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✓The Evaluation of Crime Prevention  
Through Environmental Design Programs\*

Leonard Bickman, Michael D. Maltz, & Paul J. Lavrakas\*\*  
Evaluation Institute  
Westinghouse National Issues Center

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Westinghouse Electric Corporation  
State National Bank Plaza  
Evanston, Illinois 60621

## Abstract

This article describes and analyzes the salient issues in planning and conducting evaluations of Crime Prevention Through Environmental Design (CPTED) programs. Problems concerning program implementation, the evaluation of physical changes, new research techniques, the geographic specific nature of the program, the role of theory, attribution of causality and data analytic considerations are discussed and solutions based on the authors' experiences are presented.

The Evaluation of Crime Prevention  
Through Environmental Design Programs

Background

In 1974, the Westinghouse National Issues Center consortium was awarded a contract by the Law Enforcement Assistance Administration (LEAA) to conduct a national research and demonstration of the Crime Prevention Through Environmental Design (CPTED) concept. Recognizing that traditional crime control mechanisms (e.g., police, courts, corrections) are limited in their ability to prevent crime, LEAA's National Institute of Law Enforcement and Criminal Justice sponsored CPTED research to determine the extent to which alteration in the physical and social environment of a community can impact on crime and fear of crime (Jeffery, 1977; Newman, 1972; and Tien, Reppetto, & Hanes, 1976). This particular CPTED research includes demonstrations in the Broward County, Florida school system (Crowe, Pesce, Riemer, & Hanes, 1976), in the Union Avenue commercial strip of Portland, Oregon (Bell, Day, Tien, & Hanes, 1976), and in a Minneapolis residential community (Rouse, Wiles, Pesce, & Castle, 1976). At this time, it is the largest CPTED program in the country and presents important implications for future CPTED projects.

The primary objectives of the CPTED program are:

- . To consolidate and extend knowledge about environmental conditions that can be modified to reduce crime and fear of crime;

- . To test crime prevention strategies in representative problem locations;
- . To synthesize information about crime prevention into guidelines for future CPTED practitioners; and
- . To disseminate CPTED results on a national basis.

In most program evaluations, there is no stock evaluation design which can be "taken off the shelf" and implemented without revision. Even when the same program is being implemented in another area, it may be that the organizational or legal environment dictates a change in the characteristics of the evaluation (Maltz, 1972). This is even more the case with respect to CPTED. CPTED evaluations have a number of characteristics which are shared with other evaluations, and some which are unique. Some of the more important problems and solutions discussed in the present paper focus on:

- . Control of implementation
- . Evaluating physical changes in the environment
- . Need for new, exploratory research techniques
- . Geographically specific nature of the program
- . Role of theory
- . Problem of attribution of causation
- . Data analytic considerations

Many methods within the CPTED evaluation plans are common to other evaluations, especially in terms of the types of data to be collected or in terms of impact measures used. But many differences remain. This paper describes some characteristics of a CPTED evaluation and discusses how these evaluations differ from other evaluations of crime reduction programs.

#### Conceptual Aspects of a CPTED Evaluation

The theoretical concepts underlying CPTED appear very attractive. Re-organization of the environment can bring about an increase in access control,

surveillance, activity support, and motivation reinforcement (Tien et al., 1976). These factors should lead to a reduction in crime and fear of crime. Thus, it is assumed that the activities engaged in by the CPTED program staff will be planned to conform with the above four CPTED design concepts. It should be noted that these concepts are interrelated. For example, surveillance may be seen as a form of access control. What follows is a discussion of these design concepts and the goals they are assumed to attain. It is important to have some familiarity with these concepts in order to more clearly understand the theory-based nature of the CPTED evaluation.

Access control. The primary objective of access control is to reduce the opportunity for crime by keeping potential offenders out of areas where they may commit crimes.. The physical strategy associated with this design concept is basically one of improving the physical security of the environment so that not only is unlawful entry made difficult for the potential offender, but the criminal does not perceive the opportunity to commit a crime. The physical barriers may be real or symbolic. The general social strategy is to develop a citizen/community cohesiveness that will create social and psychological barriers to potential offenders. The term, "social barrier" refers to the tendency of a citizenry to be aware of, and possibly approach, suspicious "strangers" to determine their reasons for entering the environment. A psychological barrier is assumed to result when potential offenders become aware that their behavior will be monitored by the citizenry.

Access control strategies can take on many forms, even in similar settings. A strategy utilizing street closings must consider vehicular and pedestrian traffic patterns, traffic density, street width, and community attitudes.

Surveillance. The primary objective of surveillance is to increase the offender's risk by creating an environment in which potential offenders' behaviors are very likely to be observed by non-offenders (i.e., potential witnesses). The physical strategy for surveillance is to design and/or modify the built environment so as to increase surveillability, i.e., make it easy to see what is going on. The social strategy is to encourage citizens to be aware of suspicious/criminal activity and to educate citizens about surveillance and crime reporting. Once citizens have been educated and motivated to improve their crime reporting behavior, it is assumed that crime reporting calls will increase in frequency and improve in quality. The successful implementation of surveillance is assumed to have a direct deterrent effect on the potential offender by reducing the likelihood of the commission of a crime without being seen. Improved surveillance should also lead to more efficient police response, e.g., more interrupted crimes in progress, which will eventually act as a deterrent as potential offenders realize that the citizenry is looking and reporting, and that the police are responding to these reports.

Activity support. The primary objective of developing activity support is to increase the effective use of the environment. The physical strategy for activity support involves designing and/or modifying the environment in ways that encourage its constructive use, e.g., beautification projects, improved transportation systems, improved parks, play areas and other positive gathering nodes, etc. The social strategy is to organize, develop, and/or support positive social networks in a community. The successful implementation of activity support should lead to an increase in the frequency of usage, and an improvement in the quality of usage, of the built environment. As the potential offender will find that the environment contains citizens actively engaged in noncriminal

activity and behaving in ways that indicate a positive concern for what goes on (e.g., various forms of bystander intervention), the offender would be deterred from committing a crime.

Motivation reinforcement. The primary objectives of motivation reinforcement are to develop a sense of belongingness in the environment (specifically for the potential offender population), and to promote and reinforce the development of a community identity in the citizenry. The physical strategy associated with motivation reinforcement aims to design and/or modify the physical environment in a manner that makes it more personalized and more decentralized. One aspect of the social strategy is aimed at getting the potential offender population involved in constructive behaviors in the built environment, e.g., hiring unemployed youth to aid in local revitalization activities. A second aspect of the social focus is to reinforce the nonoffender population's positive identification with the environment. The successful implementation of motivation reinforcement will bring about an increase in territoriality and social cohesion, and thus, motivation reinforcement overlaps and supports the design concepts of access control and activity support. It is assumed that as more persons are reinforced for positive usage of the environment, the proportion of potential offenders in the environment will diminish. Ultimately, motivation reinforcement is aimed at reducing the number of individuals who, because they are alienated from the environment, are likely to commit crimes.

In planning a CPTED evaluation, it is necessary to recognize that these design concepts and the proximate goals they are hypothesized to lead to, must be accomplished if the CPTED theory is to have a valid implementation (i.e., a program success). For without the attainment of these proximate goals, there is no reason to believe that the CPTED program activities will bring about a

reduction in crime and fear of crime. If crime and fear of crime are reduced without impacting on the proximate goals, then two rather mundane explanations are possible: the measures of proximate goals were not sensitive to actual changes or the construct validity of the program was weakened by a Hawthorne effect.

The ultimate goals of the CPTED process are to reduce crime and to reduce fear of crime, and thereby improve the quality of life. Depending on the specific environment the CPTED project is directed toward, there may also be other ultimate goals, e.g., in a commercial environment, such as the Union Avenue Corridor in Portland, an improvement in the economic vitality of the area may be an ultimate goal. Thus, CPTED can be expected to impact on non-crime related activities. CPTED's impact on non-crime related activities may vary in its directness. A direct impact of reducing fear of crime can be, for example, an increase in pedestrian usage of the streets at night. A more indirect impact may be felt once people's safety is assured; support of the community, for instance, may be reflected in a decreased out migration and an increase in home improvements.

The linkages between CPTED activities and non-crime related impacts should be drawn and a comprehensive evaluation should take these potential impacts into account. Once the ultimate goals have been identified, understanding the process by which these goals may be attained becomes a major consideration. While it may be reasoned that fear of crime will decrease as the actual rate of crime decreases, it can also be suggested that fear of crime may change independently of the actual crime rate. This could come about because fear of crime is an attitude held by the citizenry; and such an attitude could be changed (improved



or worsened) by factors other than the actual crime rate.

#### Measurement Issues

Based on the logical links of the hypothesized CPTED process, which relate program input to program goals, different instruments need be developed to measure the extent to which these logical links actually represent what takes place. Although the evaluation plan relies to a great extent on questionnaires and interviews, insofar as possible, the plan attempts to validate the responses of individuals with observation instruments, so as to determine the extent to which what people say they do represents what they actually do.

Whenever possible and worthwhile, in both planning and carrying out the evaluations, multiple operationalization of concepts have been utilized. That is, the plan does not depend upon one measurement instrument; rather, more than one measure is used to increase the construct validity of conclusions. For example, in the Broward County school project, surveillance was measured by:

- . Asking students, through a systematic survey, how often they were in a certain area and how aware they thought they were of what was going on in that area;
- . By having a trained observer systematically sample behavior in given geographic areas. The observer noted how many students were present, where they were, and whether they appeared to be observing the target area under question.

While each of these measures, alone, is an imperfect indicator of surveillance, convergent responses from both of these measures provides confidence concerning the validity of conclusions about surveillance.

School authorities are also cooperating in staging a number of suspicious incidents at demonstration and comparison schools to determine:

- . How many students actually notice the events;
- . Whether students report the events.

For ethical reasons, the incidents, i.e., a stranger looking through cars in the student parking lot, had to be relatively harmless. However, this technique allows for measures of actual surveillance and actual reporting of behavior. This technique has been used in basic research (Bickman, 1975, 1976; Bickman & Rosenbaum, 1977), but not in an evaluation research. This use of an active intervention technique in an evaluative setting poses problems usually not encountered in a basic research setting. There are dangers that the incident can precipitate a more serious event. School administrators, for example, were concerned that the incident might possibly provoke groups of students into rioting. Or, the credibility of the program might suffer if students discovered that the incident was staged. In working with the school administrators, these and similar considerations had to be taken into account.

When an evaluator takes an active role in eliciting behavior in a contrived situation, an additional danger exists. The evaluator may be seen by others as being responsible for the behavior of others in response to the situation. This contrasts with more typical passive measurement techniques, such as observations, surveys and archival analysis (Bickman, 1976). In the present situation, the first time an incident was staged, students did, in fact, notice and approach the "stranger." One particular group of students asked him what he was doing, and when he replied that he was "casing the parking lot," the students responded in a very helpful manner: They told him which cars had the most expensive CB's and stereo equipment and pointed out the location of the security guard. School administrators expressed not only surprise, but the opinion that this

technique was not informative and should be stopped, as well. However, the administrators allowed the collection of data for at least a week. Clearly, the remote possibility for newspaper headlines such as "Multi-million Dollar Crime Prevention Program Causes Students to Commit Crimes" was one which everyone wanted to avoid. However, subsequent incidents staged at other schools indicated that this type of student intervention was unique.

In evaluating the CPTED Commercial Demonstration in Portland, Oregon, it is of interest to determine the degree to which residents are fearful of crime and how this relates to the level of their consumer activity on the Union Avenue commercial strip. To measure this, the following procedures were employed:

- . Interviews of residents, determining their attitudes toward fear and their shopping habits;
- . Interviews with businessmen, determining their perceptions of residents' fear and residents' shopping habits;
- . Retrieval of archival economic data, determining any change in shopping habits over time; and
- . Observations of general pedestrian activity level on Union Avenue from 6pm to 12am, determining any change in utilization of the Corridor.

Once again, while each of these measures singly would be an imperfect indicator of fear and usage of the commercial environment, convergent responses will provide the more valid perspective.

#### Lack of Control Over CPTED Implementation

Most evaluations are concerned with determining the effectiveness of programs run by an individual social control, social welfare, or educational agency. For the most part, the implementation and planning were done by the agency, itself,

or by consultants to the agency, and the programs that were evaluated were wholly within the agency or included a "captive audience," i.e., the agency's personnel and clients. In other words, the control of the implementation and the evaluation strategy rested with the agency and its personnel.

Of course, plans for implementation are not always carried out faithfully by the subordinates, even when the agency administrator so prescribes. It is often the case that the plans propagated from "on high" never reach the personnel whose task it is to implement the program. The literature of evaluation research (e.g., Caro, 1971; Guttentag & Struening, 1975; or Weiss, 1972) is replete with instances in which there was an implementation failure in the program, because the program never really existed. One rather well-known example of this is the Kansas City Preventive Patrol Experiment (Kelling, Tate, Dieckman, & Brown, 1975), which "started" in July of 1972, was found not to have been implemented in August, and was restarted in the fall of 1972, with much more stringent controls on the activities of the implementation personnel.

In the CPTED programs that have been planned in Portland and Minneapolis, implementation problems have been and/or will be more severe than the problems encountered by a single agency. Unlike the Kansas City difficulties, these problems will not be due to the apparent conscious decision of agency personnel to weaken the program, but rather to the organizational framework. Specifically, in Portland, one group has planned the programs, and other agencies have funded implementation of these basic plans; a third group developed evaluation plans based on the implementation plans of the first organization, but without knowing the specifics of what the funding agencies would fund for implementation, or how much money would be available for evaluation. Finally, a fourth group was

chosen to actually conduct the evaluation. In addition, due to the scale and complexities of the target sites, the programs have often been very broad and ambitious. The programs involved both multi-variable and long-term approaches. Added to these complications is the fact that some of the CPTED strategies must be implemented voluntarily by the residents of the target area, while non-target area residents in the same general vicinity may decide to implement the strategies on their own, without the aid or knowledge of the CPTED staff. Thus, the degree of control (experimental and otherwise) that can be exerted in implementing CPTED is quite limited.

There are a number of implications of the foregoing, in terms of program design and monitoring, which the program planners are well aware of and have attempted to account for in their program management plan. With respect to evaluation, it should be pointed out that the data will be generated by many different agencies. Not all of these agencies collect data in the form which would be required for evaluation, but the evaluation would be incomplete without including these data. Thus, it can be anticipated that the cost of data collection will be somewhat greater for CPTED than would normally be the case for a crime prevention program centered almost exclusively in one single agency, and whose responsibility extends from implementation to data collection.

Another major problem due to multiple agency involvement lies in determining what was actually implemented (Datta, 1977). There is a tendency to see a promising new program, such as CPTED, as a homogeneous, well-coordinated activity. This, however, is not the case for any complex program. Undoubtedly, any CPTED program will not remain constant over time and will not be implemented as planned. Thus, it should be the responsibility of the evaluators to document

the actual implementation status of the program, and the processes involved in implementation. In this way, a good CPTED evaluation can be timed to serve formative purposes, as well as summative ones, to aid CPTED planners in monitoring CPTED's implementation status.

Given the complexity of an implementation of CPTED, a major question the evaluation should address is, "How does one get such a complex project implemented?" Since the CPTED program is a demonstration program, it is important to be able to document how the community (recognizing that few communities are homogeneous) reacts to the project. Thus, the community's evaluation of the program, itself, becomes a focus of the evaluation. For example, if the CPTED project includes the alteration of traffic patterns in a community, how does one approach the community to obtain its cooperation? One technique might be to go through city agencies, obtaining the necessary clearances. Another approach might be through a series of community meetings which discuss the need for these changes. It is important for evaluators to not only document the types of strategies employed, but to be cognizant of the citizens' reactions to these strategies. Are there lawsuits to stop the project? Does the community complain to the police about either enforcement or nonenforcement of street changes? Do community residents attempt to demolish various street changes? All of these should be documented. Additionally, it is important to know if the community is aware of the relationship between changes in the environment and the demonstration project. Unlike other projects which may best be dealt with in a covert manner, it may be critical that citizens in a CPTED target area be aware of, and be educated about, CPTED. The evaluators should be able to document changes among the community in awareness, attitude and knowledge.

### Implementation of Physical Changes

Most experienced program evaluators are accustomed to the problems associated with social program implementation. CPTED, however, includes physical changes or construction as a key strategy. Ample time must be devoted to implement and evaluate these changes. At all CPTED sites (including non-Westinghouse sites, e.g., Hartford, Connecticut), construction has been delayed due to a variety of factors, including:

- . Businessmen resistance to street changes;
- . Delays in issuing bids;
- . Inflation - construction costs rose faster than predicted;
- . Lack of response to bids;
- . Delays of local authorities.

These delays have a strong impact on the evaluation. Given a definite termination date, the evaluation must be completed by that date, even though the physical changes may be in effect only a few months before the data are collected. This shortened time frame often does not adequately allow the physical changes to impact on behavior. In addition, the CPTED "treatment" becomes implemented over a period of years, further complicating the interpretation of results.

A second problem associated with construction or modification of the physical environment concerns its cost. If demonstration costs are to be "reasonable," the modifications of the environment must be modest. This modest implementation (it is especially modest when compared to original construction costs) provides for a relatively weak "treatment." For example, in one of the Broward high schools, the hallways are a source of crime and fear. A strategy was developed to provide more surveillance in the hallways by installing windows

in the classroom doors and windows in the walls of the classrooms looking onto the hallway. However, due to cost, modifications were made in only one hallway rather than in all the hallways in the school. Thus, it is unlikely that modification of only one corridor will alter the way in which students in this school perceive the safety of all school hallways.

In addition to the weak operationalization of the surveillance construct, this strategy suffered from subsequent physical modifications made by the teachers. In an apparent attempt to increase their privacy and decrease distractors in the hallways, teachers covered the windows with paper. When the administration was informed of this by the evaluators, they requested the teachers to remove the papers or the custodian would remove them. While all the papers covering the windows were removed, teachers hit upon an alternative strategy: They placed charts and movie screens in front of the window, partially blocking the view. Because in some cases the front of the screen faced the window and not the students, it was assumed that this was not a chance occurrence.

While this strategy might not have an impact on fear in the classroom, it is clear that useful evaluative information was obtained. The need for privacy appeared to be greater (for the teachers) than fear of victimization. In the present case, limiting the implementation to just one corridor before knowing how the teachers would respond was the appropriate action.

It should be noted that, by their nature, evaluations of physical changes are usually of a summative rather than formative nature. That is, physical changes are not easily modified once introduced.

#### Program Elements and Attribution of Causation

With the ideal case, in which many program elements are to be tested for their impact, concern for the experimental design (usually of a factorial form)



and the sequencing of program elements is necessitated by the desire to rigorously estimate the interaction effects of the various program elements and how they each affect the success of the program. Given the loose control that exists with the implementation of CPTED, it is unlikely that traditional experimental or quasi-experimental evaluation designs can easily be utilized. Comparison sites may be difficult to come by. In Portland, the demonstration site was specifically chosen for its unique problems. Thus, even the most simple quasi-experimental designs would be difficult to implement, given the lack of comparison areas. At best, given the availability of enough data, some form of time series design can be utilized to test some CPTED variables, e.g., change in crime rate or change in positive usage of the environment. While there will be a sufficient number of data points for a time-series analysis, the inability to clearly define a pre- and post- period will be a problem. How, then, does an evaluator determine if program inputs are causally linked to ultimate goals?

For CPTED, and other programs that are based, to some extent, on an explicit theory or model, a theory-based evaluation is recommended. Planning for a theory-based evaluation requires three explicit steps. First, the hypothesized process by which CPTED is assumed to meet its objectives must be clearly described. Second, the evaluator must identify what has to be measured; this requires the identification of the measurement points (i.e., variables) in the CPTED process. Finally, it must be decided what data will be collected that are representative of those measurement points; this requires the identification of valid data elements.

Utilization of a theory-based evaluation for CPTED expands the evaluator's job to assessing the "goodness of fit" of at least three factors:

- . The fit between the theoretical interpretation of CPTED by program personnel and the evaluator's interpretation;
- . The fit between each of these interpretations and the actual operationalization of CPTED;
- . The fit between the outcomes predicted by CPTED theory and observed outcomes.

In this way, the evaluation can "test" if each goal has been attained and then provide a judgment regarding the extent to which CPTED has been successful.

For example, a Block Watch program, designed to involve the community in reporting crimes, can be examined to determine its impact upon its participants. Do these Block Watch members have any greater sense of safety? Do they actually provide more surveillance? Are they more aware of the crime problems and the limitations of the police department? There are a number of other attributes of a successful Block Watch program which could be evaluated. However, relating a successful Block Watch program to the ultimate goal of a community-wide reduction in crime is very difficult. On the other hand, it would logically indicate that CPTED reduced crime if, in fact, there was evidence of a reduction in crime, evidence of a successful Block Watch program, evidence of a successful security target-hardening program, and so on, without necessarily being able to relate successes in each individual CPTED sub-program directly to the reduction in crime. It is expected, nonetheless, that it would be possible to determine which of these successful program elements within CPTED contributed most to the reduction in crime. However, without evidence of the success of these sub-programs, it would be extremely difficult to explicate the underlying dynamics of CPTED. Thus, the evaluation of important program elements or components,

in and of themselves, contributes greatly to the confidence with which program input can be related to impact on the ultimate goals of reduction in crime and fear of crime.

Another major difficulty in making causal attributions is the open system nature of CPTED programs. These programs operate over a period of years, in an environment that is subject to many extraneous variables. In Portland, the characteristics of the residents has changed, the economic condition of the city has changed, and important projects other than CPTED have been introduced by the government. Even a relatively closed system, such as the Broward Schools, changes. There is staff and student turnover and there are sometimes major events (such as teacher strikes) which can affect the behavior of students and teachers. An evaluator in situations such as these should attempt to document these extraneous events and then relate them to the theoretical model.

#### Data Analytic Considerations

As noted earlier, changing an environment to reduce crime is expensive. The unit of analysis in these projects is not the individual or the crime, but a geographic area. Such considerations could lead to a multi-million dollar evaluation research strategy, just to determine whether anything works, and in which order they work best. However attractive such a research strategy may be to evaluation researchers, it is untenable to a research funding agency. It is more appropriate for the design of such a research project that operations research and decision theory techniques be used to determine the best implementation strategy; that is, the implementation strategy that maximizes the expected benefits of the research. Such a strategy is not normally included within the kit bag of social science tools, so its use will be illustrated with an example

from the Minneapolis CPTED evaluation design.

Data from police records indicated that 206 burglaries took place in 1974 in the 101 blocks comprising the section of Minneapolis under study. The number of burglaries per block ranged from zero to nine, with a mean of 1.73. The actual distribution of the frequency of burglaries per block showed a close resemblance to an exponential distribution. It is worth pointing out that exponential distributions of this sort arise from memory-less random processes from which the selection of a block from which to pick a target for burglary is independent of the number or location of past burglaries. In other words, in the absence of any other information (such as similar statistics from past years), it may be assumed that there are no specific "target" blocks and that, when an offender chooses a block to look for a house to burglarize, he may, in this case, be making a random selection from among the blocks.

In terms of evaluation, this implies that one should not use high crime blocks to implement various target-hardening procedures. One would normally expect reductions from the high crime rates in 1974 (again assuming that the target selection is random) for statistical reasons alone, i.e., regression to the mean.

There is a further, more significant implication that one can draw from the frequency distribution of burglaries per block. If a nine block region were used to implement a specific CPTED strategy, the standard deviation of the mean number of burglaries would be 1.82 divided by the square root of 9, i.e., 0.61. For a 95% confidence level (one-tailed) that the strategy worked, there would have to be a reduction from an average of 1.73 burglaries per block to 0.73 burglaries per block, or a 42% reduction in burglary for the nine block area.

This is a reduction from about 15.5 burglaries to about 9 burglaries, which is a very significant reduction, indeed. It is not anticipated that this CPTED strategy (or, for that matter, very many other strategies) can effect a reduction of this magnitude in the burglary rate. What may be suggested here is that the "null hypothesis thinking" so common to social scientists is misplaced when they are confronted with the prospect of spending a great deal of money in an area of nine city blocks to affect, at most, 15 burglaries. What is also suggested here is that one can determine the expected value of the benefit of the research strategy by looking at the Type I and Type II errors associated with the evaluation design, the cost of these errors, and the benefits associated with making the correct decisions. A procedure developed by Nagel and Neef (1977) is useful in situations like these.

A final point regards what has been alluded to here previously: It is unlikely that CPTED will be implemented with the control required of true-experiments and many quasi-experiments. At best, time series designs can be utilized to analyze data elements with sufficient data points. For example, the number of crimes reported daily from the Union Avenue Corridor, over a three-year period, has been analyzed to investigate whether there was a reliable reduction in crime associated with CPTED. In addition, observation runs to measure general pedestrian activity level was made for approximately 100 evenings. These data have been analyzed to determine whether there has been a reliable increase in evening pedestrian usage of Union Avenue associated with CPTED.

#### Recommendations and Conclusions

Based on the authors' experiences, some concrete suggestions in conducting evaluations of CPTED and similar programs are offered:

- . Control of implementation will be very difficult for program administrators. Thus, the evaluation should include a detailed monitoring aspect. Monitoring data will prove helpful in interpreting impact results.
- . Physical changes are difficult to implement and may require a lengthy interval for important impacts to be felt. Allow adequate time for implementation so the physical changes are in place for a sufficient time before final measurements are made. Time estimates can be obtained by detailing the procedures that must be followed by the agency in order to implement physical changes.
- . Consider various measurement techniques, including direct observations and experimental interventions. Behavioral data has the potential of providing vivid examples of program impact which can be very persuasive to policy-makers.
- . Work closely with program planners so that matched sites can be chosen for the treatment and comparison groups. Entry too late into the program will usually result in the lack of relevant comparison sites.
- . To help deal with the problems associated with non-experimental research designs, consider utilizing recently developed quantitative techniques such as time-series analysis.
- . A theory-based evaluation should be planned on the hypothesized CPTED process to identify effort, proximate goal, and ultimate goal measurement points. Given the weak control over implementation possible in CPTED projects, this is especially important.
- . Wherever possible, multiple types of data should be collected to represent measurement points in the CPTED evaluation model, so as to increase the validity of conclusions.

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