

# Analyzing Missing Data

Introduction

Problems

Using Scripts

# Missing data and data analysis

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- Missing data is a problem in multivariate data because a case will be excluded from the analysis if it is missing data for any variable included in the analysis.
- If our sample is large, we may be able to allow cases to be excluded.
- If our sample is small, we will try to use a substitution method so that we can retain enough cases to have sufficient power to detect effects.
- In either case, we need to make certain that we understand the potential impact that missing data may have on our analysis.

# Tools for evaluating missing data

- SPSS has a specific package for evaluating missing data, but it is included under the UT license.
- In place of this package, we will first examine missing data using SPSS statistics and procedures.
- After studying the standard SPSS procedures that we can use to examine missing data, we will use an SPSS script that will produce the output needed for missing data analysis without requiring us to issue all of the SPSS commands individually.

# Key issues in missing data analysis

- We will focus on three key issues for evaluating missing data:
  - The number of cases missing per variable
  - The number of variables missing per case
  - The pattern of correlations among variables created to represent missing and valid data.
- Further analysis may be required depending on the problems identified in these analyses.

# Problem 1

1. Based on a missing data analysis for the variables "employment status," "number of hours worked in the past week," "self employment," "governmental employment," and "occupational prestige score" in the dataset GSS2000.sav, is the following statement true, false, or an incorrect application of a statistic?

The variables "number of hours worked in the past week" and "employment status" are missing data for more than half of the cases in the data set and should be examined carefully before deciding how to handle missing data.

1. True
2. True with caution
3. False
4. Incorrect application of a statistic



# Request frequency distributions

We will use the output for frequency distributions to find the number of missing cases for each variable.

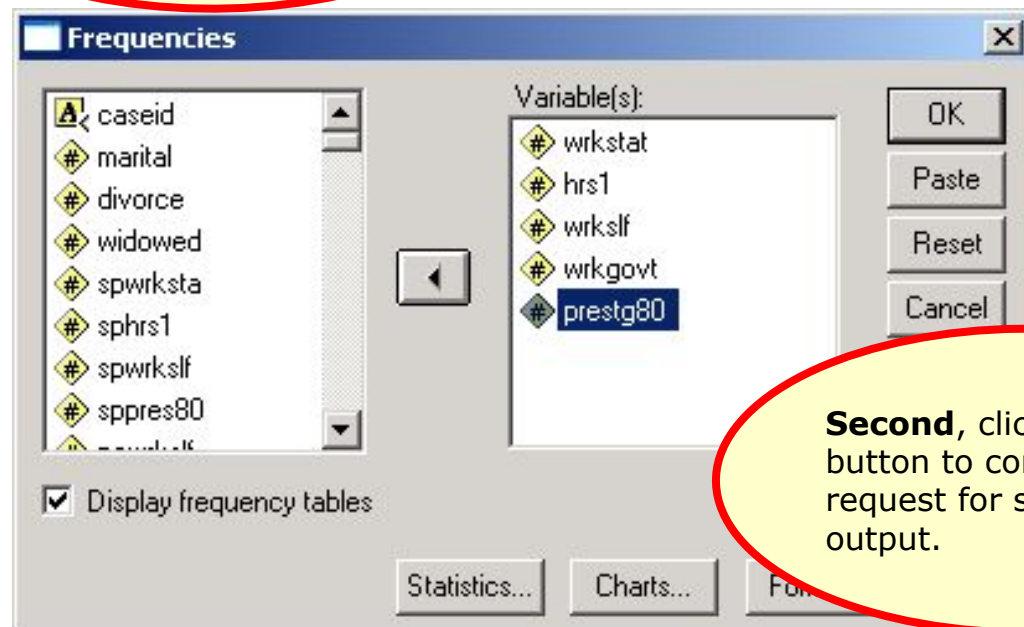
Select the *Frequencies...* | *Descriptive Statistics* command from the *Analyze* menu.

The screenshot shows the SPSS Data Editor window for 'GSS2000.sav'. The 'Analyze' menu is open, and the 'Descriptive Statistics' submenu is also open, with 'Frequencies...' selected. The background shows a data table with variables 'estg80' and 'marital'. The status bar at the bottom indicates 'SPSS Processor is ready'.

Case	estg80	marital
263	20002771	
264	20002772	
265	20002791	
266	20002794	
267	20002795	
268	20002799	
269	20002802	
270	20002804	1
271		
272		
273		
274		

# Completing the specification for frequencies

**First**, move the five variables included in the problem statement to the list box for variables.



**Second**, click on the OK button to complete the request for statistical output.



# Number of missing cases for each variable

Output2 - SPSS Viewer

File Edit View Insert Format Analyze Graphs Utilities Window Help

→ **Frequencies**

**Statistics**

		LABOR FRCE STATUS	NUMBER OF HOURS WORKED LAST WEEK	R SELF-EMP OR WORKS FOR SOMEBODY	GOVT OR PRIVATE EMPLOYEE	RS OCCUPATIONAL PRESTIGE SCORE (1980)
N	Valid	270	176	250	256	255
	Missing	0	94	20	14	15

In the table of statistics at the top of the Frequencies output, there is a table detailing the number of missing cases for each variable in the analysis.

None of the variables has more than 135 missing cases, although number of hours worked in the past week comes close.

The answer to the question is **false**.

## Problem 2

2. Based on a missing data analysis for the variables "employment status," "number of hours worked in the past week," "self employment," "governmental employment," and "occupational prestige score" in the dataset GSS2000.sav, is the following statement true, false, or an incorrect application of a statistic?

14 cases are missing data for more than half of the variables in the analysis and should be examined carefully before deciding how to handle missing data.

1. True
2. True with caution
3. False
4. Incorrect application of a statistic

# Create a variable that counts missing data

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We want to know how many of the five variables in the analysis had missing data for each case in the data set.

We will create a variable containing this information that uses an SPSS function to count the number of variables with missing data.

To compute a new variable, select the *Compute...* command from the Transform menu.

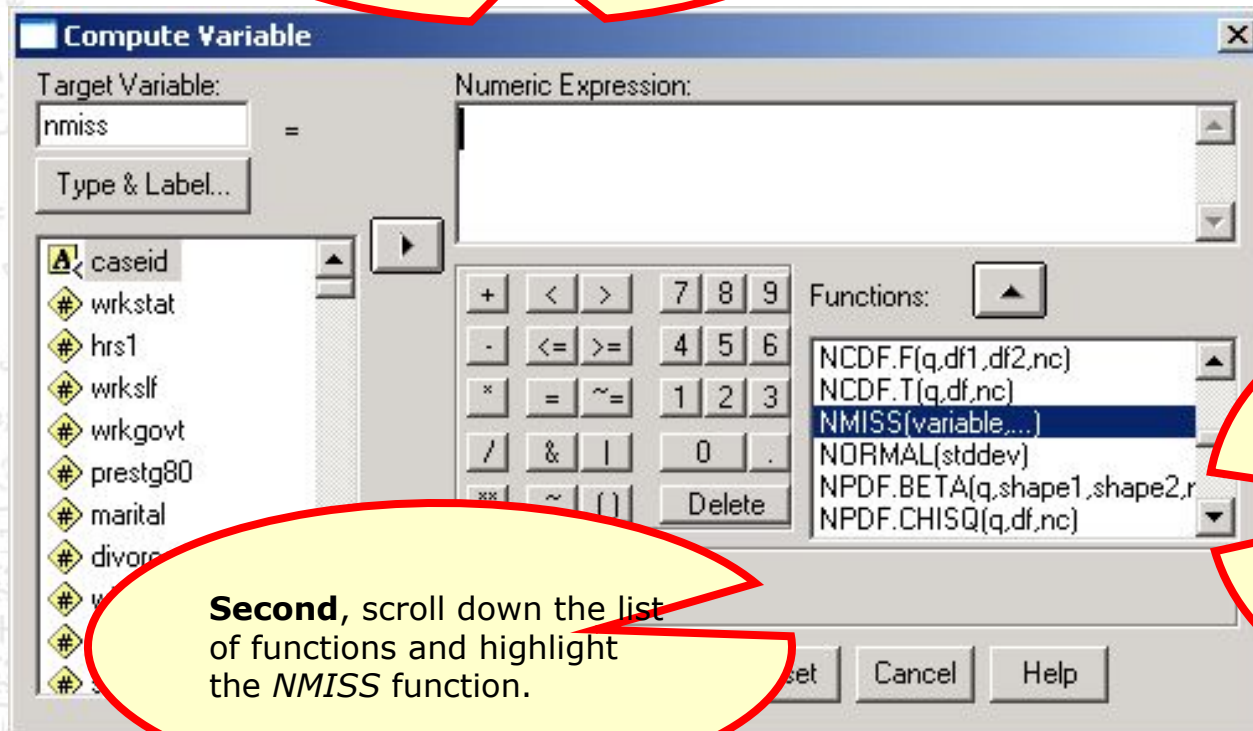
The screenshot shows the SPSS Data Editor window for a file named 'GSS2000.sav'. The 'Transform' menu is open, and the 'Compute...' option is selected. The background shows a data table with columns 'wrk', 'marital', and others. The status bar at the bottom indicates 'SPSS Processor is ready'.

	wrk	marital
1	1	1
2	1	1
3	1	1
4	3	1
5	1	5
6	4	3
7	1	5
8	38	2
9	2	2
10	2	2
11	2	2
12	2	2
13	2	2
14	2	2

# Enter specifications for new variable

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**First**, type in the name for the new variable *nmiss* in the Target variable text box.



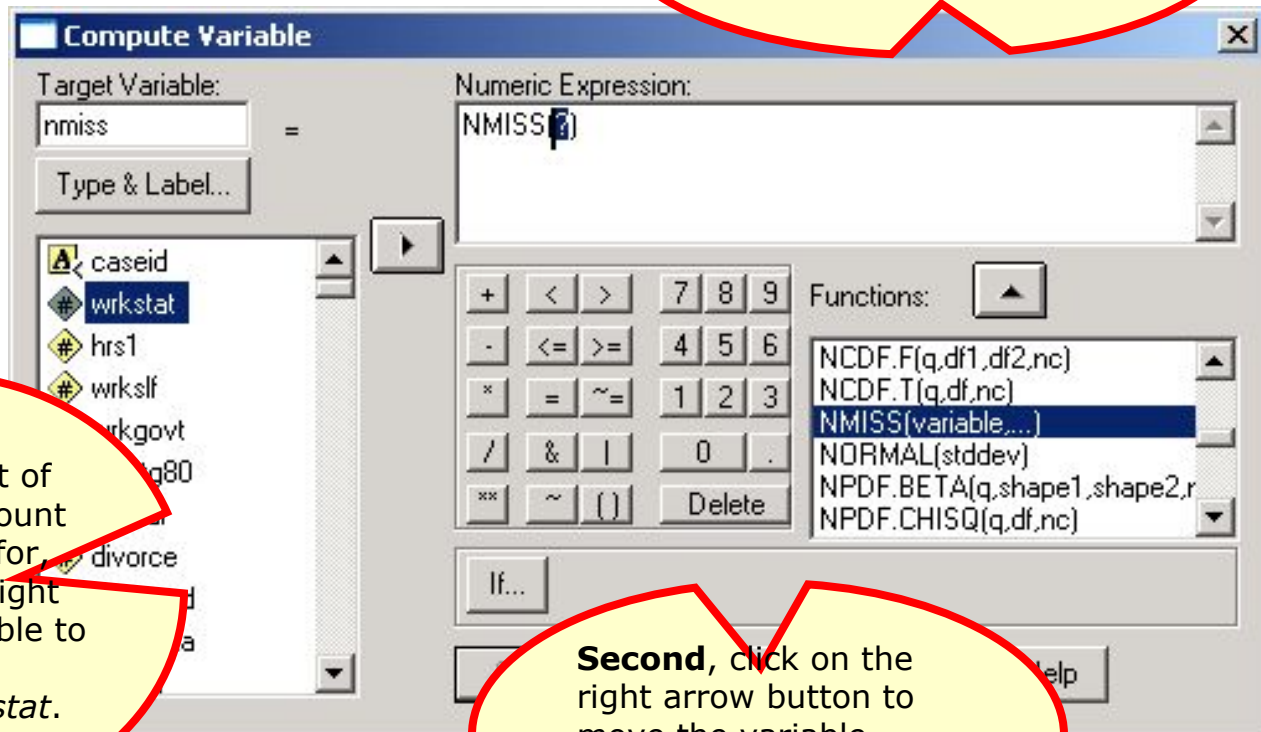
**Second**, scroll down the list of functions and highlight the *NMISS* function.

**Third**, click on the up arrow button to move the *NMISS* function into the Numeric Expression text box.

# Enter specifications for new variable

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The *NMISS* function is moved into the Numeric Expression text box.



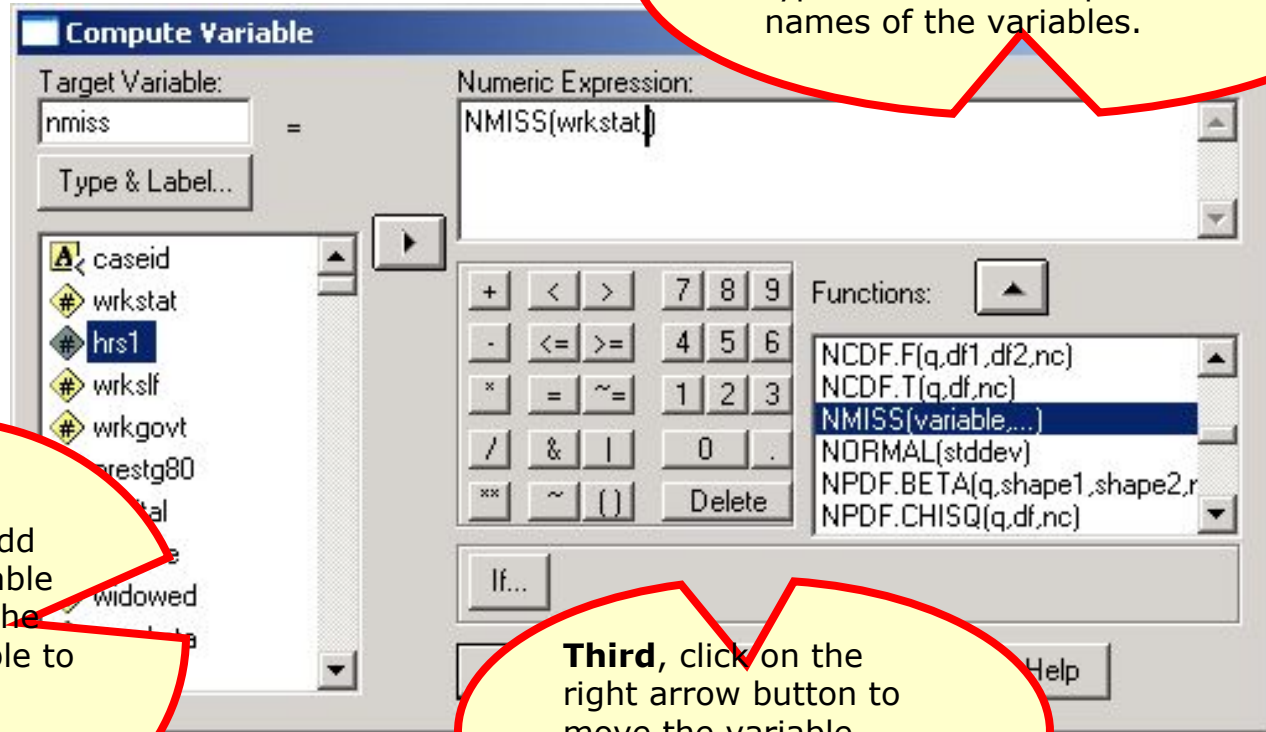
To add the list of variables to count missing data for, we **first** highlight the first variable to include in the function, *wrkstat*.

**Second**, click on the right arrow button to move the variable name into the function arguments.



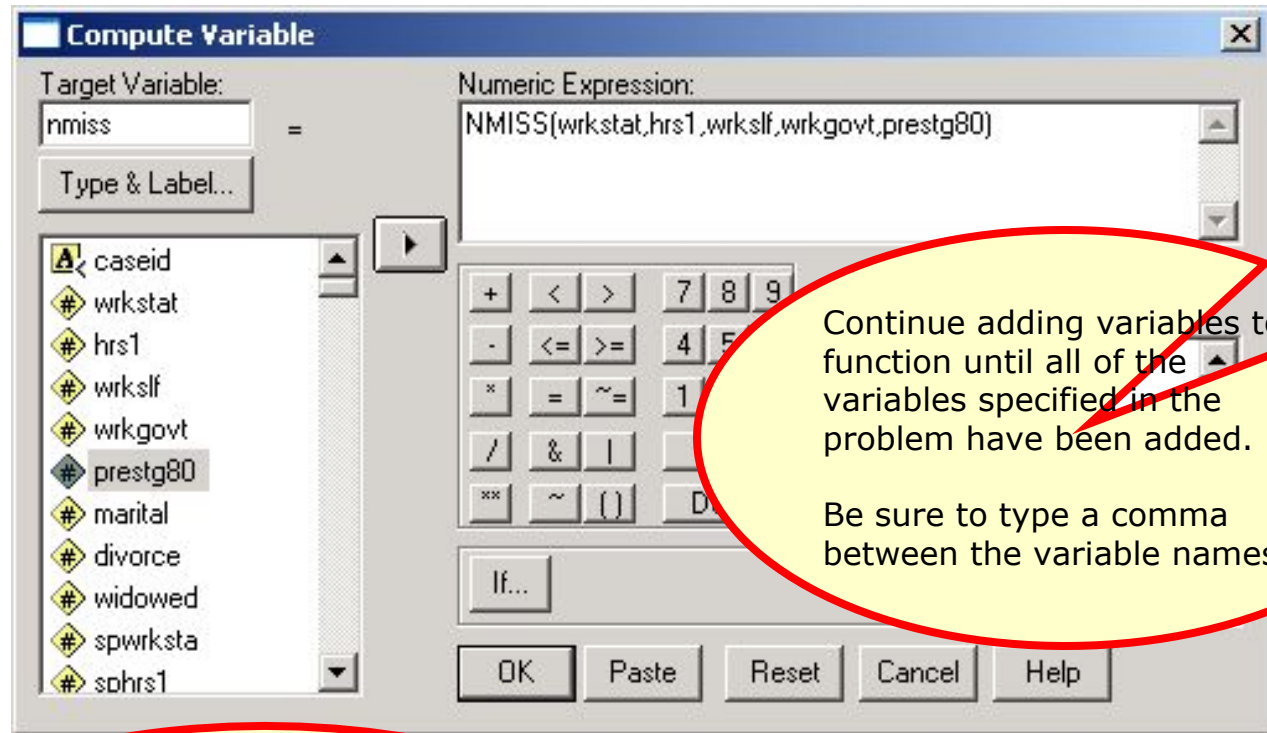
# Enter specifications for new variable

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# Complete specifications for new variable

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Continue adding variables to function until all of the variables specified in the problem have been added.

Be sure to type a comma between the variable names.

When all of the variables have been added to the function, click on the OK button to complete the specifications.

# The *nmiss* variable in the data editor

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GSS2000.sav - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Window Help

1 : nmiss 0

	zodiac	emtime	wwwtime	chattime	netime	nmiss	var
1	2	3	2	0	5	.0000	
2	6	4	6	0	10	.0000	
3	2	0	.	.	.	4.0000	
4	11	.	.	.	.	1.0000	
5	99	.	.	.	.	.0000	
6	1	.	.	.	2	.0000	
7	4	.	.	.	.	1.0000	
8	4	.	.	.	.	.0000	
9	1	.	.	.	.	1.0000	
10	8	.	.	.	.	1.0000	
11	1	0	.	.	.	1.0000	
12	2	.	.	.	.	.0000	
13	7	1	.	.	.	.0000	
14	7	.	.	.	.	.0000	

Data View Variable View

SPSS Processor is ready

If we scroll the worksheet to the right, we see the new variable that SPSS has just computed for us.



# A frequency distribution for *nmiss*

To answer the question of how many cases had each of the possible numbers of missing value, we create a frequency distribution.

Select the *Frequencies...* | *Descriptive Statistics* command from the *Analyze* menu.

The screenshot shows the SPSS Data Editor window for 'GSS2000.sav'. The 'Analyze' menu is open, and the 'Descriptive Statistics' submenu is also open, with 'Frequencies...' selected. The background data table shows values for 'nmiss' and 'var'.

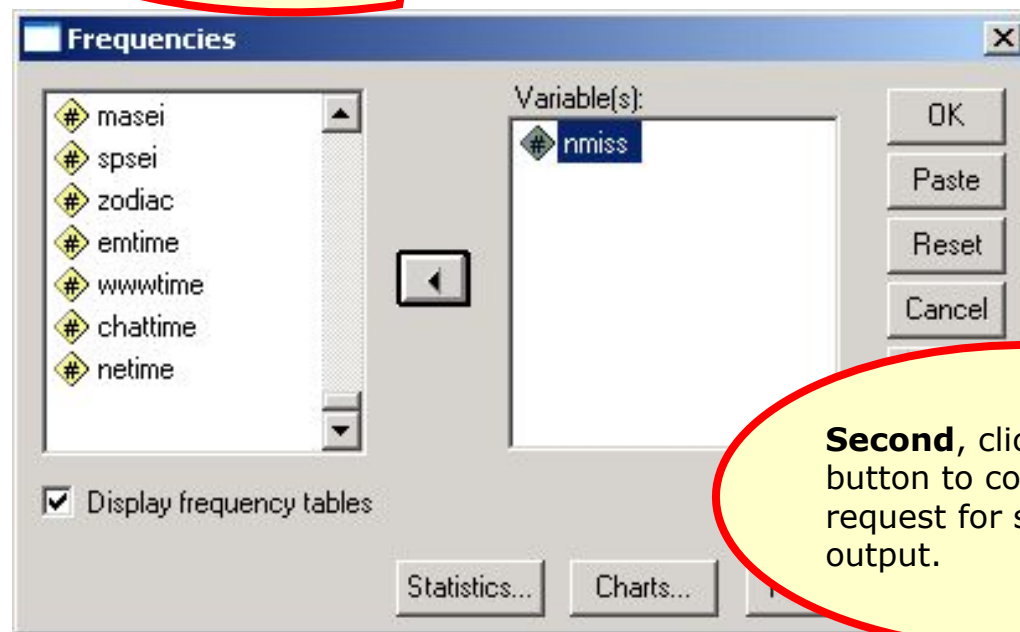
	nmiss	var
5	99	
6	1	
7	4	
8	4	
9	1	
10	8	
11	1	0
12	2	
13	7	1
14	7	

At the bottom of the window, the 'Data View' tab is active, and the status bar indicates 'SPSS Processor is ready'.

# Completing the specification for frequencies

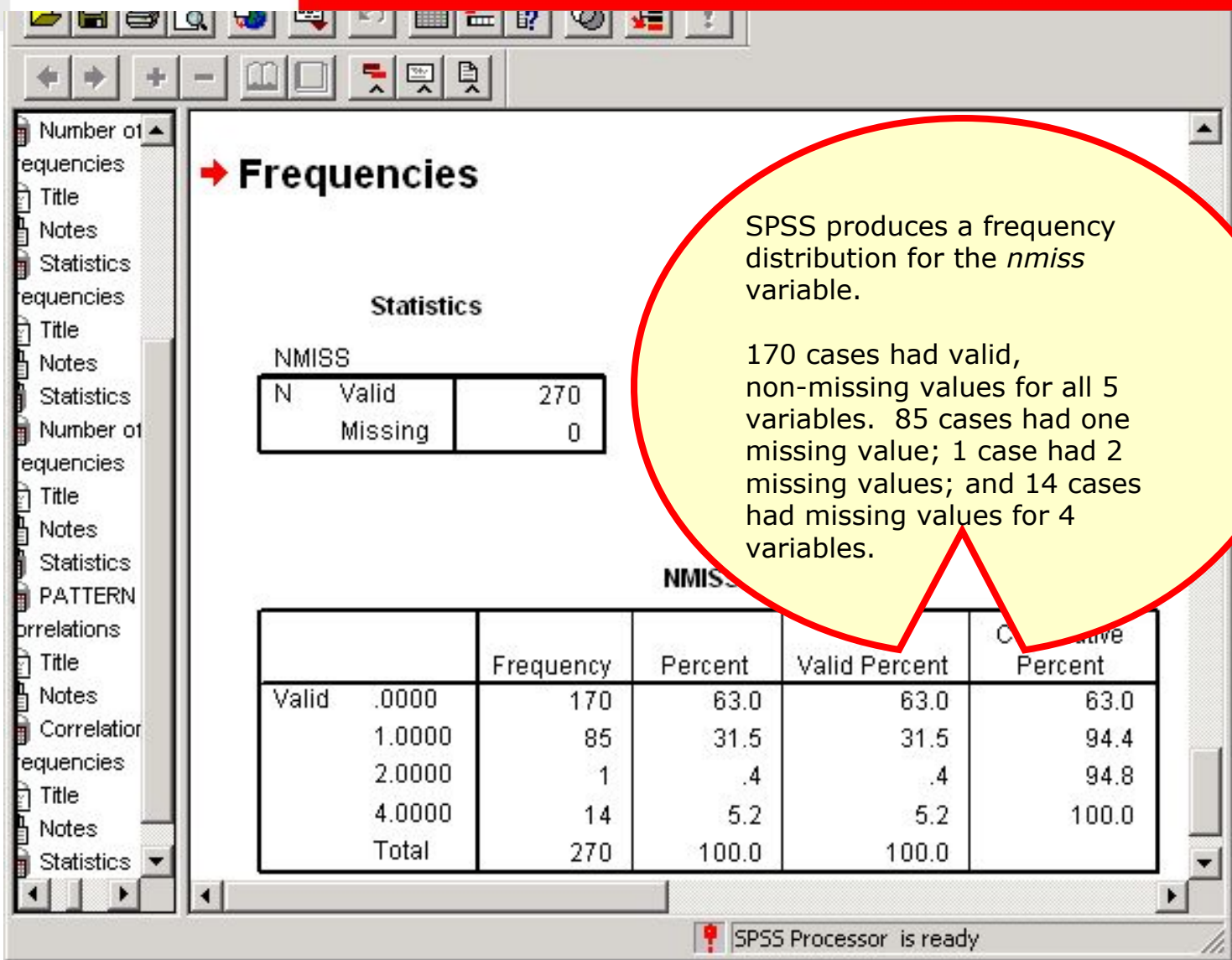
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**First**, move the *nmiss* variable to the list of variables.



**Second**, click on the OK button to complete the request for statistical output.

# The frequency distribution



SPSS produces a frequency distribution for the *nmiss* variable.

170 cases had valid, non-missing values for all 5 variables. 85 cases had one missing value; 1 case had 2 missing values; and 14 cases had missing values for 4 variables.

# Answering the problem

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The screenshot shows the SPSS interface. The 'Frequencies' dialog box is open, with 'Statistics' checked. The 'NMISS' table shows 270 valid cases and 0 missing cases. The 'Frequencies' table shows the distribution of missing values: 170 valid (63.0%), 85 missing (31.5%), 1 missing (.4%), 4 missing (5.2%), and a total of 270 (100.0%).

**Statistics**

NMISS		
N	Valid	270
	Missing	0

**Frequencies**

			NMISS	
		Frequency	Percent	
Valid	.0000	170	63.0	
	1.0000	85	31.5	
	2.0000	1	.4	
	4.0000	14	5.2	
Total		270	100.0	100.0

The problem asked whether or not 14 cases had missing data for more than half the variables. For a set of five variables, cases that had 3, 4, or 5 missing values would meet this requirement.

The number of cases with 3, 4, or 5 missing values is 14.

The answer to the problem is **true**.

SPSS Processor is ready

## Problem 3

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3. Based on a missing data analysis for the variables "employment status," "number of hours worked in the past week," "self employment," "governmental employment," and "occupational prestige score" in the dataset GSS2000.sav, is the following statement true, false, or an incorrect application of a statistic? Use 0.01 as the level of significance.

After excluding cases with missing data for more than half of the variables from the analysis if necessary, the presence of statistically significant correlations in the matrix of dichotomous missing/valid variables suggests that the missing data pattern may not be random.

1. True
2. True with caution
3. False
4. Incorrect application of a statistic

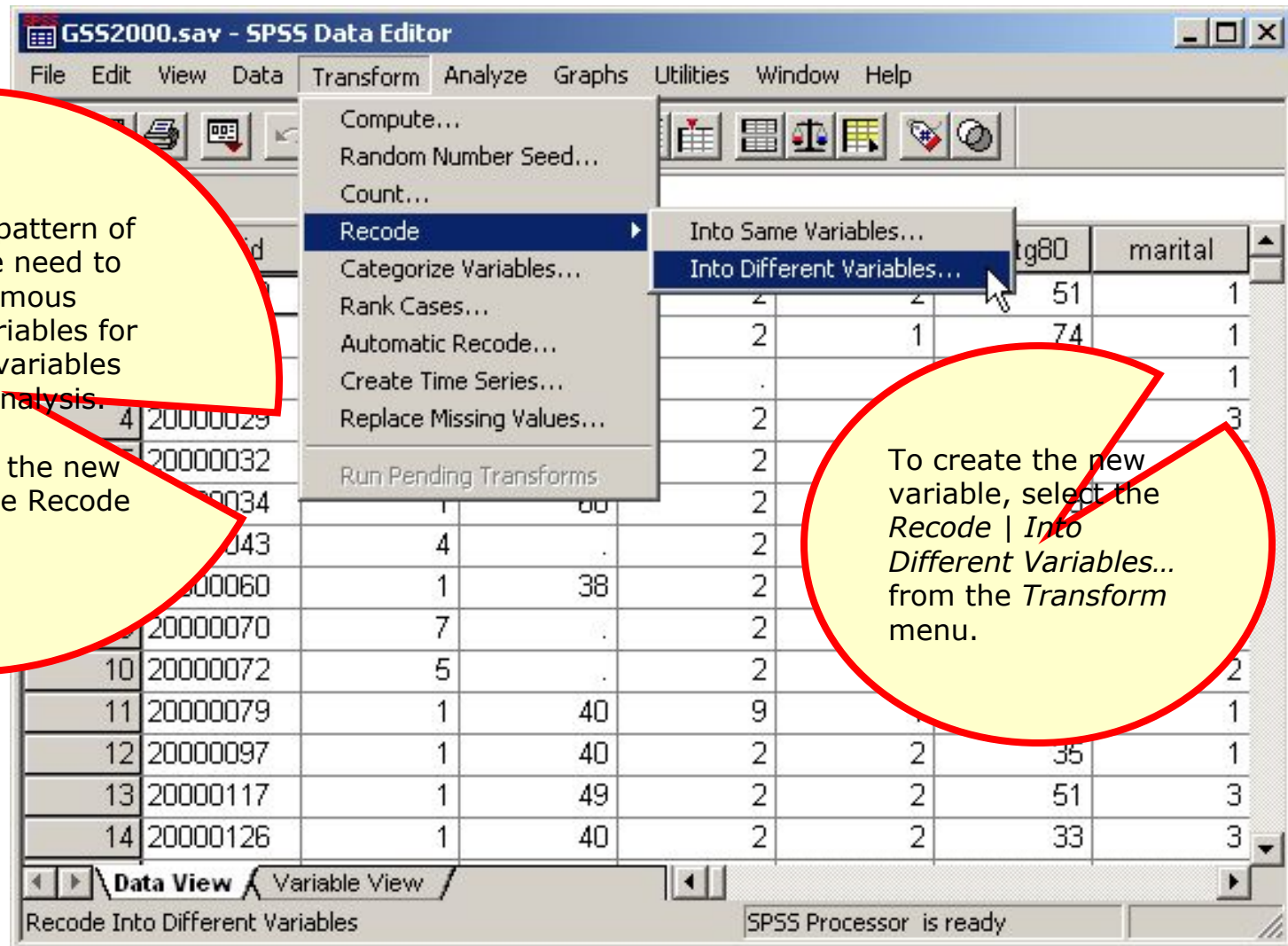


# Compute valid/missing dichotomous variables

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To evaluate the pattern of missing data, we need to compute dichotomous valid/missing variables for each of the five variables included in the analysis.

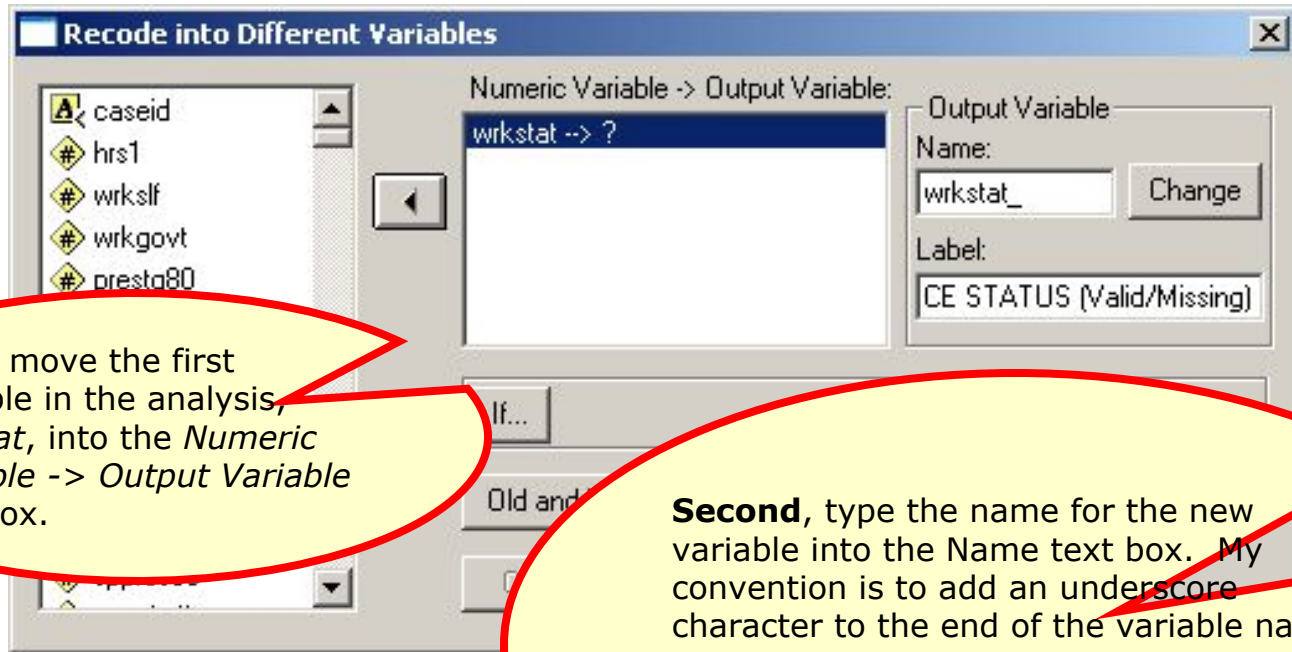
We will compute the new variable using the Recode command.



To create the new variable, select the *Recode | Into Different Variables...* from the *Transform* menu.

# Enter specifications for new variable

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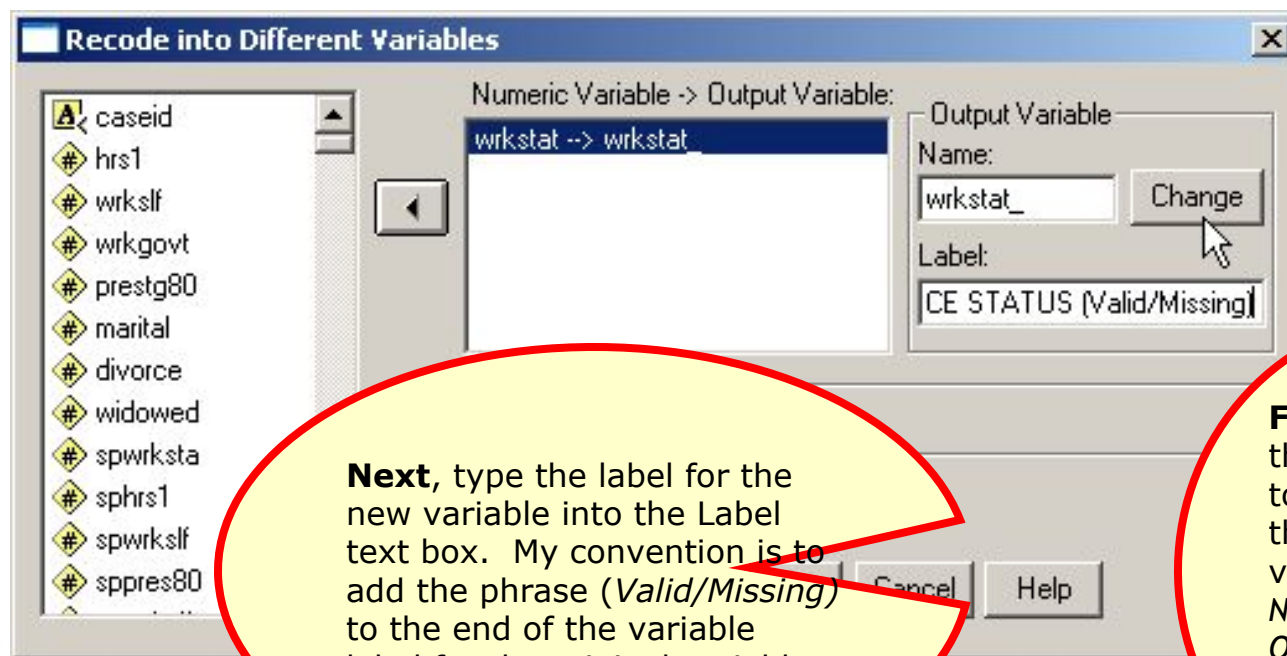


**First**, move the first variable in the analysis, *wrkstat*, into the *Numeric Variable -> Output Variable* text box.

**Second**, type the name for the new variable into the Name text box. My convention is to add an underscore character to the end of the variable name.

If this would make the variable more than 8 characters long, delete characters from the end of the original variable name.

# Enter specifications for new variable

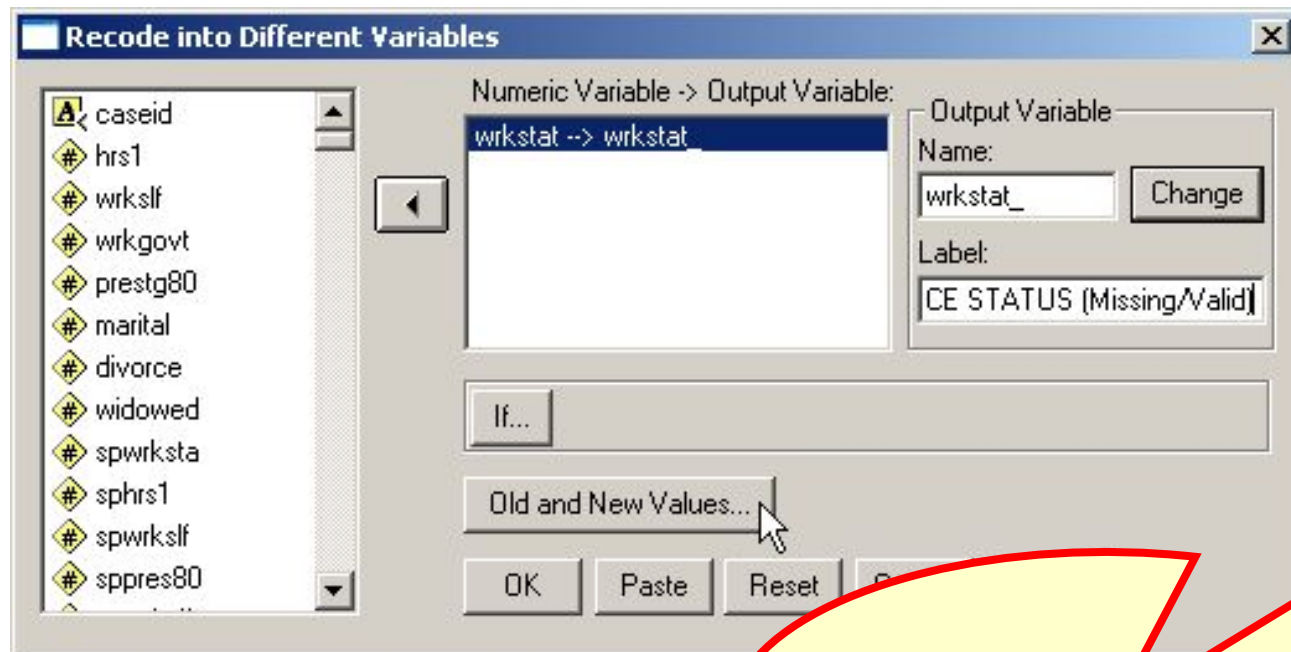


**Next**, type the label for the new variable into the Label text box. My convention is to add the phrase *(Valid/Missing)* to the end of the variable label for the original variable.

**Finally**, click on the Change button to add the name of the dichotomous variable to the *Numeric Variable -> Output Variable* text box.



# Enter specifications for new variable



To specify the values for the new variable, click on the *Old and New Values...* button.

# Change the value for missing data

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The dichotomous variable should be coded 1 if the variable has a valid value, 0 if the variable has a missing value.

**First**, mark the *System- or user-missing* option button.

**Second**, type 0 in the Value text box.

Recode into Different Variables: Old and New Values

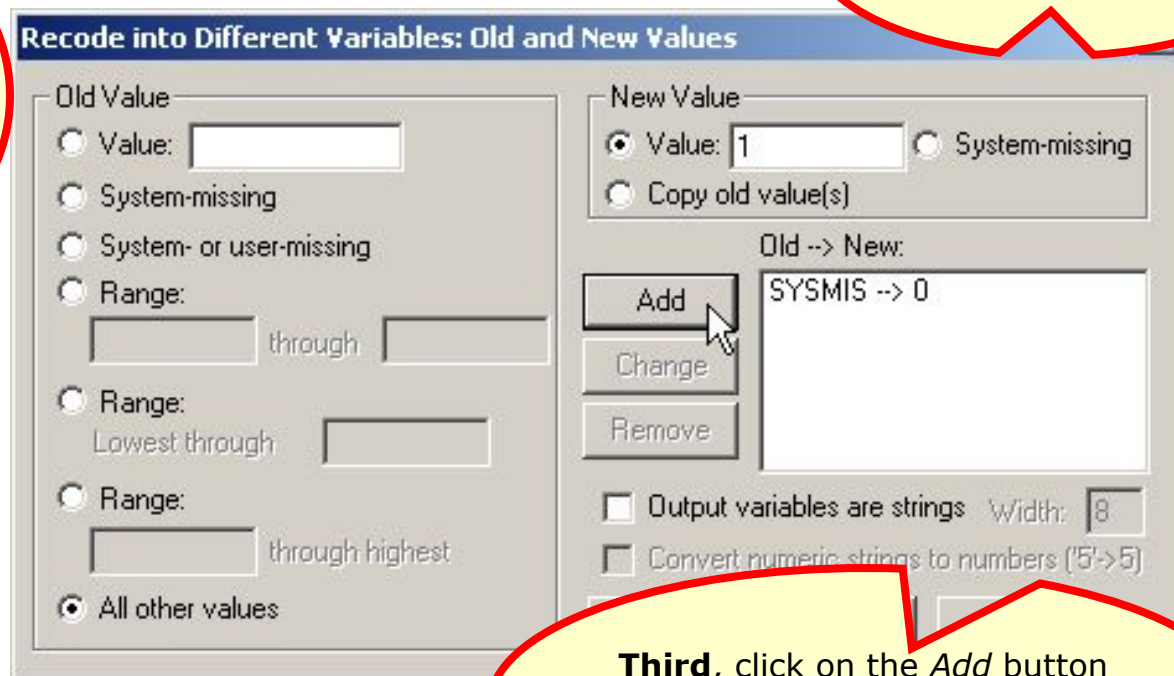
Old Value	New Value
<input type="radio"/> Value: <input type="text"/>	<input checked="" type="radio"/> Value: <input type="text" value="0"/> <input type="radio"/> System-missing
<input type="radio"/> System-missing	<input type="radio"/> Copy old value(s)
<input checked="" type="radio"/> System- or user-missing	
<input type="radio"/> Range: <input type="text"/> through <input type="text"/>	Old --> New:
<input type="radio"/> Range: Lowest through <input type="text"/>	<input type="button" value="Add"/>
<input type="radio"/> Range: <input type="text"/> through highest	<input type="button" value="Change"/>
<input type="radio"/> All other values	<input type="button" value="Remove"/>

**Third**, click on the *Add* button to include this change in the list of *Old->New* list box.

# Change the value for valid data

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**First**, mark the *All other values* option button.

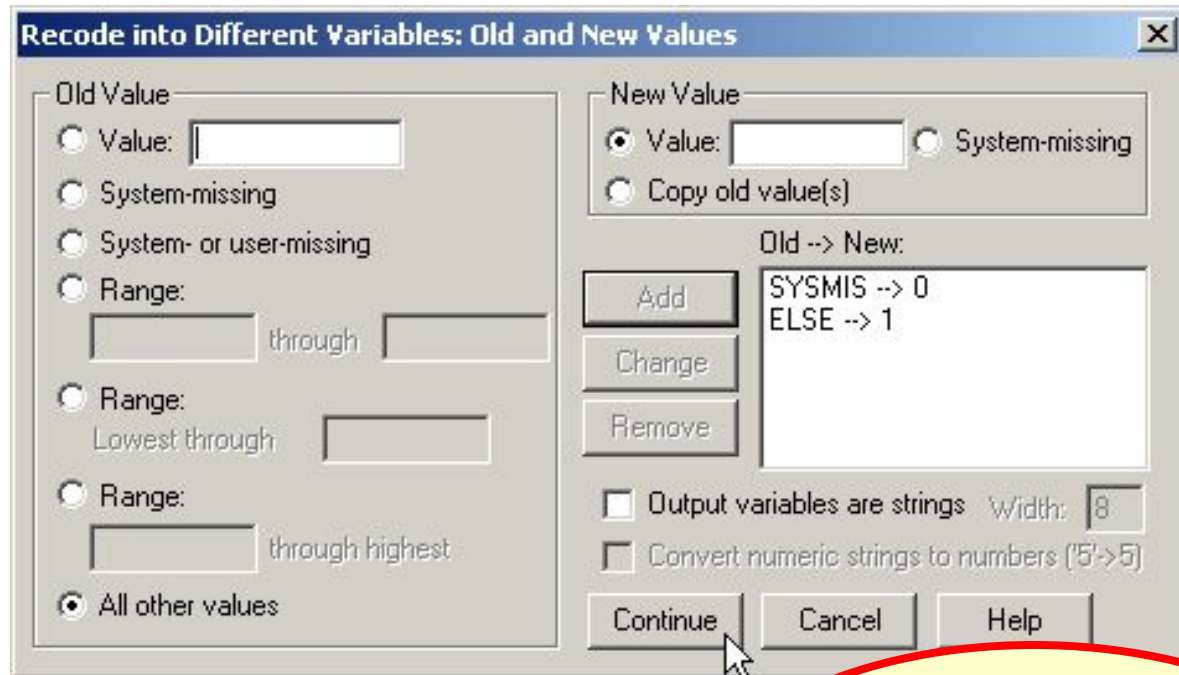


The image shows the 'Recode into Different Variables: Old and New Values' dialog box in SPSS. The 'Old Value' section on the left has the 'All other values' radio button selected. The 'New Value' section on the right has the 'Value' radio button selected, with the number '1' entered in the adjacent text box. Below these sections are 'Add', 'Change', and 'Remove' buttons. To the right of these buttons is a list box labeled 'Old -> New:' which currently contains the entry 'SYSMIS -> 0'. At the bottom right, there are checkboxes for 'Output variables are strings' (unchecked) and 'Convert numeric strings to numbers' (unchecked), along with a 'Width' field set to '8'.

**Second**, type 1 in the Value text box.

**Third**, click on the *Add* button to include this change in the list of *Old->New* list box.

# Complete the value specifications



The image shows the 'Recode into Different Variables: Old and New Values' dialog box in SPSS. The 'Old Value' section on the left has the 'All other values' radio button selected. The 'New Value' section on the right has the 'Value' radio button selected, with an empty text box next to it. Below these sections are buttons for 'Add', 'Change', and 'Remove'. A list box on the right shows the mapping: 'SYSMIS --> 0' and 'ELSE --> 1'. At the bottom, there are checkboxes for 'Output variables are strings' (unchecked) and 'Convert numeric strings to numbers' (unchecked), followed by 'Continue', 'Cancel', and 'Help' buttons. A red oval highlights the 'Continue' button.

Recode into Different Variables: Old and New Values

Old Value

- ☐ Value:
- ☐ System-missing
- ☐ System- or user-missing
- ☐ Range:  through
- ☐ Range: Lowest through
- ☐ Range:  through highest
- ☒ All other values

New Value

- ☒ Value:
- ☐ System-missing
- ☐ Copy old value(s)

Old --> New:

Add Change Remove

SYSMIS --> 0  
ELSE --> 1

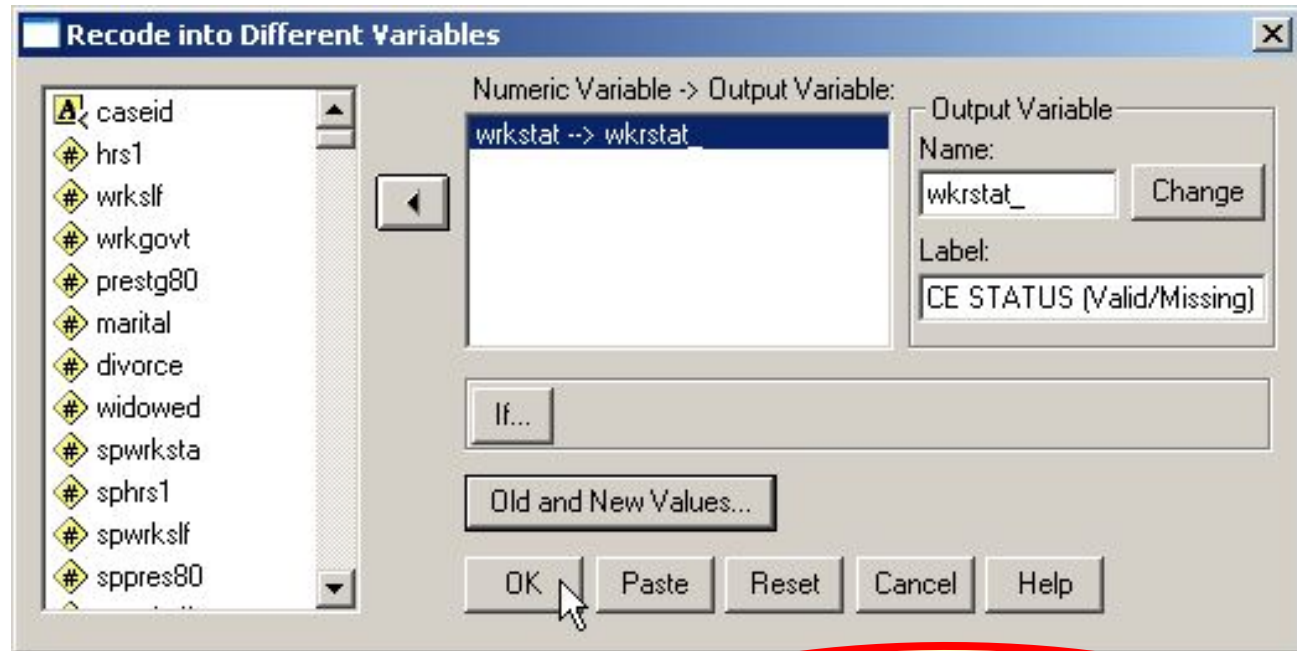
☐ Output variables are strings Width:

☐ Convert numeric strings to numbers ('5'>5)

Continue Cancel Help

Having entered the values for recoding the variable into dichotomous values, we click on the *Continue* button to complete this dialog box.

# Complete the recode specifications



Having entered specifications for the new variable and the values for recoding the variable into dichotomous values, we click on the *OK* button to produce the new variable.

# The dichotomous variable

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$$H_1: \mu < 0$$

GSS2000.sav - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Window Help

14 : netime

The procedure for creating a dichotomous valid/missing variable is repeated for the four other variables in the analysis: hrs1, wrkslf, wrkgovt, and prestg80.

							wrkstat_	var
							1.0000	
							1.0000	
							1.0000	
							1.0000	
5							1.0000	
6	0			2			1.0000	
7	.	.	.	.			1.0000	
8	0	1	.	1			1.0000	
9	.	.	.	.			1.0000	
10	.	.	.	.			1.0000	
11	0	.	.	.			1.0000	
12	.	.	.	.			1.0000	
13	1	.	.	.			1.0000	
14	.	.	.	.			1.0000	

Data View Variable View

SPSS Processor is ready

$$\sum_{i=1}^n w_i (x_i - \bar{x}) = 0$$

$$H_0: \mu = 0$$

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

$$\mu = E(x)$$

$$y = \frac{1}{2} (x_i + x_{i+1})$$

$$\sigma^2 = E(x - \mu)^2$$



# Filtering cases with excessive missing variables

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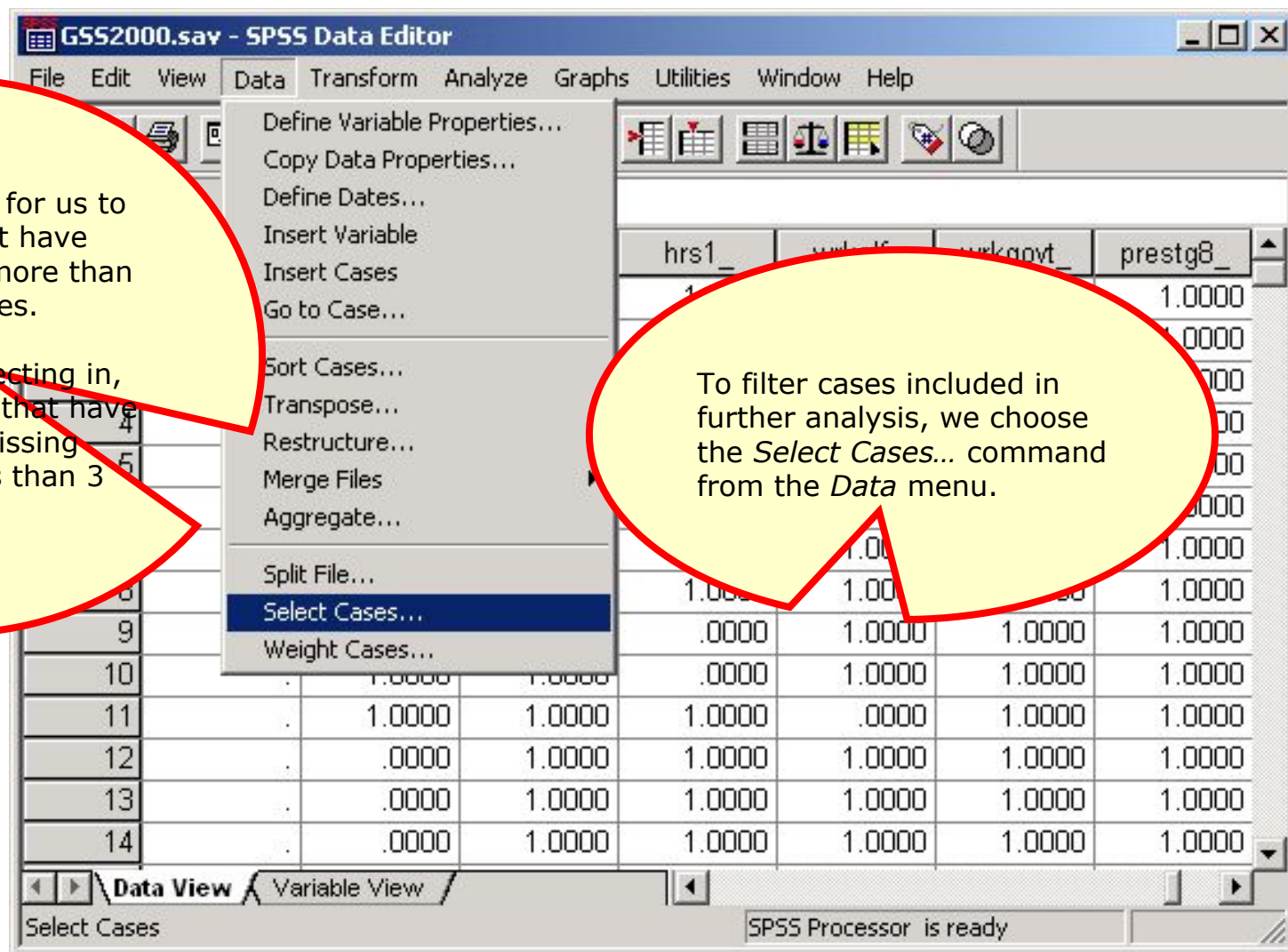
$H_1: \mu < 0$

$$(y - \bar{y}) = (x - \bar{x}) = s_f$$

$$\sigma^2 = E(x - \mu)^2 = E(x - \bar{x})^2$$
$$\mu = \frac{1}{2} (x_j + x_{j+1})$$
$$y = \frac{1}{2} (x_j + x_{j+1})$$

The problem calls for us to exclude cases that have missing data for more than half of the variables.

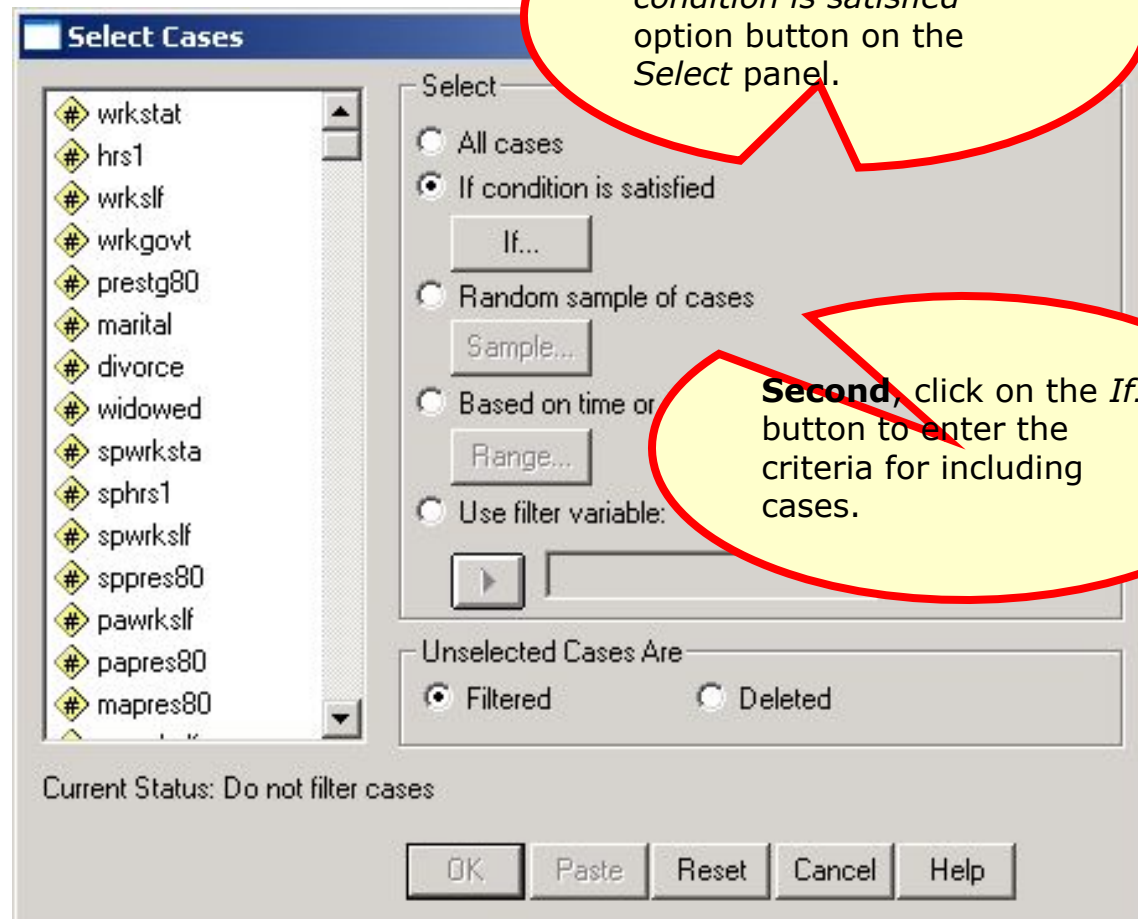
We do this by selecting in, or filtering, cases that have fewer than half missing variables, i.e. less than 3 missing variables.



To filter cases included in further analysis, we choose the *Select Cases...* command from the *Data* menu.

# Enter specifications for selecting cases

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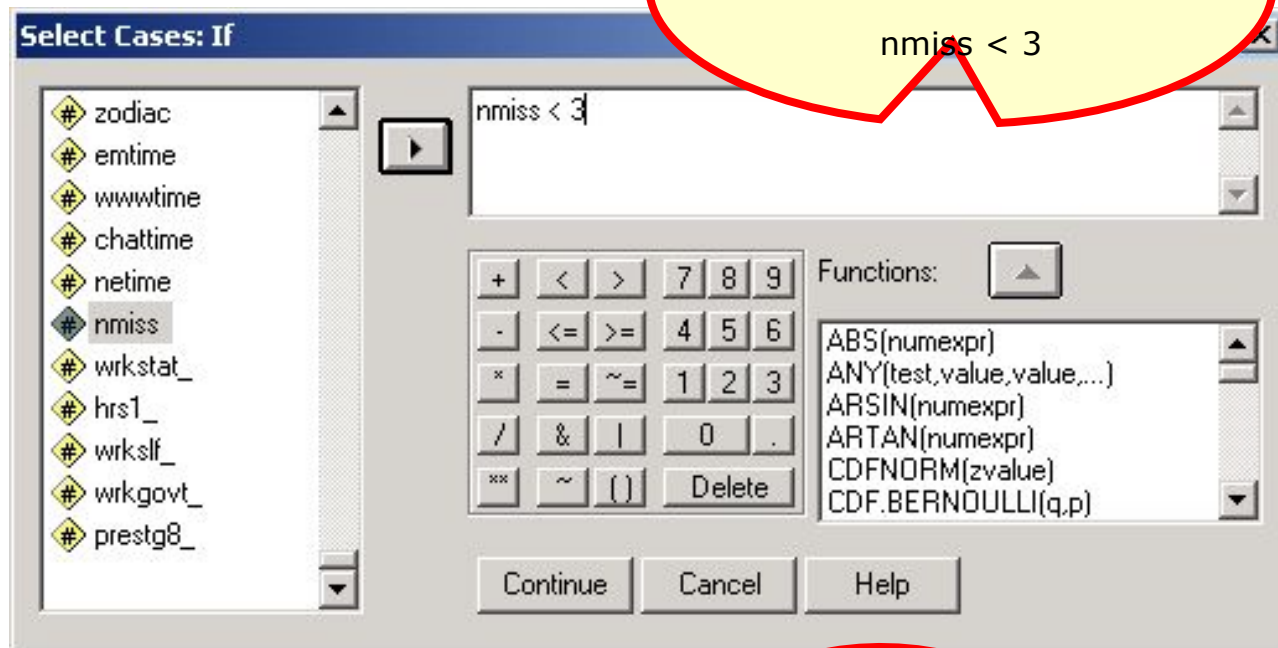




# Enter specifications for selecting cases

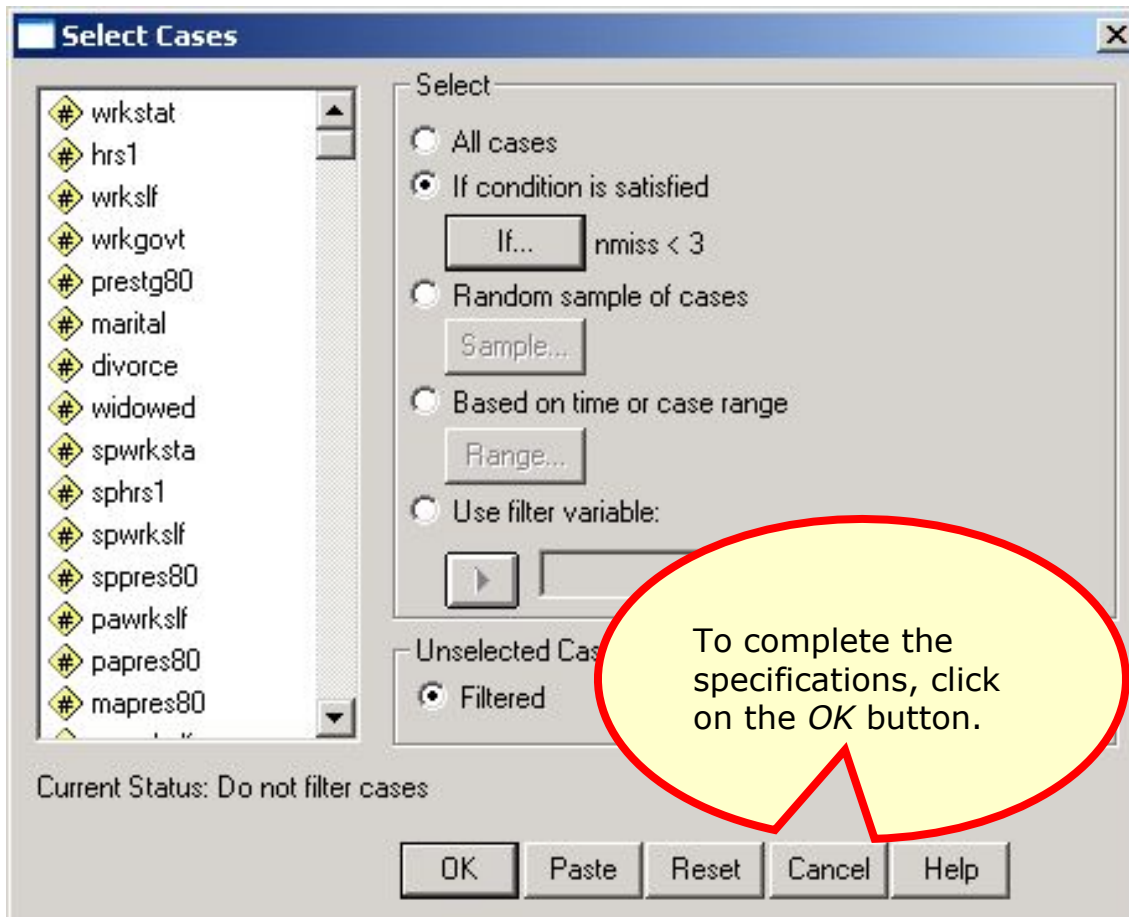
**First**, enter the criteria for including cases:

`nmiss < 3`



**Second**, click on the *Continue* button to complete the If specification.

# Complete the specifications for selecting cases



# Cases excluded from further analyses

SPSS Data Editor window titled "GSS2000.sav - SPSS Data Editor". The menu bar includes File, Edit, View, Data, Transform, Analyze, Graphs, Utilities, Window, and Help. The toolbar contains icons for file operations, editing, and analysis. The status bar at the bottom indicates "SPSS Processor is ready".

The data view shows a table with the following columns: netime, nmiss, wrkstat\_, hrs1\_, wrkslf\_, wrkgovt\_, and prestg8\_. The first column is labeled "1 : nmiss" and has a value of 0. The table contains 14 rows of data. Case 3 is marked for exclusion, indicated by a slash mark through the case number.

SPSS marks the cases that will not be included in further analyses by drawing a slash mark through the case number.

We can verify that the selection is working correctly by noting that the case which is omitted had 4 missing variables.

	netime	nmiss	wrkstat_	hrs1_	wrkslf_	wrkgovt_	prestg8_
1	5	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	10	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
<del>3</del>	.	4.0000	1.0000	.0000	.0000	.0000	.0000
4	.	1.0000	1.0000	.0000	1.0000	1.0000	1.0000
5	.	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	2	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
7	.	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8	.	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
9	.	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	.	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
11	.	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12	.	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
13	.	.0000	1.0000	1.0000	1.0000	1.0000	1.0000
14	.	.0000	1.0000	1.0000	1.0000	1.0000	1.0000

# Correlating the dichotomous variables

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$$H_1: \mu < 0$$

The screenshot shows the SPSS Data Editor window for 'GSS2000.sav'. The 'Analyze' menu is open, and the 'Correlate' option is selected. A yellow callout bubble points to the 'Correlate' menu item with the text: 'To compute a correlation matrix for the dichotomous variables, select the *Correlate* command from the *Analyze* menu.'

The data table below shows the first 14 rows of the dataset. The variables 'chattime' and 'netime' are highlighted in the first two columns.

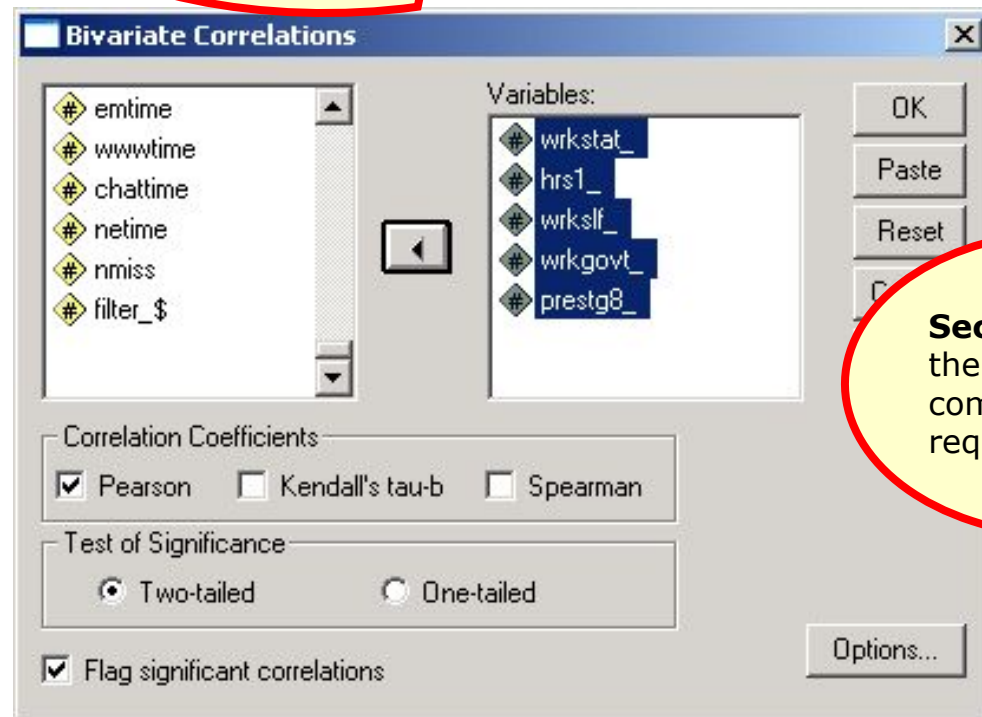
	chattime	netime
1	0	
2	0	1
3	.	
4	.	
5	.	
6	0	
7	.	
8	.	
9	.	
10	.	
11	.	
12	.	
13	.	
14	.	

At the bottom of the window, the 'Data View' tab is selected, and the status bar indicates 'SPSS Processor is ready'.

# Specifications for correlations

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**First**, move the dichotomous variables to the variables list box.



**Second**, click on the OK button to complete the request.

# The correlation matrix

Correlations

		LABOR FORCE STATUS (Valid: 1000)	NUMBER OF HOURS WORKED LAST WEEK (Valid: 1000)	IS SELF-EMP OR WORKS FOR SOMEBODY (Valid: 1000)	GOVT OR PRIVATE EMPLOYEE (Valid: 1000)	IS OCCUPATIONAL PRESTIGE SCORE (Valid: 1000)
LABOR FORCE STATUS (Valid: 1000)	Pearson Correlation	1				
NUMBER OF HOURS WORKED LAST WEEK (Valid: 1000)	Pearson Correlation		1			
IS SELF-EMP OR WORKS FOR SOMEBODY (Valid: 1000)	Pearson Correlation			1		
GOVT OR PRIVATE EMPLOYEE (Valid: 1000)	Pearson Correlation				1	
IS OCCUPATIONAL PRESTIGE SCORE (Valid: 1000)	Pearson Correlation					1

The correlation matrix is symmetric along the diagonal (shown by the blue line). The correlation for any pair of variables is included twice in the table. So we only count the correlations below the diagonal (the cells with the yellow background).

Cannot be computed because at least one of the variables is constant.



The correlations marked with footnote a could not be computed because one of the variables was a constant, i.e. the dichotomous variable has the same value for all cases.

This happens when one of the valid/missing variables has no missing cases, so that all of the cases have a value of 1 and none have a value of 0.

[illegible]

Cannot be combined because at least one of the variables is constant.

# The correlation matrix

Correlations

LABOR FORCE STATUS	Pearson Correlation	LABOR FORCE STATUS (Valid/missing)				
(Valid/missing)	Sig. (2-tailed)					
NUMBER OF HOURS WORKED LAST WEEK	Pearson Correlation					
(Valid/missing)	Sig. (2-tailed)					
IS SELF-EMPLOYED	Pearson Correlation					
WORKS FOR SOMEONE ELSE	Sig. (2-tailed)					
(Valid/missing)						
GOVT OR PRIVATE EMPLOYEE	Pearson Correlation					
(Valid/missing)	Sig. (2-tailed)					
IS OCCUPATIONAL PRESTIGE SCORE	Pearson Correlation					
(Valid/missing)	Sig. (2-tailed)					

In the cells for which the correlation could be computed, the probabilities indicating significance are 0.437, 0.501, and 0.877.

None of the correlations are statistically significant. The answer to the question is **false**. We do not need to be concerned about a missing data problem for this set of variables.

Cannot be computed because at least one of the variables is constant.



# Using scripts

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- The process of evaluating missing data requires numerous SPSS procedures and outputs that are time consuming to produce.
- These procedures can be automated by creating an SPSS script. A script is a program that executes a sequence of SPSS commands.
- Though writing scripts is not part of this course, we can take advantage of scripts that I use to reduce the burdensome tasks of evaluating missing data.

# Using a script for missing data

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- The script “MissingDataCheck.sbs” will produce all of the output we have used for evaluating missing data, as well as other outputs described in the textbook.
- Navigate to the link “SPSS Scripts and Syntax” on the course web page.
- Download the script file “MissingDataCheck.exe” to your computer and install it, following the directions on the web page.

# Open the data set in SPSS

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SPSS Data Editor window titled "Hatmiss.sav - SPSS Data Editor". The window shows a data table with 14 rows and 8 columns. The first column is labeled "id" and contains values from 201.0 to 214.0. The second column is labeled "x1" and contains values from 3.3 to 3.1. The third column is labeled "x2" and contains values from .9 to 2.7. The fourth column is labeled "x3" and contains values from .4 to 5.0. The fifth column is labeled "x4" and contains values from . to .7. The sixth column is labeled "x5" and contains values from 5.8 to 7.8. The seventh column is labeled "x6" and contains values from 3.4 to 3.6. The eighth column is labeled "x7" and contains values from 2.5 to 4.0. A yellow callout bubble with a red border points to the data table and contains the text: "Before using a script, a data set should be open in the SPSS data editor." The status bar at the bottom indicates "SPSS Processor is ready".

	id	x1	x2	x3	x4	x5	x6	x7
1	201.0	3.3	.9					
2	202.0	.	.4					
3	203.0	3.0	.					
4	204.0	.	1.5					2.5
5	205.0	5.1	1.4					2.6
6	206.0	4.6	2.1	7.9	5.8	3.4		2.8
7	207.0	.	1.5	.	4.8	1.9		2.5
8	208.0	5.2	1.3	9.7	6.1	3.2		3.9
9	209.0	3.5	2.8	9.9	3.5	3.1		1.7
10	210.0	4.1	3.7	5.9	.	.		.
11	211.0	3.0	2.8	7.8	7.1	3.0		3.8
12	212.0	4.8	1.7	7.6	4.2	3.3		1.4
13	213.0	3.1	.	.	7.8	3.6		4.0
14	214.0	.	2.7	5.0	.	2.2		.

# Invoke the script

1 : id 201

	id	x1	x2		x5	x6
1	201.0	3.3	.9		2.1	1.8
2	202.0	.	.4		1.2	1.7
3	203.0	3.0	.		3.5	3.4
4	204.0	.	1.5	4.8	1.9	2.5
5	205.0	5.1	1.4	.	.	2.6
6	206.0	4.6	2.1	7.8	4.4	.
7	207.0	.	1.5	.	.	.
8	208.0	5.2	1.3	.	.	.
9	209.0	3.5	2.8	5.9	.	.
10	210.0	4.1	3.7	7.8	7.1	3.0
11	211.0	3.0	2.8	7.6	4.2	3.3
12	212.0	4.8	1.7	.	7.8	3.6
13	213.0	3.1	.	.	.	4.0
14	214.0	.	2.7	5.0	.	2.2

Utilities menu options: Variables..., File Info, Define Sets..., Use Sets..., Run Script..., Menu Editor ...

To invoke the script, select the Run Script... command in the Utilities menu.

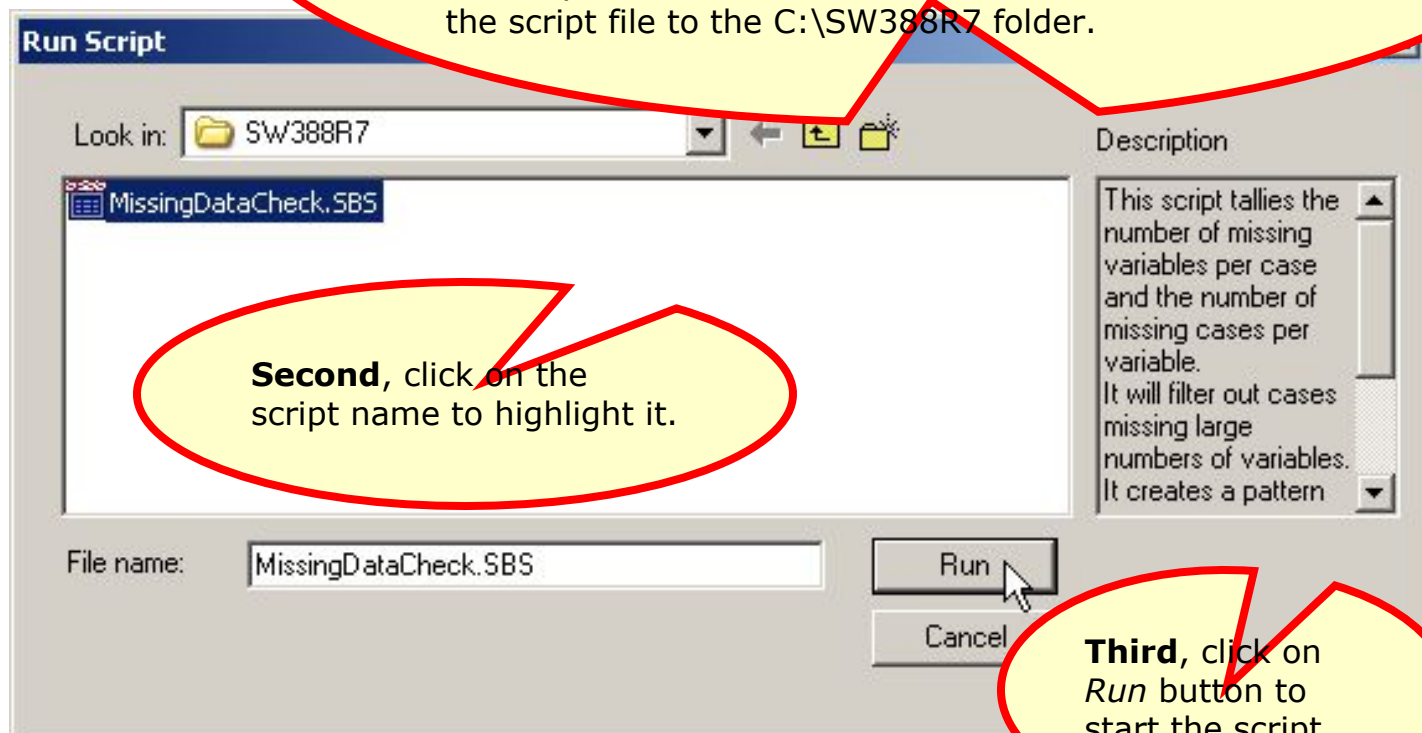
Run Script

SPSS Processor is ready

# Select the missing data script

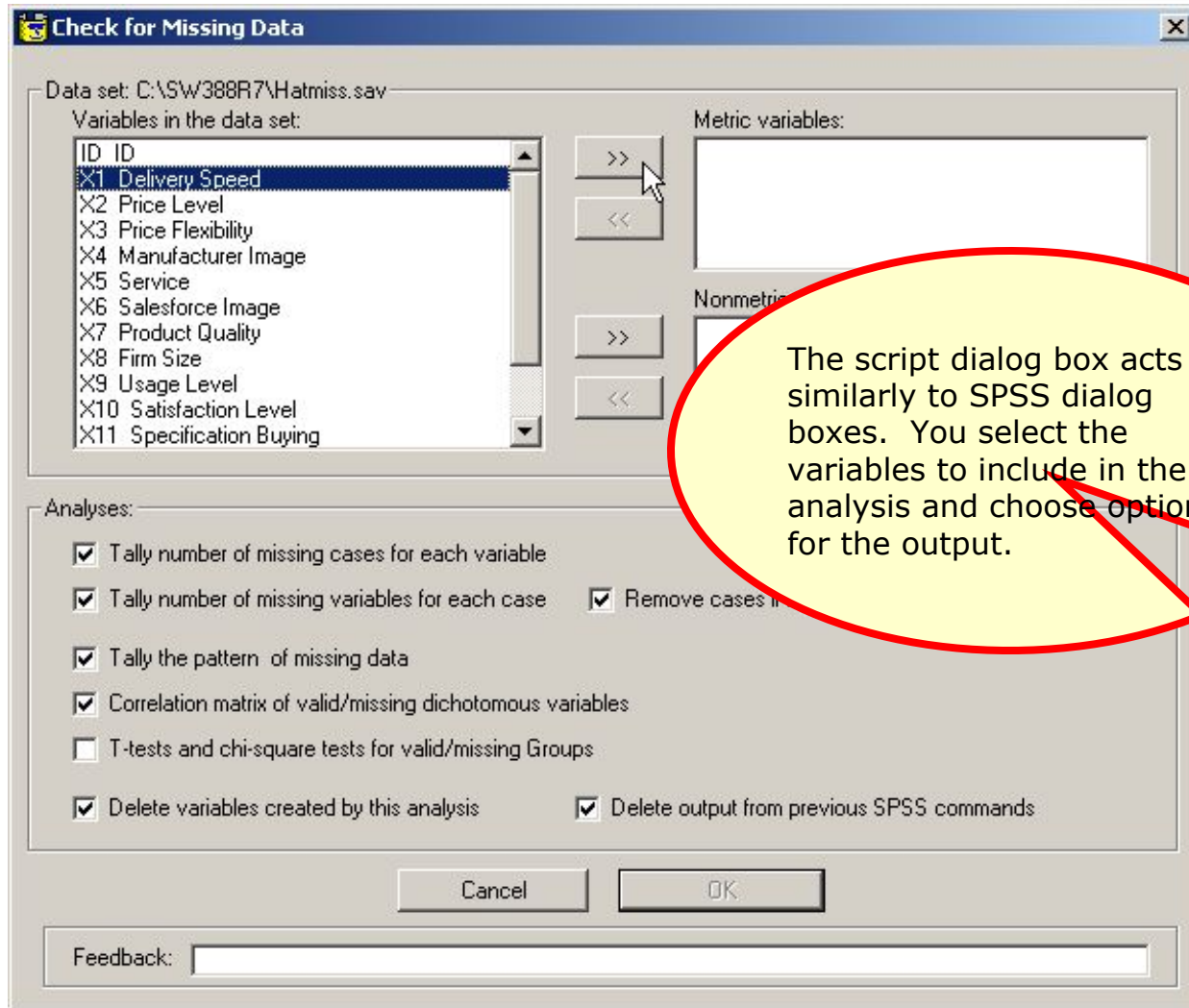
**First**, navigate to the folder where you put the script. If you followed the directions, you will have a file with an ".SBS" extension in the C:\SW388R7 folder.

If you only see a file with an ".EXE" extension in the folder, you should double click on that file to extract the script file to the C:\SW388R7 folder.



# The script dialog

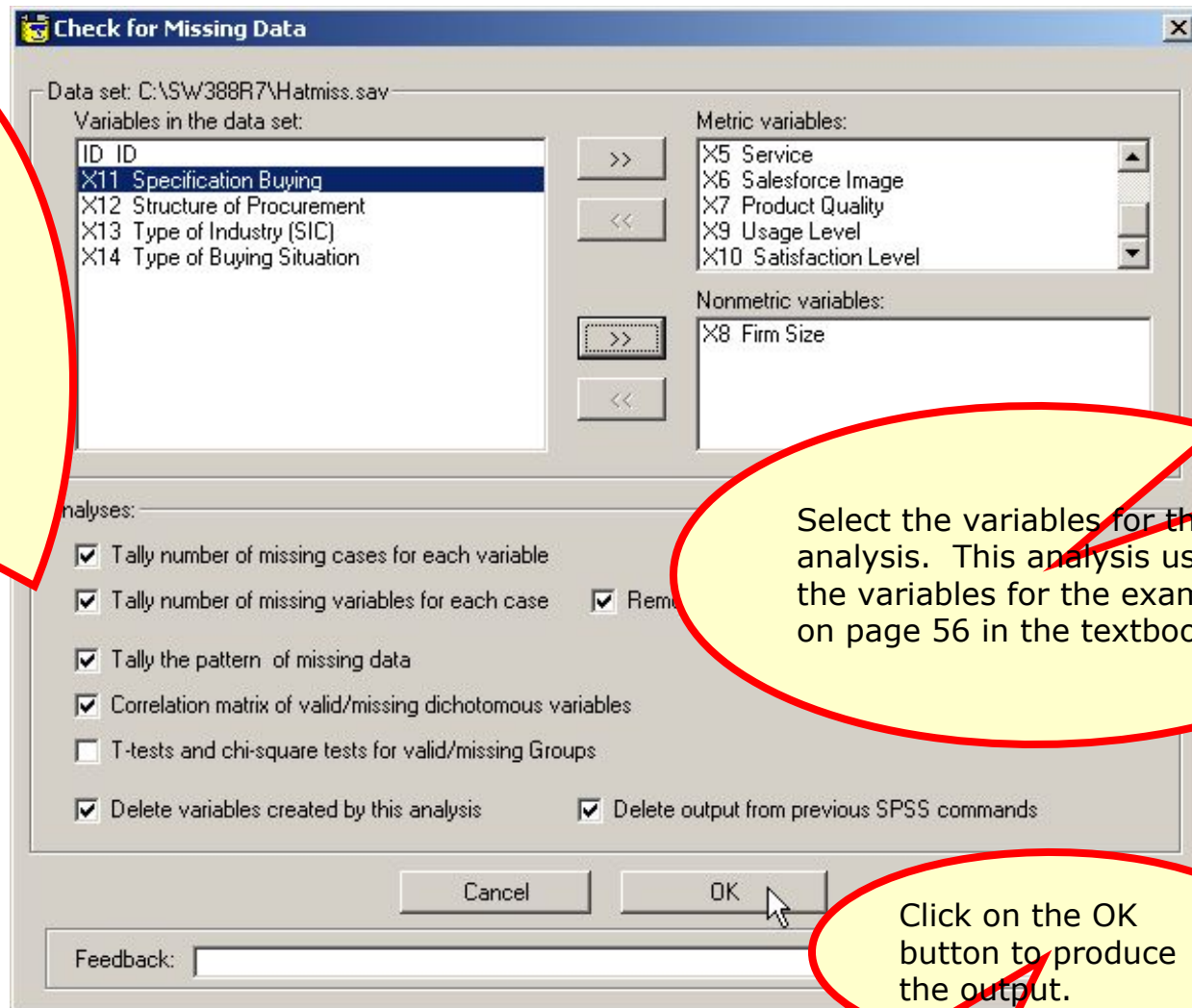
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# Complete the specifications

The checkboxes are marked to produce the output we need for our problems. The only additional option is to compute the t-tests and chi-square tests for all of the variables.



Select the variables for the analysis. This analysis uses the variables for the example on page 56 in the textbook.

Click on the OK button to produce the output.

# The script finishes

If you SPSS output viewer is open, you will see the output produced in that window.



Since it may take a while to produce the output, and since there are times when it appears that nothing is happening, there is an alert to tell you when the script is finished.

Unless you are absolutely sure something has gone wrong, let the script run until you see this alert.

When you see this alert, click on the OK button.

# Output from the script

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## Number of Valid and Missing Cases per Variable (All Cases and All Variables Selected for Analysis)

	Statistics	
	N	
	Valid	Missing
Delivery Speed	49	
Price Level	57	13
Price Flexibility	53	17
Manufacturer Image	63	7
Service Salesforce	61	9
Image	64	6
Product Quality	61	9

The script will produce lots of output. Additional descriptive material in the titles should help link specific outputs to specific tasks.