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Since you may have three, four, five or more groups in your study design, determining which of these groups differ from each other is important. You can do this using a post-hoc test (N.B., we discuss post-hoc tests later in this guide). In this "quick start" guide, we show you how to carry out a one-way MANOVA using SPSS Statistics, as well as interpret and report the results from this test. Since the one-way MANOVA is often followed up with post-hoc tests, we also show you how to carry these out using SPSS Statistics. However, before we introduce you to this procedure, you need to understand the different assumptions that your data must meet in order for a one-way MANOVA to give you a valid result. We discuss these assumptions next. SPSS Statistics Basic requirements and assumptions of a one-way MANOVA When you choose to analyse your data using a one-way MANOVA, part of the process involves checking to make sure that the data you want to analyse can actually be analysed using a one-way MANOVA. You need to do this because it is only appropriate to use a one-way MANOVA if your data "passes" nine assumptions that are required for a one-way MANOVA to give you a valid result. Do not be surprised if, when analysing your own data using SPSS Statistics, one or more of these assumptions is violated (i.e., is not met). This is not uncommon when working with real-world data. However, even when your data fails certain assumptions, there is often a solution to overcome this. In practice, checking for these nine assumptions adds some more time to your analysis, requiring you to work through additional procedures in SPSS Statistics when performing your analysis, as well as thinking a little bit more about your data. These nine assumptions are presented below: Assumption #1: Your two or more dependent variables should be measured at the interval or ratio level (i.e., they are continuous). Examples of variables that meet this criterion include revision time (measured in hours), intelligence (measured using IQ score), exam performance (measured from 0 to 100), weight (measured in kg), and so forth. You can learn more about interval and ratio variables in our article: Types of Variable. Assumption #2: Your independent variable should consist of two or more categorical, independent groups. Example independent variables that meet this criterion include ethnicity (e.g., 3 groups: Caucasian, African American and Hispanic), physical activity level (e.g., 4 groups: sedentary, low, moderate and high), profession (e.g., 5 groups: surgeon, doctor, nurse, dentist, therapist), and so forth. Assumption #3: You should have independence of observations, which means that there is no relationship between the observations in each group or between the groups themselves. For example, there must be different participants in each group with no participant being in more than one group. This is more of a study design issue than something you can test for, but it is an important assumption of the one-way MANOVA. Assumption #4: You should have an adequate sample size. Although the larger your sample size, the better; for MANOVA, you need to have more cases in each group than the number of dependent variables you are analysing. Assumption #5: There are no univariate or multivariate outliers. First, there can be no (univariate) outliers in each group of the independent variable for any of the dependent variables. This is a similar assumption to the one-way ANOVA, but for each dependent variable that you have in your MANOVA analysis. Univariate outliers are often just called outliers and are the same type of outliers you will have come across if you have conducted t-tests or ANOVAs. We refer to them as univariate in this guide to distinguish them from multivariate outliers. Multivariate outliers are cases which have an unusual combination of scores on the dependent variables. In our enhanced one-way MANOVA guide, we show you how to: (1) detect univariate outliers using boxplots, which you can do using SPSS Statistics, and discuss some of the options you have in order to deal with outliers; and (2) check for multivariate outliers using a measure called Mahalanobis distance, which you can also do using SPSS Statistics, and discuss what you should do if you have any. Assumption #6: There is multivariate normality. Unfortunately, multivariate normality is a particularly tricky assumption to test for and cannot be directly tested in SPSS Statistics. Instead, normality of each of the dependent variables for each of the groups of the independent variable is often used in its place as a best 'guess' as to whether there is multivariate normality. You can test for this using the Shapiro-Wilk test of normality, which is easily tested for using SPSS Statistics. In addition to showing you how to do this in our enhanced one-way MANOVA guide, we also explain what you can do if your data fails this assumption. Assumption #7: There is a linear relationship between each pair of dependent variables for each group of the independent variable. If the variables are not linearly related, the power of the test is reduced. You can test for this assumption by plotting a scatterplot matrix for each group of the independent variable. In order to do this, you will need to split your data file in SPSS Statistics before generating the scatterplot matrices. Assumption #8: There is homogeneity of variance-covariance matrices. You can test this assumption in SPSS Statistics using Box's M test of equality of covariance. If your data fails this assumption, you may also need to use SPSS Statistics to carry out Levene's test of homogeneity of variance to determine where the problem may lie. We show you how to carry out these tests using SPSS Statistics in our enhanced one-way MANOVA guide, as well as discuss how to deal with situations where your data fails this assumption. Assumption #9: There is no multicollinearity. Ideally, you want your dependent variables to be moderately correlated with each other. If the correlations are low, you might be better off running separate one-way ANOVAs, and if the correlation(s) are too high (greater than 0.9), you could have multicollinearity. This is problematic for MANOVA and needs to be screened out. Whilst there are many different methods to test for this assumption, in our enhanced one-way MANOVA guide, we take you through one of the most straightforward methods using SPSS Statistics, and explain what you can do if your data fails this assumption. You can check assumptions #5, #6, #7, #8 and #9 using SPSS Statistics. Before doing this, you should make sure that your data meets assumptions #1, #2, #3 and #4, although you don't need SPSS Statistics to do this. Just remember that if you do not run the statistical tests on these assumptions correctly, the results you get when running a one-way MANOVA might not be valid. This is why we dedicate a number of sections of our enhanced one-way MANOVA guide to help you get this right. You can find out about our enhanced content as a whole on our Features: Overview page, or more specifically, learn how we help with testing assumptions on our Features: Assumptions page. In the section, Procedure, we illustrate the SPSS Statistics procedure to perform a one-way MANOVA assuming that no assumptions have been violated. First, we set out the example we use to explain the one-way MANOVA procedure in SPSS Statistics. TAKE THE TOURPLANS & PRICING The pupils at a high school come from three different primary schools. The head teacher wanted to know whether there were academic differences between the pupils from the three different primary schools. As such, she randomly selected 20 pupils from School A, 20 pupils from School B and 20 pupils from School C, and measured their academic performance as assessed by the marks they received for their end-of-year English and Maths exams. Therefore, the two dependent variables were "English score" and "Maths score", whilst the independent variable was "School", which consisted of three categories: "School A", "School B" and "School C". 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You can learn about our enhanced data setup content on our Features: Data Setup. Alternately, see our generic, "quick start" guide: Entering Data in SPSS Statistics. SPSS Statistics SPSS Statistics procedure to carry out a one-way MANOVA The General Linear Model > Multivariate... procedure below show you how to analyse your data using a one-way MANOVA in SPSS Statistics when the nine assumptions in the previous section, Assumptions, have not been violated. Since some of the options in the General Linear Model > Multivariate... procedure changed in SPSS Statistics version 25, we show how to carry out a one-way MANOVA depending on whether you have SPSS Statistics versions 25 to 30 (or the subscription version of SPSS Statistics) or version 24 or an earlier version of SPSS Statistics. If you are unsure which version of SPSS Statistics you are using, see our guide: Identifying your version of SPSS Statistics. At the end of these steps, we show you how to interpret the results from this test. SPSS Statistics versions 25 to 30 (and the subscription version of SPSS Statistics) Click Analyze > General Linear Model > Multivariate... on the top menu as shown below: Note: In version 27 and the subscription version, SPSS Statistics introduced a new look to their interface called "SPSS Light", replacing the previous look for versions 26 and earlier versions, which was called "SPSS Standard". Therefore, if you have SPSS Statistics versions 27 to 30 (or the subscription version of SPSS Statistics), the images that follow will be light grey rather than blue. However, the procedure is identical. Published with written permission from SPSS Statistics, IBM Corporation. You will be presented with the following Multivariate dialogue box: Published with written permission from SPSS Statistics, IBM Corporation. Transfer the independent variable, School, into the Fixed Factor(s): box and transfer the dependent variables, English_Score and Maths_Score, into the Dependent Variables: box. You can do this by drag-and-dropping the variables into their respective boxes or by using the button. For older versions of SPSS Statistics, you will need to use the latter method. The result is shown below: Published with written permission from SPSS Statistics, IBM Corporation. Note: For this analysis, you will not need to use the Covariate(s): box (used for MANCOVA) or the WLS Weight: box. Click on the button. You will be presented with the Multivariate: Profile Plots dialogue box: Published with written permission from SPSS Statistics, IBM Corporation. Transfer the independent variable, School, into the Horizontal Axis: box, as shown below: Published with written permission from SPSS Statistics, IBM Corporation. Click on the button. 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Click on the button to generate the output. Go to the next page for the SPSS Statistics output and explanation of the output. You can ignore the section below, which shows you how to carry out a one-way MANOVA if you have SPSS Statistics version 24 or earlier. Click Analyze > General Linear Model > Multivariate... on the top menu as shown below: Published with written permission from SPSS Statistics, IBM Corporation. You will be presented with the following Multivariate dialogue box: Published with written permission from SPSS Statistics, IBM Corporation. Transfer the independent variable, School, into the Fixed Factor(s): box and transfer the dependent variables, English_Score and Maths_Score, into the Dependent Variables: box. You can do this by drag-and-dropping the variables into their respective boxes or by using the button. For older versions of SPSS Statistics, you will need to use the latter method. 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Transfer the independent variable, "School", from the Factor(s) and Factor Interactions: box into the Display Means for: box. Select the Descriptive statistics and Estimates of effect size checkboxes in the Display area. You will be presented with the following screen: Published with written permission from SPSS Statistics, IBM Corporation. Click on the button and you will returned to the Multivariate dialogue box. Click on the button to generate the output. Go to the next page for the SPSS Statistics output and explanation of the output. The term univariate analysis refers to the analysis of one variable. You can remember this because the prefix uni means one.The term multivariate analysis refers to the analysis of more than one variable. You can remember this because the prefix multi means more than one.There are three common ways to perform univariate analysis:1. Summary Statistics 2. Frequency Distributions 3. ChartsWe can create charts like boxplots, histograms, density curves, etc. to visualize the distribution of values for one variable.There are two common ways to perform multivariate analysis:1. Scatterplot MatrixWe can create a scatterplot matrix, which contains scatterplots to visualize the relationship between each pairwise combination of variables in a dataset.2. Machine Learning AlgorithmsWe can create a machine learning algorithm to fit a model like multiple linear regression that quantifies the relationship between multiple predictor variables and a response variable.We can also use an unsupervised learning algorithm like principal components analysis to find structure and relationships between multiple variables in a dataset.The following examples show how to perform both univariate and multivariate analysis with the following dataset: Note: When you analyze exactly two variables, this is referred to as bivariate analysis.Example: How to Perform Univariate AnalysisWe could choose to perform univariate analysis on any of the individual variables in the dataset.For example, we could perform univariate analysis on the variable Household Size:We can calculate the following measures of central tendency for Household Size:Mean (the average value): 3.8Median (the middle value): 4These values give us an idea of where the center value is located.We can also calculate the following measures of dispersion:Range (the difference between the max and min): 6Interquartile Range (the spread of the middle 50% of values): 2.5Standard Deviation (an average measure of spread): 1.87These values give us an idea of how spread out the values are for this variable.We can also create the following frequency distribution table to summarize how often different values occur:We can also create a boxplot to visualize the distribution of values for household size:Alternatively, we could create a histogram to visualize the distribution of values for household size:By calculating these metrics and creating these charts, we can gain a strong understanding of how the values are distributed for the variable Household Size.Example: How to Perform Multivariate AnalysisOnce again suppose we have the same dataset:One simple form of multivariate analysis that we could perform on this dataset is to create a scatterplot matrix, which is a matrix that shows a scatterplot for each pairwise combination of numeric variables in the dataset:We could create this type of matrix to visualize the relationship between household size, annual income, and number of pets all at once.Resource: Check out this tutorial to see how to create a scatterplot matrix in R.Another way to perform multivariate analysis on this dataset would be to fit a multiple linear regression model. For example, we could create a regression model that uses household size and number of pets to predict annual income.Resource: Check out this tutorial to see how to perform multiple linear regression in R.Yet another way to perform multivariate analysis on this dataset would be to perform principal components analysis, which allows us to find an underlying structure in the dataset.Resource: Check out this tutorial to see how to perform principal components analysis in R.ConclusionHeres a quick summary of this article:Univariate analysis is the analysis of one variable.Multivariate analysis is the analysis of more than one variable.There are various ways to perform each type of analysis depending on your goal.In the real world, we often perform both types of analysis on a single dataset.Univariate analysis allows us to understand the distribution of values for one variable while multivariate analysis allows us to understand the relationship between several variables. Take the Tour Plans & Pricing SIGN UP The one-way multivariate analysis of variance (one-way MANOVA) is used to determine whether there are any differences between independent groups on more than one continuous dependent variable. In this regard, it differs from a one-way ANOVA, which only measures one dependent variable. For example, you could use a one-way MANOVA to understand whether there were differences in the perceptions of attractiveness and intelligence of drug users in movies (i.e., the two dependent variables are "perceptions of attractiveness" and "perceptions of intelligence", whilst the independent variable is "drug users in movies", which has three independent groups: "non-user", "experimenter" and "regular user"). 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You will be presented with the Multivariate: Estimated Marginal Means dialogue box, as shown below: Published with written permission from SPSS Statistics, IBM Corporation. Transfer the independent variable, "School", from the Factor(s) and Factor Interactions: box into the Display Means for: box. You will be presented with the following screen: Published with written permission from SPSS Statistics, IBM Corporation. Click on the button and you will be returned to the Multivariate dialogue box. Click on the button. You will be presented with the Multivariate: Options dialogue box, as shown below: Published with written permission from SPSS Statistics, IBM Corporation. Select the Descriptive statistics and Estimates of effect size checkboxes in the Display area. You will be presented with the following screen: Published with written permission from SPSS Statistics, IBM Corporation. Click on the button and you will be returned to the Multivariate dialogue box. Click on the button to generate the output. Go to the next page for the SPSS Statistics output and explanation of the output. You can ignore the section below, which shows you how to carry out a one-way MANOVA if you have SPSS Statistics version 24 or earlier. Click Analyze > General Linear Model > Multivariate... on the top menu as shown below: Published with written permission from SPSS Statistics, IBM Corporation. You will be presented with the following Multivariate dialogue box: Published with written permission from SPSS Statistics, IBM Corporation. Transfer the independent variable, School, into the Fixed Factor(s): box and transfer the dependent variables, English_Score and Maths_Score, into the Dependent Variables: box. You can do this by drag-and-dropping the variables into their respective boxes or by using the button. For older versions of SPSS Statistics, you will need to use the latter method. The result is shown below: Published with written permission from SPSS Statistics, IBM Corporation. Note: For this analysis, you will not need to use the Covariate(s): box (used for MANCOVA) or the WLS Weight: box. Click on the button. You will be presented with the Multivariate: Profile Plots dialogue box: Published with written permission from SPSS Statistics, IBM Corporation. Transfer the independent variable, School, into the Horizontal Axis: box, as shown below: Published with written permission from SPSS Statistics, IBM Corporation. Click on the button. You will see that "School" has been added to the Plots: box, as shown below: Published with written permission from SPSS Statistics, IBM Corporation. Click on the button and you will be returned to the Multivariate dialogue box. Click on the button. You will be presented with the Multivariate: Post Hoc Multiple Comparisons for Observed Means dialogue box, as shown below: Published with written permission from SPSS Statistics, IBM Corporation. Transfer the independent variable, School, into the Post Hoc Tests for: box and select the Tukey checkbox in the Equal Variances Assumed area, as shown below: Published with written permission from SPSS Statistics, IBM Corporation. Note: You can select other post hoc tests depending on your data and study design. If your independent variable only has two levels/categories, you do not need to complete this post hoc section. Click on the button and you will be returned to the Multivariate dialogue box. Click on the button. You will be presented with the Multivariate: Options dialogue box, as shown below: Published with written permission from SPSS Statistics, IBM Corporation. Transfer the independent variable, "School", from the Factor(s) and Factor Interactions: box into the Display Means for: box. Select the Descriptive statistics and Estimates of effect size checkboxes in the Display area. You will be presented with the following screen: Published with written permission from SPSS Statistics, IBM Corporation. Click on the button and you will returned to the Multivariate dialogue box. Click on the button to generate the output. Go to the next page for the SPSS Statistics output and explanation of the output. Mikaila Mariel Lemonik Arthur The first step in any quantitative analysis project is univariate analysis, also known as descriptive statistics. Producing these measures is an important part of understanding the data as well as important for preparing for subsequent bivariate and multivariate analysis. This chapter will detail how to produce frequency distributions (also called frequency tables), measures of central tendency, measures of dispersion, and graphs in SPSS. The chapter on Univariate Analysis provides details on understanding and interpreting these measures. To select the correct measures for your variables, first determine the level of measurement of each variable for which you want to produce appropriate descriptive statistics. The distinction between binary and other nominal variables is important here, so you need to determine whether each variable is binary, nominal, ordinal, or continuous. Then, use Table 1 to determine which descriptive statistics you should produce.Table 1. Selecting the Right Univariate/Descriptive StatisticsMeasures of Central TendencyMeasures of DispersionGraphsBinaryMean; ModeFrequency distributionPie Chart; Bar graphNominalModeFrequency distributionPie Chart; Bar GraphOrdinalMedian; ModeRange (min/max); Frequency distribution; occasionally PercentilesBar GraphContinuousMean; MedianStandard deviation; Variance; Range (min/max); Skewness; Kurtosis; PercentilesHistogram Other than graphs, all of the univariate analyses discussed in this chapter are produced by going to Analyze Descriptive Statistics Frequencies, as shown in Figure 1. Note that SPSS also offers a tool called Descriptives; avoid this unless you are specifically seeking to produce Z scores, a topic beyond the scope of this text, as the Descriptives tool provides far fewer options than the Frequencies tool.Figure 1. Running Descriptive Statistics in SPSSFigure 2. The Frequencies WindowSelecting this tool brings up a window called Frequencies from which the various descriptive statistics can be selected, as shown in Figure 2. In this window, users select which variables to perform univariate analysis upon. Note that while univariate analyses can be performed upon multiple variables as a group, those variables need to all have the same level of measurement as only one set of options can be selected at a time.To use the Frequencies tool, scroll through the list of variables on the left side of the screen, or click in the list and begin typing the variable name if you remember it and the list will jump to it. Use the blue arrow to move the variable into the Variables box or grab and drag it over. If you are performing analysis on a binary, nominal, or ordinal variable, be sure the checkbox next to Display frequency tables is checked; if you are performing analysis on a continuous variable, leave that box unchecked. The checkbox for Create APA style tables slightly alters the format and display of tables. If you are working in the field of psychology specifically, you should select this checkbox, otherwise it is not needed. The options under Format specify elements about the display of the tables; in most cases those should be left as the default. The options under Style and Bootstrap are beyond the scope of this text.Figure 3. The Dialog Box for Selecting Descriptive StatisticsIt is under Statistics that the specific descriptive statistics to be produced are selected, as shown in Figure 3. First, users can select several different options for producing percentiles, which are usually produced only for continuous variables but occasionally are used for ordinal variables. Quartiles produces the 25th, 50th (median), and 75th percentile in the data. Cut points allows the user to select a specified number of equal groups and see at which values the groups break. Percentiles allows the user to specify specific percentiles to producefor instance, a user might want to specify 33 and 66 to see where the upper, middle, and lower third of data fall.Second, users can select measures of central tendency, specifically the mean (used for binary and continuous variables), the median (used for ordinal and continuous variables), and the mode (used for binary, nominal, and ordinal variables). Sum adds up all the values of the variable, and is not typically used. There is also an option to select if values are group midpoints, which is beyond the scope of this text.Next, users can select measures of dispersion and distribution, including the standard deviation (abbreviated here Std. deviation, and used for continuous variables), the variance (used for continuous variables), the range (used for ordinal and continuous variables), the minimum value (used for ordinal and continuous variables), the maximum value (used for ordinal and continuous variables), and the standard error of the mean (abbreviated here as S.E. mean, this is a measure of sampling error and beyond the scope of this text), as well as skewness and kurtosis (used for continuous variables).Figure 4. Making Graphs from the Frequencies DialogOnce all desired tests are selected, click Continue to go back to the main frequencies dialog. There, you can also select the Chart button to produce graphs (as shown in Figure 4), though only one graph can be produced at a time (other options for producing graphs will be discussed later in this chapter). Bar charts are appropriate for binary, nominal, and ordinal variables. Pie charts are typically used only for binary variables and nominal variables with just a few categories, though they may at times make sense for ordinal variables with just a few categories. Histograms are used for continuous variables; there is an option to show the normal curve on the histogram, which can help users visualize the distribution more clearly. Users can also choose whether their graphs will be displayed in terms of frequencies (the raw count of values) or percentages.Examples at Each Level of MeasurementHere, we will produce appropriate descriptive statistics for one variable from the 2021 GSS file at each level of measurement, showing what it looks like to produce them, what the resulting output looks like, and how to interpret that output.A Binary VariableTo produce descriptive statistics for a binary variable, be sure to leave Display frequency tables checked. Under statistics, select Mean and Mode and then click continue, and under graphs select your choice of bar graph or pie chart and then click continue. Using the variable GUNLAW, then, the selected option would look as shown in Figure 5. Then click OK, and the results will appear in the Output window.Figure 5. SPSS Dialogs Set Up for Descriptive Statistics for the Binary Variable GUNLAWThe output for GUNLAW will look approximately like what is shown in Figure 6. GUNLAW is a variable measuring whether the respondent favors or opposes requiring individuals to obtain police permits before buying a gun.Figure 6. SPSS Output for Descriptive Statistics on GUNLAWThe output shows that 3,992 people gave a valid answer to this question, while responses for 40 people are missing. Of those who provided answers, the mode, or most frequent response, is 1. If we look at the value labels, we will find that 1 here means favor; in other words, the largest number of respondents favors requiring permits for gun owners. The mean is 1.33. In the case of a binary variable, what the mean tells us is the approximate proportion of people who have provided the higher-numbered value labelso in this case, about of respondents said they are opposed to requiring permits.The frequency table, then, shows the number and proportion of people who provided each answer. The most important column to pay attention to is Valid Percent. This column tells us what percentage of the people who answered the question gave each answer. So, in this case, we would say that 67.3% of respondents favor requiring permits for gun ownership, while 32.7% are opposedand 1% are missing.Finally, we have produced a pie chart, which provides the same information in a visual format. Users who like playing with their graphs can double-click on the graph and then right-click or cmd/ctrl click to change options such as displaying value labels or amounts or changing the color of the graph.A Nominal VariableTo produce descriptive statistics for a nominal variable, be sure to leave Display frequency tables checked. Under statistics, select Mode and then click continue, and under graphs select your choice of bar graph or pie chart (avoid pie chart if your variable has many categories) and then click continue. Using the variable MOBILE16, then, the selected option would look as shown in Figure 7. Then click OK, and the results will appear in the Output window.Figure 7. SPSS Dialogs Set Up for Descriptive Statistics for the Nominal Variable MOBILE16The output will then look approximately like the output shown in Figure 8. MOBILE16 is a variable measuring respondents degree of geographical mobility since age 16, asking them if they live in the same city they lived in at age 16; stayed in the same state they lived in at age 16 but now live in a different city; or live in a different state than they lived in at age 16.Figure 8. SPSS Output for Descriptive Statistics on MOBILE16The output shows that 3608 respondents answered this survey question, while 424 did not. The mode is 2; looking at the value labels, we conclude that 2 refers to same state, different city, or in other words that the largest group of respondents lives in the same state they lived in at age 16 but not in the same city they lived in at age 16. The frequency table shows us the percentage breakdown of respondents into the three categories. Valid percent is most useful here, as it tells us the percentage of respondents in each category after those who have not responded to the question are removed. In this case, 35.9% of people live in the same state but a different city, the largest category of respondents. Thirty-four percent live in a different state, while 30.1% live in the same city in which they lived at age 16. Below the frequency table is a bar graph which provides a visual for the information in the frequency table. As noted above, users can change options such as displaying value labels or amounts or changing the color of the graph.An Ordinal VariableTo produce descriptive statistics for an ordinal variable, be sure to leave Display frequency tables checked. Under statistics, select Median, Mode, Range, Minimum, and Maximum, and then click continue, and under graphs select your choice of bar graph and then click continue. Then click OK, and the results will appear in the Output window. Using the variable CARSGEN, then, the selected option would look as shown in Figure 7.Figure 9. SPSS Dialogs Set Up for Descriptive Statistics for the Ordinal Variable CARSGENThe output will then look approximately like the output shown in Figure 10. CARSGEN is an ordinal variable measuring the degree to which respondents agree or disagree that car pollution is a danger to the environment.Figure 10. SPSS Output for Descriptive Statistics on CARSGENFirst, we see that 1778 respondents answered this question, while 2254 did not (remember that the GSS has a lot of questions; some are asked of all respondents while others are only asked of a subset, so the fact that a lot of people did not answer may indicate that many were not asked rather than that there is a high degree of nonresponse). The median and mode are both 3. Looking at the value labels tells us that 3 represents somewhat dangerous. The range is 4, representing the maximum (5) minus the minimum (1)in other words, there are five ordinal categories.Looking at the valid percents, we can see that 13% of respondents consider car pollution extremely dangerous, 31.4% very dangerous, and 45.8%the biggest category (and both the mode and median)somewhat dangerous. In contrast only 8.5% think car pollution is not very dangerous and 1.2% think it is not dangerous at all. Thus, it is reasonable to conclude that the vast majorityover 90%of respondents think that car pollution presents at least some degree of danger. The bar graph at the bottom of the output represents this information visually.A Continuous VariableTo produce descriptive statistics for a continuous variable, be sure to uncheck Display frequency tables. Under statistics, go to percentile values and select Quartiles (or other percentile options appropriate to your project). Then select Mean, Median, Std. deviation, Variance, Range, Minimum, Maximum, Skewness, and Kurtosis and then click continue, and under graphs select Histograms and turn on Show normal curve on histogram and then click continue. Using the variable EATMEAT, then, the selected option would look as shown in Figure 11. Then click OK, and the results will appear in the Output window.Figure 11. SPSS Dialogs Set Up for Descriptive Statistics for the Nominal Variable EATMEATThe output will then look approximately like the output shown in Figure 12. EATMEAT is a continuous variable measuring the number of days per week that the respondent eats beef, lamb, or products containing beef or lamb.Figure 12. SPSS Output for Descriptive Statistics on EATMEATBecause this variable is continuous, we have not produced frequency tables, and therefore we jump right into the statistics. 1795 respondents answered this question. On average, they eat beef or lamb 2.77 days per week (that is what the mean tells us). The median respondent eats beef or lamb three days per week. The standard deviation of 1.959 tells us that about 68% of respondents will be found within 1.959 of the mean of 2.77, or between 0.811 days and 4.729 days. The skewness of 0.541 tells us that the data is mildly skewed to the right, with a longer tail at the higher end of the distribution. The kurtosis of -0.462 tells us that the data is mildly platykurtic, or has little data in the outlying tails. (Note that we have ignored several statistics in the table, which are used to compute or further interpret the figures we are discussing and which are otherwise beyond the scope of this text). The range is 7, with a minimum of 0 and a maximum of 7sensible, given that this variable is measuring the number of days of the week that something happens. The 25th percentile is at 1, the 50th at 3 (this is the same as the median) and the 75th at 4. This tells us that one quarter of respondents eat beef or lamb one day a week or fewer; a quarter eat it between one and three days a week; a quarter eat it between three and four days a week; and a quarter eat it more than four days per week. The histogram shows the shape of the distribution; note that while the distribution is otherwise fairly normally distributed, more respondents eat beef or lamb seven days a week than eat it six days a week. There are several other ways to produce graphs in SPSS. The simplest is to go to Graphs Legacy Dialogs, where a variety of specific graph types can be selected and produced, including both univariate and bivariate charts. The Legacy Dialogs menu, as shown in Figure 13, permits users to choose bar graphs, 3-D bar graphs, line graphs, area charts, pie charts, high-low plots, boxplots, error bars, population pyramids, scatterplots/dot graphs, and histograms. Users are then presented with a series of options for what data to include in their chart and how to format the chart.Figure 13. The Legacy Dialogs/Graphs Menu in SPSSHere, we will review how to produce univariate bar graphs, pie charts, and histograms using the legacy dialogs. Other graphs important to the topics discussed in this text will be reviewed in other chapters.Bar GraphsTo produce a bar graph, go to Graphs Legacy Dialogs Bar. For a univariate graph, then select Simple, and click Define. Then, select the relevant binary, nominal, or ordinal variable and use the blue arrow (or drag and drop it) to place it in the Category Axis box. You can change the options under Bars represent to be the number of cases, the percent of cases, or other statistics, if you choose. Once you have set up your graph, click OK, and the graph will appear in the Output Viewer window. Figure 14 shows the dialog boxes for creating a bar graph, with the appropriate options selected, as well as a graph of the variable NEWS, which measures how often the respondent reads a newspaper.Figure 14. Bar Graph Dialog and Resulting Bar Graph for NEWSPie ChartsTo produce a pie chart, go to Graphs Legacy Dialogs Pie. In most cases, users will want to select the default option, Summaries for groups of cases, and click define. Then, select the relevant binary, nominal, or ordinal variable (remember not to use pie charts for variables with too many categories) and use the blue arrow (or drag and drop it) to place it in the Define Slices By box. You can change the options under Slices represent to be the number of cases or the percent of cases. Once you have set up your graph, click OK, and the graph will appear in the Output Viewer window. Figure 15 shows the dialog boxes for creating a pie chart, with the appropriate options selected, as well as a graph of the variable BORN, which measures whether or not the respondent was born in the United States.Figure 15. Pie Chart Dialog and Resulting Pie Chart for BORNHistogramsTo produce a histogram, go to Graphs Legacy Dialogs Histogram. Then, select the relevant continuous variable and use the blue arrow (or drag and drop it) to place it in the Variable box. Most users will want to check the Display normal curve box. Once you have set up your graph, click OK, and the graph will appear in the Output Viewer window. Figure 16 shows the dialog boxes for creating a histogram, with the appropriate options selected, as well as a graph of the variable AGE, which measures the respondents age at the time of the survey. Note that when histograms are produced, SPSS also provides the mean, standard deviation, and total number of cases along with the graph.Figure 16. Histogram Dialog and Resulting Histogram for AGEOther Ways of Producing GraphsOther options include the Chart Builder and the Graphboard Template Chooser. In the Graphboard Template Chooser, users select one or more variables and SPSS indicates a selection of graphs that may be suitable for that combination of variables (note that SPSS simply provides options, it cannot determine if those options would in fact be appropriate for the analysis in question, so analysts must take care to evaluate the options and choose which one(s) are actually useful for a given analysis). Then, users are able to select from among a set of detailed options and provide titles for their graph. In chart builder, users first select from among a multitude of univariate and bivariate graph formats and drag and drop variables into the graph, then setting options and properties and changing colors as desired. While both of these tools provide more flexibility than the graphs accessed via Legacy Dialogs, advanced users designing visuals often move outside of the SPSS ecosystem and create graphs in software more directly suited to this purpose, such as Excel or Tableau.To complete these exercises, load the 2021 GSS data prepared for this text into SPSS. For each of the following variables, answer the questions below.ZODIACCOMPUSESATJOBNUMROOMSAny other variable of your choiceWhat is the variable measuring? Use the GSS codebook to be sure you understand.At what level of measurement is the variable?What measures of central tendency, measures of dispersion, and graphs can you produce for this variable, given its level of measurement?Produce each of the measures and graphs you have listed and copy and paste the output into a document.Write a paragraph explaining the results of the descriptive statistics youve obtained. The goal is to put into words what you now know about the variableinterpreting what each statistic means, not just restating the statistic.Media AttributionsdefinitionStatistics used to describe a sample.An analysis that shows the number of cases that fall into each category of a variable.A measure of the value most representative of an entire distribution of data.Statistical tests that show the degree to which data is scattered or spread.Classification of variables in terms of the precision or sensitivity in how they are recorded.A characteristic that can vary from one subject or case to another or for one case over time within a particular research study.Consisting of only two options. Also known as dichotomous.A variable whose categories have names that do not imply any order.A variable with categories that can be ordered in a sensible way.A variable measured using numbers, not categories, including both interval and ratio variables. Also called a scale variable.A way of standardizing data based on how many standard deviations away each value is from the mean.The sum of all the values in a list divided by the number of such values.The middle value when all values in a list are arranged in order.The category in a list that occurs most frequently.A measure of variation that takes into account every values distance from the sample mean.A basic statistical measure of dispersion, the calculation of which is necessary for computing the standard deviation.The highest category in a list minus the lowest category.An asymmetry in a distribution in which a curve is distorted either to the left or the right, with positive values indicating right skewness and negative values indicating left skewness.How sharp the peak of a frequency distribution is. If the peak is too pointed to be a normal curve, it is said to have positive kurtosis (or leptokurtosis). If the peak of a distribution is too flat to be normally distributed, it is said to have negative kurtosis (or platykurtosis).Also called bar graphs, these graphs display data using bars of varying heights.Circular graphs that show the proportion of the total that is in each category in the shape of a slice of pie.A graph that looks like a bar chart but with no spaces between the bars, it is designed to display the distribution of continuous data by creating rectangles to represent equally-sized groups of values.A distribution of values that is symmetrical and bell-shaped.In the world of data analysis, understanding how to break down data to reveal meaningful insights is crucial. One fundamental approach is univariate analysis, a method focused on analyzing a single variable at a time. Whether youre working with survey data, experimental results, or any other dataset, mastering univariate analysis allows you to summarize, describe, and understand your data better. When it comes to performing univariate analysis efficiently, SPSS (Statistical Package for the Social Sciences) is one of the most widely used tools. In this guide, well walk you through the process of conducting univariate analysis using SPSS, focusing on generating frequency tables, calculating univariate statistics, and interpreting these results to derive useful conclusions. Understanding measures of central tendency and dispersion is also an essential part of the process, and well see how these concepts come to life in SPSS.Table of ContentsUnivariate analysis refers to the examination of a single variable within a dataset. The key goal is to describe and summarize the data in a meaningful way. Unlike multivariate analysis, which deals with multiple variables simultaneously, univariate analysis focuses solely on one. It is an essential first step in any data analysis because it allows researchers to get a sense of the distribution and characteristics of the variable at hand. Common techniques used in univariate analysis include calculating measures like the mean, median, mode, variance, and standard deviation, as well as generating frequency distributions.For example, suppose you conducted a survey to determine the age of participants in a study. A univariate analysis would involve looking at the age distribution, calculating the average age, and examining the spread of ages to better understand the participants demographic. SPSS provides a variety of tools to conduct these analyses efficiently and accurately.Why use SPSS for univariate analysis? SPSS is an advanced statistical software widely used in research across various fields, from social sciences to healthcare. It offers a user-friendly interface that simplifies complex data analysis tasks. One of its primary strengths is the ability to handle large datasets and perform both basic and advanced statistical procedures with ease. Univariate analysis in SPSS can be performed in just a few clicks, with the software automatically calculating relevant statistics and generating helpful outputs such as frequency tables, bar charts, and descriptive statistics.By using SPSS, you not only save time on manual calculations but also reduce the risk of human error. Moreover, SPSS allows you to visualize the data in different ways, making it easier to interpret and communicate your findings. Now that we understand the significance of univariate analysis, lets dive into how you can conduct it using SPSS.Step-by-step guide to conducting univariate analysis with SPSS 1. Preparing the data The first step in any analysis is ensuring that your data is properly prepared. This includes importing your dataset into SPSS, ensuring there are no missing values, and that the variables are correctly defined. To import data into SPSS, you can use the File menu and select Open or Import Data. SPSS can handle a wide range of file formats, including Excel files (.xls, .xlsx), CSV files, and even directly from databases.Once the data is imported, its important to check for any inconsistencies or missing values. You can do this by running a quick descriptive statistics check or by using the Frequencies function to spot any abnormalities. Missing data can be handled by either excluding those entries or imputing values based on the data distribution.2. Generating frequency tables One of the most basic univariate analyses is the frequency distribution, which shows how often each value or range of values occurs in your dataset. In SPSS, generating a frequency table is simple:Click on Analyze in the top menu, then choose Descriptive Statistics and select Frequencies.In the dialog box that appears, select the variable for which you want to generate a frequency table. If you have multiple variables, you can select more than one.Click OK, and SPSS will generate the frequency table in the output window.The frequency table will show the count of each distinct value (or category) in your selected variable, as well as the percentage of the total dataset that each value represents. For categorical variables, this is especially useful, as it allows you to understand how the data is distributed across different groups. For continuous variables, SPSS will often group the data into ranges (bins) and show the frequency for each range.3. Calculating univariate statistics In addition to frequency distributions, univariate analysis involves calculating several key statistics to describe your data. These include measures of central tendency (mean, median, mode) and measures of dispersion (variance, standard deviation, range). SPSS makes these calculations straightforward:Click on Analyze, then Descriptive Statistics, and select Descriptives.In the dialog box, select the variables you want to analyze and click the arrow to move them to the Variables box.If needed, you can customize the statistics that SPSS calculates by clicking on the Options button and selecting the statistics you wish to generate, such as the mean, standard deviation, variance, range, and others.Click OK to generate the output.In your output, you will see the following:Mean: The average value of the variable. Its calculated by summing all values and dividing by the number of values.Median: The middle value when the data is arranged in ascending order. This is especially useful when dealing with skewed distributions.Mode: The value that appears most frequently in the dataset.Standard deviation: A measure of how spread out the data is from the mean. A high standard deviation indicates that the data points are far from the mean, while a low standard deviation suggests they are close to it.Range: The difference between the highest and lowest values in the dataset.4. Visualizing the data Another powerful feature of SPSS is its ability to generate graphs and charts that help in visualizing the data. Visualizations are especially useful for communicating your findings to others, as they make it easier to understand trends and distributions at a glance. Common graphical representations in univariate analysis include histograms, bar charts, and box plots. Heres how you can create these visualizations:For a histogram, go to Graphs in the top menu, select Chart Builder, and choose the Histogram option.For a bar chart, you can follow the same steps, but select the Bar option instead.For a box plot, choose Boxplot from the Chart Builder menu.Once you create your chart, you can customize it by adjusting axis labels, titles, and other visual elements. SPSS provides a wide range of options to make your charts both informative and aesthetically pleasing.Interpreting the results Once SPSS has completed the univariate analysis, its time to interpret the results. Understanding the meaning behind the statistics is key to making informed decisions or drawing conclusions from the data. Lets look at how to interpret the results of the common statistics youll encounter:Mean: The mean is often the most useful measure of central tendency, but it can be misleading in the presence of outliers. For example, if the ages in your dataset range from 20 to 80, but one participant is 200 years old, the mean might not reflect the true central value.Median: The median is a better measure of central tendency when your data is skewed or contains outliers. If the mean and median are significantly different, it indicates that the data is not symmetrically distributed.Standard deviation: A high standard deviation suggests that the data points are spread out and diverse, while a low standard deviation means the data points are clustered around the mean. This can tell you how reliable or consistent your data is.Frequency table: The frequency table gives you a snapshot of how your data is distributed. It can highlight skewed distributions or tell you if one value is overwhelmingly dominant in the dataset.By understanding these statistics and visualizations, you can derive meaningful insights and make data-driven decisions. For instance, knowing the mean income of a population helps in understanding its general economic condition, but the median might give a better understanding in case of income inequality.Conclusion Univariate analysis is a vital tool in any data analysts toolkit, and SPSS is a powerful software to conduct such analyses efficiently. By generating frequency tables, calculating univariate statistics, and visualizing the data, you can gain a deeper understanding of your dataset. These steps help to describe the data, identify trends, and draw conclusions that can inform further research or decision-making. Moreover, understanding the central tendency and

How to do univariate analysis in spss. How to do multivariate analysis in spss. What is univariate and multivariate analysis. How to perform univariate analysis in spss. Spss univariate analysis. When to use univariate and multivariate analysis. Spss univariate.