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EFFECTIVE STATISTICAL PRESENTATION FOR POLICE ADMINISTRATORS

JOHN I. GRIFFIN

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Certain statistical techniques can make a direct contribution to the accomplishment of the police mission in the community and can therefore be termed "statistics essential for police efficiency" (8). The statistical procedures considered in this paper are descriptive and not analytical methods, and although widely used in other areas of administration, are not as yet thoroughly understood by the police profession. The slowness with which police administrators, in general, have adopted modern statistical methods appears to be a consequence of fear that they involve expensive equipment and a quality of professional training which cannot be found in the typical police department. While the more advanced methods of statistical analysis are complicated and in many cases, not directly relevant to the routine of police administration, descriptive statistics, in particular statistical presentation, are essential for police efficiency (2) (3) (10) (16).

Large quantities of data are now collected in the routine of police work and additional data are yielded by the many special surveys undertaken from time to time in a department (4) (6) (11). It may be anticipated that sample survey methods will prove to be of increasing value in police work and may even become a standard procedure for collecting data rapidly in respect to specific problems of community and police significance (7). It is not the concern of this paper, however, to discuss data collecting. The reporting of crime data and the maintenance of police records are well known to administrators, and the methods of collecting have become reasonably standardized thanks to the efforts of the International Association of Chiefs of Police and the Federal Bureau of Investigation (4) (5).

TABULAR PRESENTATION

Accumulated data must be effectively presented in order to be of any value and to justify the expenditure of time and effort that has gone into the collection of the figures. This requires effectively prepared tables and charts. In the preparation of this paper a comparative study was made of the annual reports of 40 of the larger police departments in the United States. Generally, the standards of statistical presentation were unsatisfactory. The result was to reduce the effectiveness of the data reported, to make a less favorable impression on the public and hence not to tell the police story in the best possible way. As the *Manual of Police Records* puts it "Enterprising police are making news rather than history in the preparation of their annual reports" (4). The essence of making news is effective presentation.

While statistical tables are frequently regarded as "dry" they are the only results of the data-collecting process which the using public sees. As a consequence the public's evaluation of all the statistical operations of a police department tends to be based on the final step, that is, upon the presentation. "Good presentation transmits the quality of the previous operations and, in turn, assists in making clear the meaning of the material" (1). It might be said that a well-prepared table is like an attractive show window in a store—it helps to sell the merchandise. Of course a well-prepared table does not improve the quality of the data if they are erroneous or inadequate.

Effective tables can be set up at minimum cost with the use of the typewriter. Ingenuity must be used, however, because the typewriter does not provide effective type-size contrast, variable spacing, or flexible ruling. The electric typewriter is some improvement over the standard models because the type-impressions are more uniform, an important consideration if the tables are to be reproduced from typescript by photographic methods such as offset printing. Substantial improvement in the format of tables can be achieved by the use of the Vari-Typer. This machine is similar to a typewriter but provides interchangeable type faces and variable spacings which make it possible to produce copy with a printed appearance. While these machines are expensive, most police departments should have access to business organizations owning Vari-Typers, and the effort of arranging to have tables typed on a machine of this sort is well worth while. If the tables are to be set in type by a printer, unless the firm is experienced in statistical work, it is best to submit table work properly setup and ruled for the guidance of the printer.

A table has several well-recognized parts: title, headnote, body, footnotes, and source. Headnote and footnotes may not always be needed, but every table must have a title, body, and source. The title should be brief and clear and answer the questions what?, when?, where?, how classified? Thus a table which is titled "Juvenile Arrests" is not adequate, it should be complete, for example "Juvenile Arrests, Big City, 1956, By Sex." The body of a table is the place where the data are shown. The body is usually separated from the title and the source by a top horizontal and bottom horizontal rules. There is usually a vertical rule to separate the stub from the columns of data. The stub is the first column to the left which identifies the rows of data in terms of their classification by years, months, types of offenses, precinct or district of occurrence, and the like. It is well in designing a table to bear in mind that the position of major emphasis in a table is at the top of the columns and the left-hand column. Thus, if the total of Part I offenses is the most important statistic it should be shown at the top of the column of data. If in comparing columns of data it is desired to emphasize the most recent year, let us say, this particular column should be placed in the left-hand position in the table.

ROUNDING NUMBERS

The proper handling of numerical data shown in tables is important. Ordinarily, when all figures in a table are expressed in the same unit, as in thousands of population, the unit is stated under the title. If the units vary in the several columns of the table, as in the comparison of police department budget appropriations with population growth, the appropriate unit should appear at the top of the column to which it

relates. Since perfect accuracy is rarely attained in statistical work and since data are frequently estimates, it is disconcerting to the reader to find tables which are not simplified by means of a rounding-off procedure. This is not to suggest, of course, that a city in which a total of 15 homicides are reported in a given year would round this off in a tabular presentation. However, the attempt to record the value of stolen property with precision carried to dollars and cents strongly suggests "spurious accuracy" and a lack of understanding of the true precision of the recorded figures. It is good statistical practice to prepare "reference tables" which present unrounded figures for the record and to prepare "text tables" in which rounding, use of percentage comparisons, and index numbers are liberally employed in order to simplify the tables and hence to make them more effective instruments of presentation.

In rounding numbers a digit less than five or a fraction less than one-half is discarded. When rounding off a digit greater than five or a fraction greater than one-half, one is added to the next digit to the left. When dropping an even five or a fraction of one-half round to the even figure, that is, do not change an even digit next to the left, but raise an odd digit by one. In order to obtain the total to be rounded, add the un-rounded detail figures and adjust the detail figures so that they do add to the rounded totals. In the same manner, percentage distributions should add to 100. If the components of the distribution do not give exactly 100 as the total, then the largest element in the distribution is arbitrarily adjusted (1) (15). These principles are illustrated by Table 1.

GRAPHIC PRESENTATION

The police administrator should take particular care in the preparation of charts. Graphic presentation has been called "a functional form of art" and requires not so much a dependence upon drafting tools as upon an understanding of the types of charts which are acceptable in particular situations and the most effective method of presenting the subject visually (14). To an increasing degree organizations concerned

TABLE 1

Original Data Carried to 2 Places	Rounded to One Decimal	Adjusted to Add to 100
83.67	83.7	84.0
2.92	2.9	2.9
1.37	1.4	1.4
1.71	1.7	1.7
.85	.8	.8
1.37	1.4	1.4
.34	.3	.3
.85	.8	.8
.34	.3	.3
1.37	1.4	1.4
2.06	2.1	2.1
.34	.3	.3
2.57	2.6	2.6
99.76	99.7	100.0

with presenting a message to the public are relying upon chart forms and the F. B. I. has recommended this same policy to police departments (4). The police administrator is necessarily in competition with other public and private agencies with messages to present. Unhappily, the study of police department reports upon which this paper is based, shows the standards of graphic presentation to be, in general, not satisfactory.

Such chart work will not impress the public as the best effort of a professionally trained police department. The tendency for newspapers to reproduce charts prepared by local police departments as illustrations for news stories and the display of charts in the course of television programs, where the police chief or other senior personnel discuss police problems before the public, is an additional justification for the preparation of acceptable graphic forms. Many police administrators appear to believe that the preparation of effective charts is a highly complex and expensive procedure beyond the resources of their department. This is not the case, however.

In the last few years a number of aids for rapid chart preparation by non-professionals have been developed and with their use it is possible to prepare completely acceptable charts at a minimum cost. First of all printed graph papers should be used when plotting the data, and the entire chart should be blocked out on this paper. A great variety of rulings and sizes are available commercially. Among the major manufacturers of graph paper who issue descriptive catalogs are: Codex Book Co. (Norwood, Mass.), Keuffel & Esser Co. (Hoboken, N. J.). The very troublesome task of lettering the title, scales, and source note is greatly facilitated by using either lettering sets or prepared letters. Lettering sets, which are comparatively inexpensive can be used by unskilled personnel and provide a wide choice of letter sizes and styles, although it is best to use simple block letters on charts. Lettering sets now on the market include Wrico (Wood-Regan Instrument Co., New York, N. Y.), Leroy (Keuffel & Esser Co.).

Prepared letters, which can be stuck on, are available in many type styles and sizes and provide a uniformity of appearance which otherwise can be obtained only by having a printer set the titles and then stripping them on the charts. One convenient form of prepared letters is Fototype (Fototype, Inc., Chicago, Ill.). This system consists of printed letters in pad form which can be assembled and fastened to the chart quite easily. Another aid to the non-professional is prepared adhesive sheets which are printed in various crosshatching patterns. Such sheets are sold in all art supply stores under such names as Zip-A-Tone and Visitype and require no skill in tracing or drawing to use them. They are available in colors and make it easy to add the color dimension to chart work should this prove desirable as in the case of display charts to be shown at public hearings and lectures. Sometimes Kodachrome transparencies of such charts can be projected in slide projectors and prove extremely effective before large audiences. A police department desiring to experiment on a limited scale with these newer techniques of chart making, might find it desirable to utilize prepared kits available from Chart-Pak, Inc. (Stamford, Conn.), which include various types of adhesive backed rolls or sheets for making bar, column, and line charts, as well as pictograph symbols in sheet form. Titling may be accomplished by typing on self-adhering correction paper and mounting the titles on the charts.

Police department reports contain examples of common charting errors. As in the case of tables, titles should be complete. A serious error, frequently encountered, is the failure to indicate the zero position on the vertical axis of the chart, thus preparing a chart of authorized departmental personnel where the lowest value shown is 300 instead of zero. This kind of error results in what Darrell Huff calls "the geewiz graph" in his delightful and informative book, *How to Lie with Statistics* (9). It is clear that the omitting of the zero base line of the chart introduces a serious distortion. Other errors frequently observed include the incorrect plotting of the data in relationship to the units of time, poor selection of shading in bar charts, and improper use of pie diagrams. All of these defects are easily remedied. Any member of a police department with a leaning toward imaginative visualization of data can create acceptable charts if he has habits of neatness and sufficient patience to carry out the detail work. Such a person is not necessarily, nor even ideally, a trained draftsman. He should be a person who always favors the simpler ways of presenting ideas. A copy of one of the several excellent books on graphic presentation, such as Schmid or Spear should be available at all times for reference (13) (14).

In police work the simplest possible chart forms should be utilized. Since most of the presentation of police data is directed to the general public which "reads as it runs" or to busy public officials, the charts must not be complicated. One idea per chart is adequate. The most important forms are bar, line, and pie. The bar chart employs vertical bars if the purpose is to compare changes in quantity of one item in various points in time, as in the comparison of year to year changes in crimes against property. If the bar chart is used to compare a number of items at a definite point in time, horizontal bars are used, as in a comparison of types of narcotics utilized by addicts. The bar chart loses its effectiveness if too many bars are used on any one chart. Frequently, bars are subdivided, either in absolute or percentage terms. In subdivided bars the sub-divisions should be indicated by different types of cross-hatching.

A line chart is used when an extended period of time is involved and where trend is the important element. A line chart would be suitable when showing changes in traffic fatalities since World War II. It is a serious error to attempt to plot too many lines on one chart, it is better to make several separate charts each to the same scale. For special purposes a semi-logarithmic line chart or "ratio chart" may be utilized (13). A "ratio chart" permits comparisons in terms of percentages and consequently is an exception to the basic rule that the zero point must be shown on the vertical axis, on this type of chart zero is never shown. A chart of this kind would be a proper solution to the problem of comparing changes in total patrol force personnel and total arrests or police salary changes and cost of living changes (12).

A pie chart is a circle divided into component parts which are expressed in percentage form, as in the comparison of adult and juvenile apprehensions for auto thefts in a given month. It is improper to utilize pie diagrams of varying diameters in showing changing total magnitudes, the only proper use is in the comparison of percentages of a total. If a pictograph is felt to be effective because of its attention getting characteristic it must be properly used. Such a picture must be a one-dimensional comparison, not two-dimensional in character, that is a larger magnitude must be shown by more symbols of the same size not larger size symbols (9). A pictograph must have

statistical, that is quantitative, significance and not merely be a picture. The symbols employed must be simple, and any attempt to picturize all types of police service is doomed to failure. An ordinary bar chart is preferable if the symbols become too complicated. It is best to use no more than 15 or 20 symbols in the longest line of symbols.

Statistical maps include dot maps, shaded area maps and cross-hatched maps. The use of a properly prepared base map of the city or town is essential for clarity and in the case of certain police problems block maps are needed. Although the use of large scale wall maps is a familiar device in police work for the plotting of arrest, crime, traffic, and population patterns, these maps are almost invariably ineffective when reproduced in reduced size in reports. Unfortunately, the areas of intense police activity are likely to be heavily concentrated geographically and not show up effectively on a statistical map. Other forms of presentation should be sought in such cases.

This paper has been concerned with the ways of making more effective the tables and charts prepared by police administrators. Presentation of statistical data has become one of the more important responsibilities of the administrators since intensive data collecting is of little value if the results are not handled effectively.

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