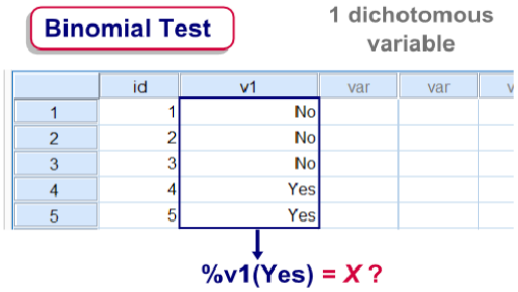
Statistical Tests
(**Comparison Tests - One Variable**)
SPSS Binomial Test

Dony Waluya Firdaus

SPSS Binomial Test

SPSS binomial test is used for testing whether a proportion from a single dichotomous variable is equal to a presumed population value. The figure illustrates the basic idea.



Dichotomous variables are variables that have o nly two distinct valid values. Dichotomous variabl es are a special case of metric variables; calculati ons are meaningful and usually result in a propor tion or a percentage. It is useful to distinguish di chotomous variables as a separate measurement level because they require different analytical pro cedures than other variables

SPSS Binomial Test Example

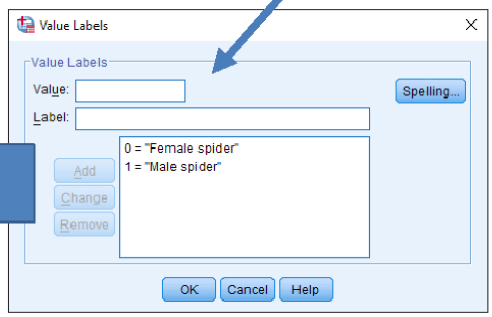
A biologist claims that 75% of a populatio n of spiders consist of female spiders. With a lot of effort he collects 15 spiders, 7 of w hich are female

Variabel View

	Name	Type	Width	Decimals	Label	Values
1	id	Numeric	2	0	Unique observation identifier	None
2	gender	Numeric	2	0	Gender of the spider	{0, Female ...

Missing	Columns	Align	Measure	Role
None	10	Right	Nominal	Input
None	10	Right	Nominal	Input

0 = "Female spider"
1 = "Male spider"



Data View

id	gender
1	1
2	1
3	1
4	0
5	0
6	0
7	1
8	1
9	0
10	1
11	1
12	0
13	1
14	0
15	0

1. Quick Data Check

Let's first take a quick look at the FREQUENCIES for gender. Like so, we can inspect whether there are any missing values and whether the variable is really dichotomous. We'll run some FREQUENCIES. The syntax is so simple that we'll just type it instead of clicking through the menu

1. Quick Data Check. cont

Statistics

Gender of the spider

N	Valid	15
	Missing	0

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 Female spider	7	46.7	46.7	46.7
	1 Male spider	8	53.3	53.3	100.0
	Total	15	100.0	100.0	

The output tells us that there are no missing values and the variable is indeed dichotomous. We can proceed our analysis with confidence.

2. Assumptions Binomial Test

The results from any statistical test can only be taken s eriously insofar as its assumptions have been met. For the binomial test these are

1. the sample size is much smaller than the populatio n size;
2. the sample is representative for the target populati on;
3. Assumption of Independent and Identically Distribu ted Variables (part of which is "independent observ ations");

These assumptions are beyond the scope of this tutori al. We presume they've been met by the data at hand.

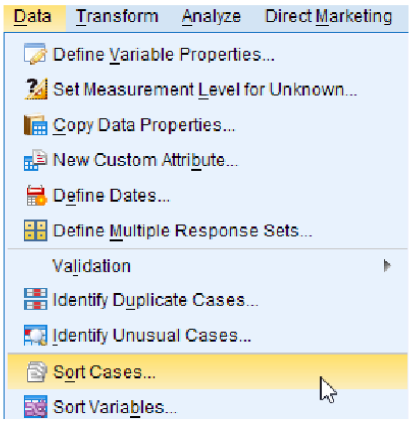
3. Run SPSS Binomial Test

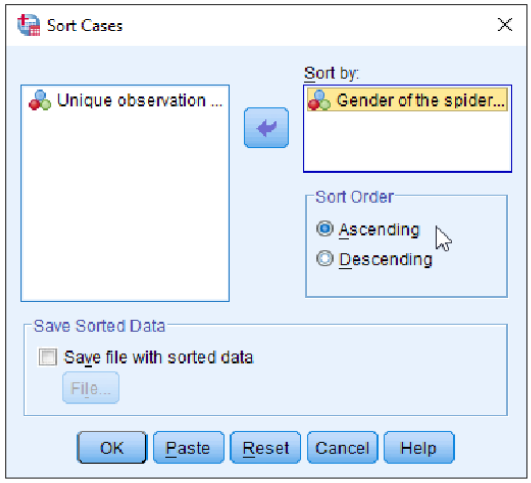
- We'd like to test whether the proportion of female spiders differs from .75 (our test pro portion). Now SPSS Binomial Test has a ver y odd feature: the test proportion we enter applies to the category that's first encounte red in the data. So the hypothesis that's tes ted depends on the order of the cases. Bec ause our test proportion applies to female (rather than male) spiders, we need to move our female spiders to the top of the data fil e. We'll do so by running the syntax below. Next, we'll run the actual binomial test

***Move Female Spiders to Top of File.**
sort cases by gender

3. Run SPSS Binomial Test…. Cont'

***Move Female Spiders to Top of File.**
sort cases by gender





3. Run SPSS Binomial Test…. Cont'

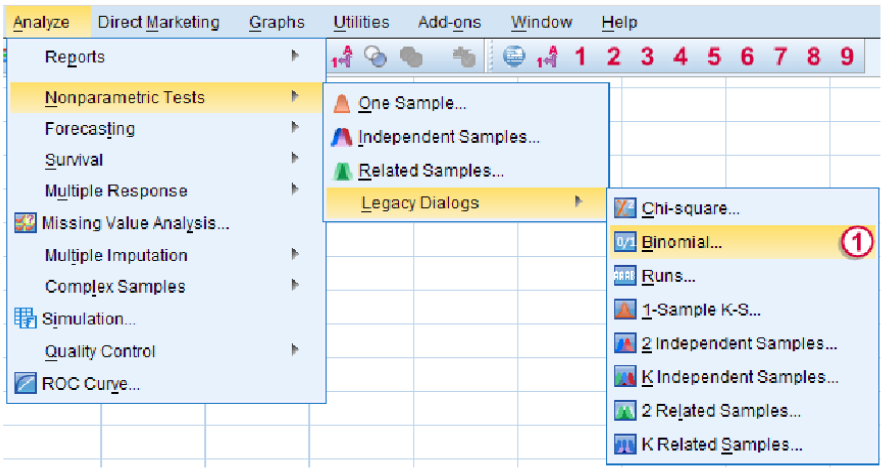
Before

id	gender
1	1
2	1
3	1
4	0
5	0
6	0
7	1
8	1
9	0
10	1
11	1
12	0
13	1
14	0
15	0

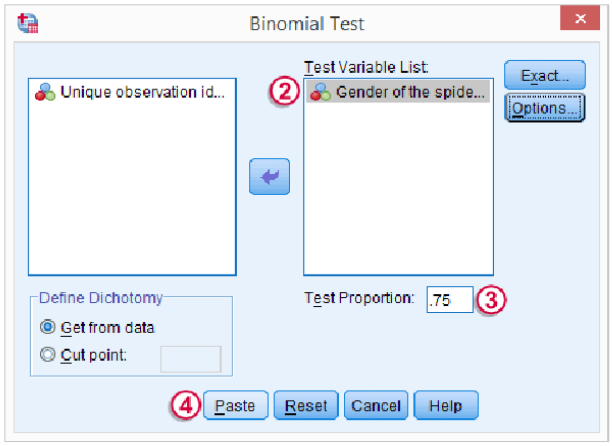
After

id	gender
4	0
5	0
6	0
9	0
12	0
14	0
15	0
1	1
2	1
3	1
7	1
8	1
10	1
11	1
13	1

3. Run SPSS Binomial Test…. Cont'



3. Run SPSS Binomial Test…. Cont'



3. Run SPSS Binomial Test…. Cont'

④ Clicking Paste results in the syntax below. We'll run it and move on the the output.

```
*Run SPSS Binomial Test.

NPAR TESTS
/BINOMIAL (.75)=gender
/MISSING ANALYSIS.
```

4. SPSS Binomial Test Output

Binomial Test

		Category	N	Observed Prop.	Test Prop.	Exact Sig. (1-tailed)
gender	Group 1	0 Female spider	7	① .47	② .75	③ .017[a]
	Group 2	1 Male spider	8	.53		
	Total		15	1.00		

a. Alternative hypothesis states that the proportion of cases in the first group < .75.

① Since we have 7 female spiders out of 15 observations, the observed proportion is (7 / 15 =) .47.

② Our null hypothesis states that this proportion is .75 for the entire population.

4. SPSS Binomial Test Output… Cont'

③ The p value, denoted by **Exact Sig. (1-tailed)** is .017. If the proportion of female spiders is exactly .75 in the entire population, then there's only a 1.7% chance of finding 7 or fewer female spiders in a sample of N = 15. We often reject the null hypothesis if this chance is smaller than 5% (p < .05). We conclude that the proportion of female spiders is not .75 in the population but probably (much) lower.

Note that the p value is the chance of finding the observed proportion or a "more extreme" outcome. If the observed proportion is smaller than the test proportion, then a more extreme outcome is an even smaller proportion than the one we observe.* We ignore the fact that finding very large proportions would also contradict our null hypothesis. This is what's meant by **(1-tailed)**.*

5. Reporting a Binomial Test

When reporting test results, we always report some descriptive statistics as well. In this case, a frequency table will do. Regarding the significance test, we'll write something like ***"a binomial test indicated that the proportion of female spiders of .47 was lower than the expected .75, p = .017 (1-sided)"***.

Refensi : Ruben Geert van den Berg on September 16, 2014