NCJRS

This microfiche was produced from documents received for
inclusion in the NCJRS data base. Since NCJRS cannot exercise
control over the physical condition of the documents submitted,
the individual frame quality will vary. The resolution chart on
this frame may be used to evaluate the document quality.

1.0	4.5 / 5.0 / 5.4 / 5.3	2.8	2.5
		3.2	2.2
		3.6	
1.1		4.0	2.0
			1.8
1.25	1.4	1.6

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A
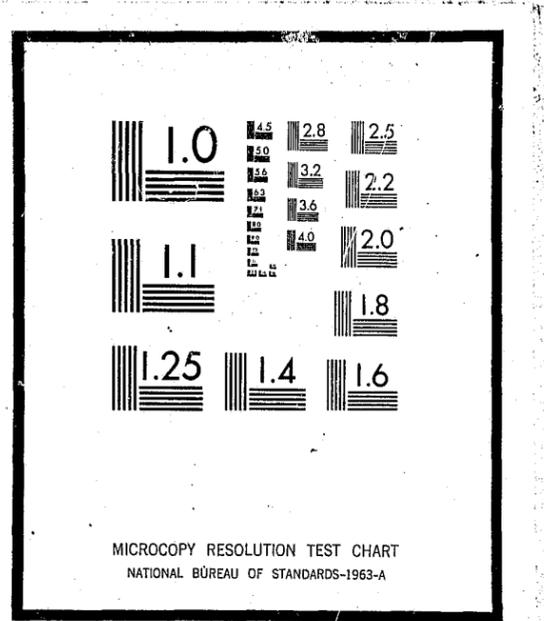
Microfilming procedures used to create this fiche comply with
the standards set forth in 41CFR 101-11.504

U.S. DEPARTMENT OF JUSTICE
LAW ENFORCEMENT ASSISTANCE ADMINISTRATION
NATIONAL CRIMINAL JUSTICE REFERENCE SERVICE
WASHINGTON, D.C. 20531

Date filmed | 11/3/75

EVALUATION OF FIRST-YEAR RESULTS

OF

COMMUNITY CRIME PREVENTION -- BURGLARY REDUCTION

Seattle —

27656

LOAN (s)

EVALUATION

Prepared by:
Kenneth E. Mathews, Jr., Ph.D.
City of Seattle
Law and Justice Planning Office
December, 1974

SUMMARY EVALUATION REPORT

Community Crime Prevention component of Burglary Reduction Project
Grant Award Contract #1161
July 1, 1973, to June 30, 1974; extended to August 15, 1974

Hypothesis: That providing Community Crime Prevention (CCP) Project
burglary prevention services of establishing block watch organizations,
home security inspections, and property marking would: (a) signifi-
cantly reduce the residential burglary rate for patrol sectors re-
ceiving CCP services when compared to sectors not receiving these
services, and (b) significantly increase the proportion of burglary-
in-progress to total burglary calls for patrol sectors receiving CCP
services when compared to sectors not receiving services.

Operational description: During the period August 15, 1973, to July
31, 1974, CCP personnel conducted 1,067 home security inspections,
performed property marking in 1,345 residences, and organized 147
block watch groups involving 1,404 households. With few exceptions,
these services were provided in Charlie, George, and Boy patrol
sectors with the majority of effort being concentrated in Charlie
sector. A random 20% sampling of inspected residences as of June,
1974, indicated that 37.8% of inspected residences had implemented
suggested security improvements within 90 days after the inspections.
This rate of implementation compares favorably with other similar
projects in other cities.

On the basis of the first 13 months of project operation, including
2½ months of second year funding, the project has averaged a cost
of $68 per household served. On the basis of the last two months
of operation during this period, the average cost per household
served was approximately $34.

Impact evaluation: Three separate comparisons were performed to
determine the impact of CCP services upon residential burglary. An
analysis of average monthly change in residential burglary from the
pre to test period in the three experimental patrol sectors resulted
in a significant decrease ($p < .05$) when compared to the rest of the
City minus the experimental sectors. Charlie sector had an average
monthly decrease of 5.9% (which was significantly different from
the control area) while George and Boy sectors (an increase of 9.5%
and 18.8% respectively) were not significantly different from the
control area (a 23.3% increase). A correlational analysis relating
the type and number of CCP services provided within 24 census tracts
to the percentage change in residential burglary for those census
tracts was non-significant. However, due to methodological problems
(see full evaluation report for further details), this should not
be viewed as conclusive. An analysis of resident's self-report of
burglary six months prior (5.21/100 households/6 months) and sub-
sequent (3.50/100 households/6 months) to receipt of services

indicated a significant ($p < .05$) reduction in burglary for those
households participating in the CCP project. This represents a
32.8% reduction in the burglary rate.

An analysis of burglary-in-progress calls was not performed because
of data insufficiencies (see full evaluation report for further
details).

Comments: Based on the analyses performed, it is appropriate to
conclude that CCP activities were instrumental in significantly
reducing burglary within those households receiving CCP services.
Data relevant to the question of crime displacement either by crime
type or physical location was not available for first year project
operation. During the second year, victimization data will be
collected to determine both long-term (up to 1½ year follow-up data)
and crime displacement effects.

KMathews:jn
1-28-75

EVALUATION OF FIRST-YEAR RESULTS
of
COMMUNITY CRIME PREVENTION -- BURGLARY REDUCTION
Grant Award Contract #1161

Prepared by Kenneth E. Mathews, Jr.
        Seattle Law and Justice Planning Office
        December 1974

The Community Crime Prevention Project's (CCP) first year of operation was an attempt to test the ability of citizen-based crime prevention efforts to reduce burglary through the establishment of block watch organizations, home inspection, and property-marking services (see final operational report for complete details).

The originally-stated goal of the Community Crime Prevention component of the Burglary Reduction grant was the "...reduction of predicted burglary rates for all areas of program activity by 10%." Subsequent discussions conducted among the Community Crime Prevention Director and personnel, Burglary Reduction grant staff, and Seattle Law and Justice Planning Office research and evaluation staff, resulted in a restatement of CCP goals and objectives. The restated goal was to "Bring about a statistically significant reduction in the number of residential burglaries in test communities during the 10 field operational months of the project." The reasons for this restatement were to set statistical criteria for evaluation rather than an arbitrary standard; i.e., a 10% reduction, and to eliminate the use of predicted vs observed burglary rates as a data base.

The initially stated objectives for CCP, and the extent to which they were achieved, are discussed within the Community Crime Prevention final operation report.

The restated objectives against which the CCP project is to be evaluated are:

1. Given the implementation of a community crime prevention effort within patrol sectors, a statistically significant decrease in the number of residential burglaries will be demonstrated when these sectors are compared with the City as a whole minus these sectors.

2. Given the implementation of a community crime prevention effort within patrol sectors, a statistically significant increase in the number of burglary-in-progress calls will be demonstrated.

The defined target population was residential units within the City of Seattle Police Department C, G and B sectors. The actual target population was single and duplex residential units within C and G sectors which received property-marking services, home inspections, and participated in block watch activities; and residents of B sector who were recipients of a burglary-prevention information campaign (See final operational report for complete details).

RESULTS

Objective 1: Given the implementation of a community crime prevention effort within patrol sectors, a statistically significant decrease in the number of residential burglaries will be demonstrated when these sectors are compared with the City as a whole minus these sectors.

To assess the project's success in achieving this objective, three separate series of analyses were conducted. The first series deals with the extent to which burglary was reduced within target police sectors relative to the rest of the City. The second series of analyses is based on the 24 census tracts within C and G sectors and compares the amount of work performed by community crime prevention personnel with subsequent changes in burglary rates. The third series of analyses is a comparison of residential burglary victimization data for the six months preceding and following receipt of CCP services.

Sector comparisons: A one-way analysis of variance (See Appendix D

for rationale for using this test) comparing the mean monthly change
in burglary rate in the three separate target sectors (C, G and B) with
the City as a whole minus C, G and B sectors (S-) was performed. The
research design was essentially a non-equivalent control group design
with S- sector as the control group and C, G and B sectors as separate
experimental groups. For each of the four areas (C, G and B and S-),
monthly percent change scores were based on the number of burglary
incidents as reported by SPD for the comparable months of October 1, 1972
to September 1973, and October 1973 to September 1974. For example, the
first monthly percent change score for C sector was -18.6. This was
based on the number of burglaries committed during October 1973 minus
the number committed during October 1972, this difference divided by the
number committed October 1972 (See Appendix A for raw data). The
starting date of October 1, 1974 was chosen because although CCP work
began in September, only 12 residences received services (See Appendix C)
during that month.

Percentage change scores for comparable months were used for two
reasons. First, these scores automatically adjust for population dif-
ferences within the various test areas and should be maximally sensitive
to relative change in reported burglaries. Second, by using comparable
months (e.g. May 1973 and May 1974), variation in burglary rates due to
seasonal fluctuation is also automatically controlled.

This analysis (see Table 1) resulted in statistically significant
overall differences (p < .05) in average monthly percent change in bur-
glary rates. Dunnett's test, which compares a control group (in this
case S- or Seattle minus C, G and B sectors) with experimental groups,
indicates that only C sector was significantly different from S- in

that while C showed an average monthly decrease of 5.9%, S- increased
23.3%. The failure of G and B sector to differ significantly from the
control areas is not surprising when one considers that services pro-
vided in B and G sectors were approximately one-tenth the number pro-
vided in C sector (See operational final report).

Census tract comparisons: Although the results of the above analysis
indicate that residential burglary did decrease significantly for the
sector receiving the major portion of CCP efforts, it is possible that
other factors may have partially, or totally, caused such changes.
Several plausible alternatives that might account for this change are
increased or new police activities, or regression to the mean. The
latter possibility refers to the fact that when a series of measures,
in this case burglaries, tend to be extremely high (or low) when com-
pared to other similar areas, there is a tendency to find that subsequent
measures will be less extreme when compared to the average of the other
areas. Since both C and G sectors have tended to have a higher burglary
rate than the rest of the City, it may be that the decrease in C sector
would have occurred without CCP's intervention.

In order to test whether the decrease in burglary rate is attribu-
table to CCP operation, a correlation between services provided in C and
G sector census tracts and percentage change in burglary rate was per-
formed (See Appendix B for raw data). If significant negative correla-
tions were found, this would indicate that as the number of services
provided increased, there was a corresponding decrease in reported
burglary within those census tracts. To perform these correlations,
services provided between October 1973 and September 10, 1974 were cor-
related with the percent change in reported residential burglary from

the base period of October 1, 1972 - September 30, 1973 to the test period
of October 1, 1973 - September 30, 1974.

It should be noted that this particular analysis is biased against
showing a significant relation. The reason for this statement is that
some census tracts did not begin to receive services until late in the
test period. Therefore, portions of time within the test period include
actual pre-treatment data. However, if span of pre and treatment time
were made comparable on the basis of when each census tract began to re-
ceive services, it would introduce two other factors that would similarly
bias the analysis. These factors are reliability and possible seasonal
fluctuation. The latter factor has been discussed above. The problem of
reliability refers to the large amount of variability that exists from
month to month in burglary data reported on the basis of census tracts.
From one month to the next, reported burglaries within a census tract
may vary as much as 50%. However, when burglaries are averaged over
longer periods of time, the fluctuation becomes less extreme.

The results of the correlational analyses (see Table 2) indicate
that there is a consistent but non-significant relation between the
introduction of varying amounts of CCP services into C and G sector
census tracts and subsequent reductions of the burglary rate. To de-
termine if the various services when considered simultaneously were re-
lated to burglary rates, a multiple correlation (R^2) was performed. This
also resulted in a non-significant relation.

However, there are problems in drawing firm conclusions from these
results. In addition to the bias already mentioned concerning this
analysis, there is an additional problem in that the data are reported
burglaries rather than actual burglaries. One of the assumptions within

the community organization efforts is that increased citizen involvement
will lead to increased reporting of crime and suspicious activities.
Schram (1973)[1] found that of those surveyed who had been burglary victims, 54%
did not report that fact to the police. If CCP efforts were successful
in causing an increased amount of victim reporting, a possible decrease
in actual burglaries might not be reflected in official burglary statis-
tics because of the increased reporting rate.

To test whether this actually occurred, decreased actual burglaries
while increased reporting of those occurring, the following data analyses
were performed.

Burglary victimization comparisons: As individuals or families
were contacted to receive services, they were asked to complete a short
survey. This survey included a question about whether or not they had
been burglarized in the last six months (pre-victimization). When six
months had elapsed since receiving services, they were recontacted and
asked if they had been burglarized since they received services (post-
victimization).

These data (See Appendix C) provide the most precise measure of
the effectiveness of the Community Crime Prevention Project to reduce or
prevent burglaries in that the burglary rate data is for only those
residences receiving services. The prior analyses up to this point are
based on experimental or post data which include as a major portion of
the measures, those residences not receiving CCP services but located
within the same geographic area.

On the other hand, a shortcoming of these data is that they exist
only for those residences receiving home inspection, property marking
and/or block watch involvement. Ideally, similar victimization data

1. Schram, D.C. Study of Public Opinion and Criminal Victimization in Seattle. City of Seattle Law & Justice Planning Office, 1973

data would have been collected from randomly-chosen residences to be compared with possible changes in burglary that would have occurred without CCP intervention. Data necessary for this kind of comparison will be collected during the second year of project operation.

With these precautionary comments in mind, the following comparisons were made. First, a comparison of pre-CCP victimization data with similar 1972 victimization data obtained in Seattle by Schram (1973). Second, a comparison of pre and post CCP victimization data gathered during the same time period was performed.

The reason for the first comparison (pre-CCP with 1973 victimization data) was to determine if people requesting CCP services differ significantly from the general population in terms of prior burglaries. It might be plausibly argued that those requesting such service are cautious to begin with and that even without CCP assistance they would have taken actions to lower their chance of being burglarized. An even more plausible argument would be that those who have been burglarized recently are most likely to request such services. This second sort of self-selection would result in pre-victimization data that indicate a higher burglary rate than is true for the general population. If one then assumes that burglars pick targets on a more or less random basis, the probability of any of these prior-burglarized individuals being "hit" a second time during the post period should be equivalent to that of the general population. This would result in post-CCP data reflecting a reduced burglary rate that might be due to either self-selection or an actual effect of CCP efforts, or some combination of both.

Therefore, pre-CCP burglary victimization data was compared with burglary victimization data collected by Schram (1973) to insure that recipients of CCP services did not differ significantly by chi-square

from the general population in terms of prior victimization. This might be criticized on the basis that since Schram's data was collected there has been an increase of approximately 17% in reported City-wide residential burglaries. To take this into account, the burglary rate reported by Schram was increased by 17% (this assumes a constant relation between occurrence and reporting of burglary). The burglary rate for the pre-CCP period was 5.51 burglaries per 100 households per 6 months. During 1972, the rate was 5.62. If Schram's data is adjusted to reflect the 17% increase in reported residential burglaries, the rate is 6.58 per 100/6 months. Neither of these latter two rates is significantly different from the pre-CCP rate (see Table 3).

Although these comparisons with pre-CCP data obviously are not as satisfactory as one might wish, they do offer some assurance that changes from pre to post periods are not due to self-selection.

If a chi-square analysis is performed on total pre-post victimizations, there is a statistically significant decrease in burglaries (x^2=4.504, $p < .05$, two-tailed test). However, this does not take into account possible seasonable fluctuation or the existence of an overall downward trend in residential burglaries for the test area. To control for these factors and determine if CCP efforts were responsible for decreasing victimization, a chi-square test was performed on pre and post data obtained during the same time period, April 1 through July 31, 1974. This comparison (see Table 3c) resulted in a statistically significant decrease (p=.05, one-tailed test) in that there was a 32.8% reduction in burglary rate (5.21 to 3.50 burglaries per 100 residences per 6 months). Since this data was obtained for the same time period from the same area, C and G sectors, seasonal fluctuation, time trends, and other agency activities seem unlikely

explanations for the observed change.

Of the 147 households burglarized in the pre period, 120 were reported to the police, 21 were not reported, and in 6 cases it was not known if reporting occurred. Of the 24 households burglarized in the post period, 20 were reported, 3 were not reported, and in one case it was not known. Excluding the unknown cases, this represents a reporting rate of 85.1% for the pre period and 86.95% for the post period. A chi-square test of this difference was non-significant. However, in light of prior victimization studies and particularly Schram's (1973) study in which it was found that only 46% of burglaries were reported, the reporting rates obtained during the pre and post periods are somewhat suspect. It may be that these reporting rates are grossly inflated by respondents giving what they perceive to be a socially desirable answer. That is, when contacted by an organization which has as one of its aims to increase reporting, they claim to have reported burglaries when in fact they did not. An attempt to verify whether this actually occurred is presently underway.

Objective 2: Given the implementation of a community crime prevention effort within patrol sectors, a statistically significant increase in the number of burglary-in-progress calls will be demonstrated.

The purpose of this objective was to determine if reporting rates were influenced by CCP activities. If increased reporting of burglaries and suspicious activities actually occurred, one would expect a significant increase in the proportion of burglary-in-progress calls to total burglary calls. This measure would have the advantage of being relatively unaffected by either a change in actual number of burglaries or reported burglaries.

To measure this hypothesized change, data from the Seattle Police Department dispatching computer was to be used. However, due to mechanical problems associated with the initial computer start-up, there was not sufficient data to perform a statistical evaluation of this objective. Data for the second year of CCP operation will be available and this particular aspect of victim reporting will be evaluated in the second year final evaluation report.

CONCLUSIONS AND DISCUSSION

Based on the analyses performed above it is appropriate to conclude that CCP activities were instrumental in significantly reducing burglary within those households receiving CCP services. The victimization data indicates that the burglary rate was decreased by approximately a third (32.8%) if a household was involved in a block watch program or received home inspection or property marking services or some combination of these. It is not possible at this time to determine the relative importance of these activities since residences typically received all three services. Furthermore, it is not possible to determine whether displacement by area or crime type occurred. However during the second year of operation, a victimization survey will be conducted prior to and subsequent to introduction of CCP services in an experimental and control area. This will provide information regarding possible displacement effects and will also include a means of verifying victim reporting rates. An additional attempt to assess possible reporting rate changes will involve an examination of the proportion of burglary-in-progress calls to total burglary calls received by the SPD dispatch center.

The analysis of burglary change within police sectors which found a significant decrease for C sector should not be over-interpreted.

Although it was the area of maximum CCP effort, there are three factors that should be noted. First, C sector has had a higher than average burglary per occupied residence rate than the City as a whole, thus making it subject to possible regression effects. Second, the number of C sector residences involved in the CCP project, less than 2000, make up a small proportion of the total households within that sector, 27,831 according to the 1970 census. To interpret the overall sector change, a 5.9% average monthly decrease, as due to the approximately 7% of households receiving services, could be unwarranted. Third, there is not sufficient data available to accurately assess the effect that police or related law enforcement activities may have had on burglaries within C sector independently of CCP efforts.

However, these qualifications of the sector analysis do not apply to the victimization data. Data for pre and post-burglary rates were compared for the same time period, thus ruling out regression effects. Since the data for pre and post-comparison were obtained from the same sectors (C and G), it is unlikely that police or other activities were related to observed difference. For this to be a valid conclusion, it would be necessary to show that with the introduction of CCP services to each household there was a simultaneous increase of law enforcement or other agency activity for that household.

The failure to find a significant correlation between amount of CCP services provided and decrease of burglaries within census tracts is probably due to the problems mentioned in the results section. These were possible change in reporting rates, and the inclusion of pre-CCP data within the post-CCP period (see results section for more complete discussion).

In summary, the Community Crime Prevention Project appears to have produced a significant decrease in burglaries for those residences receiving service. At this time, there is not sufficient information concerning possible crime displacement, which of CCP services are responsible for the observed change, and what effect CCP may have had upon reporting rates. During the second year of operation, efforts will be made to obtain data relevant to these questions.

TABLE 1

Mean, standard deviations, and analysis of Sector monthly percent change in burglary rate.

	SECTOR % CHANGE ON MONTHLY BASIS			
	C	G	B	S-
Mean*	-5.93	9.46	18.84	23.33
Standard Deviation	21.99	18.59	31.14	12.01

Source of Variance	df	SS	MS	f	P
Between	3	6,023.54	2,007.85	4.131	$<.025$
Within	44	21,383.25	485.98		
Total	47	27,406.79			

* Smallest significant difference (p< .05, one-tailed test) between S- and test sectors by Dunnett's test is 19.169

TABLE 2

Correlations and R^2 for Community Crime Prevention activities with percent changes in burglary rate for the 24 census tracts totally or partially included within C and G sectors.

	Block Watch (1)	Property Marking (2)	Home Inspection (3)	Percent Change (Y)
1		.9807	.9747	-.2232
2			.9804	-.2244
3				-.2826

$$R^2 y \cdot 123 = .1348 \qquad F_{3,20} = 1.037$$

$$Ry \cdot 123 = .3672$$

TABLE 3

Chi-square analysis of burglary victimization data

3a: Comparison of burglary victimization rate for pre-CCP survey and 1972 Seattle data (adjusted 6 month rate)

Survey	Number of Residences Interviewed		Burglary rate/100
	Burglarized	Not Burglarized	
Pre CCP [1]	147	2520	5.51
1973 Study	29	487	5.62

$x^2 = 0.0108$ Not significant

3b: Comparison of pre-CCP & 1972 summary data, 1972 data increased by percent increase in reported residential burglary

Survey	Number Burglarized	Number Not Burglarized	Burglary rate
Pre CCP	147	2520	5.51
1973 Study [2]	34	482	6.58

$x^2 = 0.9762$ Not Significant

3c: Comparison of pre and post-CCP data obtained during the same time period, April-July, 1974.

Survey	Number Burglarized	Number Not Burglarized	Burglary rate
Pre CCP	48	873	5.21
Post CCP	24	661	3.50

$x^2 = 2.6687$

$z = \sqrt{x^2}_{1df} = 1.633$ one-tail p = .0516

1. Schram (1973) data for burglary victimization occurring between Jan. 1, 1972 and Dec. 31, 1972. To obtain 6 month rate, total number of burglaries was divided by 2, and "not burglarized" category increased by 29 to maintain same total N (516) as reported in original survey.

2. Schram (1973) victimization data increased by 17% to reflect increase in reported burglaries since calendar year 1972 through Sept. 1974

APPENDIX A

Number of burglaries by month within each test and control (S-) sector

Month	Number of Burglaries Within Police Sectors*							
	C		G		B		S-	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Oct.	142.5	116	81.7	93.8	83.4	77.9	413.4	535.3
Nov.	106.6	122.3	95.7	85.7	93.9	108.2	513.8	613.8
Dec.	132.6	122.4	82.5	92.4	102.2	113.7	521.7	726.5
Jan.	121.9	122.	91.7	81.5	88.6	118.8	471.8	583.7
Feb.	126.6	103.3	88.6	74.3	86.9	70.5	450.9	560.9
Mar.	123.	91.5	103.	91.6	77.1	73.3	467.9	503.6
Apr.	128.5	86.1	91.6	96.2	89.4	65.	460.5	478.7
May.	149.9	154.8	86.6	117.7	69.4	84.1	376.1	553.4
June	102.9	153.9	88.1	121.4	68.3	97.6	388.7	491.1
July	124.9	109.2	87.7	110.1	78.5	113.7	427.9	533.
Aug.	138.8	111.1	107.8	121.3	66.2	121.6	476.2	557.
Sept.	164.4	159.3	111.	132.2	67.6	88.3	454.	531.2

*Note: Burglary data is based on census tract of occurrence. Since police sectors do not correspond exactly with census tract boundaries, census tract monthly burglaries were multiplied by the proportion of geographic area within police sectors.

APPENDIX B

Number and type of services provided by CCP, and number of burglaries occurring within C and G sector census tracts for the pre and test period.

Fraction of Census Tract Within Police Sector	SPD Census Tract	Number of Block Watch Organizations	Property Marking	Home Inspection	Number of Residential Burglaries October '72-September '73	October '73-September '74
C	80		2		81	93
C	90	6	45	41	115	97
C	91	47	376	370	89	73
C	92	46	290	294	103	116
C	81	3	75		82	129
C	82			62	87	79
C	123			2	217	189
C	110		39	7	217	178
C	111	23	164	160	160	121
C	100		42	42	184	160
1/2 C/G	101	7	61	60	215	217
2/3C 1/3G	112	6	49	45	146	146
1/2 CG	133				103	89
1/3 G	131				58	52
2/3 G	132				24	24
G	134		1	1	60	90
G	113		3		80	105
G	114		4	3	128	118
G	102	2	21	22	126	143
G	170	1	21	21	142	163
G	160		5	4	36	55
G	161				119	142
1/2 G	151		7	8	12	22
1/2 G	171	5	47	48	225	213

APPENDIX C

Pre and Post Victimization Data for Residences Receiving Community Crime Prevention Services

Month Surveyed	Pre		Post	
	Number Surveyed	Number Burglarized	Number Surveyed	Number Burglarized
September 1973	12	0		
October	149	17		
November	426	31		
December	95	9		
January 1974	289	15		
February	422	14		
March	353	13		
April	223	13	58	3
May	272	19	197	8
June	202	5	265	8
July	224	11	165	5
TOTAL	2667	147	685	24

APPENDIX D

Rationale for use of analysis of variance model in examination of
Sector burglary data.

A frequently occurring problem in the planning, performance, and
interpretation of statistical analyses based upon criminal justice system
data is the justification for the use of parametric as opposed to non-
parametric tests. Siegel (1956), as an advocate of non-parametric tests
in behavioral studies, has identified two main considerations in choosing
statistical tests. These are the power of a statistical analysis and the
assumptions associated with use of a statistical analysis.

The power of a test refers to its ability to indicate a significant
difference or reject the null hypothesis (the hypothesis of no difference)
when in fact there is a true difference. Another way of stating this is
that as more powerful tests are used, sample differences that reflect
actual population differences will be more likely judged to be signifi-
cantly different. For example, suppose that we randomly select a sample
of scores from two populations known to be significantly different on
the characteristic we are measuring. Further suppose that the average
of one sample is 15 while the average of the second sample is 20. If
test A indicates that the two samples are significantly different (which
we know to be true) while test B indicates that the two samples are not
significantly different, then test A is a more powerful test.

The assumptions associated with a test refer to certain conditions
that must be met before the conclusions of the test can be considered
valid or truthful statements about the population(s) represented by the
sample scores. For example, it is typically assumed that scores represent

a random sampling of the population of scores. That is, each individual
or score or whatever has an equal chance of being included in the sample
and there is no bias in the selection procedure. When this is not true,
then the results of a statistical test may not accurately represent the
true situation. A rehabilitation program which only selected "good risks"
to work with and then compared their recidivism rates with only "bad risk"
inmates might find a significant difference between the two groups. How-
ever the differences could be due to the violation of the assumption of
random selection rather than some program effect.

The power and assumptions of a particular test determine whether it
is appropriate for use in particular situations. In general, parametric
tests are more powerful than non-parametric tests. They require smaller
real differences to conclude that groups are significantly different. In
general, non-parametric tests make fewer assumptions about what conditions
must be met than is the case for parametric tests. That is, fewer quali-
fications must be made about the results when it is impossible to determine
if the conditions (assumptions) of a test are met, or if it is determined
that they are not met.

In a one-way analysis of variance (a parametric test and therefore
more powerful than equivalent non-parametrict test; e.g., Kruskal-Wallis
one-way analysis of variance), there are more assumptions underlying its
use. There are two assumptions that are added by using this particular
parametric test rather than the corresponding non-parametric test. These
are that the scores are normally distributed and that the variances of
different groups are equal. Although there are techniques available to
test for deviations from normality (D'Agostino, 1970; D'Agostino and Cure-
ton, 1972) and equivalence of group variances, there are a number of

reasons to believe that violation of these assumptions does not affect the accuracy of test conclusions.

Regarding the assumption of normally distributed scores, Scheffé (1959) has provided a mathematical proof that its validity is not an important factor. A number of empirical sampling studies (Boneau, 1960; Bradley, 1964; Donaldson, 1968; and Lindquist, 1953) have further demonstrated that non-normally distributed data does not affect the results of the one-way analysis of variance F test.

In the case of the equal variance assumption, Box (1954) has shown that unequal variance , even to the extent of 20 to 1, does not affect the conclusions of the F test as long as equal numbers of observations are present within treatment groups, the sampling studies cited above substantiate Box's proof.

Since these studies indicate that the violation of these assumptions of the F test is not a crucial issue and since the F test is a more powerful test than any non-parametric test, it was decided to use one-way analysis of variance for sector comparisons.

Parenthetically, it might be noted that the same data analyzed by means of the non-parametric Kruskal-Wallis one-way analysis of variance also indicates significant difference at the $p < .05$ level.

REFERENCES

Boneau, C.A. The effects of violations of assumptions underlying the t test. Psychological Bulletin. 1960, 57, 49-64.

Box, G.E.P. Some theories on quadratic forms applied in the study of analysis of variance problems: I. Effect of inequality of variance in the one-way classification. Annals of Mathematical Statistics. 1954, 25, 290-302.

D'Agostino, R.B. Simple compact portable test of Normality: Geary's Test revisited. Psychological Bulletin. 1970, 74, 138-140.

D'Agostino, R.B., and Cureton, E.E. Test of normality against skewed alternatives. Psychological Bulletin. 1972, 78, 262-265.

Donaldson, T.S. Robustness of the F-test to errors of both kinds and the correlation between the numerator and denominator of the F-ratio. Journal of the American Statistical Association. 1963, 322, 660-676.

Lundquist, E.F. Design and Analysis of Experiments in Psychiatry and Education. Boston: Houghton Mifflin. 1953, pp. 78-90.

Siegel, S. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw Hill, 1956.

END