The effect of business improvement districts on the incidence of violent crimes

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ABSTRACT

Objective To examine whether business improvement districts (BID) contributed to greater than expected declines in the incidence of violent crimes in affected neighbourhoods.

Method A Bayesian hierarchical model was used to assess the changes in the incidence of violent crimes between 1994 and 2005 and the implementation of 30 BID in Los Angeles neighbourhoods.

Results The implementation of BID was associated with a 12% reduction in the incidence of robbery (95% posterior probability interval −2 to 24) and an 8% reduction in the total incidence of violent crimes (95% posterior probability interval −5 to 21). The strength of the effect of BID on robbery crimes varied by location.

Conclusion These findings indicate that the implementation of BID can reduce the incidence of violent crimes likely to result in injury to individuals. The findings also indicate that the establishment of a BID by itself is not a panacea, and highlight the importance of targeting BID efforts to crime prevention interventions that reduce violence exposure associated with criminal behaviours.

Research indicates the importance of community-level attributes for explaining the incidence of interpersonal violence and crime in neighbourhoods, but there are few examples of effective community-level violence prevention interventions.[1–3] Several studies suggest that implementation of the community economic development model of the business improvement district (BID) reduces crime in affected neighbourhoods.[4 5] The BID model relies on special assessments levied on commercial properties located within designated business areas to augment services typically provided by public agencies, including sanitation, public safety, place marketing and planning efforts.[6] Although managed and operated by private sector non-profit organisations, the majority of BID are public entities, chartered and regulated by local governments.[7] The services delivered through BID assessment schemes, however, do not typically replace current public services. BID services typically are directed towards sanitation and security of common public space areas such as sidewalks (and not interior spaces), analogous to the common area service arrangements seen in home owners' associations.[8] BID often focus their budgets on providing private security to their business locales and surrounding neighbourhoods, as a basic level of enhancement to publicly funded police services.[9]

One of the more rigorous evaluations of BID by Brooks[5] indicated that their adoption in areas of Los Angeles was associated with a significant drop in the number of serious crimes reported to the police between 1990 and 2002, controlling for time stable differences between areas and in comparison with neighbourhoods that proposed BID but did not end up adopting them. Given that the adoption of a BID in Los Angeles requires extensive support from business and property owners (eg, at least 15% of the business owners or 50% of the property owners must sign supporting petitions) and a laborious process of legal and legislative oversight, the simple proposed adoption of a BID may not provide a strong comparison group.[10 11] The actual process of BID adoption is, by itself, a signal of commitment from business merchants and landowners to promote economic development through various community change activities. Even after taking into account time stable area differences in the average volume of crime, poverty rates and other neighbourhood features, it is difficult to reconcile whether establishing a BID is independent from other facets of community change that may presage drops in crime. A detailed analysis of budget data and observations of neighbourhoods in Los Angeles where BID are situated, for example, showed that their priorities of spending were correlated with observable indicators of neighbourhood physical decay and surrounding economic conditions.[12] Therefore, using the BID area before BID implementation may be a more appropriate comparison group.

We rely on a pre—post intervention design to assess the effects of BID on the incidence of violent crimes. We use the year of implementation to reflect the exposure to the BID intervention and examine the pre—post changes in the incidence of violent crimes in affected neighbourhoods, controlling for overall time trends.

METHODS

Design

We examined BID effects by modelling the pre—post changes in the incidence or rate of violent crimes from 1994 to 2005 for all neighbourhood areas exposed to BID. Between 1996 and 2003, a total of 30 separate BID were implemented in Los Angeles. The unit of analysis is any of the 30 neighbourhood areas that eventually adopted a BID in Los Angeles during the period of observation. Table 1 reports the number of BID areas that became fully operational at any given year. We consider a BID fully operational if its implementation occurred for the entire calendar year. The formulation of BID in Los Angeles requires a formalised and uniform planning and adoption stage that is structured by law. Details are provided

elsewhere.[12] For all the areas that eventually adopted a BID in Los Angeles, there are at least 2 years' worth of data during which no BID (pre) was operational and, similarly, at least 2 years of data during which all the BID were fully operational (post). We make use of this type of interrupted time series to estimate the average BID effect on the rate of violent crimes.

Data
The data consist of the yearly counts of officially recorded violent felony crimes (homicide, rape, robbery and aggravated assault) by the Los Angeles Police Department that were aggregated from police reporting districts to corresponding BID areas. If a reporting district is present in a BID this district is counted as receiving the BID intervention. A total of 179 reporting districts are present in the 30 BID neighbourhood areas. We focus primarily on the counts of robbery, because this crime is less susceptible to underreporting by the police, is more likely than other crimes to occur in public settings between strangers and just over 30% of people who are robbed experience an injury.[13–15] Nearly one out of five robberies nationally result in a serious injury that requires medical treatment, such as a gunshot wound, knife/stab/slash wound, broken bones or teeth, internal injury and/or loss of consciousness.[16 17] The estimated social costs of an average robbery are high, with an average cost of US$39 287 (in 2005 dollars) if one includes monetary costs associated with medical and emergency services, lost productivity, mental health and general quality of life.[18] By focussing our analysis primarily on violent crimes, and in particular robbery, we are offering a closer look at the effective role that BID expend on crime prevention efforts that attempt to improve the social control of public space areas through environmental design modifications and spending on private security. We do not examine property crime offences because they are less likely to be reported to the police, many occur in private settings (eg, larceny/theft) and are not 'street crimes' directly subject to BID efforts to enhance social control in public spaces.

Time trends
Table 2 presents a summary of the average frequency of robbery and all violent crimes for areas exposed to BID compared with non-BID areas that incorporate the rest of Los Angeles. The simple linear trend of these data indicates that BID areas experienced greater, on average, yearly reductions in the incidence of robbery and violence than non-BID areas. For example, the average yearly reduction in robbery was 1.9 in BID areas, compared with 1.2 in non-BID areas. The log of the average robbery counts indicates a 7% reduction in BID areas compared with a 5.7% reduction in non-BID areas. During the 12-year period, however, the average yearly count of reported violent offences dropped by 58% for Los Angeles as a whole, suggesting that it is important to take into account this secular trend in assessing the effects of BID on violent crimes.

Statistical model
We used a Bayesian hierarchical model to assess the pre−post effects of BID adoption in areas that were exposed to BID. We estimate the BID effect in each individual area and the average BID effect across all areas. We model the number of reported robberies and violent crimes with a Poisson distribution with mean (λ_{it}) for each of the 30 BID areas (i) over a 12-year (t) time period. We include a random effect parameter for areas to scale the time trend for the volume of crimes in each BID area, and to account for time invariant differences across the 30 BID areas. We account for the overall 12-year crime time trend in Los Angeles with a natural cubic spline.[19] As the yearly incidence of violent crimes for Los Angeles as a whole was declining over the 12-year study period, it is important to account for the secular trend in the model so as not to overestimate the BID effect. The population at risk of violent crimes in each BID area is unknown, representing a mix of residents and non-residents (eg, shoppers). We bypass the problem of having to estimate the population at risk of violent crimes by comparing every BID area with itself. Under the assumption that the population at risk

Table 1 BID by year of observation in Los Angeles

Year	No of BID started	BID area
1994	—	
1995	—	
1996	2	Wilshire Centre Fashion District
1997	2	Hollywood Entertainment I San Pedro
1998	6	Los Feliz Village Larchmont Village Downtown Centre Figueroa Corridor Century Corridor Greater Lincoln Heights
1999	11	Granada Hills Canoga Park Van Nuys Boulevard Auto Row Tarzana Studio City Hollywood Media Westwood Village Historic Core (Downtown) Toy District Downtown Industrial Jefferson Park
2000	2	Chatsworth Sherman Oaks
2001	4	Encino Los Angeles Chinatown Wilmington Lincoln Heights Industrial
2002	2	Northridge Highland Park
2003	1	Reseda
2004	0	—
2005	0	—

Source: Los Angeles City Clerk's Office.
BID, business improvement district.

Table 2 Average crimes, by year in BID and non-BID reporting districts

Year	Non-BID areas (n=893)		BID areas (n=179)	
	Robbery M (median)	Violent M (median)	Robbery M (median)	Violent M (median)
1994	25.88 (17)	64.27 (42)	41.6 (35)	86.53 (66)
1995	24.01 (16)	60.89 (41)	41.56 (35)	89.75 (74)
1996	21.06 (13)	54.70 (35)	34.3 (29)	77.35 (61)
1997	16.85 (11)	49.14 (33)	29.37 (24)	70.52 (57)
1998	13.06 (8)	42.99 (28)	22.34 (17)	59.77 (51)
1999	11.82 (7)	40.58 (26)	19.98 (16)	56.46 (46)
2000	12.90 (8)	43.63 (26)	21.66 (18)	60.26 (51)
2001	15.43 (10)	49.38 (31)	26.20 (21)	68.74 (55)
2002	14.05 (8)	44.56 (26)	24.83 (20)	62.94 (54)
2003	13.60 (8)	42.24 (26)	23.92 (19)	60.21 (51)
2004	11.81 (7)	36.65 (22)	19.43 (15)	49.12 (44)
2005	11.49 (7)	26.49 (15)	18.06 (14)	37.91 (34)
Average	16.00 (9)	46.29 (28)	26.94 (10)	64.96 (52)
Linear trend	−1.2	−2.5	−1.9	−3.6

Each column presents the average (M) and median (50th percentile) values for the number of incidents in business improvement district (BID) and non-BID areas.
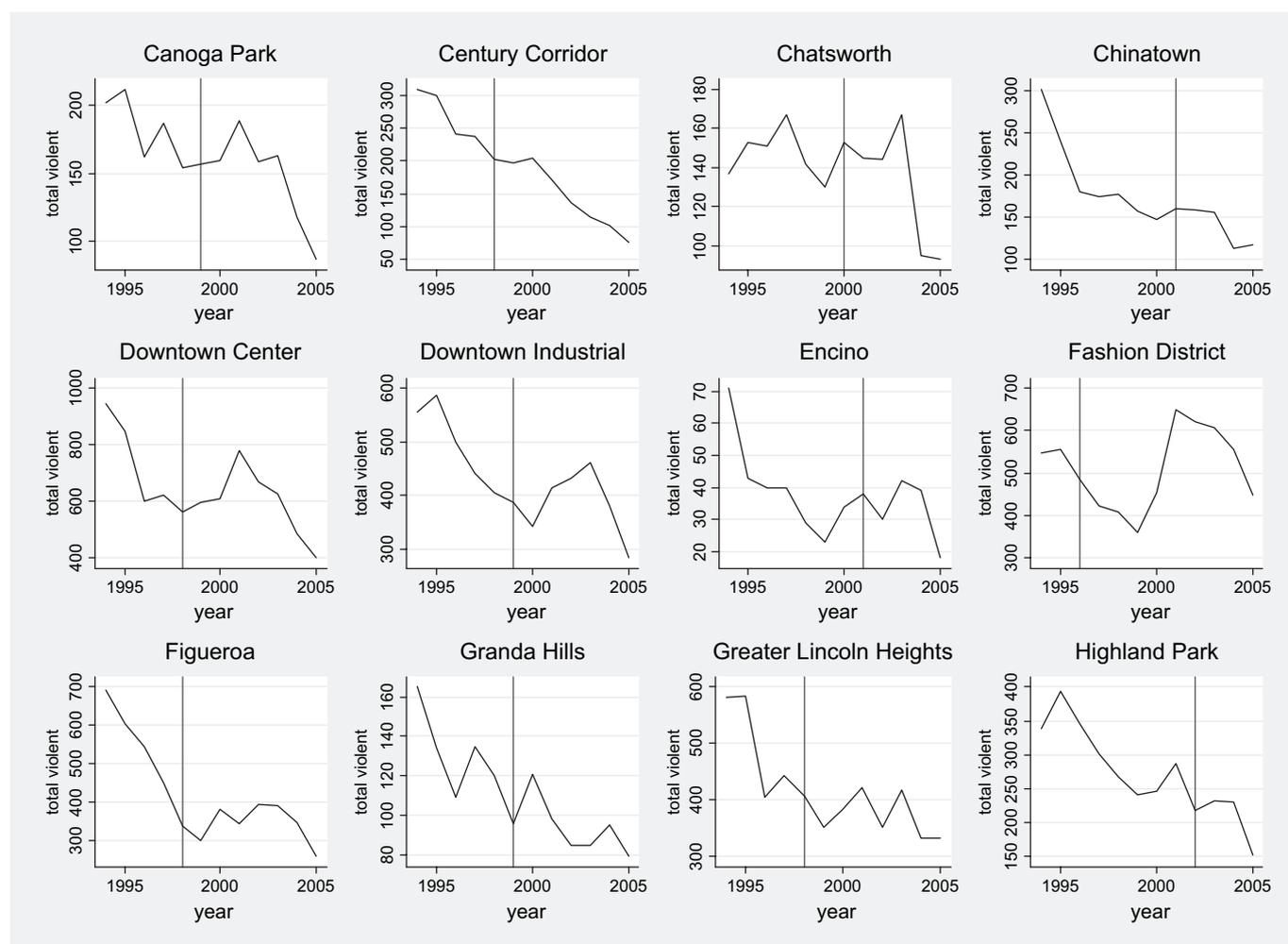
Figure 1 Total violent crime counts for select business improvement district (BID) areas. Note: year of BID implementation noted in vertical lines.

does not change over time, we propose a model that has as the main parameter of interest for area i the ratio (K_i) of the crime rate if a BID was adopted divided by the crime rate that the trends predict would have happened if the BID had not been adopted. If K_i is less than 1, this indicates that the presence of a BID in area (i) is associated with a reduction in the incidence of violent crimes for that area. We use a Bayesian hierarchical model to assess individual effects across each BID area (i) and to approximate the average overall BID effect (μ_K) across all 30 areas.[20] Full technical details on the model and specification of priors are available elsewhere.[12]

The yearly violent crime trends for a sample of 12 of the 30 BID areas are displayed in figure 1 and show the timing of each of the BID interventions (denoted by a vertical line). Figure 1 provides a visual sense for the fact that the Bayesian hierarchical model is estimating an interrupted time series for each unique BID area and then pooling the effect across all areas. The Poisson model implies the counterfactual that the rate of violent crimes in an area after the BID becomes fully operational is proportional to what the rate would have been in that area had the BID not been implemented.

RESULTS

Table 3 reports the overall BID effect for the incidence of robbery and violent crimes in terms of the percentage reductions (posterior mean) associated with the adoption of BID and the 95% posterior probability intervals. Table 3 also reports the posterior probability of observing an overall BID effect on reducing the incidence of robbery and violent crimes (P(μ_K<1), where μ_K represents the overall effect across the 30 BID areas. We find that the posterior probability of a BID effect is 0.96. In other words, there is strong evidence that BID reduced the robbery rate. The estimated percentage reduction: obtained as one minus the posterior mean (μ_K) indicates a 12% average reduction (95% posterior probability interval −2 to 24) in the incidence of robbery associated with the implementation of BID. For the total incidence of violence BID effects are in the same direction, but the statistical evidence is not as strong (P(μ_K<1)= 0.91), and indicates an 8% average reduction (95% posterior probability interval −5 to 21) in the total incidence of violence associated with the adoption of BID.

Given that the observed probability of an overall BID effect was strongest for robbery, table 4 reports the BID area-specific effects for official reports of robbery in terms of percentage reductions in robberies ($1−K_i$). The individual BID area results for robbery show that for 14 of the 30 areas the posterior

Table 3 Estimated percentage reduction in reported violent crimes from BID

Outcomes	Posterior mean*	95% Posterior probability interval	Posterior probability BID effect (P(μ_K<1))
Robbery	12	(−2,24)	0.96
Violent	8	(−5,21)	0.91

*Posterior mean reflects the percentage reduction as calculated by $(1−\mu_K)\times100$.
BID, business improvement district.

Table 4 Area-specific estimates of BID effects on robbery

BID name	Posterior mean $(1-K_i)$	BID effect $(p=K_i<1)$	95% Posterior CI
Granada Hills	18	0.93	−6, 37
Chatsworth	5	0.65	−20, 25
Northridge	18	0.94	−5, 36
Reseda	15	0.90	−9, 33
Canoga Park	3	0.60	−24, 25
Van Nuys	26	0.99	7, 41
Tarzana	−10	0.25	−44, 16
Encino	11	0.76	−22, 35
Sherman Oaks	10	0.76	−18, 31
Studio City	9	0.76	−20, 31
Los Feliz Village	21	0.98	1, 39
Highland Park	11	0.83	−14, 30
Hollywood Entertainment	9	0.80	−16, 28
Hollywood Media	15	0.95	−5, 32
Larchmont Village	34	0.99	5, 53
Wilshire Centre	4	0.63	−25, 26
Los Angeles Chinatown	21	0.98	0, 38
Westwood Village	21	0.97	−1, 39
Downtown Centre	7	0.74	−17, 25
Historic Core	1	0.55	−21, 21
Toy District	8	0.77	−16, 27
Fashion District	−24	0.05	−63, 5
Downtown Industrial	14	0.90	−8, 31
Figueroa Corridor	20	0.96	−2, 36
Jefferson Park	17	0.95	−4, 33
Century Corridor	27	1.00	8, 43
Wilmington	−7	0.28	−34, 14
San Pedro	8	0.75	−18, 29
Lincoln Heights	11	0.77	−20, 34
Greater Lincoln Heights	25	1.00	6, 41

K_i=ratio of robbery crimes (post-business improvement district (BID)/pre-BID). Bold indicates a BID with a probability of a BID effect of ≥0.90.

probability of observing a BID effect is 0.90 or higher. In terms of effect sizes for these 14 areas, the robbery rate is reduced by a high of 27% in the Century Corridor BID to a low of 14% in the Downtown Industrial BID. For another two BID areas, the observed posterior probability is more than 0.80, which still provides evidence for the presence of a BID effect in the expected direction. The BID effects appear to be most pronounced for the incidence of robbery, which one would expect is likely to be affected by environmental features of the neighbourhoods, such as hiring private security officers, which are the focus of BID efforts to control public space areas. Overall, there seems to be evidence in the data that the BID in Los Angeles had an effect in reducing the incidence of reported robberies.

Given the size of the BID effects appear to be most pronounced for robbery, this raises the question of how much BID spending occurs in relation to social costs saved by reducing robberies. Multiplying our estimated 12% (annual) reduction to the average incidence of robberies (M=160.7) associated with BID implementation to the estimated social costs (US$39 287 in 2005 dollars)[18] of an average robbery shows a marginal cost saving of approximately US$757 611 (in 2005 dollars) (annually). Given that the average annual budget of the 30 BID in Los Angeles was approximately US$736 670 (in 2005 dollars),[12] this suggests that a sizeable social cost–benefit of BID implementation can be attributed to the reductions in robbery alone.

Additional tests

We also conducted several additional tests on our measures of violent crime and the methods for approximating BID effects.

Homicides, for example, are the most accurately reported violent crimes, but we did not discuss the yearly trends in homicide because the counts are so low. The average number of homicides per year in neighbourhoods associated with BID is less than one, and the median (50th percentile) is zero. The point estimates from replicating our model for homicide counts varies widely, and the probability of detecting a BID effect is low (P(μ_K<1)= 0.43)), suggesting that BID have no appreciable effect on homicide. In particular, the homicide model indicates a 5% increase associated with BID adoption but with a large CI (95% posterior probability interval −50 to 29), resulting from low counts and imprecision in our estimate. A combined estimate of the count of robbery and homicide together was statistically identical to that of robbery alone, suggesting that the BID adoption effect observed is driven by the rate of robberies.

We also constructed alternative model specifications in line with previous work that Brooks[5] used on an analysis of the effects of BID on reported serious crimes in Los Angeles during earlier years. We compared the estimated effect of BID implementation on robberies and all reported violent crimes using all police reporting districts in Los Angeles as the unit of analysis, including those that do not intersect BID areas. We then included a dummy variable denoting the timing of BID, adjacent neighbourhoods to BID as control variables, and fixed-effect terms (dummy variables) for each individual reporting district, year, and their interactions (reporting district*year). Our results from these specifications were sensitive to the parameterisation of the outcomes. If we relied on ordinary least squares regression we found a statistically significant BID effect in reducing the mean incidence of robberies (b=−4.63; p<0.001) and all violent crimes (b=−7.33; p<0.001) by approximately 16% and 11%, respectively. However, if we relied on a Poisson regression model the results were substantially lower and were only marginally significant for robberies (b=−0.02; p=0.07) and total violence (b=−0.01; p=0.09), reducing the respective incidence by 3% and 2%. We think this sensitivity test provides further justification for our use of a simpler model that estimates only the BID effects for those areas that eventually adopted BID, rather than assigning BID effects to the entire city of Los Angeles.

Limitations

The Bayesian hierarchical model provides an estimate of the effect of BID on the incidence of robbery and violent crimes in areas that were exposed to BID. Like all models this approach has several limitations. First, the model assumes that the population at risk of violence does not change once a BID starts. It is, however, possible that the establishment of a BID could change the population at risk of violent crimes in a number of ways. If, for example, there is a substantial increase in the number of shoppers or new residents because a BID was implemented then even a substantial decline in the incidence of violence would be offset by an increase in the denominator for the population at risk. Such an increase in the population at risk of violence would lead one to conclude that the adoption of the BID did not have an effect in reducing violence. Assuming that the population at risk coincides with the residential population in an area would be incorrect, as it is almost certain that successfully implemented BID attract a larger number of people for commerce to areas.

Second, the model assumes that the level to which violent crimes are reported to the police does not change systematically with the adoption of a BID. If, however, the adoption of a BID implies an increase in local merchants' and residents' willingness to report crimes to the police and an increased response from the

police to combat crime, then the violent crime reports may actually increase as a function of the implementation of a BID. If this were the case, the adopted model would suggest that adopting a BID has the effect of increasing the incidence of violent crimes. Given that the findings suggest an overall effect of BID on reducing the robbery rate and marginal effects for all violent crimes, we have some confidence in these results.

In addition, if one assumes that BID areas have unique features in terms of the businesses that operate and the communities that encourage their establishment, constructing a group of comparison areas that are matched to the BID areas with respect to certain demographic features of area residents would represent a less conservative test of the effects of BID. We think that the areas that will eventually adopt a BID are the best comparison group for those areas that have already adopted a BID, as there are clearly features of BID areas that are unique in their ability to get a majority of landowners and merchants interested in their adoption. At the same time, our analysis offers no prescription for the various mechanisms by which BID impact robbery rates. BID adopt a variety of tactics, such as mobilising the police, hiring private security officers, street cleaning and environmental redesign to increase a sense of cleanliness and safety of BID areas. Unfortunately, the tactics adopted by each BID area are complex and not easy to approximate in a statistical model.

DISCUSSION AND CONCLUSIONS
The results from this study suggest that BID reduce the rate of robbery crimes in affected Los Angeles neighbourhoods. The overall effect of BID on robberies is consistent with the efforts that many of these Los Angeles BID expend on improving the physical appearance of their areas to make them more attractive to commercial business and less attractive to potential offenders (eg, painting over graffiti, increased street lighting, closed-circuit television, or CCTV, cameras). The size of the BID effect on robberies varies across the 30 BID areas and appears to indicate a greater than expected reduction in robberies in those located in neighbourhoods that have undergone significant patterns of economic development or invested heavily in crime prevention. For example, BID area-specific effects were apparent in Jefferson Park and Figueroa Corridor, which are situated close to the University of Southern California, in areas of notable gentrification and economic development. Hollywood Media and Larchmont also exhibited BID-area-specific effects on the incidence of robberies and are situated in neighbourhoods undergoing gentrification. BID effects are present in Century Corridor, Figueroa Corridor and Hollywood Media, all of which invest heavily in crime prevention through hiring private security officers and other activities. [10–12] Los Angeles BID spend a considerable share of their resources hiring private security or public ambassadors who focus on keeping streetscapes clean and safe, thereby increasing the level of social control in public spaces. Approximately 13 of the 30 BID in Los Angeles spend more than US$200 000 a year (2005 dollars) on such 'clean' and 'safe' efforts. These strategies are closely linked to research and theory on crime prevention through environmental design to reduce opportunities for crime and violence and, in particular, robbery. [21–23]

Given the limited budgets and staff of many BID, it is of no surprise that the mere presence of a BID is not uniformly associated with a reduced incidence of violence. Some BID spend as much as half their annual budgets on crime prevention and environmental redesign or beautification efforts. BID crime prevention activities may also garner additional resources from

What is already known on this subject

► The incidence of violence is associated with neighbourhood environments.
► BID focus on public safety.
► Community economic development models may help reduce crime.

What this study adds

► The first systematic look at the effects of BID on violent crimes.
► Rigorous methodology for assessing the effects of BID on violent crimes.

the police, as the police now have an active 'partner' in a community. Other established Los Angeles BID have relatively small budgets and focus their efforts primarily on place promotion in an effort to foster improved commercial activity for their constituent businesses. [12] While the protocol for establishing a BID in Los Angeles is uniform and codified into law, [12] the dosage of tactics to improve neighbourhood environments varies between BID areas. Relying on a conservative estimate of pre—post changes in reported violent crimes for only those areas that adopted BID we found significant overall effects on robbery, with some BID areas exhibiting greater effects than others. We cannot say whether spending on private security or economic development efforts caused these reductions or are merely correlated with them. This study relied on observational data, which limits our ability to infer as to whether the correlations observed are causally related. We attempted to remove the potential selection effects of establishing a BID by estimating pre—post effects on reported violent crimes for only those areas that eventually adopted a BID. In the absence of an experimental design in which BID are randomly assigned to neighbourhoods we do not know whether BID activities actually caused the declines in robbery rates.

The efforts spent by BID in Los Angeles on economic development activities and social control efforts that focus on crime prevention, beautification and advocating for more public safety and sanitation services to many blighted sections of Los Angeles [12] are associated with a reduction in the incidence of robberies. This information can assist in designing and testing the feasibility of BID as a community-level violence prevention intervention.

REFERENCES

1. **Sampson RJ,** Stephen WR, Felton E. Neighborhoods and violent crime: a multilevel study of collective efficacy. *Science* 1997;**277**:918—24.
2. **Sampson RJ,** Jeffrey DM, Thomas GR. Assessing 'neighborhood effects': social processes and new directions in research. *Annu Rev Sociol* 2002;**28**:443—78.
3. **Taylor RB.** *Breaking away from broken windows: Baltimore neighborhoods and the nationwide fight against crime, grime, fear, and decline*. Boulder, Colo: Westview Press, 2001.
4. **Hoyt L.** Collecting private funds for safer public spaces: an empirical examination of the business improvement district concept. *Environ Plann B Plann Des* 2004;**31**:367—80.
5. **Brooks L.** Volunteering to be taxed: business improvement districts and the extra-governmental provision of public safety. *J Public Econ* 2008;**92**:388—406.
6. **Mitchell J.** Business improvement districts and the 'new' revitalization of downtown. *Economic Development Quarterly* 2001;**15**:115—23.
7. **Briffault R.** A government for our time? business improvement districts and urban governance. *Columbia Law Rev* 1999;**99**:365—477.
8. **Houstoun LO.** *BIDs: business improvement districts*. Washington, DC: Urban Land Institute In cooperation with the International Downtown Association, 1997.
9. **Stokes R.** Place management in commercial areas: customer service representatives in Philadelphia's central business district. *Security J* 2002;**15**:7—19.
10. **City of Los Angeles Office of the City Clerk.** Business improvement districts. 2008. http://cityclerk.lacity.org/bids/ (accessed 17 Dec 2008).
11. Citywide business improvement district program: detail of service operations, 2000. http://www.lacity.org/clk/BIDS/biddos.pdf (accessed 2 Jan 2009).
12. **MacDonald J,** Bluthenthal R, Kofner A, et al. Neighborhood effects on crime and youth violence: the role of business improvement districts in Los Angeles. Santa Monica, CA: RAND Corporation, 2009.
13. **Hindelang MJ.** Variations in sex—race—age-specific incidence rates of offending. *Am Sociol Rev* 1981;**46**:461—74.
14. **Hindelang MJ,** Hirschi T, Weis GW. *Measuring delinquency*. Beverly Hills, CA: Sage Publications, 1981.
15. **Cook PJ,** Laub JL. After the epidemic: recent trends in youth violence in the United States In: Tonry MH, ed. *Crime and justice: a review of research*, **29**. Chicago, IL: University of Chicago Press, 2002:1—37.
16. **US Department of Justice.** Bureau of justices statistics, criminal victimization in the United States, statistical tables (see table 75), 2006. http://www.ojp.gov/bjs/pub/pdf/cvus06.pdf (accessed 15 Aug 2009).
17. **US Department of Justice.** *Bureau of justice statistics. Injuries from violent crime, 1992—98*. Washington, DC: Bureau of Justice Statistics, 2001. http://www.ojp.gov/bjs/abstract/ivc98.htm (accessed 15 Aug 2009).
18. **Miller TR,** Cohen MA, Rossman SB. Victim costs of violent crime and resulting injuries. *Health Affairs* Winter 1993;**12**:186—97.
19. **Hastie T,** Tibshirani R, Friedman JH. *Elements of statistical learning: data mining, inference, and prediction*. New York: Springer, 2001.
20. **Gelman A,** Carlin JB, Stern HS, et al. *Bayesian data analysis*. London: Chapman and Hall, 1996.
21. **Wilson JQ,** Kelling GL. Broken windows: the police and neighborhood safety. *Atl Mon* 1982;March:29—38.
22. **Sampson RJ,** Lauritsen JL. Violent victimization and offending: individual-, situational-, and community-level risk factors In: Reiss AJ, Roth JA, eds. *Understanding and preventing violence. Vol. 3: Social influences*. Washington, DC: National Academies Press, 1994:1—114.
23. **Felson M,** Clarke RVG, eds. *Business and crime prevention*. Monsey, NY: Criminal Justice Press, 1997.