

YOU MEAN I AM GOING TO ANALYZE DATA—PART II

(ANALYSIS OF DATA)

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Dear Reader,

In our previous letter we discussed about nominal level of data. "Do you remember the other kinds of data we mentioned earlier?"

"Yes, there are four levels of data—Nominal, Ordinal, Interval and Ratio Level Data."

Ordinal Data

Well, the second type of data is called **ordinal data**. This is placing observations into a set of categories on a scale which has a **rule of order** (high, medium, low). The level implies **ranking**, but—there is no implication of equal distance between groups on the scale.

"I don't understand that either. Well, I understand the idea of ranking, because in nominal data, any male-female, neither is higher or lower. But say levels of nurses (staff nurses, supervisor, director) there is a rule of order. But what about that business of no equal distance between groups

on a scale?"

"In your nurse example, is there just as much ranking space between a staff nurse and a supervisor as there is between a supervisor and a director?"

"How can one know?"

Well, is a director twice as high as staff nurse? "No, you couldn't say that there was equal space between the rankings."

If you look above at the second half of the definition, you see it says that in the ordinal scale, there is no implication of equal distance between group on the scale.

"I get it."

Take Abdellah and Levine's attempt to create a graphic rating for assessing nursing care. The categories are ranked in order from "care of the highest quality," to "very poor care, with varying degrees of service in between."¹

Care is of highest quality could not be better.

Care very good. A few things could be improved but for most part fine.

Average care No better or worse than could be expected.

Care is below average. Some services below par.

Very poor care. Many services could be improved.

So they took a concept of care and conceptualized it along a rank order scale. Observe a second example of ordinal level data:

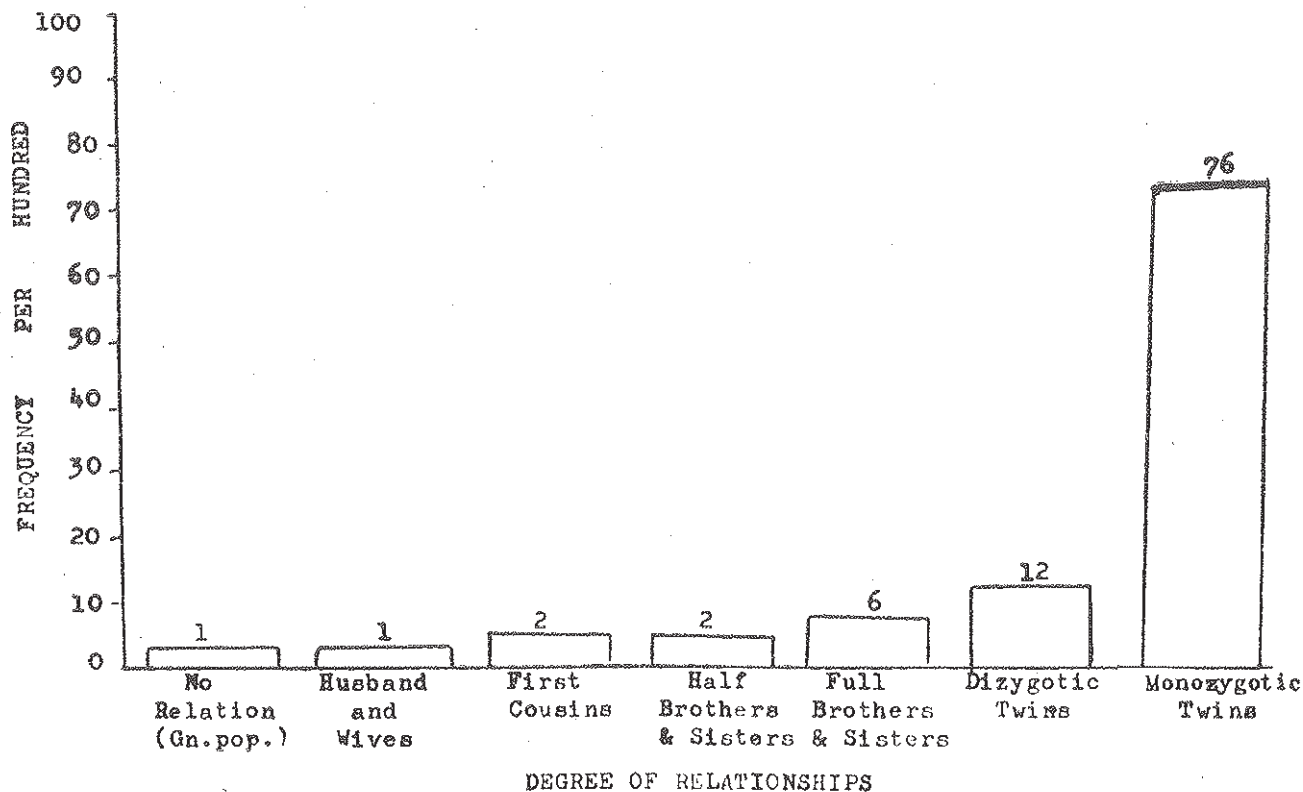


Fig. 1. Frequency of Schizophrenic Nurses among Relatives of Schizophrenics.

¹Faye Abdellah, E. Levine, *Better Patient Care Through Nursing Research*.

Fig. 1 shows the frequency of Schizophrenic Nurses for 100 persons among Relatives of Schizophrenics. Note:

- * Can put in categories but can not add up or get percentages
- * No numerals assigned.

"That is an interesting example—here it is degree of relationship that's ranked, and no indication of equal distance between categories."

"At least a boy could not say that he was twice as close to his fraternal twin than he was to his full brother."

Right. Now again, you can put your data in categories but you cannot add up the columns and get percentages. For example, in Figure 2, you could not combine the registered nurse and auxiliary nurse columns—ordinal data does not lend itself to that kind of treatment. Observe that you can put in categories but can't add up or get percentages.

"A good many of the studies in nursing, though, seem to be at these two levels."

That's right, because in nursing, health and social sciences, measurement is still in its infancy, and refinement will take time. The physical sciences are much more advanced in their levels of measurement and hence in their statistical freedom to use many kinds of techniques.

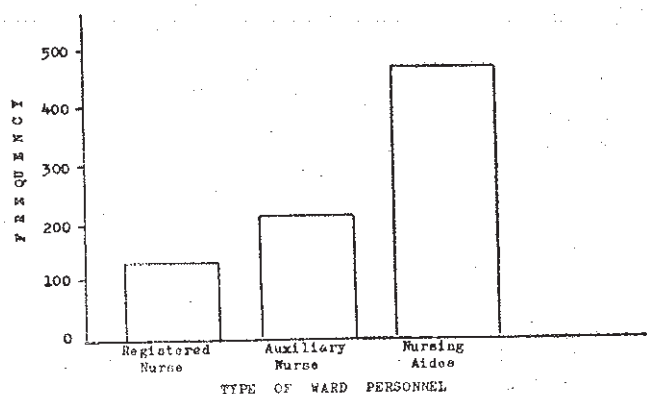


Fig. 2. Distribution of Ward Personnel.

So, for ordinal level data, medians, percentiles and rank order correlation are available; techniques are still limited, but not as severely as with nominal level data.

Interval Level

The third level of measurement is the interval scale. Here we place observations on a scale that has **equal spaces** (intervals or relative distance) between the units as well as a **rule or order** as shown in Figure 3.

"Interval level scales possess the characteristics of nominal and ordinal scales, especially the rank-order characteristic. In addition, numerically equal distances on interval scales represent equal distances in the property being measured."¹ Let's say we measured three items on an interval scale and got the values of 21, 20, 19, we can say that the difference between the first and the third number is two which is one more than the difference between the second and third measure.

"So here I can add and subtract the intervals—not like the ordinal scale."

That's right.

But we cannot say, using an interval scale, that one of the measure was twice as great as the other. We are not adding or subtracting quantities or amounts, but intervals or distances. Here we are speaking in terms which reflect units of measurement rather than "more or less." For interval level data then, because the units or intervals of measurement are equal, mathematical relationships can be explored.

"Such as — — ?"

Such as: means, standard deviation, product moment correlation, standard error and variance; plus all those used for the other two levels. Almost all statistical methods are appropriate for interval level data.

Ratio Data

The final and highest level of data is called **ratio level data**. Here not only are there some rules of order (ordinal quality), and equal intervals (interval quality), but there is also a **meaningful zero point**. For example, if we are looking at the income of villagers by occupational category we might have the following bivariate data given in Table 1.

¹Fred N. Kerlinger, *Foundations of Behavioural Research*, N.Y. Holt, Rinehart and Winston, 1973, p. 437.

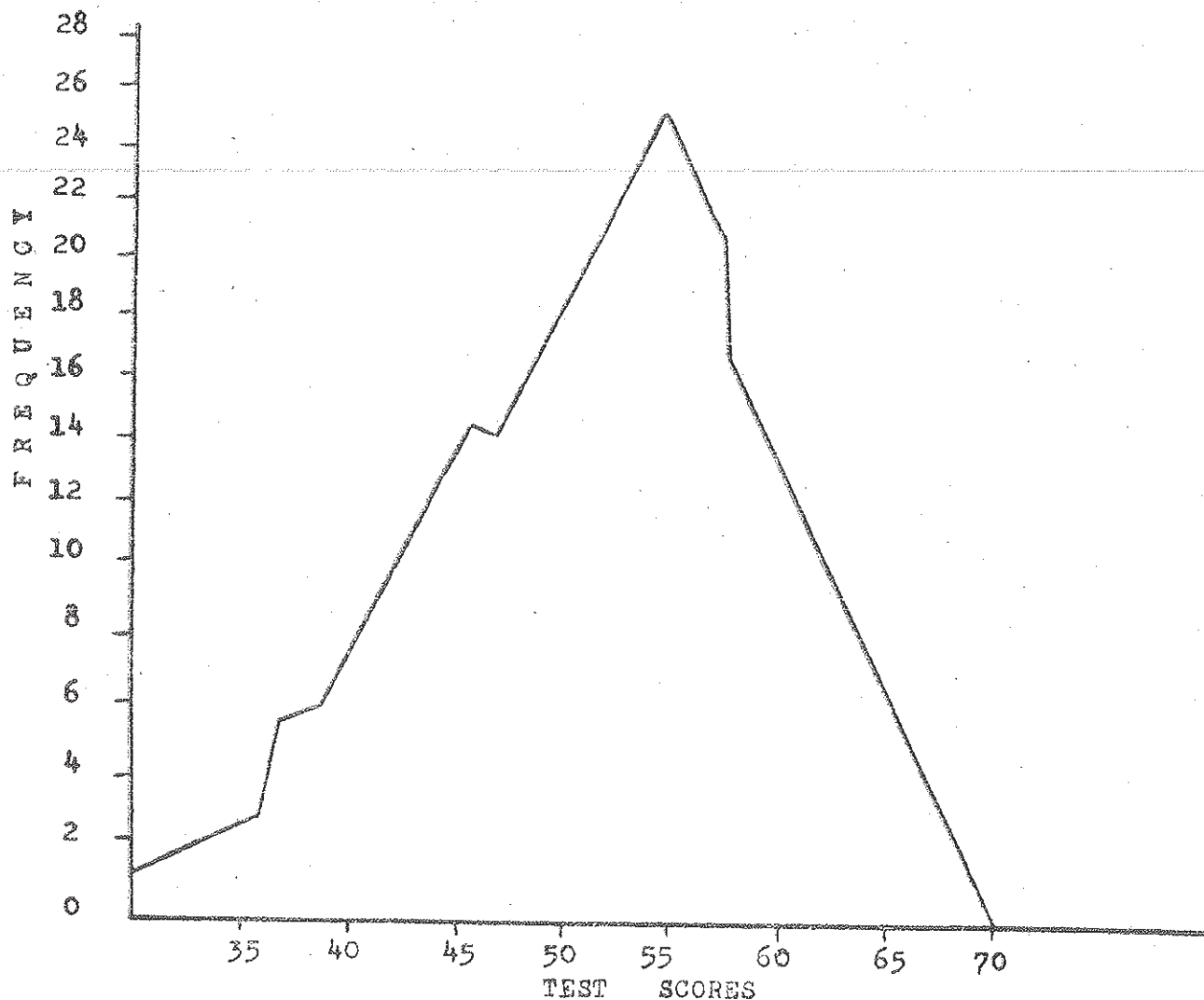


Fig. 3. Frequency Polygon of Nurses Essay Test Scores.

Thus, in addition to possessing the characteristics of interval level data, ratio level data contains an absolute zero.

Table 1. Monthly Income and Occupational Background of the Respondents

Monthly Income	Occupational Category		
	Farmer	Carpenter	Blacksmith
401—500	10	5	1
301—400	70	35	32
201—300	15	30	47
0—200	5	10	20

Note: }
Equal
Intervals
Zero
Point

"So I could say that the farmer could earn twice as much as, say, the carpenter."

Right, because of the meaningful zero point, which became a very desirable quality in a variable, and establishing a zero point in one of the goals in defining variables.

Summary

Let's see if we can summarize very briefly the two letters on data analysis.

Data is: collected, organized, summarized, analyzed, interpreted and presented.

"Right, the levels of data are?"

"Normal, ordinal, interval, and ratio and I think I need a rest. This will take some review.

And, some practice. We'll include some interesting problems for your—but before that—time for break.