A Study of the Effectiveness of a Workplace Violence Intervention for Small Retail and Service Establishments

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Objective: *Examine the effectiveness of a robbery and violence prevention program in small businesses in Los Angeles.* ***Methods:*** *Gas/convenience, liquor and grocery stores, bars/restaurants, and motels were enrolled between 1997 and 2000. Intervention businesses (n = 305) were provided training, program implementation materials, and recommendations for a comprehensive security program. Control businesses (n = 96) received neither training nor program materials.* ***Results:*** *Rate ratios comparing intervention to control businesses were 0.90 for violent crime (95% confidence limits [CL] = 0.53, 1.53) and 0.81 for robbery (95% CL = 0.38, 1.73). The reduction in violent crime was concentrated in high-compliance intervention businesses (risk ratio = 0.74, 95% CL = 0.40, 1.36). Low-compliance intervention businesses had practically the same postintervention crime as the control businesses.* ***Conclusions:*** *Our results suggest that the workplace violence intervention may reduce violent crime among high-risk businesses, especially those with high program compliance.* (J Occup Environ Med. *2008;50:1365–1370*)

Homicide is the fourth leading cause of workplace death in the United States.[1] It is the leading cause among foreign-born workers and the second leading cause among women.[2] Rates of workplace homicide have decreased since 1980 but at a proportionately slower rate than for unintentional workplace injury deaths.[3,4] Reasons for the disproportionate decline in workplace homicides include lack of dissemination of prevention measures known to be effective and slow diffusion of measures into businesses that need them most.[4]

Over two thirds of all workplace homicides[2] and nearly 20% of nonfatal assaults[5] occur in the course of a robbery. The retail industry accounts for nearly half of all workplace homicides and almost one fifth of all nonfatal assaults, largely due to the frequency of robberies perpetrated against these business types.[2,5]

Protective factors associated with robbery-related homicide and nonfatal injury include the use of cash control and storage systems, employee training for violent situations, good lighting, access control mechanisms, and the presence of security and surveillance devices.[6,7] These measures have been successful as single- or multiple-component intervention programs in reducing robberies in convenience store settings.[8] Many of these program evaluations, however, are limited by the failure to use a comparison group, control for confounding, or measure intervention compliance. In addition, the evaluation of programs to reduce vi-

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olent events beyond robbery and in business settings other than convenience stores has been limited.

The objectives of this study were to evaluate the effectiveness of a workplace violence intervention program in reducing violent crime in retail and service establishments, evaluate program effectiveness across levels of compliance, and examine whether program effectiveness was modified by neighborhood crime and business type.

Materials and Methods

Study Population

Small, independently owned businesses at high risk for robbery-related violence in Los Angeles City were eligible for study participation. Business types included grocery stores, liquor stores, gas/convenience stores, restaurants, bars, and motels. We randomly sampled eligible businesses within strata of community crime and business type from an electronic directory of all Los Angeles City businesses, with community crime defined as the number of Federal Bureau of Investigation index crimes (including murder, rape, and assault) in each Los Angeles Police Department (LAPD) jurisdiction. A community crime rate per 10,000 resident population was calculated for each LAPD jurisdiction per year and categorized into tertiles to represent high, medium, and low levels of crime. We randomly sampled 50% of the businesses from high community crime areas, 30% from medium crime, and 20% from low. Businesses in high crime areas were oversampled under the hypothesis that the intervention program would be most effective in areas with higher neighborhood crime rates.[9,10]

We enrolled intervention businesses over a 3-year period between August 1, 1997 and July 31, 2000, and frequency-matched control businesses by community crime and business type. Enrollment rates for both intervention and control businesses were 45%, yielding 305 enrolled intervention and 96 enrolled control businesses.

Data Collection

Security consultants licensed by the American Society of Industrial Security enrolled and collected baseline and follow-up data for both intervention and control businesses and implemented individualized security programs for the intervention businesses. Baseline data on risk factors for violence and preventive measures already in place were collected and used to prepare the individualized programs. The programs were discussed during a one-on-one consultation with the intervention business operator. In addition to the individualized program, intervention businesses received a comprehensive workplace security manual, video and brochures for employee training, and security decals. Control businesses did not receive any consultation or intervention materials.

Follow-up data were collected 3 months and 1 year after the consultation (for intervention businesses) and the baseline assessment (for the control businesses) to determine whether business operators had made any changes to their security practices. Intervention businesses complied with many of the program recommendations made by the consultants, whereas control businesses made few changes from their baseline practices.[11]

Intervention Program

The security program was developed using the Crime Prevention Through Environmental Design (CPTED) model, which theorizes that the risk for criminal activity can be controlled by modifying the environment.[12] CPTED concepts included in the security program included keeping a minimum amount of cash in the register (eg, reducing available cash to $50 for businesses with lower customer volumes, keeping a drop safe in the cash counter area), maintaining good visibility into and outside of the business (eg, removing signs, merchandise displays and advertisements that obstruct views), maintaining good interior and exterior lighting (eg, balancing lighting so people can see in and employees can see out), controlling access into and within the business (eg, locking noncustomer entrances, minimizing escape routes), training employees in crime control and injury prevention (eg, knowing what to do to prevent robbery by maintaining the physical environment, and if a robbery occurs, complying with robber demands to reduce the likelihood of injury), and posting security decals that indicate low cash availability and no employee access to safes. Casteel and Peek-Asa[8] found that these measures resulted in a 45% median decrease in robberies across studies. Additional details about the intervention have been published by Peek-Asa et al.[11]

Evaluation Variables

The outcome variable was the number of violent crimes occurring in each business over a 1-year period before and a 1-year period after delivery of the intervention program (for intervention businesses) and completion of the baseline assessment (for control businesses). Violent crimes were defined as nonfatal robberies, assaults, batteries, and attempts of these crimes identified from LAPD records. Crimes were identified by linking enrolled intervention and control businesses by address to an electronic LAPD database of business crimes occurring in Los Angeles City between 1997 and 2000. An individual record review was conducted for each address-linked crime to validate the match with the enrolled business. Intervention programs similar to the one evaluated in this study have appeared successful in reducing robberies in convenience[13–15] and liquor[16] store settings. We therefore examined the effectiveness of the security program in reducing robberies and attempted robberies independently. The expo-

sure variable was intervention status (intervention vs control).

To control for decreasing commercial crime trends during the 3-year study period, we adjusted for the absolute difference in background crime rates over the pre- and postperiods in Los Angeles City by including the rate in the models. The rate was defined as the number of robberies, assaults, batteries and attempts of these crimes occurring in all Los Angeles City businesses per 10,000 resident population over the pre- and postperiods. We examined possible differences in effect related to community crime rate (high, medium, and low); business type categorized as retail (grocery, liquor, and gas/convenience stores) and service (restaurants, bars, and motels); and program compliance categorized into high, low, and noncompliance levels.

We graded intervention businesses on compliance with the individualized program recommendations after 1 year. The baseline score was the total number of recommendations in the intervention business' individualized security program at baseline (range, 1 to 8). Employee training was recommended in each intervention business.[11] After 1 year of follow-up, each program recommendation was assessed and categorized as unchanged (score = 0), upgraded (score = 1), or completely implemented (score = 2), for a possible range of follow-up scores from 0 to 16. Program compliance was calculated as the ratio of the 1-year follow-up score to the baseline score to adjust for baseline differences in risk across businesses and to account for varying levels of program implementation. We categorized program compliance as "high" ($1 < \text{score} \leq 2$), "low" ($0 < \text{score} \leq 1$), and "noncompliance" (score = 0).

Analytic Methods

Taking A as the number of postintervention violent events and B as the number of preintervention violent events, we used logistic regression to model the proportion A/(A + B), which is equivalent to linear modeling of the logit of the proportion, ln(A/B). The association between the workplace violence intervention program and the change in the rate of violent crimes is then represented by the difference in this logit between intervention and control businesses. Because all events were measured over the same pre- and postintervention time spans (T = 1 year), the logit difference is equal to the difference in log rate ratios ln(RR) for intervention and control businesses, where RR = (A/T)/(B/T) is the ratio of crime rates in the post- and preintervention years. This comparison is based on within-business differences and thus accounts for business-specific features. Because intervention-business differences are compared to control-business differences, the analysis also accounts for any overall change in background rates over the study period.

The previous analysis is statistically equivalent to the case-time control analysis proposed by Suissa.[17] Because it makes no assumption about the stability of crime rates over the study period, it has very low power. We therefore repeated the analysis using a more powerful method equivalent to the case-specular method of Zaffanella et al.[18] This method assumes there is no meaningful change in the background rate over the study period, an assumption which is highly compatible with our data. In this analysis, the logit expected under the null hypothesis is 0 (no change in the event rate going from pre- to postintervention), and so the proportion is modeled by no-intercept logistic regression[19] (ie, the analysis estimates the change in rate moving from pre- to postintervention, assuming no change would have occurred in the absence of intervention). The results are much more precise, although subject to bias to the extent that the change over time is not due to the intervention.

All statistical analyses were performed using SAS Statistical Software (SAS Institute, Cary, NC). This study was approved by the University of California Los Angeles Human Subjects Review Board.

Results

Overall, businesses with the workplace violence intervention had a postintervention rate of violent crimes 10% lower than that among control businesses (rate ratio [RR] = 0.90, 95% confidence limits [CL] = 0.53, 1.53) (Table 1). The postintervention rate of robberies and attempted robberies was 19% lower in intervention businesses, compared with the rate among control businesses (RR = 0.81, 95% CL = 0.38, 1.73) (Table 1).

Program Compliance

Intervention businesses with high program compliance had a 26% lower rate of violent crime than control businesses in the postintervention period (RR = 0.74, 95% CL = 0.40, 1.36), whereas low-compliance intervention businesses had practically the same postintervention crime as the control businesses (RR = 0.98, 95% CL = 0.55, 1.75) (Table 1). Noncomplying intervention businesses had a 43% increase in postintervention rates of violent crime, compared with the rates among control businesses (RR = 1.43, 95% CL = 0.51, 4.02). The rates of robbery and attempted robbery were 41% lower in intervention businesses with high program compliance, compared with the control businesses (RR = 0.59, 95% CL = 0.25, 1.39). There were little differences found in the rates of robbery and attempted robbery in low and noncomplying intervention businesses compared with control businesses.

Business Type

The rate of violent crime was 18% lower in retail intervention establishments, compared with control retail establishments (RR = 0.82, 95% CL = 0.42, 1.61), and the rate of robbery and attempted robbery was reduced 12% (RR = 0.88, 95%

TABLE 1
Comparison of Crime Rates Over the Post- and Preintervention Time Periods for Intervention and Control Businesses, by Program Compliance, Business Type, and Community Crime Level

		All Violent Crime			Robbery and Attempted Robbery		
	Number of Businesses	Number		Adjusted Rate Ratio* (95% CL)	Number		Adjusted Rate Ratio* (95% CL)
		Pre	Post		Pre	Post	
Study population							
Intervention	305	124	145	0.90 (0.53, 1.53)	57	65	0.81 (0.38, 1.73)
Control	96	30	39	Reference	15	21	Reference
Compliance level							
High compliance	132	55	53	0.74 (0.40, 1.36)	28	23	0.59 (0.25, 1.39)
Low compliance	131	62	79	0.98 (0.55, 1.75)	24	35	1.04 (0.45, 2.42)
Non-compliance	42	7	13	1.43 (0.51, 4.02)	5	7	1.00 (0.27, 3.76)
Control	96	30	39	Reference	15	21	Reference
Type of business†							
Retail	261	95	107	0.82 (0.42, 1.61)	55	58	0.88 (0.36, 2.11)
Service	140	59	77	1.03 (0.43, 2.47)	17	28	0.64 (0.14, 2.92)
Community crime‡							
High	191	85	93	0.87 (0.43, 1.76)	44	40	0.77 (0.29, 2.08)
Medium	115	33	41	0.72 (0.16, 3.26)	12	22	1.27 (0.18, 8.87)
Low	95	36	50	1.06 (0.39, 2.86)	16	24	0.56 (0.12, 2.60)

*All models adjusted for Los Angeles City background crime.
†Retail includes grocery store, gas/convenience store, and liquor store. Service includes motel and restaurant.
‡Crime level in LAPD jurisdiction.

CL = 0.36, 2.11) (Table 1). Intervention and control service establishments had similar postintervention rates of violent crime (RR = 1.03, 95% CL = 0.43, 2.47). Nonetheless, intervention service businesses had 36% lower robbery and attempted robbery rates, compared with control service businesses (RR = 0.64, 95% CL = 0.14, 2.92).

Community Crime

Rates of violent crime were lower among intervention businesses located in medium crime areas (RR = 0.72, 95% CL = 0.16, 3.26), and rates of robbery and attempted robbery among intervention businesses located in low crime areas were lower than control business located in the same areas (RR = 0.56, 95% CL = 0.12, 2.60) (Table 1). In high community crime areas, intervention businesses had 13% lower rates of violent crime (RR = 0.87, 95% CL = 0.43, 1.76) and 23% lower rates of robbery and attempted robbery (RR = 0.77, 95% CL = 0.29, 2.08) postintervention, compared with the control businesses.

Discussion

If the differences we observed are attributable to the workplace violence intervention program, it appears that the program had greater impact as program compliance increased, suggesting that the program might be more effective with good incentives or requirements (such as ordinances) to implement the security measures. It would also appear that the program had an impact on robberies and attempted robberies in both retail and service establishments, which suggests that the program can be adapted for small, independently owned businesses other than convenience stores if consideration is given to the individual business environments. Nonetheless, our findings should be interpreted as very tentative considering the high statistical uncertainty of the estimates.

Compliance was a strong indicator of program success in this study. Most CPTED-based programs to reduce robberies and related injuries have not addressed compliance as a measure of program effectiveness.[8] In this study, we created a compliance index that accounted for differences in baseline crime risk across businesses, as well as level of program implementation. Employee training was the most commonly implemented program component, followed by improvements in interior lighting, cash handling procedures, and visibility into the business.[11] Program receptivity was high, likely due to security consultants individualizing the program for each business, which provided operators with specific and tangible security recommendations, and complementing program delivery with suggestions for improving existing surveillance equipment (eg, changing camera positions for enhanced robbery deterrence) and addressing other safety concerns of business operators (eg, panhandling outside of the business).

The CPTED-based program had a greater impact on robberies and attempted robberies in the study businesses than violent crimes overall. The program was initially developed as a robbery deterrent for convenience stores[14] and has been successful in reducing robberies in these

settings.[8] The findings from this study suggest that a similar program can also be effective in retail settings other than convenience stores, as well as service establishments like bars, restaurants, and motels.

This study was one of the first to provide small, independently owned businesses with a comprehensive workplace violence prevention program. Most businesses in this study were family-owned and had fewer than five employees. Small businesses traditionally have few resources, no corporate backing, and if fewer than 10 workers are employed, they are not required to have state Occupational Safety and Health Administration oversight. Although robbery and violence prevention programs exist, many small businesses lack the financial stability to purchase one and hire a security expert to assist in implementation, both of which can cost an average of nearly $1000 (personal communication, James L. Grayson, CPP, Pacific Protection Services Inc, Los Angeles, CA). Components of the CPTED-based intervention were low-cost and required little long-term maintenance, therefore, providing a very feasible program for small business owners to implement.

The study was limited by low power to conduct the analyses due to program dissemination expense, barriers to program implementation, and rigor of the model. Security consultants licensed through the American Society for Industrial Security were employed to individualize the program for each intervention business due to their expertise in security models and application to business environments. The research investigators determined that enrolling fewer businesses to maximize correct implementation of program components outweighed the cost of this expertise because of the overall benefit to the business, as well as the fidelity of intervention implementation.

Most businesses (86%) implemented at least one of the consultant recommendations from their security plans, and 43% implemented nearly all of them to some degree. Nonetheless, the magnitude of effectiveness may have been stronger and more precise had businesses fully implemented more, if not all, of the recommendations. Barriers to program implementation included business operators' perceptions that intervention components would negatively affect the appearance of the business (eg, posting signage or increasing lighting in restaurants); recommendations for implementing more expensive components (eg, purchasing a drop safe for the cash counter area); and language barriers. Language barriers, however, were partially resolved by having program materials available in Spanish, Korean, and Mandarin. The cooperation of local business associations, such as the Korean American Grocers Association, was invaluable. They assisted with business acceptance of the program, and when needed, provided language interpreters.

Our results suggest that the robbery and violence prevention program aided small, high-risk businesses in Los Angeles, specifically those that complied with many of the security plan recommendations. The findings also suggest that a CPTED-based program, shown to be successful in convenience store settings, can also be successful in other small, independently owned retail and service environments. Most workplaces in the United States are small businesses that have limited or no access to workplace violence prevention programs. They also greatly rely on local police to address incidents of crime.[20] Because the police are generally the first point of contact after a workplace violence incident, they are in a position to take on a workplace violence prevention role, especially for these small businesses. Therefore, community-level sustainability of a program like that evaluated in this study could be executed by police with training in CPTED principles. This mechanism of delivery would then provide small businesses with a community resource, as well as measures for protecting workers from violence-related injury and death.

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