

Instructions for carrying out statistical procedures and tests using Minitab

These instructions are closely linked to the author's book:

Essential Statistics for the Pharmaceutical Sciences
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For all references to chapters or tables, see the above book.

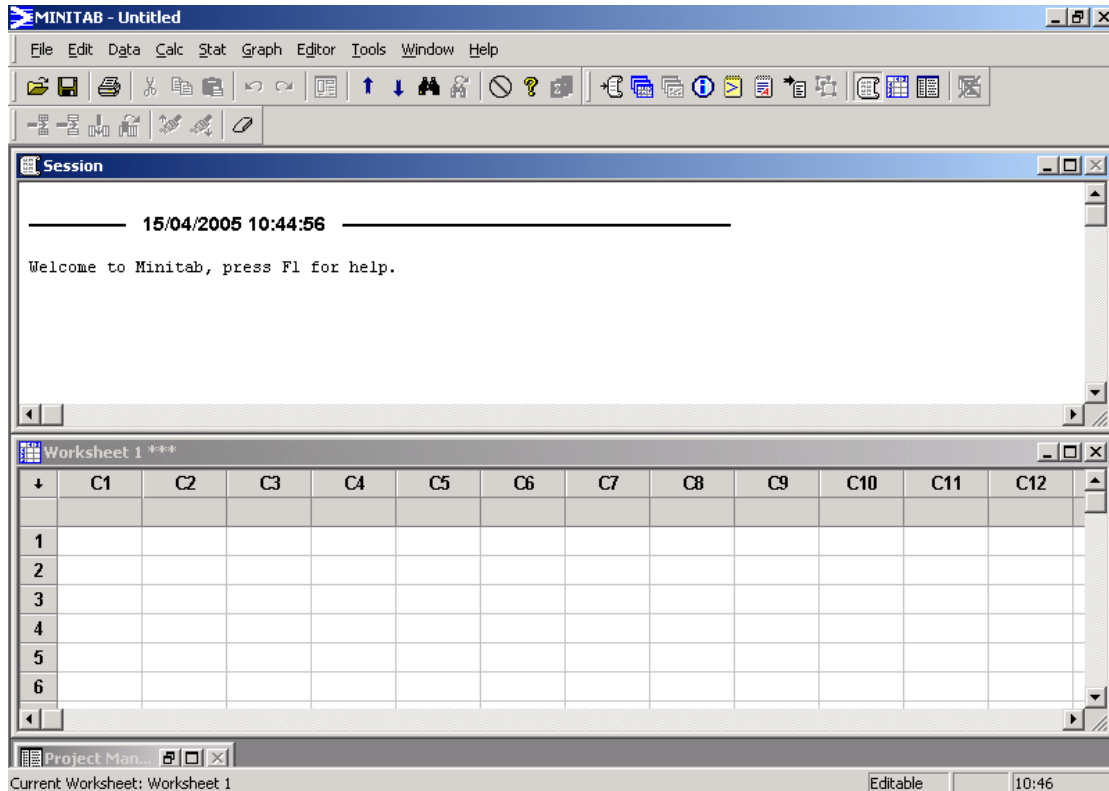
**Absolute basics -
using Minitab to obtain descriptive statistics**

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Example: Table 2.1 Potencies of 10 batches of vaccine (Units/ml)

The initial appearance of Minitab (Version 14) is shown below (Fig 1):

Fig 1: Initial appearance of Minitab



There are three main features:

- A lower window labelled 'Worksheet'. This is used somewhat like a spreadsheet. Data are entered into a grid of rows and columns. At the head of each column is a grey cell into which a descriptive label can be added.
- An upper window labelled 'Session'. When a statistical analysis has been carried out the results will appear in this window.
- A menu bar along the top of the screen. This offers groups of functions classed as 'File', 'Edit' etc. The most important of these is the fifth button, labelled 'Stat'. This opens up a cascade of menus that provide all of Minitab's statistical procedures and tests.

To analyse the vaccine potency data (Table 2.1), we proceed thus:

Enter a label into the grey cell at the top of column 1. This is not essential, but is good practice as it avoids confusion and leads to clearer output from statistical analyses. 'Vaccine' is added as a label.

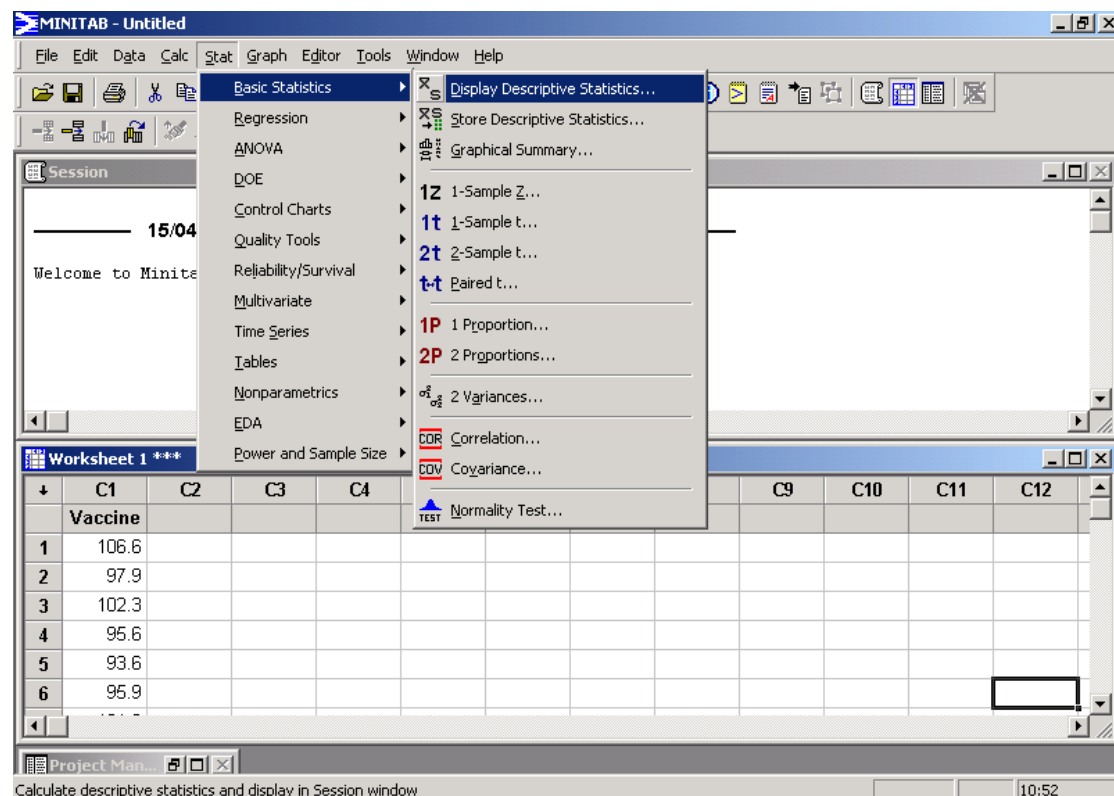
Type the data into the first 10 rows of column 1.

Click 'Stat' on the menu bar. This opens up a menu of broad categories of statistical procedures.

From this, select 'Basic Statistics'. That opens up a further menu of specific statistical procedures.

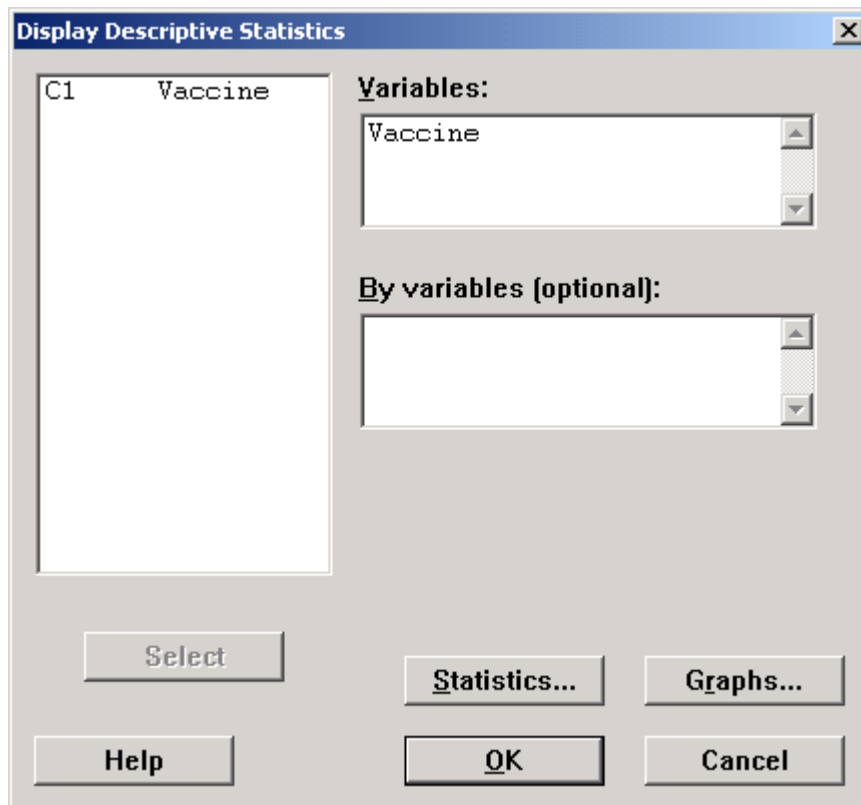
From this final menu, select 'Display Descriptive Statistics ...' At this point Minitab will appear as in Fig 2.

Fig 2: Minitab ready to produce descriptive statistics.



This will then open a dialogue box (Fig 3) that allows us to define which columns contain the data to be analysed:

Fig 3: Dialogue box allowing us to select which column(s) to analyse



There is a box on the left that contains a list of all the columns containing data. In our case there is just the one - C1 that has been labelled Vaccine.

On the right is a box labelled 'Variables:' into which you enter the names of all the columns we want to analyse. You could type in either 'C1' or 'Vaccine'. Alternatively, you could double click on 'C1 Vaccine' in the left hand box and its details will automatically be transferred to the right hand box.

Finally, click 'OK' to confirm the analysis. The results appear in the upper (Session) window, as shown below:

Descriptive Statistics: Vaccine										
Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	
Vaccine	10	0	99.15	1.35	4.27	93.60	95.43	98.70	102.58	
Variable	Maximum									
Vaccine	106.60									

You are provided with the following information:

- Under 'Variable' you will find 'Vaccine'. This is confirming that it is the Vaccine data that has been analysed.

- N (The sample size) is reported as 10.
- N* is the number of 'Missing values'. If there were any gaps in the column of data, they would be reported here. In this case there are none.
- Mean is 99.15. Happily, this coincides exactly with the figure calculated manually in Chapter 2!
- SE Mean is the Standard Error of the Mean - which is discussed in Chapter 4.
- StDev is the Standard deviation reported as ± 4.27 Units/ml.
- Minimum and Maximum are pretty self explanatory - the lowest and highest values in the column.
- Q1 is the first quartile (See Chapter 2).
- Median is 98.7. There is no actual observation of 98.7. This is a case where there is an even number of observations. The middle pair of observations are 97.9 and 99.5 and if we split the difference we get 98.7. Notice that no value is quoted for Q2 (the second quartile) as this would only repeat the median.
- Q3 is the third quartile