY

In considering the role of CCTV in public safety, it is important to acknowledge the rapidly changing nature of modern technology. Considered through this lens, CCTV perhaps should not be considered as a singular technology, but rather as a multitude of technologies that differ in terms of functionality and sophistication. The CCTV systems evaluated in the earliest studies included in the most recent systematic review (Piza et al., 2019), for example, bear little resemblance to modern systems developed within an "internet of things" framework (Skogan, 2019). Within such an integrated technological ecosystem, surveillance cameras can more easily connect with complementary technologies than ever before.

One particularly promising integration is computer vision technology (CVT) that could "learn" to recognize critical images in video that may warrant police attention. This can support proactive monitoring efforts by alerting CCTV operators upon detection of an image of concern such as a weapon, fugitive vehicle, or physical behavior indicative of crime (e.g., a person repeatedly striking a vehicle window as if trying to break in) (Idrees et al., 2018). By focusing human attention on specific cameras only during moments of heightened risk, CVT has the

promise to bypass barriers to proactive monitoring functions research identifies as essential to effective CCTV use (Skogan, 2019).

An emerging body of research has focused on using CVT to identify the presence of weapons within CCTV footage. Santos et al. (2024) conducted a review to identify existing CVT approaches to weapon detection in video images. They identified 22 original research studies published between 2019 and 2022 that used deep learning for weapon detection, incorporated simple images as training inputs for the models, clearly defined their methods, and conducting a statistical analysis of results. The most common detection approaches were convolutional neural networks and the open source You Only Look Once algorithm. Overall, the results indicate that the use of quality images, specifically of weapons other than handguns, increases the accuracy of CVT. Studies consistently highlight poor lighting conditions of CCTV footage as an impediment to CVT accuracy. Smaller weapons, such as knives and small caliber handguns, are associated with low model performance. Conversely, a more recent study by Houser et al. (2024) found the algorithm's precision of gun detection (94.6%) was comparable to the detection precision for persons (97.3%). However, a main challenge in the literature is the common use of custom datasets by researchers, which complicates the comparison of results across studies.

Despite the benefits of CVT, it is unclear the level to which the technology has been integrated into CCTV systems. None of the evaluation studies identified in Piza et al.'s (2019) review

reported the use of CTV technology. Other contemporary video analytics, such as facial recognition, were also not explicitly mentioned in any of the studies. This may be more reflective of empirical research failing to keep pace with contemporary practice, rather than the lack of video analytics in contemporary CCTV systems given the emergence of low-cost video analysis software, such as Amazon's Rekognition service (Skogan, 2019) and the documented integration of artificial intelligence in body-worn cameras (Adams et al., 2024).

CONCLUSION

This report provided a primer on research relevant to the use of CCTV video surveillance cameras for public safety, with an emphasis on lessons for the private sector. Overall, the research evidence shows that CCTV can be a useful security tool, but that a range of contextual factors can influence effectiveness. Private entities considering CCTV should therefore carefully consider their current security operations, specific safety needs, and resources to ensure any investment made in video surveillance achieves the anticipated goals.

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APPENDIX: RESEARCH SUMMARY TABLE

VIDEO SURVEILLANCE AND SECURITY
Research Summary Table

Study	Location	Setting	Monitoring Style	Other Interventions	Post-Period	Main Findings
Circo & McGarrell (2021)	Detroit, MI, USA	Businesses	Active	Lighting and signage	1 year	Decrease in property crimes, inconsistent results for disorder.
Circo et al., (2023)	Detroit, MI, USA	Businesses and non-commercial locations	Active	Lighting and signage	30 months	Increased reporting of property crimes, little impact on disorder or violent crimes.
Gerell (2021)	Gothenburg, Sweden	Residential	Mostly passive	Directed patrols, community policing, situational crime prevention	11 months	Significant reduction in violent crimes, no impact on property crimes.
Gómez et al. (2021)	Medellín, Colombia	City-wide	Active	GPS-assisted directed patrol, community alarm buttons, strategic police centers	41 months	Significant reduction in property and violent crimes.
Jang et al. (2018)	Seoul, South Korea	City-wide	Unknown	None	2 years	Reduction in property crimes, mixed effects on assaults based on local factors.

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VIDEO SURVEILLANCE AND SECURITY
Research Summary Table

Study	Location	Setting	Monitoring Style	Other Interventions	Post-Period	Main Findings
Lai et al. (2019)	Taipei, Taiwan	City-wide	Unknown	License plate readers	27 months	Marginal effect on robbery reduction, no significant effect on other property crimes.
Lang et al. (2025)	Anniston, AL, USA	Housing complex, commercial, mixed-residential	Passive	Media campaign	19 months	No effect on property crimes (other crime types were not evaluated)
Matczak, et al. (2023a)	8 cities in Poland	City-wide	Unknown	None	5 years	Marginal impact on car-related crimes, no effect on other crime types.
Munyo & Rossi (2020)	Montevideo, Uruguay	City-wide	Active	Directed patrol	1 year	Significant reduction in overall crime. Significant diffusion of benefits.
Piza et al. (2025)	Newark, NJ, USA	City-wide	Active	None	11 years	Reduction of motor vehicle theft during intermediate period (3-4 years). No other effects.

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VIDEO SURVEILLANCE AND SECURITY
Research Summary Table

Study	Location	Setting	Monitoring Style	Other Interventions	Post-Period	Main Findings
Ratcliffe & Groff (2019)	Philadelphia, PA, USA	City-wide	Mostly passive	None	10 years	No significant reduction in violent or disorder crimes.
Robin et al. (2021)	Milwaukee, WI, USA	City-wide	Active	License plate readers and gunshot detectors	1 year	Increased crime detection but no significant effects on arrests.

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