

# Robbery Characteristics and Employee Injuries in Convenience Stores

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**Background** Each year approximately 30,000 convenience store employees are at risk for injuries related to robberies and many are fatal.

**Methods** A prospective cohort study of 460 convenience store robberies from 1 February 1995 to 30 September 1996 was conducted to uncover possible associations between injury and pertinent robbery circumstances and work environments. Data collection sources included police reports, employee interviews, store evaluations, and relevant Census data. Rate ratios and correlation statistics were calculated to identify associations with injury and relationships between variables.

**Results** Injury risk was strongly associated with the following characteristics: employee resistance, robberies without firearms or money taken, daytime and merchandise robberies, stores with limited escape routes and no cash policy or drop safe, older clerks, and surrounding areas with lower valued buildings, less expensive rent, more vacant structures, and younger residents. Numerous intercorrelations between these characteristics were identified.

**Discussion** Training opportunities, store procedures, and environmental designs are important factors to consider in reducing robbery-related injuries. *Am. J. Ind. Med.* 40:703–709, 2001. Published 2001 Wiley-Liss, Inc.†

**KEY WORDS:** robbery; assault; violence; occupational injury; circumstance; environment; resistance; convenience store

## INTRODUCTION

Convenience store workers are at a substantial risk for violence. These and other grocery-store employees are among the group of retail workers with the fourth highest annual risk for homicide [Bureau of Labor Statistics, 1997]. A study of National Association of Convenience Store (NACS) members found that as many as two-thirds of convenience store homicides were related to robberies [Erickson, 1991]. A study spanning several states found that

for every 100 convenience store robberies there were approximately 10 employees who were injured severely and one who was murdered [Amandus et al., 1997]. Earlier analyses of the data presented here determined that the overall annual probability of an employee robbery-related injury occurring in convenience stores was approximately one in 50 [Faulkner et al., 1998].

The majority of research has focused on deterring robbery as means of reducing robbery-related injury risk. Additional consideration for reducing injuries during robberies is also needed, since reducing robberies is only one part of the injury equation, i.e.,  $P(\text{injury}) = P(\text{injury/robbery}) * P(\text{robbery})$ , where  $P$  = probability. Studies addressing possible risk factors for robbery-related injuries are limited. Amandus et al. [1997] used data from four eastern states and identified potential risk factors of employee injuries during robberies: (1) robberies in which the perpetrator(s) did not use a weapon; (2) robberies in which the perpetrator used a weapon other than a firearm or

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knife; (3) robberies resulting in no money taken; (4) robberies in which no customers were present; and (5) robberies occurring in stores that were robbed multiple times.

Numerous theories have been developed to explain why perpetrators injure (sometimes murder) their victims [Zimring and Zuehl, 1986; Marchbanks et al., 1990; Warshaw and Messite, 1996]; however, that research question is beyond the scope of this study. Investigators collected extensive robbery data, ranging from circumstances, store designs and operations, and neighborhood socioeconomic factors and crime-level indicators. The purpose of this study is exploratory in nature; it aims to uncover associations between the rates of employee injuries during robberies and numerous possible risk factors so that criminologists can piece together the framework of a complex etiologic model.

## METHODS

The study prospectively identified 460 convenience store robberies from 1 February 1995 to 30 September 1996. This cohort was identified from a parent case-control study in Virginia that examined risk factors for convenience store robberies [Hendricks et al., 1999]. Specifically, the Virginia Department of Criminal Justice identified all convenience store robberies using police records from 14 police jurisdictions in metropolitan areas of Arlington, Richmond, and Tidewater, Virginia. In all, 1,271 convenience store businesses were identified during the study period using state tax and beverage license records. Convenience stores were defined as any retail store, smaller than 5,000 square feet, that sells a combination of some or all of the following goods: gasoline, fast foods, soft drinks, dairy products, beer, cigarettes, publications, grocery items, snacks, and non-food items. Gasoline stations with store operations were also considered a convenience store. To qualify as a robbery, incidents had to involve 'the taking of' or 'an attempt at taking' money or goods either by force or through an implied threat of force.

Due to loss-to-follow-up on 60 robberies, data on 400 robberies were collected from several sources: (1) injury status and robbery circumstances from police reports and clerk interviews; (2) store characteristics, including administrative controls and staff demographics, from clerk and manager interviews; (3) other store characteristics, including environmental designs and proximity to police-defined "focal points for high crime", from on-site store evaluations; and (4) community characteristics, including socioeconomic and area factors, from the most recent Census data [Bureau of the Census, 1992]. 1990 Census information was linked to these data using a store's address to identify latitude and longitude as well as the corresponding census tract. A large chain of stores refused to allow their employees to be interviewed (47%); however, we

imputed data on several characteristics (e.g., employee training, cash limits, and weapon keeping) using company policies.

Employee interviews and on-site store evaluations were conducted with questionnaires during store visits by off-duty or retired police officers familiar with the area. Interviews were administered to all staff on duty at the time of the robbery. When clerks were not available for interviews, managers served as proxies. Sample questions included: "Does the store have a cash limit policy?", "What is the cash limit?", and "Have you received training in robbery prevention?". Staff was also asked to provide a narrative describing the robbery. Stores were evaluated using observations made from touring the premises. Officers additionally used their knowledge of various police-defined "high-crime-police-focal-points" to measure their proximity to each store (rounded to the nearest 0.1 mile). Examples of observations made from inside the store included: the presence and/or visibility of cash limit signs, security cameras, drop safes, and weapons under the counter. Outside the store, officers counted escape routes, such as hedges, alleyways, and vacant lots. Using copies of police reports, the Virginia Department of Criminal Justice Statistics abstracted data onto a Crime Coding Sheet, which included a police narrative. Some of the data collected included the date and time of the robbery, number of employees on duty, number of customers in store, type of weapon used, and money taken. Specifically, both police and clerk narratives were used together to determine injury status and resistance level of each employee.

Data were collected on 36 variables and analyzed. Most of the factors were defined in Hendricks et al. [1999], with the exception of data uniquely relevant to this study on injury—employee resistance, robbery type, number of robbers, multiple robberies, and presence of clerks. A slight modification to the coding methods used in the parent study was made—the cut point for 'good' visibility within the store was changed to greater than or equal to 2.0 [Hendricks et al., 1999]. Only those variables to be presented in this study are defined here.

Employee resistance to robbery took one of three forms. Active resistance included any aggressive attempts to stop robberies in progress. Passive resistance included non-aggressive attempts to either stop robberies or avoid them, for example, pushing a panic button or attempting to run and hide. The category no resistance included incidents in which no attempts to resist robberies were made and acts of self defense in which physical force may have been used by the employee, but only for protection after being physically attacked first. Robberies were classified into three types: 'straight robberies' involving the taking of money immediately upon a perpetrator entering or surveilling a store; 'customer robberies' also involving the taking of money, but which occur sometime after entering a store and include the

perpetrator engaging in the act of making a purchase; and 'merchandise robberies' which involved the taking of goods.

All data were analyzed using SAS software (Statistical Analysis System software, Cary, NC). Rate ratios and 95% confidence intervals were calculated to compare injury rates with respect to various robbery situations and environments. After excluding the company that did not allow their clerks to complete questionnaires, a separate analysis was performed on three store characteristics (cash limit, permitted weapon keeping on premises, and training in violence prevention) using this subset of data ( $N = 305$ ). To provide a better understanding of the interrelationships between select factors, Cochran-Mantel-Haenszel statistics were calculated. For a given pair of variables, correlations were assessed using one of three methods: non-zero correlation for two ordinal variables; row-mean score difference for nominal and ordinal variables; and general association for two nominal variables [SAS Institute Inc, 1990]. All variables were considered ordinal except for weapon use, time, robbery type, and employee training, which were all nominal.

## RESULTS

In all, 571 clerks were identified in 382 robberies. Information on clerks on duty at the time of the robbery was missing for 18 of the 400 robberies with follow-up. Data attainment rates on the 571 robbed clerks varied from 48 to 100% with a mean of 96%. Only two factors had particularly low data attainment: money taken (48%) and number of customers present (64%).

Table I shows the number and distribution of employee injuries by the number of employees on duty at the time of the robbery. Slightly more employees (8 vs. 6%) were injured in robberies with one-clerk on duty versus two-clerks.

Table II displays the distribution and rate ratios of 15 robbery characteristics identified to have a strong association with injury—those with rate ratio greater than or equal to 2.0 or less than or equal to 0.5. Injury rates were highest among employees who actively resisted, were robbed with a weapon other than a firearm or no weapon at all, or experienced a merchandise robbery. Injury rates were lowest among employees who were robbed at night and had US\$ 1–99 taken. Injury rates were also lowest for employees working in stores with either a visible drop safe or a cash

limit less than US\$ 100. Low rates of injury were also evident for employees working in areas with either a building value greater than or equal to US\$ 75,000 or a median rent greater than or equal to US\$ 500.

Subset analyses using only those stores that completed questionnaires were also performed on several variables (i.e., cash limits, permitting clerks to use weapons, and training in violence prevention) and these results were nearly identical. Since the second analysis generated results very similar to the first, they are not displayed.

Table III displays the relationships between select robbery and environmental characteristics using a correlation matrix. *P*-values for the Cochran–Mantel–Haenszel procedures are indicated. Every characteristic was shown to be associated with at least one other ( $P < .05$ ).

All circumstantial characteristics of robbery were interrelated ( $P < .001$ ). The percentage resisting robbery was associated with weapon use (9% in robberies with firearms vs. 20 and 30% in robberies with knives and other/no weapons, respectively), time of day (10% at night vs. 23% at day), type of robbery (9, 11, and 49% for straight, customer, and merchandise robberies, respectively), and money taken (8 and 52% with money and without money taken, respectively). Percentage using firearms was associated with type of robbery (83, 71, and 40% for 'straight', customer, and merchandise robberies). The type of robbery was also associated with number of robbers, as 95% of the cases involving two or more robbers were straight or customer robberies versus only 85% among cases with a single robber.

Store environments were highly inter-correlated ( $P < .005$ ). The percentage having a visible drop safe was correlated with number of escape routes (70% in cases with two or more vs. 62% in cases with one or none), cash limit (93% in robberies involving a US\$ 99 limit vs. 73 and 18% involving no limit and limits between US\$ 100 and 300, respectively) and employee training (85% for clerks trained in robbery prevention vs. 39% for clerks not trained, respectively). Training in robbery prevention was also correlated with escape routes (68 and 53% with two or more and one or none), and cash limit (82, 10, and 31% for US\$ 99 or less, no limit, and a limit between US\$ 100 and 300, respectively).

Circumstances of robberies were associated with store environments ( $P < .005$ ). The percentage of nighttime rob-

**TABLE I.** Number of Employees on Duty by Number and Frequency Injured

Employees on duty	Robberies	Employees at risk	Robberies with one employee injury	Robberies with two employee injuries	Total employee injuries (%)
One	207	207	18	—	18 (8%)
Two or more	175	365	17	3	23 (6%)
Total	382	571	35	3	41 (7%)

**TABLE II.** Robbery Characteristics (N = 571)

Factor	Category	No. injured	No. robbed	Rate ratio (95% CI)
Employee	—	19	474	1.0
resistance	Passive	3	31	2.4 (0.8, 7.6)
	Active	19	36	9.7* (5.6, 16.7)
Weapon use	Firearms	12	432	1.0
	Knives	11	62	6.4* (3.2, 12.8)
	Other/no weapon	15	75	7.2* (3.8, 13.5)
Time	Day: 0600–1759	14	107	1.0
	Night: 1800–0559	24	464	0.4* (0.2, 0.7)
Robbery type	Straight	19	367	1.0
	Customer	10	151	1.3 (0.6, 2.7)
	Merchandise	8	40	3.9* (1.8, 8.1)
Money taken	None	14	94	1.0
	US\$ 1–99	7	122	0.4* (0.2, 0.9)
	US\$ 100–9,000	4	55	0.5 (0.2, 1.4)
Number of robbers	Two or more	13	113	1.0
	One	25	456	0.5* (0.3, 0.9)
Escape routes	Two or more	8	216	1.0
	None or one	28	335	2.3* (1.1, 4.7)
Drop safe	No	8	67	1.0
	Yes: not visible	11	124	0.7 (0.3, 1.8)
	Yes: visible	18	375	0.4* (0.2, 0.9)
Cash limit	None	8	53	1.0
	US\$ 100–300	6	66	0.6 (0.2, 1.6)
	< US\$ 100	24	444	0.4* (0.2, 0.8)
Training	No	16	147	1.0
	Yes	18	357	0.5* (0.2, 0.9)
Age (employee)	< 35 years	9	240	1.0
	≥ 35 years	21	252	2.2 (1.0, 4.6)
Percent aged 15–24	Low: < 15%	14	330	1.0
	High: ≥ 15%	23	236	2.3* (1.2, 4.3)
Percent single males	Low: < 15%	10	243	1.0
	High: ≥ 15%	27	323	2.0 (1.0, 4.0)
Population density	Low: < 2.5	19	383	1.0
	High: ≥ 2.5	18	183	2.0* (1.1, 3.7)
Building value	Low: < US\$ 75,000	24	250	1.0
	High: ≥ US\$ 75,000	13	316	0.4* (0.2, 0.8)
Percent vacant	Low: < 9%	21	19	1.0
	High: ≥ 9%	320	132	2.4* (1.2, 4.6)
Median rent	Low: < US\$ 500	20	196	1.0
	High: ≥ US\$ 500	17	370	0.4* (0.2, 0.8)

\*Significant at the 95% confidence level.

beries was associated with employee training (86% involving trained clerks and 73% involving untrained clerks), cash limit (85% in cases with a US\$ 99 limit vs. 73 and 62% in cases with US\$ 100 to 300 and no limit, respectively), drop safe (85% in stores with visible drop safes, 77% in stores without a visible drop safe and 66% in stores with no drop safes at all), and number of employees (85 and 75%

with two or more clerks and a single clerk, respectively). The percentage of employees trained in robbery prevention was associated with money taken (81% involving no money taken, 74% with less than US\$ 100, and 45% with more than US\$ 100). Having a cash limit restricted to US\$ 99 or less was associated with money taken (91% involving less than US\$ 100 vs. 72 and 42% with no money taken and with at

**TABLE III.** Associations Among Robbery Characteristics: Test *P*Values\*

	1	2	3	4	5	6	7	8	9	10	11	12
1	—	.001	.001	.001	.001	.78	.54	.24	.23	.05	.35	.001
2		—	.42	.001	.001	.04	.01	.06	.05	.01	.050	.50
3			—	.41	.04	.16	.24	.001	.001	.001	.94	.003
4				—	.001	.001	.02	.19	.63	.20	.32	.20
5					—	.57	.02	.05	.003	.001	.99	.20
6						—	.49	.007	.31	.45	.31	.27
7							—	.005	.01	.002	.93	.20
8								—	.001	.001	.007	.30
9									—	.001	.22	.03
10										—	.58	.001
11											—	.80
12												—

\*Cochran–Mantel–Haenszel.

1, Resistance; 2, weapon use; 3, time; 4, robbery type; 5, money taken; 6, number of robbers; 7, escape routes; 8, drop safe; 9, cash limit; 10, employee training; 11, age (employee); and 12, number of employees.

least US\$ 100 taken, respectively). The percentage resisting robbery was correlated with number of employees, as 20% of cases resisting involved only one employee and 8% of cases involved two or more employees.

## DISCUSSION

This study used extensive data on robbery circumstances and work environments to uncover associations between a wide range of factors and employee injury during a robbery. The numerous associations identified among selected factors will be useful for future research in describing causal pathways. The objective of this study was to establish possible risk factors for employee injury; a discussion of causal relationships goes beyond the scope of this study.

Caution needs to be taken in interpreting the findings due to several limitations with the data, case ascertainment, and methods. Low response for ‘money taken’ (48%), due primarily because of the non-participation from the large chain of stores on employee interviews, is available from only 53% of the population. Consensus opinion among interviewers also indicated that store managers might have generally responded to questionnaires in a way that presented the company in the best light. Based on this perception, training in robbery prevention, limiting cash in register, and not permitting weapon use may have been overestimated in frequency.

For robberies where multiple clerks were on duty, observations are thought to be correlated; however, previous analyses of these data used generalized estimating equations to look at this issue, and found no difference. With instances where clerks are on duty, it was not possible to

distinguish those cases where clerks were all involved in the robbery from those cases where one or more clerk(s) was never involved in the robbery (i.e., in the backroom stocking the cooler). Therefore some clerks that were coded as not resisting and not injured may have never been directly at risk for injury and thus, the injury-resistance association is an overestimate. A second indication of an overestimate in the resistance-injury association is present. Because our study population included only robberies reported to the police, many attempted robberies which were stopped through employee resistance and ended without injuries may not ever get reported [Zimring and Zuehl, 1986].

Results are largely consistent with established theories on criminal behavior [Jeffrey, 1977, Clark, 1992]. When applied to a robbery situation, these theories imply that employees would be at increased risk for escalated violence (physical assault) if the perpetrator is hindered in their ability to succeed (reward) or get caught [Zimring and Zuehl, 1986; Erickson, 1996; Warshaw and Messite, 1996].

Inconsistent with applied theories for robbery prevention is the result for limited escape routes and cash limit. An environment with few opportunities to escape and less cash in the register could be considered more dangerous to the employee if it increases risks involved for the perpetrator and reduces potential rewards. This apparent contradiction reaffirms the need to consider these findings on injury along with research focused on robbery outcomes. Crow and Bull [1975] reported reduced robbery rates with fewer escape routes. In addition, robbery risk has been shown to be greater at night, whereas this study found that nighttime hours (1800–0559) are associated with less violence in terms of lower injury rates during robberies [Washington Department of Labor and Industries, 1992].

A prior four-state study also reported reduced injury risks during robbery associated with firearm use and any resulting money taken [Amandus et al., 1997]. Findings on employee resistance are consistent with industry recommendations, including Occupational Safety and Health Administration (OSHA [1998]) recommendations for late-night retail establishments, and with NACS educational materials promoting employee cooperation during robberies [NACS, 1987; NACS, 1994; OSHA, 1998]. Since most robberies last no longer than 90 sec, employees are instructed to do anything possible to help a robbery finish quickly and smoothly [NACS, 1987; NACS, 1994]. For example, Washington State Department of Labor and Industries (NACS) and others recommend that employees should neither keep a weapon nor activate an alarm during a robbery, and that employees should be truthful with robbers and announce the presence of customers or other employees so that a robber is not surprised [NACS, 1987; Washington Department of Labor and Industries, 1992; NACS, 1994].

The generalizability of the findings to other comparable metropolitan areas is reasonable. Each of the three metropolitan areas represented was selected such that urban, suburban, and rural convenience stores were all represented. In addition, convenience stores represented in the study population experienced annual incidence rates of robbery fairly consistent to national estimates (17% of the study population vs. 20% nationally) [Schreiber, 1991; Faulkner et al., 1998]. Also consistent among the selected stores and national estimates is the annual distribution pattern of robbery, with 13% in both groups experiencing only one robbery, and with 11 and 7% experiencing two or more robberies, respectively [Schreiber, 1991; Faulkner et al., 1998]. Therefore, these findings may be generalizable to many of the convenience stores in comparable metropolitan areas that are experiencing robberies.

Important considerations for preventing injuries during robberies may include training employees about the importance of cooperating during a robbery and allowing money to be taken. It is also important to emphasize that workers were injured during what might appear to be less threatening situations (one robber, no weapon or a weapon other than a gun or knife, daytime, and robberies involving merchandise). Additionally, worker resistance was strongly associated with what might appear to be less threatening. It is clear that in order for training to address worker injury risks, it must emphasize non-resistance in all robbery circumstances. It should be noted that while use of firearms to commit robberies has been shown to be associated with decreased injury risk (most of which are not severe), they are responsible for the majority of fatalities [Zimring and Zuehl, 1986; Amandus et al., 1997].

Other preventive opportunities may include environmental and operational aspects of stores. Common preventive robbery strategies also appear to be protective of

injury should a robbery occur (e.g. drop safes, cash limits, and training in robbery prevention), with the exception of escape routes. Since two or more escape routes were negatively correlated with drop safes and negatively associated with training, the importance of this result is unclear.

The association between US\$ 100 or more taken and having either no cash limit or a cash limit of US\$ 100 or greater supports the recommendation for tight restrictions on cash kept in the register, not only for reducing cash losses but also injuries. Although multiple-clerk staffing was not related in any way to injuries, it was associated with cooperation during robberies and may warrant additional investigation. In summary, this study highlights a number of opportunities and considerations for preventing convenience store employee robbery-related injuries through employee training, store operations and environmental designs. Future research should look at establishing causal pathways and evaluating interventions for robbery-related injuries.

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