

Employee Injuries and Convenience Store Robberies in Selected Metropolitan Areas

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omicide is the third leading cause of work-related death and the leading cause among women.¹ The taxicab industry has had the highest rate of work-related homicides and the grocery store industry has had the highest number of homicides.¹⁻³ Approximately 75% of work-related homicides during 1993 occurred in a robbery.³ Approximately 100 homicides occurred in convenience stores (C-stores) during 1990,² and two-thirds of the homicides during 1990 in C-stores occurred during a robbery.⁴

Robbery is the primary risk factor for work-related homicide, but is not the primary circumstance for work-related nonfatal injuries. The health services industry had the highest rate of nonfatal injuries during 1993.³ Injury to an employee occurred in 23% of robberies during 1987 to 1992.⁵

Historically, programs to prevent robbery in C-stores have focused on robbery-behavior training, store design, cash-handling procedures, security systems, staff characteristics, and store-layout features. With the exception of training, these factors can be viewed as store environmental designs (ED). Because of the high frequency and incidence of homicides among C-store workers, the effectiveness of EDs to prevent robbery is an important issue. Presently, evidence for their effectiveness is not definitive.^{6,7}

In response to this situation, during 1993 to 1994, the National Institute for Occupational Safety and Health initiated two investigations of the effectiveness of EDs to deter

The number of robberies and robbery-related injuries to employees in convenience stores (C-stores) during 1992 or 1993 were estimated for selected metropolitan areas around Miami and Tampa, Florida; Atlanta, Georgia; Chicago, Illinois; Baltimore, Maryland; Boston, Massachusetts; Detroit, Michigan; Pittsburgh and Philadelphia, Pennsylvania; Charleston, Columbia, Greenville, and Spartanburg, South Carolina; and Arlington, Chesterfield, and Henrico counties, Virginia. Of the 1835 C-store robberies that occurred during 1992 or 1993 in all selected areas (excluding Atlanta and Chicago), there were 12 homicides of C-store employees; 219 nonfatal injuries of C-store employees; 1071 robberies in which there were no injuries but a weapon was used, displayed, or implied toward a C-store employee; and 132 robberies in which there was no injury and no weapon used, but an employee was struck, pushed, or shoved. Corresponding figures for the 238 robberies that occurred in Chicago during January to June 1993, and for which victim employment status was unknown (customer or employee) were three homicides, 53 nonfatal injuries, 120 attacks in which a weapon was used but there was no injury, and 57 attacks in which a person was struck, pushed, or shoved but there was no injury. The proportion of robberies that resulted in a homicide or injury to an employee varied among selected areas from .03 to .25. The proportion of homicides and injuries to an employee was .14 or higher for target areas in Baltimore (.24), Detroit (.25), and Virginia (.14); the proportion to an employee or customer was .24 in Chicago. The conclusions from these data are that the risk of employee injury in C-store robberies was high in selected metropolitan areas. This underscores the need for effective robbery prevention programs to reduce injury. In addition, further research is needed to determine the effectiveness of present prevention programs in the C-store industry and the application of these programs to other retail industries.

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TABLE 1
Target Areas

State	Police Jurisdictions (PD)/Counties
Florida	Metro-Dade PD Miami PD Hillsborough County Sheriff's Office Tampa PD
Georgia	Metro-Atlanta (Clayton, Cobb, DeKalb, Fulton, and Gwinnett Counties)
Illinois	Chicago PD
Maryland	Baltimore County Prince George's County
Massachusetts	Boston PD
Michigan	Detroit PD
Pennsylvania	17 jurisdictions in and around Pittsburgh and Philadelphia
South Carolina	Charleston County Sheriff and PD North Charleston PD Columbia PD Greenville PD and County Sheriff Richland County Sheriff Spartanburg PD and County Sheriff
Virginia	Arlington, Chesterfield, Henrico

robbery and robbery-related injuries in C-stores. The first effort was the development of a case-control study of robbery in a cohort of approximately 1100 Virginia C-stores tracked over a 1-year period.⁷

The second effort was to determine the feasibility of a case-control study of robbery-related injuries. The purpose of the feasibility study, among other things, was to estimate the number of C-store robberies and robbery-related employee injuries in selected high-risk target areas. Although information on the number of C-store robberies is available from the Federal Bureau of Investigation's (FBI) Uniform Crime Report (UCR) system, there is no published information on the number or proportion of injuries during robbery situations.

The purpose of this article is to present an estimate of the annual number of C-store robberies and associated employee injuries in selected metropolitan areas. A secondary purpose is to describe the methods of data collection for this study.

Methods

State Statistical Analysis Centers (SACs) have responsibility for the

evaluation of crime-incident data, particularly those from the FBI's UCR system. The UCR system is a national crime reporting system with which local police departments (PDs) voluntarily report data to the FBI in a standardized format.

The Justice Research and Statistics Association, an affiliation of SAC directors, queried all 48 SACs as to whether they wanted to participate in this feasibility study. Of the 48 SACs, 21 expressed interest and submitted an annual estimate of the number of C-store robberies in their state from their 1992 UCR data base. Of these 21 SACs, nine (Table 1) were selected because they had the highest statewide frequency of C-store robberies during 1992. This rationale was utilized to identify areas with the highest numbers of robbery-related injuries for the design of future research studies.

Each of the nine selected SACs then estimated the number of robberies during 1992 or 1993 by county or police jurisdiction from UCR or police department records. Robbery was defined as taking or attempting to take goods or money from the store or store employee by force. The target areas (ie, counties or police

jurisdictions) that were selected (Table 1) were those that had the highest concentration of robberies in the state. For most states, these target areas were the states' largest metropolitan areas. The number of robberies in the target areas, which was estimated by the SACs from this analysis, is presented in Table 2 ("All Robberies").

The nine SACs utilized different procedures (see the Appendix) to estimate the number of robbery-related injuries in their target area. All SACs (except Georgia and Illinois) estimated the annual number of robbery-related injuries to C-store employees from all or a sample (Table 2) of PD robbery incident reports during 1992 or 1993. From the robbery reports, each SAC abstracted and coded information on victim employment status (customer or employee), type of offense, type of injury, treatment received, type of weapon used, and level of force, using a standardized study format.

The Georgia SAC did not abstract and code information from all robbery reports. However, all homicide reports during 1992 were reviewed and the number of robbery-related homicides in C-stores was estimated.

The Illinois SAC used automated files to estimate the number of robbery-related injuries, but did not have information on victim employment status, ie, whether the injuries were to employees or customers.

For the purpose of this paper, a C-store was defined as a retail store that sells a combination of gasoline, fast foods, soft drinks, dairy products, beer, cigarettes, publications, grocery items, snacks, or non-food items, and has a size of less than 5000 square feet. Gasoline stations with C-stores were also included. All SACs used the study definition except Florida, Pennsylvania, and South Carolina (see the Appendix for definitions).

A nonfatal injury to an employee was defined as including: a complaint of pain, but no visible injury bruises/scratches; cuts; or a punctur

TABLE 2

Total Number (n) and Proportion (P) of Robbery-Related Homicides, Nonfatal Injuries, and Traumatic Incidents to Convenience Store Employees for Selected Target Areas

State*	Data Source [§]	Year	All Robberies [†]		Police Department Robbery Incident Report Data [‡]									
			Number of Robberies	Year of Data	Data Type	Number of Robberies	Homicides		Non-fatal Injuries		Weapons Implied/Displayed		Struck, Pushed, Shoved	
							n	P	n	P	n	P	n	P
Florida	UCR	1992	1028	1992	Sample	202	0	.000	6	.03	130	.64	35	.17
Georgia	PD	1992	745	1992			1							
Illinois	UCR	1992	826	1993 [¶]	All	238	3	.013	53	.22	120	.50	57	.24
Massachusetts	PD	1993	168	1993	All	168	2	.012	6	.04	132	.79	6	.04
Maryland	UCR	1992	530	1992	All	408	2	.005	94	.23	282	.69	8	.02
Michigan	PD	1993	191	1993	All	191	2	.010	45	.24	114	.59	3	.02
Pennsylvania	UCR	1992	848	1992	All	379	4	.011	21	.06	146	.39	35	.09
South Carolina	UCR	1992	372	1993	Sample	290	1	.003	20	.07	146	.50	35	.12
Virginia	PD	1992 to 1993	197	1992 to 1993	All	197	1	.005	27	.14	121	.61	10	.05

* See Table 1 for target areas in each state.

[†] Total number of robberies estimated in target area from UCR or PD records.

[‡] Number of robberies reviewed, all or a sample of all robberies that did and did not result in a homicide; homicides, all robberies that resulted in a homicide; nonfatal injuries, all robberies that resulted in an injury to an employee, excluding homicides; weapons implied/displayed, all robberies in which a weapon was used, implied, or displayed toward an employee, but an injury did not occur; Struck, pushed, shoved, all robberies in which an employee was struck, pushed, or shoved, but a weapon was not implied/displayed and an injury did not occur.

[§] UCR, Uniform Crime Report data; PD, police department records.

[¶] A review of all or a representative sample of robbery reports was not made. All homicide reports were reviewed to determine the number of robbery-related homicides.

^{||} January to June of 1993 (6 months). Status of victim (whether employee or customer) was not determined.

wound requiring or not requiring treatment at the scene or at a hospital. For data analysis, a hierarchical scale of injury severity was utilized in terms of a combination of nature of injury, treatment received, and level of force as follows:

1. Death, or
2. Nonfatal injury, or
- No injury reported and no treatment received, and
3. Weapon displayed or implied, or
4. Struck, pushed, or shoved.

Category 2 excludes robberies in which an employee was killed. Categories 3 and 4 exclude robberies in which an injury occurred. In addition, category 4 excludes robberies in which a weapon was displayed or implied.

Results

Of 1835 C-store robberies that occurred during a 1-year period in 1992 or 1993 in all selected areas (exclud-

ing Georgia and Illinois) (Table 2, "Police department robbery incident report data"), there were 12 homicides of C-store employees; 219 nonfatal injuries of C-store employees; 1071 robberies in which there were no injuries but a weapon was displayed or implied toward a C-store employee; and 132 robberies in which there was no injury and no weapon used, but an employee was struck, pushed, or shoved. Corresponding figures for the 238 robberies that occurred in Chicago during January to June 1993, and for which victim employment status was unknown (customer or employee), were three homicides, 53 nonfatal injuries, 120 attacks in which a weapon was used but there was no injury, and 57 attacks in which a person was struck, pushed, or shoved but there was no injury.

The proportion of robberies that resulted in a homicide of an em-

ployee varied from .000 to .013 among target areas. The proportion of robberies in which an employee sustained a nonfatal injury varied from .03 to .24 among target areas.

The proportion of robberies in which an injury to an employee did not occur (excluding Illinois), but in which a weapon was displayed or implied, varied from .39 to .79 among target areas. The proportion of robberies in which an injury did not occur and a weapon was not used (excluding Illinois), but an employee was struck, pushed, or shoved varied from .02 to .17 among target areas.

Corresponding figures for the proportion of robberies for Chicago (where victim employment status was unknown) was .013 for homicides; .22 for nonfatal-injuries; .50 for weapons used, displayed or implied, but no physical injury reported; and .24 for an employee or customer struck, pushed, or shoved,

but no physical injury or weapon use reported.

Discussion

Results indicate that the risk of homicide and injury to C-store employees during a robbery situation was high during 1992 or 1993 in many of the selected metropolitan areas. The proportion of robberies that resulted in a homicide or nonfatal injury of one or more employees (excluding Illinois and Georgia) was .14 or higher in three target areas, and .23 or higher in two target areas. The proportion of robberies that resulted in a homicide or nonfatal injury to either an employee or customer was .24 for Chicago.

The proportion of robberies in which a physical injury did not occur to a C-store employee, but a weapon was used, displayed, or implied or an employee was struck, pushed, or shoved, exceeded .48 in all selected areas. Although these events were not physical injuries, they were situations that were likely associated with considerable stress.

The estimated proportion of C-store robberies during 1992 or 1993 that resulted in a homicide was higher for most of the selected target areas than that estimated during 1990 from an industrywide study conducted by Schreiber.² Schreiber estimated that 99 homicides of customers or clerks and 22,935 robberies occurred during 1990 in approximately 71,200 US C-stores. The proportion of homicides per C-store robbery in C-stores during 1990 estimated from the Schreiber data would be .004 (99/22,935). From our study, the estimated proportion of homicides of employees among seven target areas (excluding Georgia and Illinois) during 1992 or 1993 exceeded .004 for four areas, and the average over seven states was .007 (12/1835).

One explanation why the rate in the target areas would be somewhat higher than that in the United States (based on the Schreiber data) is because the target areas were selected

from areas in each state with the highest number of robberies. The target areas also tended to exclude rural and small communities.

The variability among target areas in the number of robbery-related injuries was quite large. This may possibly be explained by geographic differences or by the differences in reporting. Errors in the reporting of robbery reports by PDs are difficult to determine and were not evaluated.⁸ Clearly, the number of robberies varied among areas, which might explain the geographic variability in the number of injuries.

The data from this study have several strengths and weaknesses with regard to their accuracy and comparability. PDs and target areas were not chosen by a random sample; however, they were selected systematically from areas with the highest robbery frequency, based on 1992 to 1993 UCR or PD data. PD robbery reports were not collected during the same time period by all states; however, reports were collected for 1992 or 1993. Finally, the definition of C-store differed somewhat among states; however, all states captured chain convenience stores and gas station operations with C-stores.

The primary strength of the study data is that a standardized definition of robbery was utilized, based on the FBI UCR system, and seven of the nine states employed a standardized format to code injuries from PD reports. The data provide an accurate classification of robbery, C-store status, employee status of victim, and injury classification. This is the only published study that provides estimates of the number of nonfatal C-store robbery-related injuries based on standardized coding of incident reports.

Some SACs found that C-store robberies were frequently misclassified on PD reports. Explanations for misclassified reports include: (1) shoplifting incidents reported as robberies, (2) another type of commercial establishment listed as a C-store, (3) incidents in which customers

were victimized outside the store, or (4) incidents in which robbers who had robbed another place were captured on the store property and which were listed as having occurred at the C-store address.

Maryland and Pennsylvania abstracted data from all PD C-store robbery reports during 1992, and the number of all robberies could be compared with the number reported to their UCR system in their target area. The ratio of the number of C-store robberies from PD reports to that from the UCR system (Table 2) was .77 (408/530) for Maryland and .45 (379/848) for Pennsylvania.

Differences between the number of C-store robberies reported to the UCR and that from abstracted PD reports (Table 2) does not suggest that UCR data are in error. UCR incidents are coded by location of incident, and employee or customer status is not critical. However, this feature is important to consider when using UCR to estimate the number of work-related incidents.

Because robbery appears to be associated with a very high probability of fatal or nonfatal injury, effective robbery prevention is very important to reduce injury. The C-store industry has included ED strategies and employee training in its robbery prevention programs. Minimum elements of C-store robbery prevention programs, and some state and local government regulations, include: keeping low amounts of cash in the register; ensuring good visibility within, into, and out of the store; maintaining good lighting within and outside the store; using security cameras and video systems; limiting access and escape routes to and from the store and the surrounding property; and training employees in proper behavior, such as passive response, in a robbery situation. Although evidence is somewhat equivocal for the effectiveness of these minimum prevention elements,^{6,7} they are accepted industry standards.

More controversial robbery prevention measures that have been rec-

ommended by some local and state governments and adopted by a small part of the C-store industry, include: employing multiple clerks at night, using bulletproof shielding around the cash-register station, and employing guards or off-duty police officers at night. Although these more controversial prevention measures have intuitive appeal, they are not widely used and their effectiveness has not been confirmed.^{6,7}

There is a need to evaluate these specific environmental design interventions further to determine whether they effectively reduce robbery risk and to estimate their cost benefit. Because the ED approach also may be useful in other retail settings, there is a need to evaluate the applicability of these interventions in other retail industries.

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This study highlights the need for standardized information from surveillance data bases on injuries associated with work-related violent crime for evaluating trends in crime rates, circumstances of crimes, and interventions. In particular, detailed information on circumstances of specific crimes in the workplace, such as robbery-related assaults, is not available from the Bureau of Labor Statistics, the FBI Uniform Crime Reports, or the Bureau of Justice Statistics National Crime Victimization Survey. This study emphasizes the need for standardized data for research purpose, because the SACs had to utilize different available data sources with varying quality for the purpose of the study. This problem has been described by Castillo in more detail.⁹

One area of research in which standardized data are needed is the evaluation of programs for robbery-prevention through ED and injury control. The results from this study indicate that robbery is associated with a very high probability of fatal or nonfatal injury, emphasizing the need for more effective robbery prevention and injury control programs in the C-store industry.

Appendix

The methods utilized by the states to estimate the number of robbery-related injuries in their selected target areas are described below.

Florida

Approximately 60 robbery incidents reports were selected from the Metro Dade PD, Miami PD, Hillsborough County Sheriff Department, and Tampa PD (241 total reports selected). Florida's UCR system definition of a C-store is the grocery/miscellaneous type business that is commonly referred to as a convenience store. That is, one that is usually open after regular business hours for the convenience of the public. These include 7-11, Lil' General, Minute Market, Magic Market stores, etc, or may be a privately owned store with a similar operating policy. These stores sell gasoline as a secondary function. Of the 241 robbery incidents that occurred during 1993 and were selected for review from PD records, 202 were verified as actually being C-store robberies. Data on injury to C-store employees were abstracted from PD reports and coded according to the standardized study format.

Georgia

The Georgia SAC developed a list of 11,094 businesses from state liquor-license records. Of the 11,094 business addresses, 2990 were ascertained to be in the metropolitan Atlanta area (Clayton, Cobb, DeKalb, Fulton, and Gwinnett counties). A subsequent sort of business type was made using records from the Georgia

Association of Convenience Stores, the Yellow Pages, and consulting with police jurisdictions and personal contacts with the stores. A final list of 1269 C-stores, which met the study's C-store definition, was identified for the metropolitan Atlanta area. The reports for all violent incidents at C-stores on the list occurring during 1992 were then provided by local PDs, and 745 C-store robberies were enumerated. A review and coding of a representative sample of robbery reports was not made. However, a review of all homicides reports were made and the number of robbery-related homicides identified.

Illinois

Illinois estimated the number of robbery-related injuries by linking several databases. A list of all C-stores in Chicago that met the study definition was developed from the Illinois Lottery Commission records and other sources. The geocoded addresses of the C-stores on the list were matched to a file of geocoded addresses of all Chicago crime incidents for the period of January to June 1993, and all robbery incidents at C-stores identified.* Robbery case identification numbers were then matched to the victim-level information in CPD Case Report Information Management Evaluation System (CRIMES) database to determine whether an injury occurred during the robbery incident. All injuries were tabulated. However, the status of the person injured, whether a C-store employee or a customer, could not be determined.

Massachusetts

A list of C-stores in Boston was developed using the study definition from lottery records, county tax-assessment records, state Department

* This address-matching was done by Richard Block of Loyola University, using files of all Chicago incidents (50,000 per month) provided by the Chicago PD which he geocoded, and an address-matching technique that he had developed. We greatly appreciate his assistance.

of Employment identification records, the Alcoholic Beverages Commission licenses, phone books, PD robbery lists, and follow-up phone calls. Boston PD incident reports were obtained for 343 robberies that occurred in Boston during 1993 in streets, allies, variety stores, taverns, cafes, drug stores, department stores, commercial houses, gas stations, and chain stores. Of the 343 robberies, 168 were ascertained from the various sources to have occurred in C-stores. Data from robbery reports were abstracted and coded according to the standardized study format.

Maryland

Using the study C-store definition, all 419 PD incident reports of C-store robberies that occurred during 1992 in Baltimore County and Prince George's County PDs were reviewed. The data from the robbery reports were abstracted and coded according to the standardized study format.

Michigan

A list of 1632 Detroit C-stores was identified according to the study definition by using records from state liquor licenses, lottery, and Yellow Page listings. A second list of all 497 robbery incidents that occurred in Detroit during 1993 were obtained from the Detroit PD. After matching the two lists, 247 C-store robberies were identified. Crime incident reports were then obtained from the Detroit PD and reviewed. After eliminating robberies that did not take place in a C-store, 191 C-store robberies were verified. Data from robbery reports were abstracted and coded according to the standardized study format.

Pennsylvania

C-stores were defined from state records as a grocery store with fewer than 15 employees. A list of 9872 convenience stores was compiled using records from the Pennsylvania Food Merchants Association's Con-

venience Store Council, and from records on unemployment taxes, workers' compensation, unemployment, sales, employee income withholding, and cigarette-tax payees from the Pennsylvania Department of Labor and Industry and the Department of Revenue.

UCR records were reviewed for all 17 jurisdictions. The jurisdictions were either from Pittsburgh and its surrounding counties or from the southeast corner of the state, including the Philadelphia and Harrisburg areas. A list of 848 robberies, and seven homicides, in C-stores and gas stations was developed. Police incident or investigative reports were reviewed for all of these robberies and homicides. The additional detail in the police reports resulted in 377 of the robberies being excluded from the study. These incidents were either robberies of gas stations as originally reported in the UCR, and were eliminated because the incident or offense did not meet the definitions of a robbery or robbery related homicide, or sufficient information was available to determine that the location did not meet the study definitions of a C-store. Data from the police reports for the remaining 478 robberies and homicides were abstracted and coded to the standardized study format. The information from the 478 coded incidents was then matched to the C-store list that had been developed and another 99 incidents were eliminated because the location did not match a location on the C-store list. The result was a database of 379 verified robberies and homicides in C-stores.

South Carolina

All 390 robbery incidents that occurred during 1993 in convenience stores were identified from the South Carolina UCR system. C-stores were included if the establishment contained a Standard Industrial Codes (SIC) for C-store (SIC 5411-03) or grocery store (SIC 54511-05) from the South Carolina Business Direc-

Robbery incident reports were requested from target-area PDs. The C-store status was further verified if (1) they were among establishments listed by police, (2) they were members of the same corporate chain or franchise as establishments listed by police, or (3) they sold gasoline. Of the 390 UCR reports reviewed, 290 C-store robberies were identified. The data from robbery reports were abstracted and coded according to the standardized study format.

Virginia

Approximately 1100 convenience stores that met the study definition were identified from state beverage-license records, trade-association lists, telephone directories, telephone books, and personal communications. All 197 robbery reports for the convenience stores on the list were obtained and coded from PDs in Chesterfield, Arlington, and Henrico counties. The data from robbery reports were abstracted and coded according to the standardized study format.

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