

Burglary and cul-de-sacs: comparing burglaries on cul-de-sacs with non-cul-de-sac streets

James E. Guffey, Ph.D. National University

With his book, *Defensible Space* (1972), Oscar Newman introduced a new criminological sub-discipline that has been labeled, "Crime Prevention Through Environmental Design" or CPTED. This very basic concept spawned grants for federal housing redevelopment when the federal Housing and Urban Development Office of Policy Development and Research asked Newman to prepare a casebook to assist public and private organizations with the implementation of defensible space theory. This study examines data on burglaries from cul-de-sac streets versus adjacent non-cul-de-sac streets in five California cities to determine if cul-de-sacs offer better defensible space and thus targeted less frequently by burglars. The underlying theory is that, with only one point of entry and exit, cul-de-sacs offer superior defensible space than non-cul-de-sac streets. If the data show significance, then there is support for housing development that makes use of more cul-de-sac type residential streets.

defensible space, residential burglaries, cul-de-sac streets, permeability, routine activities, CPTED

INTRODUCTION

Crime prevention is the nation's most promising vehicle to ameliorate the ever burgeoning crime problem. However, most law enforcement agencies in the United States do not devote much time or resources to crime prevention. Why is this case? Why are law enforcement agencies organized to respond to crime after the fact? The obvious reason is that many crimes are very difficult to prevent. Crimes such as murder, robbery, assault, arson, rape, kidnapping, vandalism, illicit drug use, and prostitution, to name just a few, are virtually impossible to predict and intercept before they occur.

Problem-Oriented Policing has been implemented in many law enforcement agencies as a means of at least attempting to reduce some persistent quality of life crimes such as prostitution, drug dealing and use, and theft. Herman Goldstein (1979) first proposed the idea of devoting more police officer resources to being pro-active rather than reactive in reducing crime and improving quality of life for particularly inner-city residents.

While problem-oriented policing builds on the best of the past, it is obviously much more than just a new tactic or program to be added on to prevalent forms of policing. It entails more than identifying and analyzing community problems and developing more effective responses to them. . . . When implemented, it has the potential to reshape the way in which police services are delivered (Goldstein, 1979, p. 3).

Goldstein's concept for radically changing the organization and delivery of police services has had 35 years to emerge as dominate, but it has not been adopted as the primary method of delivering police services by any U.S. law enforcement agency. The reason for this is city politicians, citizens, and police executives want police resources to be instantly deployable to show visibility and immediacy to crime and especially violent crime. Problem-oriented/community policing is not designed to deliver quick, responsive police resources to emergencies and crimes-in-progress. Moreover, violent crime is nearly impossible to detect and prevent in a problem-oriented policing model.

On the other hand, Problem-oriented Policing does provide police departments with a method of improving their success with crime reduction. In the community policing/problem-oriented policing model, police officers are not tied to calls for service which effectively prevents officers from trying to prevent some of the reoccurring crimes on their beats.

Community policing is an organization-wide philosophy and management approach that promotes (1) community, government and police partnerships; (2) proactive problem solving to prevent crime; and (3) community engagement to address the causes of crime, fear of crime and other community issues (Miller, Hess, & Orthmann, 2011, p. 4).

Property crime lends itself more to a crime prevention model and comprises the major effort of police departments employing community policing/problem-oriented policing. Examples of property crimes are burglary, theft, auto theft, shoplifting, vandalism, and arson. In this paper, the author will be concentrating on residential burglary prevention, not because it is more important or results in more monetary loss than the others identified above, rather because it is a UCR Part 1 crime and has proven to be arguably the most preventable Part 1 crime.

Community policing/problem-oriented policing is not the only method by which governments can reduce crime. Another proven-successful method of reducing crime in neighborhoods is through architecture and design of neighborhoods. Eck and Weisburd (2005) have espoused the importance of places and the concentration of crime in certain locations within urban and suburban areas. In their article, *Crime Places in Crime Theory*, they suggest three perspectives as pointing to places and crime concentration: rational choice; routine activity theory; and crime pattern theory. Rational choice theory proposes that offenders rationally choose a crime target based on factors that

make the target less of a risk than other crime targets. A home without a burglar alarm presents less risk than one with an alarm. Routine activities theory proposes that crimes will occur in location where certain routine activities make crime more likely where these routine activities take place. Three factors comprise the routine activities theory: a motivated offender, a suitable target, and absence of guardians (residents gone from the home for long periods and no one else watching the property, for example). Crime pattern theory suggests that, as offenders conduct their normal legitimate activities, they become aware of criminal opportunities. Thus, criminal opportunities that are not near the areas offenders routinely move through are unlikely to come to their attention. A given offender will be aware of only a subset of the possible targets available. Criminal opportunities found at places that come to the attention of offenders have an increased risk of becoming targets (Brantingham & Brantingham, 1993). Therefore, crime can be reduced, according to various theories, by designing neighborhoods so that they are not easy targets for the potential offender.

LITERATURE REVIEW

Crime Prevention through Environmental Design

Criminologist C. Ray Jeffery (1971) is credited with the concept of *Crime Prevention through Environmental Design* (CPTED) as explained in his book. In his book, Jeffery espouses a multidisciplinary approach to deterring criminal behavior by redesigning communities architecturally to make them less appealing targets for criminals. Jeffery's book and concept did not receive attention until Oscar Newman (1972) published his work, *Defensible Space*.

Defensible Space

Oscar Newman was an architect and city planner by occupation. His primary focus was on inner-city housing, particularly federal Housing and Urban Development (HUD) housing projects that were being built in the late 1960s and early 1970s in the nation's growing inner-city areas. In his book, *Defensible Space*, he posits that residents in high-rise apartment buildings, particularly HUD housing developments, felt no control or personal responsibility for an area occupied by so many people. His ideas for redesign of communities were well-received after the publication of his book, and he received several HUD grants to implement his concepts in new housing developments.

Newman (1996) first identified the concept of Defensible Space in the late 1960s as a professor at Washington University in St. Louis. He witnessed the complete destruction of the 2,740 unit high rise HUD Pruitt-Igoe Housing Project. As the project slowly deteriorated toward eventual implosion by the federal government, Newman observed that units where only two families shared a landing, the apartments were clean and well-maintained. However, corridors shared by 20 families, and lobbies, elevators, and stairs shared by 150 families were a disaster. He concluded that where families feel a sense of territoriality and belonging they went to lengths to keep their property clean and tidy. Newman also experimented with closing streets in HUD housing to reduce through traffic and discourage outsiders who came into these developments to commit various crimes.

Routine Activities Theory

Both C. Ray Jeffery and Oscar Newman's concepts rely on the routine activities theory as being valid. Routine activities theory was advanced by Larry Cohen and Marcus Felson (1979). The theory states that the volume of criminal offenses is related to the nature of everyday patterns of social interaction. Their theory has three major areas of focus for a victimization to occur. First, there must be a motivated offender. Second, they emphasized there must be a target—something of value to steal. Third, there must be an absence of a capable guardian: no one present (either property owner or watchful eye of a resident) who could prevent the occurrence of the crime.

To put this in perspective with C. Ray Jeffery and Oscar Newman's concepts, the design, construction, and observability of a community must employ routine activities theory as its foundation.

Newman's ideas have been implemented in the newer federal housing developments that have been built since the 1990s.

Studies of Cul-de-Sac Streets and Crime Reduction

The Hartford Program. One of the first studies funded to examine the efficacy of CPTED and Defensible Space was the Hartford, Connecticut Program in 1973. It was funded by the National Institute of Law Enforcement and Criminal Justice (NILECJ), now the National Institute of Justice (NIJ). Space in this paper does not allow for a detailed summary of this program. Briefly, the program sought to reduce the incidence of robbery and burglary, employing an interdisciplinary team of experts in urban design and land use planning, as well as criminological, police, and research experts. A follow-up study was conducted from 1977-1979 to determine the longitudinal success of the original program.

Fowler and Mangione (1981) identified many findings in their executive summary of the Hartford Program; the author chooses to focus on their burglary rate findings because they support the findings of this study of cul-de-sacs and burglary rates. A physical design of the streets in the North Asylum Hill area of Hartford where the program was focused included the closure of 11 streets to through traffic. This, in effect, made these streets cul-de-sacs. Additional crime prevention measures included more police involvement with the Asylum Hill area, and emphasis on neighbor observation of suspicious activity. As a result, in 1977 the burglary rate was much better than expected.

One of the fundamental questions to be answered in this project is whether the rate of burglary victimization was different in North Asylum Hill than it would have been if the program had not been implemented. In 1977, the North Asylum Hill burglary rate was much better than expected. The expected burglary rate in North Asylum Hill in 1977, adjusting for the experience in the rest of Hartford, was over 22 burglaries per 100 household. The observed burglary rate in North Asylum Hill in 1977 was less than 11 per 100 households, a statistically significant reduction (Fowler & Mangione, 1981, p. 16).

"Designing Out" Gang Homicides and Street Assaults. Lasley (1996) conducted a study of Cul-de-Sacs in Los Angeles from 1990-1991 in which selected streets in Los Angeles were sealed off with barriers to form cul-de-sacs. Lasley's study was designed to reduce gang member drive-by shootings in particular, but other gang crimes were also targeted. The premise was that sealing off escape routes would make gang members less likely to commit drive-by and other crimes because they would be trapped inside if responding police officers arrived to cut off their one escape route. Lasley found that crime fell during the first year of the Operation Cul-de-Sac (OCDS) program; rose (though not back to preprogram levels) in the 2nd year when some aspects of the program were withdrawn, and returned to preprogram levels after all aspects of the program were withdrawn.

Permeability and Burglary Risk: Are Cul-de-Sacs Safer? Johnson and Bowers (2009) conducted the most extensive study to date on the relationship of burglary and cul-de-sacs. Their study stirred the author's interest in conducting this study. Below is their appeal for further research:

... the findings observed here may not apply elsewhere. The fact that they chime with those of other studies is encouraging, but the external validity of the findings can only be established through systematic replication. Given that they are not commensurate with all studies (see Hillier 2004) highlights the need for replication and suggests that context may play an important role (p. 21).

Their study focused on one police district--Merseyside, United Kingdom (UK) which covered an area of 56.8 kilometers. The area comprised a total of 118,161 homes and 10,760 street segments. The authors used Geographical Information System (GIS) technology to identify the cul-de-sacs. Through roads were defined as segments that shared both nodes (the start and end of the segment) with at least one other and represented part of a through route that connected other segments to a major or minor road in both directions. In contrast, street segments were classified as being part of a cul-de-sac

(system) if the route(s) of which they were most clearly a part led to a terminal node in the street network. The authors identified two types of cul-de-sacs: (1) Linear cul-de-sacs—cul-de-sacs that were linear in geometry and were one turn off a through road (major, minor, or local roads, and (2) sinuous or isolated cul-de-sacs—roads that were non-linear in geometry so that there would be little visibility down the road from the road to which they were connected (p. 11). The authors also added a series of sociodemographic models—the fraction of unemployed residents, vacant homes, and the type of housing in the area expressed as a fraction. The proportion of the population aged 10-15 was included in recognition of research concerned with the peak age of offending. Finally, an index of ethnic heterogeneity was factored as an indicator of social cohesion (Johnson & Bowers).

The findings of Johnson and Bowers' study were significant and foundational because their methodology was sound and supported by statistical accuracy. They used a statistical method called Poisson Regression Analysis, which is a statistic used when variables are expressed in rates. "Results clearly show cul-de-sacs to have lower rates of burglary, and this is particularly the case for those that are sinuous in geometry. These effects are above and beyond those associated with sociodemographic factors and other influences. The basic finding that connectivity carries an elevated risk is in line with much (...) of the existing research (p. 20)."

The overarching theory in Johnson and Bowers' study, and their primary hypothesis, is the effect that permeability in general and cul-de-sacs in particular have on residential burglary rates. The authors describe permeability as a combination of informal social control (neighborhoods with high internal homogeneity with respect to resident characteristics, established neighborhoods) plus physical configuration of the street network. The author's (Guffey's) study did not factor in informal social control; it was simply another look at cul-de-sacs and their relationship to burglary reduction.

Durham, N.C. Study of Cul-de-Sacs. Whittaker (2012) analyzed crime overall in the City of Durham, N.C. concentrating on cul-de-sacs versus through streets. Whittaker found that "in total, there were 89 crimes committed within the selected communities, with 74 occurring on properties located on two-way streets and 15 within communities located on cul-de-sacs. This yields a 1-to-4.93 cul-de-sac to two-way street crime ratio. Stated differently, for every crime committed in a community based around a cul-de-sac, there are nearly 5 committed in a related community along a two-way street" (Whittaker, 2014, p. 2). Whittaker concluded that in general cul-de-sac streets are less crime prone than through, 2-way streets in Durham, N.C.

Vulnerable Cul-de-Sacs

Not all cul-de-sacs are more burglary-safe than through or non cul-de-sac streets. Hillier and Shu (2003) found evidence that contradicts the widely held belief that all cul-de-sacs are superior to other street designs insofar as burglary reduction is concerned. Shu chose three towns about fifty miles from London, England with very different overall social characteristics—one very affluent, another much less so, and a third new town. He then selected an area within each town with a range of population types and many special types: cul-de-sacs, through streets, footpaths, driveways, back alleys, etc. In short, Hillier and Shu found that burglaries were more prominent on cul-de-sacs "deeper" into the cul-de-sac. They also found cul-de-sacs which were accessible through back alleys, footpaths, or long driveways which concealed the house from the street were victimized by burglary in numbers significantly greater than through streets.

Definition of a Cul-de-Sac

For the purposes of this paper, a cul-de-sac is a street that has only one point of entry and exit. Cul-de-sac streets are most commonly named *courts*, *circles*, and *coves*.

METHODOLOGY

The methodology for this study was secondary data analysis. Data for burglaries on cul-de-sacs was compared with burglaries from the same geographical neighborhoods for non-cul-de-sac streets. Five California cities were selected for comparison: Los Angeles, San Diego, Sacramento, Stockton, and

Chula Vista. For the Cities of Sacramento and San Diego, the data were obtained from crime analysts in these police departments. Data from Los Angeles, Stockton, and Chula Vista Police Departments were obtained from the website <http://crimemapping.com> which is a website that shows crime occurrences from almost every police department in the U.S. It is a consolidation of the crime analysis data from all of the police departments that share data with this website.

The data obtained for Los Angeles, Stockton, and Chula Vista reflect 1 month of burglaries from November 15 through December 16, 2013. The data for Sacramento reflects burglaries in Sector 4 of the Sacramento Police Department's patrol districts and covers the four year period, 2008-2012. The data for the San Diego Police Department represents all of the burglaries for a 1-year period, November 15, 2012 through November 15, 2013.

Table 1 (Appendix) shows the actual number of burglaries and totals that occurred on cul-de-sac versus nearby non-cul-de-sac streets for the 5 selected cities. Table 2 (Appendix) shows the information in Table 1 as percentages.

Table 3 (Appendix) shows the author's interpretation of the data from Tables 1 and 2. The data from Sacramento and San Diego included the total number of cul-de-sac as compared to the non cul-de-sac streets. This allowed the author to determine a percentage of cul-de-sac streets as compared to non-cul-de-sac streets for a given area of these two cities. For Sacramento, this was Area 4, a large police district within the city. For San Diego, this was the entire city. For Sacramento, the number of cul-de-sac streets was 4% of the entire Area 4. For San Diego, cul-de-sac streets represented 18% of the entire city. The author used the mean of these two figures—11%. Intuitively, 11% seems to be an acceptable percentage for most cities in the U.S. Therefore, 11% was used as the comparison in Table 3. The author was unable to find data for all U.S. cities or any one city expressed as a percentage of cul-de-sac streets.

Table 3 (Appendix) shows that 4 of the 5 cities—Los Angeles, San Diego, Stockton, and Chula Vista—experienced burglaries on non-cul-de-sac streets in great percentage than cul-de-sac streets. In Los Angeles and San Diego, the percentage difference was significantly greater. In Stockton, the percentage difference was also significant but not quite as significant as Los Angeles and San Diego. In Chula Vista, the difference was slight. Sacramento was the only city in which the data reveal a larger percentage of burglaries on cul-de-sacs versus non cul-de-sac streets.

The data from San Diego and Sacramento covered the longest periods: in the case of San Diego, 1 year, and in the case of Sacramento, 4 years. However, for San Diego the data revealed a significant percentage difference with cul-de-sacs being a very low percentage; for Sacramento, the data revealed that cul-de-sacs accounted for a slightly greater percentage than non cul-de-sac streets. The conclusion to be made is that data gathered over a longer period does not show a clear trend in one direction or the other. Thus, the author is confident that only 1-month's data from Los Angeles, Stockton, and Chula Vista are significant despite the shorter period of data collection.

FINDINGS AND RESULTS

This study resulted from the author's interest in crime prevention through environmental design and the part that cul-de-sac streets might play in reducing burglaries in residential communities. A study by Johnson and Bowers (2009), discussed above in the literature review, encouraged additional research to determine if there is support for their study's findings, which clearly showed that cul-de-sac streets do indeed show fewer burglaries than through or non cul-de-sac streets.

This study shows support for this position. Four of the five cities studied show significantly lower or moderately lower burglary percentages versus non cul-de-sac streets in the same neighborhoods. There were limitations to the author's study. Five California cities were selected for this study, but there was no attempt at randomizing the selection. The sample size is small and cannot be considered significantly large enough to overcome sampling error. The data from Sacramento and San Diego were provided by crime analyst employed by these departments through police officers the

author knows who are employed as adjunct faculty at National University. The data from Los Angeles, Stockton, and Chula Vista were obtained by going to the web site, <http://crimemapping.com>, and finding streets identified as courts, circles, or coves and comparing burglaries from these streets to burglaries on neighboring non cul-de-sac streets. A final limitation of the author's study is the author did not interview residents of any of these cul-de-sacs as was done in the Johnson and Bowers' study to determine the degree of social cohesion of residents on cul-de-sacs versus that of residents on larger through streets. Referring to Cohen and Felson's theory of routine activities, neighborhoods which have "guardians," protect each other's property by watching for suspicious individuals and circumstances. These neighborhoods are also more likely to have security guards who serve as guardians.

Despite the limitations of this study, the author's findings show evidence of support for Johnson and Bower's study as well as the several other studies identified in the Literature Review and identified in Johnson and Bower's study. Clearly cul-de-sac streets create a deterrent to burglaries and probably create a deterrent to other crimes as well.

CONCLUSIONS AND RECOMMENDATIONS

The conclusions of this study and the others identified in the Literature Review are that cul-de-sac streets are a deterrent to burglaries. In fact, cul-de-sac streets may be a deterrent to other crimes as well, but this was not a premise or hypothesis of this study. If cul-de-sac streets are safer, what are the policy implications of this finding? The answer is clearly future developments, and in particular federal housing construction, must be built with more cul-de-sac streets.

In their study, *Residential Street Pattern Design for Healthy Livable Communities*, Grammenos and Tasker-Brown (2002), single-out the importance of cul-de-sacs in development of healthy livable communities. They state that:

Efficiency is chiefly the result of combining two standard street types—loops and cul-de-sacs—with long blocks. Contrary to popular opinion, the curvilinear streets that are typical of conventional suburban subdivisions are not efficient; they reflect an aesthetic preference and have little impact on land consumption. While irregular lot shapes do not pack efficiency, this is of relative little consequence at low densities. In fact, for comparable residential densities, loop and cul-de-sac streets are more efficient than tradition gridiron geometry (p. 1).

In summary, the findings of this study and others identified in this study point to the importance of cities that are designed with an abundance of cul-de-sac streets and fewer through streets. City planners, developers, and builders should plan new communities with more cul-de-sac streets. Police department leaders should have more input into the planning of new subdivisions. Police chiefs and other high ranking police administrators should have training in city planning and urban design, and at least one course at the master's degree level should be titled, City Planning and Urban Design for Police Administrators. This is a concept that has not been addressed in any city in the U.S. but is vitally important to efficient community and problem-oriented policing .

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APPENDIX

Table 1: Burglaries Occurring on Cul-de-Sac and Non-Cul-de-Sac Streets in Selected Cities

Burglaries: Cul-de-Sac versus Non-Cul-de-Sac Residential Areas in Five California Cities					
	Los Angeles	San Diego	Sacramento	Stockton	Chula Vista
Cul-de-sac	2	153	120	8	4
Non Cul-de-sac	160	3912	772	85	36
Total	162	4065	892	93	40

Table 2: Burglaries Occurring on Cul-de-sac versus Non-Cul-de-Sac Residential Areas as percentages

Burglaries: Cul-de-Sac versus Non-Cul-de-Sac Residential Areas in Five California Cities as percentages					
	Los Angeles	San Diego	Sacramento	Stockton	Chula Vista
Cul-de-sac	1.2%	3.7%	13.4%	8.6%	10%
Non Cul-de-sac	98.8%	96.3%	86.6%	91.3%	90%
Total	100%	100%	100%	100%	100%

Table 3: Comparison of Burglaries in Selected Cities Using 11% as the Percent of Cul-de-sac Streets

	Los Angeles	San Diego	Sacramento	Stockton	Chula Vista
Cul-de-sacs = Approximately 11% residential streets	11% of residential streets; only 1.2% of burglaries	11% of residential streets; only 3.7% of burglaries	11% of residential streets; but 13.4% of burglaries	11% of residential streets; only 8.6% of residential burglaries	11% of residential streets; only 10% of residential burglaries
Non Cul-de-sac= Approximately 89% of residential streets	89% of residential streets; but 98.8% of burglaries	89% of residential streets; but 96.3 of residential burglaries	89% of residential streets; only 86.6% of residential burglaries	89% of residential streets, but 91.3% of residential burglaries	89% of residential streets, but 90% of residential burglaries
Results: Indicated as	Los Angeles showed a	San Diego showed a	Sacramento showed a	Stockton showed a	Chula Vista showed a

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significantly lower, lower, slightly lower, and slightly higher	significantly lower residential burglary rate on Cul-de-sac streets	significantly lower residential burglary rate on Cul-de-sac streets	slightly higher residential burglary rate on Cul-de-sac streets	lower residential burglary rate on Cul-de-sac streets	slightly lower residential burglary rate on Cul-de-sac streets
-----------------------------------------------------------------	---------------------------------------------------------------------	---------------------------------------------------------------------	------------------------------------------------------------------------	-------------------------------------------------------	----------------------------------------------------------------