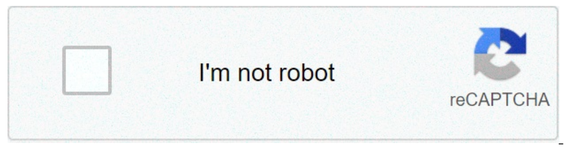

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Relative frequency table in statistics

Frequency tables, pie charts, and bar charts can be used to display the distribution of a single categorical variable. These displays show all possible values of the variable along with either the frequency (count) or relative frequency (percentage). Relative frequencies are more commonly used because they allow you to compare how often values occur relative to the overall sample size. They are calculated by dividing the number of responses for a specific category by the total number of responses. Pie charts represent relative frequencies by displaying how much of the whole pie each category represents. Frequency tables and bar charts can display either the raw frequencies or relative frequencies. If you wish to perform an inferential test on the distribution of a single categorical variable, see the chi-squared goodness-of-fit test. Example: A researcher asked her class to pick who would win in a battle of superheros. Below is a frequency table and charts of the results: Out of a total of 128 responses, 41% (or 52/128) of students reported that Batman would win the battle, followed by Iron Man with 27%, Captain America with 19%, and Superman with 13%. A pie chart and bar chart of these results are shown below: Example 1: Creating a frequency table and pie chart in Excel 2016 on This video will show how to create a frequency table and pie chart about beliefs about the impact of social media. Dataset used in video PDF corresponding to video Example 2: Creating a frequency tables and bar charts in RStudio This video will show how to create a frequency table and bar chart to display the number of patients in different age groups (categorized into young adults, adults, and older adults). Dataset used in video R script file used in video In statistics, a frequency distribution is a list, table (i.e.: frequency table) or graph (i.e.: bar plot or histogram) that displays the frequency of various outcomes in a sample.[1] Each entry in the table contains the frequency or count of the occurrences of values within a particular group or interval. Example Here is an example of a univariate (=single variable) frequency table. The frequency of each response to a survey question is depicted. Rank Degree of agreement Number 1 Strongly agree 22 2 Agree somewhat 30 3 Not sure 20 4 Disagree somewhat 15 5 Strongly disagree 15 A different tabulation scheme aggregates values into bins such that each bin encompasses a range of values. For example, the heights of the students in a class could be organized into the following frequency table. Height range Number of students Cumulative number less than 5.0 feet 25 25 5.0–5.5 feet 35 60 5.5–6.0 feet 20 80 6.0–6.5 feet 20 100 Example of a pie chart A frequency distribution shows us a summarized grouping of data divided into mutually exclusive classes and the number of occurrences in a class. It is a way of showing unorganized data notably to show results of an election, income of people for a certain region, sales of a product within a certain period, student loan amounts of graduates, etc. Some of the graphs that can be used with frequency distributions are histograms, line charts, bar charts and pie charts. Frequency distributions are used for both qualitative and quantitative data. Construction Decide the number of classes. Too many classes or too few classes might not reveal the basic shape of the data set, also it will be difficult to interpret such frequency distribution. The ideal number of classes may be determined or estimated by formula: number of classes = C = 1 + 3.3 log n {\displaystyle {\text{number of classes}}=C=1+3.3\log n} (log base 10), or by the square-root choice formula C = n {\displaystyle C={\sqrt {n}}} where n is the total number of observations in the data. (The latter will be much too large for large data sets such as population statistics.) However, these formulas are not a hard rule and the resulting number of classes determined by formula may not always be exactly suitable with the data being dealt with. Calculate the range of the data (Range = Max – Min) by finding the minimum and maximum data values. Range will be used to determine the class interval or class width. Decide the width of the classes, denoted by h and obtained by h = range number of classes {\displaystyle h={\frac {\text{range}}{\text{number of classes}}}} (assuming the class intervals are the same for all classes). Generally the class interval or class width is the same for all classes. The classes all taken together must cover at least the distance from the lowest value (minimum) in the data to the highest (maximum) value. Equal class intervals are preferred in frequency distribution, while unequal class intervals (for example logarithmic intervals) may be necessary in certain situations to produce a good spread of observations between the classes and avoid a large number of empty, or almost empty classes.[2] Decide the individual class limits and select a suitable starting point of the first class which is arbitrary; it may be less than or equal to the minimum value. Usually it is started before the minimum value in such a way that the midpoint (the average of lower and upper class limits of the first class) is properly[clarification needed] placed. Take an observation and mark a vertical bar (|) for a class it belongs. A running tally is kept till the last observation. Find the frequencies, relative frequency, cumulative frequency etc. as required. Joint frequency distributions Bivariate joint frequency distributions are often presented as (two-way) contingency tables: Two-way contingency table with marginal frequencies Dance Sports TV Total Men 2 10 8 20 Women 16 6 8 30 Total 18 16 16 50 The total row and total column report the marginal frequencies or marginal distribution, while the body of the table reports the joint frequencies.[3] Applications Managing and operating on frequency tabulated data is much simpler than operation on raw data. There are simple algorithms to calculate median, mean, standard deviation etc. from these tables. Statistical hypothesis testing is founded on the assessment of differences and similarities between frequency distributions. This assessment involves measures of central tendency or averages, such as the mean and median, and measures of variability or statistical dispersion, such as the standard deviation or variance. A frequency distribution is said to be skewed when its mean and median are significantly different, or more generally when it is asymmetric. The kurtosis of a frequency distribution is a measure of the proportion of extreme values (outliers), which appear at either end of the histogram. If the distribution is more outlier-prone than the normal distribution it is said to be leptokurtic; if less outlier-prone it is said to be platykurtic. Letter frequency distributions are also used in frequency analysis to crack ciphers, and are used to compare the relative frequencies of letters in different languages and other languages are often used like Greek, Latin, etc. See also Mathematics portal Count data Cross tabulation Cumulative frequency Empirical distribution function Notes ^ Australian Bureau of Statistics, language+-+frequency+distribution ^ Manikandan, S (1 January 2011). "Frequency distribution". Journal of Pharmacology & Pharmacotherapeutics. 2 (1): 54–55. doi:10.4103/0976-500X.77120. ISSN 0976-500X. PMC 3117575. PMID 21701652. ^ Stat Trek, Statistics and Probability Glossary, s.v. Joint frequency External links Media related to Frequency distribution at Wikimedia Commons Learn 7 ways to make frequency distribution table in Excel Retrieved from " You have worked with one-way tables (even though you may not have called them by that name). A one-way table is simply the data from a bar graph put into table form. In a one-way table, you are only working with one categorical variable. Two-Way Frequency Table: (displays "counts") You can probably guess that a two-way frequency table will deal with two variables (referred to as bivariate data). In so doing, these tables examine the relationships between the two categorical variables. Two-way frequency tables are especially important because they are often used to analyze survey results. Two-way frequency tables are also called contingency tables. The Basics of a Two-Way Frequency Table Two-way frequency tables are a visual representation of the possible relationships between two sets of categorical data. The categories are labeled at the top and the left side of the table, with the frequency (count) information appearing in the four (or more) interior cells of the table. The "totals" of each row appear at the right, and the "totals" of each column appear at the bottom. Note: the "sum of the row totals" equals the "sum of the column totals" (the 240 seen in the lower right corner). This value (240) is also the sum of all of the counts from the interior cells. A survey asked, "If you could have a new vehicle, would you want a sport utility vehicle or a sports car? Let's take a look at the vocabulary used to identify cell locations in two-way frequency tables. Entries in the body of the table (the blue cells where the initial counts appear) are called joint frequencies. The cells which contain the sum (the orange "Totals" cells) of the initial counts by row and by column are called marginal frequencies. Note that the lower right corner cell (the total of all the counts) is not labeled as a marginal frequency. Take a look at the Sports Car column. This table shows 45 women chose Sports Car, while 39 men chose Sports Car. Would this information answer the question, "In this survey, do more women or men prefer Sports Car? Not really! Read on to discover why this would be misleading information if interpreted in this manner. Two-Way Relative Frequency Table: (displays "percentages") When a two-way table displays percentages or ratios (called relative frequencies), instead of just frequency counts, the table is referred to as a two-way relative frequency table. These two-way tables can show relative frequencies for the whole table, for rows, or for columns. Notice that the relative frequencies may be displayed as a ratio, a decimal (to nearest hundredth), or percent (to nearest percent). Relative Frequency for Whole Table: If the two-way relative frequency is for the whole table, each entry in the table is divided by the total count (found in the lower right corner). The ratio of "1", or 100%, occurs only in the cell in the lower right corner. Each of the main body cells (blue) is telling you the percentage of people surveyed that gave that response (based upon the total number of people responding). Under the Sports Car column, are we again seeing more women choosing a sports car than men (19% of the women and 16% of the men)?? Not really! Read on to discover why this can still be misleading information even when interpreted as a percentage. So what's up with more women, than men, choosing a sports car? It is certainly possible that women may love sporty cars just as much, or more, than men. While this may be possible, it is not the real situation regarding this survey data. The misleading information is that the frequency table and the relative frequency table shown above do not take into consideration how many women, and how many men, responded to this survey. There were only 60 men responding, while there were 180 women. There were three times more women responding to this survey, which presents misleading results when based upon the entire population. To avoid such problems when comparing the categorical variables in a two-way frequency table, we need to exam the table by separate categories (rows or columns). When a relative frequency is determined based upon a row or column, it is called a "conditional" relative frequency. To obtain a conditional relative frequency, divide a joint frequency (count inside the table) by a marginal frequency total (outer edge) that represents the condition being investigated. You may also see this term stated as row conditional relative frequency or column conditional relative frequency. Basically, we are going to look at the women and men separately, based upon how many women were surveyed, and how many men were surveyed. Conditional Relative Frequency for Rows: If the two-way relative frequency is for rows, the entries in each row of the table are divided by the total for that row (on the right hand side). The ratio of "1", or 100%, occurs in all right hand "total" cells. If we want to answer the question, "In this survey, do more men, or more women, prefer a sports car?", we need to set up a row conditional relative frequency. The listings of men and women are row headings, and we want to examine these categories separately to determine the answer to our question. By choosing a row method, we are comparing men and women in relation to car type. Do you see how this changes our previous interpretation of the data? Using a row conditional relative frequency, we can see that 65% of the 60 men responding chose Sports Car, while only 25% of the 180 women responding chose Sports Car. This method takes into account the count of men and women separately, giving us a more realistic view of the relationship between the variables. Conditional Relative Frequency for Columns: If the two-way relative frequency is for columns, the entries in each column of the table are divided by the total for that column (at the bottom). The ratio of "1", or 100%, occurs in all of the "total" cells at the bottom. So, what the heck is this method showing us? Are we back to more women than men choosing the Sports Car? The problem is that a column approach does not address the issue of which car men and women prefer. In the column method, we are comparing an SUV to a sports car in relation to gender. An appropriate question would be, "Were SUVs or sports cars chosen more often by females? What we have seen, by examining all of these tables, is that different tables answer different types of questions about the data. If you want to look for a relationship between the categorical variables, you will need to prepare a conditional relative frequency table. You will then need to decide if a "row" method or a "column" method will address the situation you wish to examine. What Two-Way Tables Tell Us: A variety of questions can be answered by examining a two-way frequency table. Let's look at some possibilities: Two-way frequency table How many people responded to the survey? 240 How many males responded to the survey? 60 How many people chose an SUV? 156 How many females chose a sports car? 45 How many males chose an SUV? 21 Two-way relative frequency table (whole table) What percentage of the survey takers was female? 75% What is the relative frequency of males choosing a sports car? Was there a higher percentage of males or females choosing an SUV? higher percentage of females Associations Based on Conditional Relative Frequency: An "association" exists between two categorical variables if the row (or column) conditional relative frequencies are different for the rows (or columns) of the table. The bigger the differences in the conditional relative frequencies, the stronger the association between the variables. If the conditional relative frequencies are nearly equal for all categories, there may be no association between the variables. Such variables are said to be independent. In our Sports Car and SUV example (above), the row conditonal relative frequencies showed a good degree of difference. Based upon that information, if we knew the gender of a survey respondent, we could make a good prediction as to whether he/she chose a sports car or an SUV. The statistical information is strong enough to support an "association" between gender and choice of vehicle. Now, this does not mean that there is always an association between gender and choice of vehicle. It just means that such an association is evident in the data from this survey. Variables can be associated in many ways and to different degrees. Sometimes the best way to tell whether two variables are associated is to ask yourself whether they are not associated. Think backward. In a two-way frequency table, if the relative frequencies for one variable are the same (or close) for all categories of another variable, there is no (or little) association.

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