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ABSTRACT

In recent years the costs of school vandalism and the incidence of vandalism in the public schools have been rising. The study concerns itself with the application of production functions, Monte Carlo techniques, and Shannon's model of information theory to determine the most efficient use of preventive vandalism techniques in a large school system. The results of the study indicate the gain in efficiency of communication to administrative decision-makers as a result of the information processing and retrieval system employed by the researchers. (Author)

DESTRUCTION OR LOSS OF SCHOOL PROPERTY: ANALYSIS AND SUGGESTIONS FOR IMPROVEMENT OF SCHOOL SECURITY

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Need and Overview of Situation:

At a time when the Los Angeles Unified School District is beset by both financial difficulties and rising militancy on the part of teachers, parents, and students, the problem of the number of and costs of unlawful acts to schools grows larger and larger. These increased costs are caused by the rising incidence of damage or loss of school property from fire, theft, burglary, and malicious mischief (vandalism).

Although this problem is greater in certain areas of the school district, such as the Jordan Complex of Schools in Watts in Zone A (the focus of this study), it is not foreign to any school. Cost estimates of unlawful acts upon the schools are biased greatly downward. A disproportionate amount of time is spent by school staff in: (1) repairing damage to classrooms and reconstructing class instructional units in the face of damage or loss of instructional materials; and (2) discusing the vandalism issue with school staff and members of the community both to find solutions and to bolster sagging teacher morale.

The reported destruction of school property over the past five years shows an alarming trend upwards. Five years ago the damage due to burglary, theft, arson, and malicious mischief was about $611,000. Last year the damage due to these causes was approximately $2,119,000. Five years ago the insurance premiums were $207,797. It is estimated that the insurance premiums for the 1970/71 school year will exceed $800,000. In areas of higher incidence such as Zone A and in the Jordan Complex of Schools destruction of school property is held to be the highest priority problem by both school administrators and the community at large.

Security operations in the Los Angeles Unified School District fall into two broad areas. One of these is daytime on-campus surveilance and is devoted to assisting the school administrators in maintaining an atmosphere of law and order during the school day. The second is the off-school hour surveilance of school property by use of (1) security guards with patrol cars, and (2) intrusion alarm systems placed at school sites.

The Los Angeles Unified School District spends large sums of money in the security effort and the demand for the service is steadily increasing. For example, five years ago the Security Section staff consisted of 15 security agents plus clerical and supervisory personnel at an annual cost of $239,082. This year the staff consists of 104 security agents plus clerical and supervisory personnel at a cost of $1,363,222. Virtually all of the increased staff is utilized in the on-campus daytime work. At least 100 more agents would be required to satisfy the security needs already expressed by school principals.

The particular area of concern voiced by both administrators and principals of the school system is the protection of school property during off-school hours(particularly during weekends). Despite the alarming increase in the security problem during this time period, stake-out and patrol staff has not been increased due to the severe budgetary difficulties sustained by the district in recent years. The total off school hour staff consists of 16 security agents.

As the result of an emergency school board decision to add three patrol cars and up to eight security guards, the off-school hour staff will be raised to 24 security agents. This is of particular importance since in the interest and welfare of security agents the security agency has had to go to two-man patrols as opposed to one-man patrols (coverage power is only half of manpower).

It is believed by school administrators that the long-term answer to off school hour burglary, theft, arson, and malicious mischief is a coordinated system of intrusion alarms. However, such an alarm system can only be effective if there are sufficient security guards and patrol cars to promptly respond to any alarms.

The school district has pioneered with imagination to develop intrusion alarms that would be suitable for school sites. Radar, light, and sound have been the basic systems that have been installed in 52 locations. Each installation is only partial and does not include the entire school site. As these intrusion alarm systems have been installed, it has become evident that certain types of intrusion devices perform much more adequately than others. In particular, the sound actuated type has proven entirely unsatisfactory. It will have to be replaced by the radar actuated type of intrusion alarm system. The installation of intrusion alarm systems is presently being funded out of money set aside from the building program. Given the severity of the earthquake damage sustained by the school district it is doubtful whether intrusion devices can be financed much longer from this source of funds.

School Selection:

As stated earlier, certain areas of the school district are more prone to the vandalism, theft, burglary, and arson problem than are others. The concern of the researchers is in the area of zone A known as the Jordan Complex. It includes 8 elementary schools, a junior high school, and a high school.

The Jordan Complex can ill afford the expense of destruction or loss of school property. Its students are consistently in the lower half of the school district distribution on academic achievement. The wanton destruction or theft of Federal Title I and III instructional materials as well as the insuing reduction in teacher morale can only further accentuate the academic performance disparity between this area and the rest of the school system.

The Jordan Complex was also chosen because of the participation of one of the researchers in a field work experience concerning the vandalism problem in the Jordan Complex. This enabled the researchers to have special access to the statistics on crimes and the logistics of the security agency effort in the Complex. Presently one patrol car with its two men team is assigned to the Jordan Complex during off school hours. The School Board decision to increase the number of patrols during off school hours will allow for one more two man team to be added to the effort in the Jordan Complex.

Literature:

The security problem faced in the schools is really part of a more general problem of crime and law enforcement in the general society. The researchers have had to turn to turn to the literature on police law enforcement and prevention of crime. There exists no independent literature on the problem of law enforcement and crime prevention in the public schools.

More specifically, the researchers have searched the literature on the use of intrusion detection devices, patrol cars and men, and on-site security guards for crime prevention, detection, and apprehension. The Literature (see bibliography at the end of this report) is notable in the lack of any systematic marginal or incremental analysis yielding dollar cost/benefit data for intrusion detection devices, patrol cars and men, and on-site guards. This makes it especially difficult in arriving at any systematic procedures for maximizing the deterrance of an objective function for crime prevention, detention, and apprehension.

The attempts by Shoup and Mehay and Olson to construct production functions and incremental cost/benefit ratios for police patrol are only partially successful. They indicate that a significant relationship does exist between police patrol and crime prevention, but they are not able to come up with cost/benefit relationships to allow for an improved effectiveness of the police patrol function. The problem seems to be with the great difficulties of running a completely controlled experiment. Instead, these researchers and others have resorted to the expediency of linear regression techniques on existing data with the resulting problem of the lack of independence among the explanatory variables.

The researchers are aware of the Rand Corporation efforts towards program budgeting for the police and fire departments of New York City. One of the writers of this report has discussed these efforts at some length with one of the Rand Corp. Staff, John Benton. It is the researchers' judgment that, although the Rand Corp. approach is very provocative, the type collection and utilization of the data does not make the approach applicable to the specific security problem faced by the Los Angeles City Schools in the Jordan Complex.

An other literature source used, the U.S. President's Commission on Law Enforcement, is an effort to see the school crime problem in a greater societal context. This source would suggest that the long-term solution to the security problem is to be found in greater community concern and action. There is only so much the police can accomplish with this problem without the encouragement and assistance of the public. In the Jordan Complex, where concerned citizens who aid school security officers face retaliation by fire bombing or some other form of reprisal, the difficulties the police must face and their limitations are graphically illustrated.

Finally there is the work of Hirsch attempting to show the relationship of the production of police services (supply curve) to other public services. This article, although included in the bibliography as pertaining to the general problem of school security problem addressed to in this project, is the least useful.

Rationale for the study:

The rationale for this study is to suggest ways that the school security agency can improve its allocation (assignment) of patrol cars and men and on-site security guards to lower the incidence of crime and vandalism in the Jordan Complex. Information is needed by school officials as to how the extra security guard team should be allocated with the Complex. In pursuit of this objective, the researchers have acquired, from the security agency, statistics for the 1969/70 school year for all ten schools of the Jordan Complex giving cost data and incidence of destruction and loss of school property.

The specific objectives of the researchers are fourfold: (1) to evaluate the usefulness of this data for the construction of an information system for purposes of decision making, and (2) to determine if a simple decision-making rule can be used to allocate a pair of security guards and patrol car to an area within the complex without dollar marginal benefit data. The decision-making rule is that a patrol car and men should only patrol a school when the expected dollar loss from destruction and loss of school property equals or exceeds the marginal cost of surveillance by security guards and patrol car. (3) An attempt will also be made to assess whether the present equal coverage of all ten schools in the Jordan Complex by pairs of guards during off-school hours (nights and weekends) and unequal coverage during on-school hours (relative to off-school hours) is consistent with the above simple decision making rule given the collected data. (4) For purposes of building an information system for decision makers determine whether this type of problem and data (uncertainty of coverage and incidents happenings) are applicable to Monte Carlo techniques.

Method of Study:

By using frequency counts of incidents and costs of occurrences it is hoped that these specific objectives may be obtained. An analysis of the frequency counts and costs and of how descriptive they are should allow objective one to be satisfied. The means and standard deviations of the various tabulati ns and cross tabulations of the data subsets should allow for objectives 2 and 3 and for a determination of whether a Monte Carlo technique to generate and simulate the actual occurrences can be accomplished (objective 4), allowing for the predicting of the future costs of incidents and the assignment of personnel to prevent the crimes and vandalism (rationale of the study).

The above analysis of means, standard deviation, and frequency counts will allow for an assessment of the current information collection and retrieval system of the Los Angeles City School's security division as an information system for decision makers (objective 1). Applying Shannon's model of information theory an assessment will be made of the data processing of the security division in terms of communication efficiency (amount of loss of information from sender to receiver).

Description of the data and data processing:

The Los Angeles City Schools Security Office keeps records on individual crimes committed in individual schools in the system. The 1969/70 school year was chosen for the study data because it was the latest full school year for which records could be obtained and the data was obtainable in fairly complete form. In the 1969/70 school year for each individual crime reported, the following information is supposed to be available: (1) time of day of occurrence of crime; (2) day of occurrence of crime; (3) date crime committed; (4) date crime was reported; (5) type of crime committed; (6) amount of money lost in crime; (7) value of other property lost; (8) damage costs; (9) total cost of the crime; (10) number of window panes broken in incident; (11) dollar cost of number of window panes broken; (12) security force area in which the crime occurred; (13) school in which crime occurred; (14) area of school system in which crime occurred; (15) police district in which crime occurred; (16) how many adults were involved in the crime; (17) how many juveniles were involved in the crime; (18) whether criminals were caught or not; (19) whether costs of crime were recovered; (20) whether case was closed; and several other pieces of miscellaneous information.

The only data for each incident of use to this study from the 1969/70 school year were: (3) time of day of occurrence, (4) day of occurrence, (2) type of crime committed, and (6) total cost of the crime, and (1) school in which crime occurred, and (5) month crime was committed. Many of the other statistics have no relevancy to the problem being studied (police district involved), some are encompassed within the types of data per school selected (such as damage costs), others do not provide sufficient delineation to make them independently useful to this study (separate costs of broken window panes -- useless to this study since whether windows were broken from within or without are not obtainable).

Of the 222 reported incidents only 195 had cost data and were considered usable. Fortunately, the 27 non-usuable incidents were distributed among the ten schools in the complex in the same ratio as the usable incidents and their rejection from the data set used seems to be acceptable in this study without biasing the study results.

The security force breaks down criminal incidents into nine types: (1) burglary, (2) theft, (3) malicious mischief (vandalism), (4) arson, (5) flooding, (6) others, (7) assault and crimes of violence, (8) trespassing and loitering, and (9) narcotics and drunkenness. The only reported incidents in the Jordan Complex were the crimes of: (1) burglary, (2) theft, and (3) vandalism. For each incident one and only one of these three categories of crime was reported as committed.

Data on day of the week of occurrence and time of day of occurrence are very poor. Few incidents have an actual time of day and day of week of occurrence specified. In the data set of 195 incidents, only 52 incidents are reported with a specific time of day of occurrence or a time period of occurrence of 3 hours or less. Only 105 incidents are reported with a specific day of the week of occurrence. Thirty-seven other incidents occurred somewhere within a two day period. This was between the beginning of the evening of the first day (at 4:00 PM) and the beginning of the next school or work day (at 8 AM). Fifty-three incidents occurred sometime during a weekend period from Friday evening (4:00 PM) to late Sunday evening (midnight) or Monday morning (8:00 AM).

Substantial difficulties ensue in attempting to use this data for day of week of occurrence and time of day of occurrence. The times of the day were broken into three segments: 12:00

midnight to 8:00 AM, 8:00 AM to 4:00 PM, and 4:00 PM to 12:00 midnight. An incident could occur in one of these three time groupings, or, it could have occurred in more than one of these groupings, or in two or all three of them.

The day of the week data was grouped by day of the week when specified as such, or as two-day over night incident or as a weekend occurrence when necessary . A major limitation to the use of the data is this lack of specificity of day of week of occurrence and time of day of occurrence.

Frequency and costs of incidents per school, per type crime, per month, on weekend (defined as Friday, 4:00 PM to Sunday, midnight) versus school days (all other times) and on school day day (8:00 AM to 4:00 PM) versus school day off-time (4:00PM to 8:00AM) and/or weekends and many other cross tabulations were easily generated from the data.

Distribution of "non-specific" weekend data followed the rule that its distribution would be similar to specific data whenever it was reasonable to do so. This was considered as a best estimate with known facts, which was considered as better than total uncertainty.

No incidents were reported as having occurred from Sunday midnight (12:00 AM) to Monday morning (8;00 AM). Therefore, a Monday early morning incident was considered as highly improbable. All incidents reported as occurring Friday night to Monday morning were combined with and reported as occurring between Friday night and Sunday midnight. There were then fifty-three incidents "non-specific" for the newly defined weekend.

Data Processing:

The Biomed BMD06D description of data strata program was used to generate frequency counts, means, and standard deviations for costs of all incidents: (1) per school, (2) per type crime, (3) per day of the week or block of days, (4) per time block, (5) per month of year; for (6) weekend versus weekday, (7) elementary versus junior high versus senior high school, (8) daytime versus night time, and (9) known time block versus unknown time block.

Then frequency counts and means and standard deviation for costs for incidents occurring at school levels (elementary, junior high, senior high school) for (2) to (6) and (8) to (9) above were also generated with the use of the same program (cross tabulation). This could have also been done for each elementary school but the investigators felt nothing would be gained by such a procedure.

The card sorter was then used to sort the data deck on the basis of the day of the week of occurrence code into weekday versus weekend. Data decks were submitted with the BMD06D program to obtain costs, frequencies, and means and standard deviations of these two catagories for (1) schools, (2) type crime, (3) time of day, (4) daytime versus night time, (3) known time block versus unknown time block. (cross tabulations)

Further sorting allowed for the obtaining of frequency counts, means and standard deviations of costs within the categories (cross tabulations): weekday--school time block, weekday-evening time block, weekday out of school time block, weekday-unknown time, weekend--school time block, weekend-evening time block, weekend-out of school time block, and weekend-unknown time block, as well as simply school time block (8:00 AM-4:00PM), evening time block (4:00 PM--midnight), early morning time block (midnight--8:00 AM), and of school time block (4:00 PM--8:00AM) and unknown time block (anytime) for (1) schools, (2) levels of schools, (3) type crime, and (4) day fo week with time block.

The generation of an enormous amount of output was undertaken to not only determine the relevance of the output to this particular study (where much of it turned out to be not useful), but to other studies with much greater aggregates of data (or better defined data--see below) as well.

In terms of data processing the researchers found the above procedures to contain far higher potential information content (i.e., less loss of potentially valuable information to decision makers from raw data) than current information processing practices employed at the Security Agency of Los Angeles City Schools. Using the criterion of the model of information theory there is a resulting gain in efficiency of communication to administrative decision makers as a result of the information processing and retrieval system employed by the researchers.

Coding for the BMD06D Program (how to read output):

The schools were easily stratified by coding each with a number from 1.0 to 10.0.

1.0=(first interval)=Grape Elementary School

2.0=(second interval)=Ritter Elementary School

3.0=(third interval)=102nd Street Elementary School

4.0=(fourth interval)=111th Street Elementary School

5.0=(fifth interval)=Weigand Avenue Elementary School

6.0=(sixth interval)=Compton Avenue Elementary School

7.0=(seventh interval)=96th Street Elementary School

8.0=(eighth interval)=112th Street Elementary School

9.0=(ninth interval)=Markham Junior High School

10.0=(tenth interval)=Jordan High School

(Thus, 1.0 - 8.0 referred to elementary schools)

The type of crime was coded for stratification is:

1.0=Burglary

2.0=Theft

3.0=Vandalism

The time of day of occurrence was coded for stratification as:

2.0=8:00 AM--4:00 PM

2.5=12:00 Midnight--8:00 AM

3.0=4:00 PM--12:00 Midnight

3.5=4:00 PM--8:00 AM (next day)

4.5=no time of day known

(Thus, 2.5-3.5 referred to off-school hours, 2.0=on-school hours)

The day of week of occurrence was coded for stratification as:

1.0=Monday

2.0=Monday/Tuesday

3.0=Tuesday

4.0=Tuesday/Wednesday

5.0=Wednesday

6.0=Wednesday/Thursday

7.0=Thursday

8.0=Thursday/Friday

9.0=Friday

10.0=Friday/Saturday

11.0=Saturday

12.0=Saturday/Sunday

13.0=Sunday

14.0=Weekend (Friday thru Sunday)

(Thus, 1.0 - 9.0 refer to school days and 10.0 - 14.0 refer to weekends)

The month of occurrence was coded for stratification:

1=July, 1969

2=August, 1969

3=September, 1969

4=October, 1969

5=November, 1969

6=December,1969

7=January,1970

8=February,1970

9=March,1970

10=April,1970

11=May,1970

12=June,1970

Summary of Gross Breakdown (Delineation) of Data:

Source	Frequency	Mean Cost	Std. Dev.	Total Cost
Grape E.S.	11	116.74	109.52	1284.19
Ritter E.S.	13	174.85	232.82	2273.01
102nd Street E.S.	17	68.12	89.88	1158.09
111th Street E.S.	11	128.74	142.71	1416.19
Weigand Street E.S.	13	150.57	182.02	1957.37
Compton Ave. E.S.	13	163.52	192.57	2125.53
96th Street E.S.	7	154.91	233.70	1084.90
112th Street E.S.	18	236.58	557.60	4258.35
All Elem. Schools	103	151.05	277.16	15557.74
Markham Junior H.S.	36	102.73	111.55	3698.35
Jordan H.S.	56	301.14	815.56	16864.02
All Schools	195	185.23	486.79	36120.11
Burglary	142	224.90	562.03	31935.66
Theft	12	147.98	150.32	1775.82
Vandalism	41	58.75	84.88	2408.63
Daytime (8AM-4PM)	23	127.37	141.39	2929.56
Morning (Midnight-8AM)	5	111.83	192.98	559.15
Evening (4PM-Midnight)	24	105.09	92.43	2522.18
Over Night time	35	252.50	466.53	8837.47
Any time of day	108	196.96	590.86	21271.79
Daytime	23	127.37	141.39	2919.56
Night time	64	186.23	358.23	11918.78
Known time	52	115.59	124.55	6010.89
Unknown time	143	210.55	561.92	30109.22

Source	Frequency	Mean Cost	Std. Dev.	Total Cost
Monday	8	857.73	1992.24	6861.83
Mon/Tues.	3	816.46	1399.32	2449.39
Tuesday	13	138.96	141.58	1806.10
Tues/Wednes.	8	257.27	362.83	2058.14
Wednesday	10	115.43	142.70	1154.35
Wed/Thurs.	12	150.93	172.81	1811.15
Thursday	11	119.67	123.84	1316.39
Thurs/Fri.	4	371.39	512.80	1485.56
Friday	10	144.85	133.79	1448.54
Fri/Sat	3	145.38	144.40	435.13
Saturday	10	49.75	73.54	497.46
Sat/Sun	7	128.41	156.59	898.85
Sunday	43	161.05	316.60	6915.37
Sometime during Weekend	53	131.52	170.45	6970.61
Weekday	79	258.12	708.96	20391.72
Weekend	116	135.59	229.58	15728.32
July	11	347.52	730.58	3822.75
August	10	108.63	114.05	1086.29
September	13	111.98	86.14	1455.74
October	28	151.44	363.84	4240.21
November	24	105.04	104.11	2520.84
December	21	127.30	170.58	2673.36
January	10	69929	1798.33	6992.95
February	13	123.60	137.64	1606.85
March	18	162.11	266.48	2918.03
April	10	231.32	221.57	2313.22
May	17	136.82	122.58	2325.94
June	20	208.20	266.55	4164.06

Analysis:

Summaries and breakdowns of delineations of data in subsets and cross tabulations will not be reported specifically unless they become relevant to the discussion which follows.

The use of the data for determining the placement of security guards and patrol cars is extremely limited by a number of factors: (1) the uncertainty (to even an eight hour period of time) in the time of the day of occurrence in 74% of the incidents accounting for 83% of the costs of all incidents; (2) the uncertainty of the day of occurrence during the weekend period in 46% of weekend incidents accounting for 44% of the total weekend incident cost; (3) the extremely large variance in the possible cost of an incident (as seen by the huge standard deviations as compared to the means). The great variance in possible costs of an incident is caused by the range in incident costs from a maximum of $5785 to a minimum of $1.25. There is no possible way to control this range of the incident cost under present cost reporting procedures and all data of this sort will show such variations. The distribution of frequency of incidents and costs of incidents does not seem to take on the appearance of a normal curve but instead seems to show several peaks of differing intensity and may be discontinuous, There is no way of getting a reasonably certain cost per occurrence (even if a type of crime, day of occurrence, and/or time of day is specified).

The aggregate cost results of the data yield almost surprising result. Given the cost of a two man security guard team with car as $90.00/8 hour shift, there are no time periods of day slots whereby the cost of an extra pair of guards would be exceeded by the cost of damage or loss of school property. This conclusion assumes that the guards in patrol cars would not deter a significant amount of potential crime and vandalism at sites other than the one patrolled at that moment. It also assumes that the team adds very little extra deterrence value to the surveillance devices in use which require security guards with patrol cars to answer alarms. One security guard team costs the school district $23,400 per year which is almost 2/3 of the aggregate costs of all losses from crimes and vandalism in the entire complex of ten schools. There is no way for a pair of security guards to be allocated to the complex without their cost exceeding the savings which they bring the district (assuming that the security guards and car serving the complex exclusively would reduce to zero the aggregate costs of crime and vandalism for the 1969/70 school year for the times they are on the job). Thus, the simple decision-making rule is not applicable to the situation which exists in the Jordan Complex as described by the data. The data collected by the Security Agency is only useful in allocating guards according to the decision rule: place the guards in such a way that the maximum amount of cost of crime is saved, thereby minimizing the cost of the guard team to the school system.

Assuming the probability of deterrence and prevention of crime is greater by employing on-site guards over guards in patrol cars, this would be the best prevention strategy for the school system given that a guard must be placed in the Complex. Further investigation of the costs and frequencies of occurrences leads to the conclusion that placement at Jordan High School offers the maximum potential prevention of crime. High school incidents account for 29% of all incidents and 44% of the total costs of incidents. Insufficient incidents and costs occur at any one elementary school or at the junior high school to warrant the allocation of a special security guard team to one of these schools. The allocation of a team to cover a group of elementary schools will reduce the ratio of incident occurrence at site to incidence of prevention at site from its assumed high value for on-site guards (=1) to a considerably smaller value (<<1). Such an allocation would not be acceptable at present. The only day of occurrence of crime at Jordan High School showing a substantial number of incidents is Sunday, 8:00 AM to 12:00 midnight when 29 % of the Jordan High incidents and 22% of the incident costs take place. The cost of the guard team for 52 weeks and 16 hours (two shifts, two man teams) on Sunday would be $9360 producing the minimum loss to the district of $5700. The three other 8 hour time slots most amenable to two man guard team coverage (least cost to the district) are Monday, Wednesday, and Thursday evenings (4:00 PM to midnight).

Equal coverage of all schools in the Complex does not make sense either since 29% of the incidents and 22% of the costs took place at the high school, 19% of the incidents and 10% of the costs took place at the junior high school, and 9% of the incidents and 12% of the costs took place at 112th Street Elementary School; these schools accounted for 57% of the incidents and 44% of the costs. Coverage should be distributed to account for where and when incidents and costs are occurring.

The above points to the need for simulation of incident occurrence and costs using Monte Carlo techniques. This would allow for the determination of expenses (costs) and allocation of security resources for a generalized pattern over the long run that would minimize vandalism and crimes for the Jordan Complex. Using the data available from the Security Agency, with the variances involved, this is not sensible in this study. This type study and the description of strata technique described in it would be extremely amenable to Monte Carlo simulation techniques on "well-behaved" data (or "well-described" data) for known cost distribution.

Limitations of Analysis:

The researchers find the aggregate cost total for the Jordan Complex of $36,120.19 extremely surprising. On the basis of interviews with security guards, personnel from the office of assistant superintendant, principals, teachers, and concerned parents, the researchers find this figure is at serious variance with the subjective appraisal of the crime and vandalism problem of the parties concerned.

The researchers can account for this discrepancy by the cost accounting procedure used by the Los Angeles City Schools in determining the costs of crime and vandalism. As in the United States Army, labor is considered to be a free good with zero marginal productivity and cost. The cost of crime and vandalism is measured in terms of costs of materials destroyed and needing replacement. The principal and school staff, including teachers, can spend one week indexing and alphabetizing attendance and academic records scattered on the floor by vandals and yet this incident would be reported in security records as having caused <u>zero costs</u>! The treatment of school labor as having zero cost in terms of clean-up from vandalism can only be based on the supposition that school administrators and teachers need not spend all their time teaching and educating children. At a time when the public school's educational productivity is being seriously questioned this indeed is an embarrassing admission.

Although the researchers have their own question about the productivity of school labor, they would not be this bold in their assessment and would not value it at zero. Instead the researchers suggest that the school system should place a value on the time of its employees equal to their salary per hour and include costs of labor and time lost costs in the costs of vandalism and crime in the school.

The other limitation of the analysis is in the assumption that patrol cars and surveillance devices have no deterrent value. Although the researchers have found no hard data on deterrence with either patrol cars and surveillance devices, they find that the assumption of zero deterrent value has not been justified. The foundation for expenditures for patrol cars and surveillance devices is especially important since the school system has been authorized funds by the school board for three new patrol cars, and hundreds of thousands of dollars in new surveillance equipment, to be used by the schools including those in the Jordan Complex.

Conclusions, Recommendations, and Summary:

First, the study shows the need to survey the schools in the Complex to determine the labor costs resulting from crime and vandalism. Teachers would be asked to estimate the time spent redoing school units and time lost in terms of student performance (some amount of money would be necessary to, in some cases, give students additional instruction to compensate for loss in class instruction). For example, Jordan High School repeatedly has had its typewriters stolden. The damage to the vocational education of students should be in some way estimated to be included in cost figures on burglary. .

The inclusion of labor costs and costs to student education will considerably reduce, in the researchers' estimation, the tremendous variance presently found with cost data on school crime and vandalism. The data will become much more well-behaved. Thus, the researchers believe, it will become more meaningful to use Monte Carlo techniques to generate incident and cost data for use in decision making. It is also imperative that an investigation of the distribution of frequency versus costs of incidents is undertaken to produce well-defined or well-described data (The Biomeds can do this for specified cost intervals and with specified transgenerations.) Once the distribution is available Monte Carlo techniques of simulation of crimes upon schools becomes useful and effective.

Finally, the researchers would like to see some effort made to estimate effectiveness of on-site surveillance devices.

This would lead to more informed decisions on how to trade-off less man power with more on-site surveillance devices. At present the school district is installing more and more security devices. There must be enough security guards to answer the alarms in a reasonable time to apprehend thieves and vandals.

The results of this study show once again that the educational planner is only as good as his data. Despite the high expectations of these two researchers to use mathematical modeling techniques, data limitation forced them to use only simple statistics and a "canned" Biomed program giving strata description, with modified cross tabulations by sorting procedures on the variables of interest.

The above should not be interpreted as a failure on the part of mathematical modeling techniques. On the contrary, the frustration of the researchers on not being able to use mathematical modeling techniques led them to find serious inadequacies in terms of security division data processing: (1) as part of an information system for decision makers, and (2) in the quality of the data collected (restricting costs of crime and vandalism to material damages instead of including all costs, especially labor and classroom disruption).

In conclusion, if educational planners are to use the types of planning and management tools presented in systems analysis and mathematical modeling for the problem of crime and vandalism in the public schools, serious examination of the quality of existing information collection and information retrieval processes must <u>first</u> be performed.

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