A Simple Introduction to Qualitative Data and its Qualitative or Quantitative Analysis

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The Difference between Qualitative and Quantitative Data

In general, if data comes from measurements, and are in numerical form, the data are quantitative. If the data come from observations, and are not in numerical form, the data are qualitative. Descriptions, verbal images, colors, tastes, smells, shapes, and beauty are all qualitative.

Qualitative data can be observed, but it can't be measured. It deals with qualities of what is being described, thus the term "qualitative".

Quantitative data can be measured or counted. Quantitative data are expressed in numbers signifying weight, speed, length, height, thickness, consistency, strength, temperature, decibels, horsepower, cost, age, members, or monetary value, or anything else that can be measured or counted. It deals with quantities of what is being described, thus the term "quantitative".

Table 1: Qualitative and Quantitative Descriptions

Object or person	Qualitative Description	Quantitative Description
Sarah	Nice, friendly young woman, curly brown hair, personable, from Kansas, civic minded, religious, athletic, works as a mortgage broker, etc.	23 years old, weighs 112 lbs., 5'8" tall, finished 17 years of schooling, has a 27"waist size, earns $38,000 per year, etc.
car	Blue Toyota Camry sedan, comfortable, sporty, great sound system, automatic transmission, great condition, variable valve timing, double overhead cam, airbags, etc.	3 years old, four cylinder, 2.4 liter displacement, 160 horsepower, 16 valve, 9.6 compression ratio, four doors, 7 speakers, 33 mpg highway, 18.5 gallon fuel tank, 189 inches long, 71 inches high, 59 inch wheelbase, 3,109 lbs., etc

Quantitative research deals with numbers, while qualitative research deals with descriptions and meaning. Quantitative research measures or counts, while qualitative research observes and describes.

Quantitative research tools include: inventories, tests, measuring devices. With qualitative research, the researcher is the principle research tool. The researcher becomes familiar with the social, cultural and linguistic context of what is being studied, and then based on this broadened perspective, observes and describes.

Myths and Misunderstandings about Qualitative Data and Research

Myth 1: Quantitative data and research are good and scientific, qualitative data and research are neither good nor scientific

Both qualitative research, resulting in qualitative data, and quantitative research, resulting in quantitative data:

- Can be used for just about any kind of research question
- Are valid and scientific
- Are rich and valued scientific traditions

Much of what we know comes from qualitative research methods and data. Most of the material in any encyclopedia is qualitative. People, who are the main research tools of qualitative research, are incredible scientific "machines", able to perceive, understand, analyze, categorize, interpret and explain all types of phenomena. Qualitative data and research are in no way second class to quantitative research and data. In fact, a good argument can be made for qualitative research and data being superior.

Myth 2: The opposite of good quantitative data is qualitative data

The opposite of good quantitative data is bad quantitative data. And the opposite of good qualitative data is bad qualitative data. Both quantitative data and qualitative data can be bad in the same ways.

Bad Sampling

If the sample doesn't represent the population, the data collected from the sample are bad are not able to be extended to the population. And this is true for both quantitative data and qualitative data.

For example, if during an election year, someone did a study on public opinion as to who would be the next president, and did that study in the coffee house across the street from the campaign headquarters of one of the candidates, the sample would be biased. It would not represent the larger population of the state or country. It would not matter if the research was quantitative, counting straw votes, or qualitative, based on interviews, the resulting quantitative or qualitative data would be flawed and biased because of bad sampling.

My favorite example of bad sampling comes from a newspaper article I read years ago. It stated that a certain scientist went out one night to a pond with a frog net, and caught all the frogs he could. Back at his lab, he noticed that 40% of all the frogs he caught only had one leg. So he concluded that 40% of all the frogs in the State where he lived had only one leg. Firstly, his one pond was not a random sampling of the ponds in the States, and in no way should his results have been extended to the whole State. Perhaps his pond was next to a dioxin producing plant, or a frog leg restaurant. And secondly, and more pertinent to the point of this section, a one-legged frog is easier to catch than a two-legged frog. A two-legged frog hears a noise and jumps straight ahead, maybe 6 feet or more right into the pond. A one-legged frog hears a noise and jumps in pitiful, comical circles. This scientist's sampling had too many one-legged frogs because they are easier to catch.

Bad sampling results in bad data, either qualitative or quantitative.

Observers Skewing the Responses

If the responses are skewed by who the researchers are, or what they say, the data will be bad data. And this is true for both qualitative and quantitative data.

Imagine this hypothetical situation: there are two surveys being done about alcohol consumption at a university, the only difference between the two being in one case the researchers introduced themselves as representatives of Beck's Beer, and in the other case the researchers introduced themselves as representatives of Mothers Against Drunk Driving. What do you think would happen? What results would you expect? The researchers who introduced themselves as sent by Beck's Beer would observe or record much higher amounts of alcohol consumption than those associated with Mothers Against Drunk Driving. And it would not matter if the research was quantitative, counting the ounces of alcohol consumed, or qualitative, based on participant observations.

Imagine a different hypothetical situation: with two different researchers dealing with the same test population, the same location, the same general time, and the same questionnaire about the vernacular language and the official language, with one researcher introducing themselves as part of a group interested in revitalizing vernacular languages and the other researcher introducing themselves as part of a group interested in the educated use of the official language in that country. What do you think would happen? The researchers would probably get significantly different results, whether they were using qualitative or quantitative designs.

Incorrect Assumptions

If the data is based on incorrect assumptions, then the data will be bad data. And this is true for both qualitative and quantitative data.

For example if someone was counting or observing the number of men in Cameroon who hold hands in public with other men as part of a qualitative or quantitative study to give insight into sexual orientation in that country, they would be basing their data on the wrong assumption that men holding hands in public in Cameroon is an indicator of homosexuality. An American researcher could make this mistake, because in America, men holding hands in public is a good indicator that the men are homosexual. In

Cameroon, as in many other countries in the world, this isn't the case. Men who are friends and who are not homosexual often will hold hands in public.

An incorrect assumption means that the researcher has collected the wrong data, data that doesn't really relate to the research question. And both qualitative and quantitative data can be bad because the data are the wrong data through incorrect assumptions.

The opposite of good quantitative data is bad quantitative data. And the opposite of good qualitative data is bad qualitative data. Both quantitative data and qualitative data can be bad through poor sampling, observers skewing the responses, or incorrect assumptions.

Myth 3: Quantitative research is confirmatory while qualitative research is exploratory

Much of quantitative research is confirmatory, but there is also a lot of exploratory quantitative research. And much of qualitative research is exploratory, but there is also a lot of confirmatory qualitative research. Both traditions, qualitative and quantitative, are used to address all different types of research questions.

The Real Difference between Qualitative and Quantitative Research

According to William M.K. Trochim, and I agree with him, the real difference between qualitative and quantitative research is ontological and epistemological. For a quick review of these terms:

- Ontological: means having to do with the nature or being of existence or reality
- Epistemological: means having to do with the nature or being of knowledge

People who view reality as tied into societal perceptions and interpretations of what is seen, the emic, often view knowledge as something to be gained through becoming immersed in someone's culture and language. These people and philosophies lean toward qualitative research.

People who have a view of reality that says there is one unitary reality, and it is independent of perceptions and interpretations, often see knowledge as something that can be gained through testing and measuring parts of that unitary reality. These people and these philosophies lean toward quantitative research.

In phonology, part of the task is to see how the sounds of a language (phones) are grouped together into psychologically real units (phonemes). For example, in American English, the aspirated [t] at the beginning of 'top', the unaspirated [t] in 'stop' and the flapped [t] in 'butter' are three sounds (phones) that are grouped together in the psychologically real /t/ in English (phoneme). For good and fluent reading, it is this /t/ phoneme that needs a letter. Each of the sounds that are grouped together in the psychologically real /t/ phoneme doesn't need their own letter. Reality, at least in this aspect of reading, is associated with the emic, the societal perceptions and interpretations of what is seen or heard.

Table 2: Difference between Qualitative and Quantitative

	Nature of Reality	Nature of Knowledge
Qualitative	No single unitary reality apart from our perceptions: reality is in the emic, the societal perceptions and interpretations of what is seen	Through becoming immersed in someone's culture and context
Quantitative	Single unitary reality apart from our perceptions	Through testing and measuring parts of that unitary reality

Lincoln and Guba (1985) examined these different approaches in their work, "Contrasting Positivist and Naturalist Axioms (Beliefs and Assumptions)" Table 3, below is adapted from their work.

Table 3: Positivist and Naturalist Axioms

Axioms About	The nature of reality	The relationship of knower to the known
Naturalist Paradigm (Qualitative)	Realities are multiple, constructed, and holistic.	Knower and known are interactive, inseparable.
Positivist Paradigm (Quantitative)	Reality is single, tangible, and fragmentable.	Knower and known are independent, a dualism.

The real difference between qualitative and quantitative research and data has to do with the nature of knowledge and reality. And because it is sometimes useful to look at knowledge and reality from both a positivist paradigm and a naturalist paradigm, qualitative and quantitative research are complementary. When an in-depth, culturally based understanding is necessary, qualitative research is called for. When there is a need for "proof facts", often a quantitative approach is what is needed.

The Strengths of Qualitative and Quantitative Data

This complementary nature of qualitative and quantitative research methodologies and data leads to a short discussion of the strengths of qualitative and quantitative research and data.

The main strength of qualitative research is that it gives rich and detailed data that give insights into peoples' behavior and views of reality.

The main strength of quantitative research is that it provides data that is easily gathered and analyzed with statistical techniques (e.g., variability of the data, central tendencies between groups), is easy to present in graphs and charts, and is good for convincing arguments.

And of course views of these relative strengths of qualitative and quantitative research are influenced by people's views of reality and knowledge.

Qualitative Methods

The main qualitative methods are:

- Observation:
- Interviews: question and answer format to gather data. An "in-depth interview" is an extended interview between a skilled researcher and a subject, with the goal of eliciting detailed material to be used in analysis,
- Focus groups: this method is half interview, half observation. It is done in an interview format, but with a group instead of one subject. It has the advantage of presenting an opportunity to observe group dynamics,
- Document studies: the study of public records or private documents that can provide relevant data, and
- Recording studies: the study of public or private video or audio recordings with the goal of finding relevant data.

Analyzing Qualitative Data Qualitatively

This section draws heavily on Susan Berkowitz's 1997 work "Analyzing Qualitative Data". Berkowitz presents a list of questions that the analyst should be "asking and reasking" when involved in qualitative analysis. She then goes on to discuss the three main processes that Miles and Huberman (1994) outlined for Qualitative analysis.

Berkowitz's five questions are:

"Throughout the course of qualitative analysis, the analyst should be asking and reasking the following questions:

- *What patterns and common themes emerge in responses dealing with specific items? How do these patterns (or lack thereof) help to illuminate the broader study question(s)?*
- *Are there any deviations from these patterns? If yes, are there any factors that might explain these atypical responses?*
- *What interesting stories emerge from the responses? How can these stories help to illuminate the broader study question(s)?*
- *Do any of these patterns or findings suggest that additional data may need to be collected? Do any of the study questions need to be revised?*
- *Do the patterns that emerge corroborate the findings of any corresponding qualitative analyses that have been conducted? If not, what might explain these discrepancies? "* (Berkowitz 1997:1)

The processes that Berkowitz presents for the analysis of qualitative data are: data reduction, data display, and conclusion drawing and verification.

Data reduction has to do with organization and any needed reduction or reconfiguration of the data in view of the research questions. Miles and Huberman (1994) state that, *"Data reduction refers to the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written up field notes or transcriptions."*

Data display, according to Miles and Huberman (1994) has to do with presenting information in a way that facilitates the drawing of conclusions. It involves organizing, assembling, and compressing the information in the way that best facilitates the drawing of conclusions. It can have to do with a new way of arranging the data that leads to a new way of thinking about the data. Flow charts that map out critical paths, decision points or supporting evidence can be helpful.

Conclusion drawing is the final step of qualitative analysis. The analyst considers what the data mean in view of the research questions. Attention is paid to interconnections in the data, both expected and counter-expectational interconnections.

Analyzing Qualitative Data Quantitatively

All qualitative data can be coded so it can be treated and analyzed in numerical form, quantitative form. For instance, if you have 125 questionnaire responses to a particular question, you can code the responses into two categories, those that responded "favorably" and those that didn't. You, of course, would have to define "favorably". Then, if you had 97 "favorable" responses and 28 "non-favorable", you could see and say that "78% of respondents were favorable to . . . ". You could then do some other

analyses, made possible by the quantitative analysis. You could, for example, note that of the 28 non-favorable responses, 22 of these were from women. So you could see and claim that 22 out of the 60 women in the study (37 %) gave non-favorable responses, while only 9% of the men (6 out of 65) gave non-favorable responses to the question. You then, if you wished, could see if these percentages were statistically significant.

The main idea is that all qualitative data can be coded so it can be treated and analyzed in quantitative form.

Exercise in Coding Data

Here is a little exercise in coding data. Consider the following data in Data Set 1, below.
S_1 to S_{10} are subjects 1 – 10.
M/F is male or female,
10, 20, 30… are decades of life,
NE is 'no education', PE is 'primary education', and SE is 'secondary education'
VL is 'vernacular language', LWC is 'language of wider education', and OL is 'official language'

Data Set 1: Language Ability Questionnaire Responses

S1: M30SE
VL: It is my language
LWC: very well
OL: well

S2: M20SE
VL: perfectly
LWC: very well
OL: very well

S3: F10PE
VL: I speak it
LWC: a little bit
OL: a bit

S4: M50PE
VL: very well
LWC: enough to use at the market
OL: some

S5: F30NE
VL: It is my first language
LWC: some
OL: none

S6: F50NE
VL: I speak only VL
LWC: not very well
OL: don't speak it

S7 M40PE
VL: well
LWC: OK
OL: OK

S8: F40NE
VL: well
LWC: a few words
OL: a few words

S9: F20SE
VL: the way it should be spoken
LWC: fluently
OL: the way it should be spoken

S10: M10SE
VL: It is my mother tongue
LWC: I speak it
OL: well

For this data set, examine the data. Here are all the responses given:

it is my language	none
very well	I speak only VL
well	don't speak it
perfectly	OK
I speak it	a few words
a little bit	the way it should be spoken
a bit	fluently
enough to use at the market	it is my mother tongue
some	not very well
it is my first language	

Code the responses into 3 categories.

Then code the responses into 5 categories.

Did you code the "I speak it" of Subject 3 the same as the "I speak it" of Subject 10?

From this exercise, you can learn that it is probably easier to code the responses into 3 categories than into 5 categories. You can also learn that the same words, such as "I speak it", might be categorized in different ways depending on the context. For Subject 3, the "I speak it" was at the top of her humble, low self-confidence, competence scale. For Subject 10, the "I speak it was two notches down from the top of his confident competence scale. If your three categories of claimed language competence were "Well", "OK", and "Poorly", Subject 10's "I speak it" could have been categorized in the "OK" category while Subject 3's "I speak it" could have been categorized in the "Well" category.

Clustering, Sorting, Categorizing and Coding the Data

With qualitative analysis of qualitative data, there is a process called "data display". As mentioned above, data display, according to Miles and Huberman (1994) has to do with presenting information in a way that facilitates the drawing of conclusions. It involves organizing, assembling, and compressing the information in the way that best facilitates the drawing of conclusions. It can have to do with a new way of arranging the data that leads to a new way of thinking about the data.

Quantitative analysis of qualitative data involves the same kind of process. It involves managing and organizing the data in the way that will best help answer the research questions. The process includes clustering and sorting the data. Using the terminology of Miles and Huberman (1984) it has to do with organizing, assembling, and compressing the information. However, with quantitative analysis, this process also includes the step of coding the data, assigning particular answers or observations into categories.

For example, if your research question has to do with comparing language use in the city with language use in the countryside, you first sort your questionnaires into two piles according to location (clustering, sorting, organizing assembling). You then look at the questionnaire questions having to do with

languages used in different domains. For each domain (home, market, school, …), and in each category (city, rural), you code, (coding, categorizing) count, and compile the answers relevant to this question.

So, for example, for the domain of the home, you can code the responses into those that use the vernacular at home, and those that use the language of wider communication at home. You then can count the number of responses in each category and present the data in a helpful way. Table 4, below, gives an example of this. There were 50 questionnaires taken in the city, and 50 in rural locations. For the city questionnaires, the responses about what language was used at home were coded into two categories, one having to do with primary use of the vernacular language (22 responses), and one having to do with the primary use language of wider communication (LWC) (28 responses). The same was then done for the rural questionnaires.

Table 4: Primary Language Used at Home

	City	Rural
Vernacular N	22	36
LWC N	28	14

This same information is presented below in Table 5 along with the percentage of households that reported primary use of the two languages, in order to facilitate the analysis of the data in view of the research question.

Table 5: Primary Language Used at Home with Percentages

	City	Rural
Vernacular N	22	36
Vernacular %	44%	72%
LWC N	28	14
LWC %	56%	28%

This clustering, sorting, and coding of the data can be done iteratively and/or experimentally. The general idea is to manage and organize the data in the ways that will best answer the research questions.

This clustering, sorting and coding can be done in many different ways, ranging from making piles of copies of questionnaires, cutting copies of data into strips of paper and organizing those, using spreadsheets, to using advanced database programs for the analysis of data.

The USA Center for Disease Control (CDC) has developed a program for the analysis of epidemics that is very useful in the analysis of other types of information. The program is called "Epi Info™". It is copyright owned by the CDC but shared as public domain software. It facilitates questionnaire construction, database construction, data entry, and then the clustering, sorting and coding of the data for analysis in view of social and other factors. It also contains statistics, mapping and graphing tools.

Exercises in Clustering, Coding, and Charting Data

A. Using Data Set 1, above, group and code the data as if your research question had something to do with knowing what effect formal schooling has on Official Language comprehension and fluency. Display the results in table form.

B. Using Data Set 1, above group and code the data as if your research question had something to with age and gender related patterns of bilingualism in the LWC. Display the results in table form.

Do not give categories number labels and then use those numbers (example, categories 1 to 5 with 5 being high). Rather count the number of tokens coded into each category to get your numbers. The reason for this will be explained below.

From these exercises, you can learn the importance of clustering according to the particular research question in focus.

From exercise B you can see that age can be expressed as young/old, young/middle/old, or according to decade for these data. The rule of thumb is to use the clustering that best provides data to answer your research question.

Table 6, below, presents one example of how the data can be tabularized for Exercise A. Table 7, below, presents an example for Exercise B, grouping age by Young/Middle Aged/ Old.

Table 6: Self evaluation of Official Language Ability by Schooling

No Education		Primary Education		Secondary Education	
Low	3	Low	0	Low	0
Medium	0	Medium	3	Medium	0
High	0	High	0	High	4

Table 7: Self evaluation of LWC Ability by Age and Gender

	Young	Middle Aged	Old
Men	L 0 M 1 H 1	L 0 M 1 H 1	L 0 M 1 H 0
Women	L 1 M 0 H 1	L 1 M 1 H 0	L 1 M 0 H 0

Analysis and Conclusions

The next step is the analysis, the drawing of conclusions from the displayed data. It is analogous to the 'conclusion drawing' process of qualitative analysis. It basically has to do with relating the arranged data to the research questions.

Exercises in Analysis and Conclusions

A. Examine Table 5, above. What analyses and conclusions can be drawn concerning the primary language used at home in rural verses urban environments?

B. Examine Table 6, above. What analyses and conclusions can be drawn concerning reported official use competence in view of education?

C. Examine Table 7, above. What analyses and conclusions can be drawn concerning reported LWC ability in view of gender and age?

Rule of Thumb

You sort, cluster, arrange, organize, group, then code or categorize your data, and you chart or tabularize your data in the ways that will best answer your research questions. The quantification of qualitative data is selecting out from the masses of data, and then counting those grouped and coded responses in the ways that will best answer your research questions.

- Group, cluster, sort, or organize data
- Code or categorize responses
- Present data
- Analyze and draw conclusions

If you don't yet have research questions and want to quantitatively analyze qualitative data, you can experiment with sorting, clustering, organizing and coding your data in different ways and permutations to learn all you can from the data.

Statistical Analysis of Qualitative Data that has been coded Quantitatively

Extending Conclusions

It has been said that one shouldn't extend conclusions from qualitative data to the whole population. We hear this because qualitative research often or usually doesn't follow good representative sampling methods. But, if you do use good representative sampling methods, in other words, if the people you observed or interviewed were representative of the population, then it is valid to extend conclusions from that sample to the entire population. There is nothing intrinsically about either qualitative or quantitative data that makes it more extendable to the entire population. There is only the tendency in practice to pay more attention to sampling when one is dealing with quantitative data.

Use of Statistics with Qualitative Data that has been coded Quantitatively

There are certain statistics (means or "average", for example) that shouldn't be used on nominal or ordinal data, but only on cardinal or interval data. Here is a quick review of the data types:

- Nominal: where the data is descriptive, qualitative (examples: red, blue, yellow)
- Ordinal: where there is an ordering of the categories (example: first, second, third, forth)
- Cardinal: 1, 2, 3, where the difference between 1 and 2 is the same as the difference between 2 and 3 (example: a count of items or individuals)
- Interval: 1.3, 4.7, where intermediate values are possible for a continuous variable (examples: temperature scale, distance measurements)

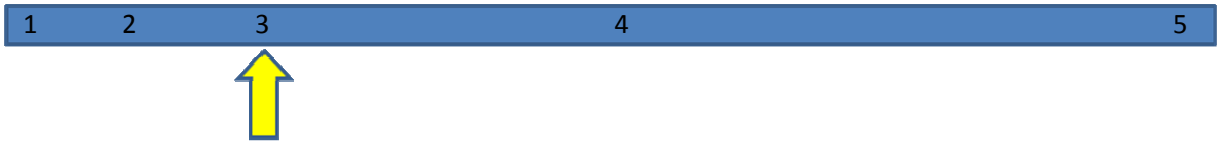
Some people have the practice of coding qualitative nominal or ordinal type data with cardinal or interval looking numbers. An example of this would be attributing the numbers 5 to 1 to "Huge, Big, Medium, Small, Extra Small".

Huge = 5, Big = 4, Medium = 3, Small = 2, Extra Small =1

And then they apply statistics only designed for cardinal or interval data. This is not legitimate

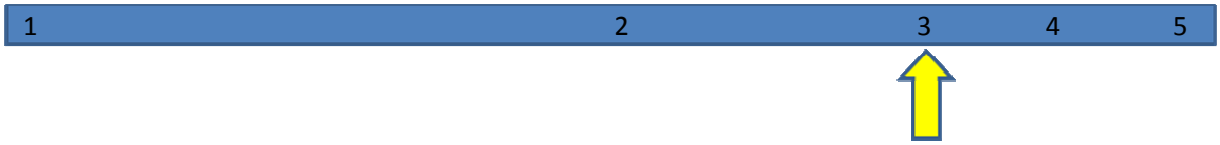
If we examine halfway points in ordinal and nominal continua, we can see why it is not legitimate to use certain statistics with nominal or ordinal data (that have been given number labels). The first continuum, below, is ordinal. The distance between 1 and 2 is not the same as the distance between 4 and 5. A continuum like this could come, for example, from a questionnaire question, "On a scale of 1 – 5, How was the food at the conference, with 1 = Fabulous, 2 = Great, 3 = Good, 4 = OK, 5 = Poor?"

The intuitive distance between 1 and 2 (Fabulous and Great) would be a lot smaller than the intuitive distance between 4 and 5 (OK and Poor). The intuitive similarity between a Fabulous Meal and a Great Meal is a lot greater than the intuitive similarity between an OK Meal and a Poor Meal.



The intuitive midpoint of this continuum is somewhere around the “4”.

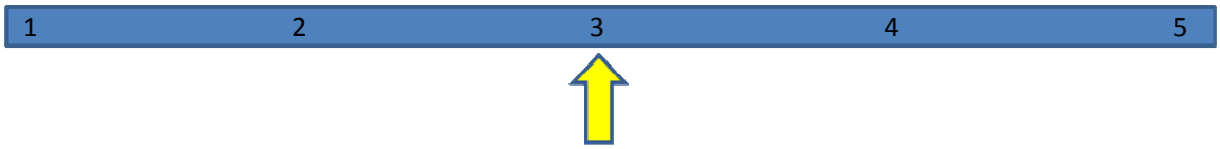
This next continuum is also ordinal, and could come from a similar question, but with the numbers reversed.



The intuitive midpoint of this continuum is somewhere around the “2”.

If we applied a means statistic (average), on 1 through 5, on either of these two continua, the means would be 3 (illustrated by the yellow arrows). But this would be misleading, because as the distance between the numbers is not consistent, the means would suggest that the midpoint was either way low (the 3 on the first continuum) or way too high (the 3 on the second continuum).

The following continuum is cardinal data, with the difference between 1 and 2 being the same as the difference between 4 and 5. It is only when the data are cardinal (or interval) that the means statistic points accurately to the intuitive midpoint of a continuum (the 3, illustrated by the yellow arrow.



In this same way, many different statistics are only accurate, and should only be used, when dealing with ordinal or interval data.

Ascribing number labels to coding categories is not a good idea, because the coding categories are just about always ordinal, and numbers intrinsically look cardinal or interval. When an averaging, or even a percentage, based on these numbers used, the results are likely to be inaccurate.

However, the good news is that when we count items that are coded alike, the data are cardinal. The difference between 1 and 2 people is the same as the difference between 4 and 5 people; one person. The difference between 1 and 2 similar responses is the same as the difference between 4 and 5 similar responses; one response. So we can legitimately use all appropriate statistics (and percentages) when we quantify data with counts of similarly coded responses.

William M.K. Trochim (2006) in the online "Research Methods Knowledge Base" demonstrates how quantification of qualitative data can be useful in analysis. Comparing counts of similarly coded responses is helpful. He then shows how correlation matrixes of either coded categories, or respondents, can also be useful tools in analysis.

A value of statistics used on quantified qualitative data has to do with the persuasiveness of statistics and numbers. When we can legitimately make statements like, "the percentage of men responding positively is significantly more than the percentage of women responding positively", or "the two factors correlate very highly", there is more legitimate persuasiveness in what we are writing and saying.

It isn't always necessary to use statistics and even percentages, but they are useful and persuasive tools when used appropriately. Counting tokens of similarly coded responses permits the legitimate use of statistics and percentages, while ascribing number labels to coding categories does not.

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