Learn How to Perform Fisher’s Exact Test in SPSS: A Step-by-Step Guide

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Fisher's Exact Test is a powerful statistical technique utilized to determine whether a statistically significant non-random association exists between two categorical variables. This test is foundational in analyzing data presented in small sample sizes.

It is typically deployed as a reliable alternative to the standard Chi-square test of independence, particularly when analyzing 2x2 contingency tables where one or more of the expected cell counts is less than five. This condition violates the core assumptions of the Chi-square approximation, necessitating the precision offered by Fisher's method.

This comprehensive tutorial is designed to guide you through the process of executing and interpreting Fisher's Exact Test using the statistical software package, SPSS (Statistical Package for the Social Sciences).

Understanding Fisher's Exact Test

The primary strength of Fisher's Exact Test lies in its ability to compute the exact probability (p-value) of observing the current data distribution, or one even more extreme, assuming the null hypothesis of independence between the two variables is true. Unlike the Chi-square test, which relies on asymptotic approximations that break down with sparse data, Fisher's test calculates this probability based on the hypergeometric distribution, ensuring accuracy even with very small sample sizes.

The test maintains the strong rigor required for statistical inference when dealing with low frequencies, a common occurrence in specialized research areas such as clinical trials, genetics, or small-scale sociological studies. It calculates the probability across all possible tables that have the same marginal totals as the observed table, making it a robust and non-parametric approach.

Practical Example Setup in SPSS

Consider a scenario where researchers aim to determine if there is an association between **gender** and **political party preference** at a specific university. To investigate this potential relationship, a random sample of 25 students was polled regarding their self-identified party affiliation (Democrat or Republican).

The resulting data, structured as a 2x2 contingency table, is shown below. Due to the small total sample size (N=25), some cell counts are low (e.g., 4), suggesting that Fisher's Exact Test is the most appropriate method for analysis rather than the standard Pearson Chi-Square test.

	Democrat	Republican
Female	8	4

Male	4	9

The objective is to leverage the power of SPSS to rigorously test the statistical significance of the association between these two variables. We will follow a detailed, step-by-step procedure to perform the test accurately.

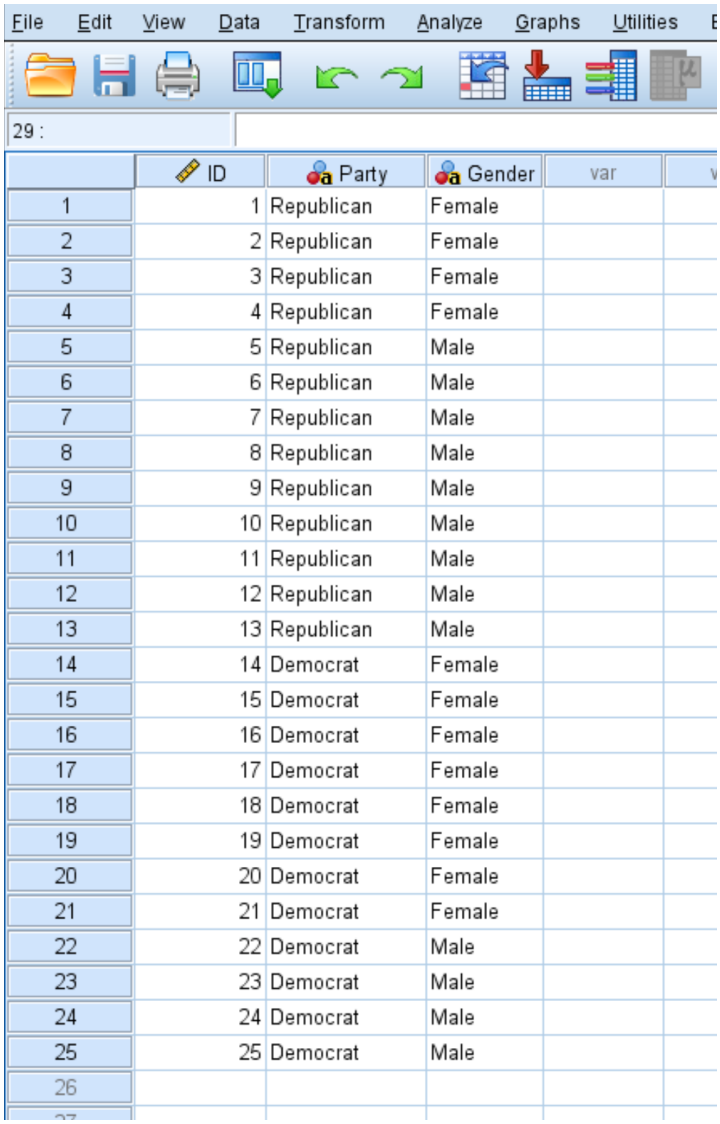
Step-by-Step Procedure: Data Entry and Preparation

The initial and most critical step in SPSS involves entering the raw data correctly. For this specific analysis, the data must be entered in the "long format," meaning each row represents a single individual or case, and columns represent the variables measured for that case.

Step 1: Enter the Data.

The dataset requires at least three columns: an identifier (ID), the political **Party** preference, and the **Gender** of the respondent. Ensure that both **Party** and **Gender** are defined as categorical variables within the Variable View tab in SPSS.

The data should be structured as shown in the visualization below, with 25 distinct rows corresponding to the 25 polled students. Notice how each row uniquely defines the individual's political affiliation and gender, which allows SPSS to construct the necessary contingency table internally during the analysis phase.



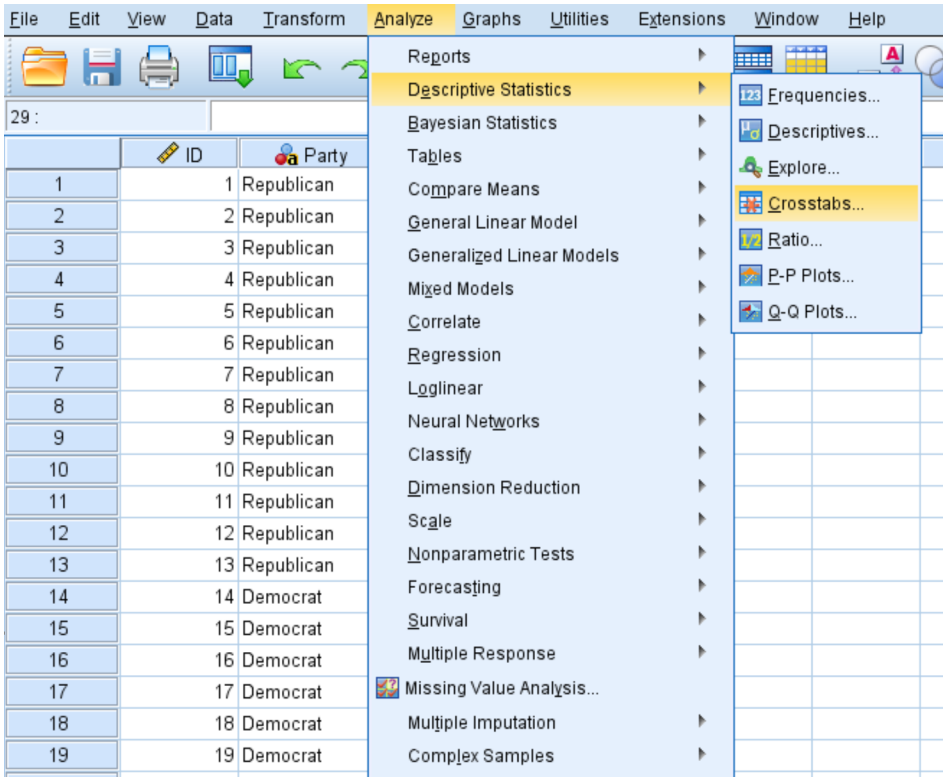
	ID	Party	Gender	var
1	1	Republican	Female	
2	2	Republican	Female	
3	3	Republican	Female	
4	4	Republican	Female	
5	5	Republican	Male	
6	6	Republican	Male	
7	7	Republican	Male	
8	8	Republican	Male	
9	9	Republican	Male	
10	10	Republican	Male	
11	11	Republican	Male	
12	12	Republican	Male	
13	13	Republican	Male	
14	14	Democrat	Female	
15	15	Democrat	Female	
16	16	Democrat	Female	
17	17	Democrat	Female	
18	18	Democrat	Female	
19	19	Democrat	Female	
20	20	Democrat	Female	
21	21	Democrat	Female	
22	22	Democrat	Male	
23	23	Democrat	Male	
24	24	Democrat	Male	
25	25	Democrat	Male	
26				

Executing the Fisher's Exact Test in SPSS

Once the data has been accurately entered and defined in the SPSS Data Editor, the next phase involves navigating the menu system to specify and run the Fisher's Exact Test. This test is nested within the Crosstabs procedure.

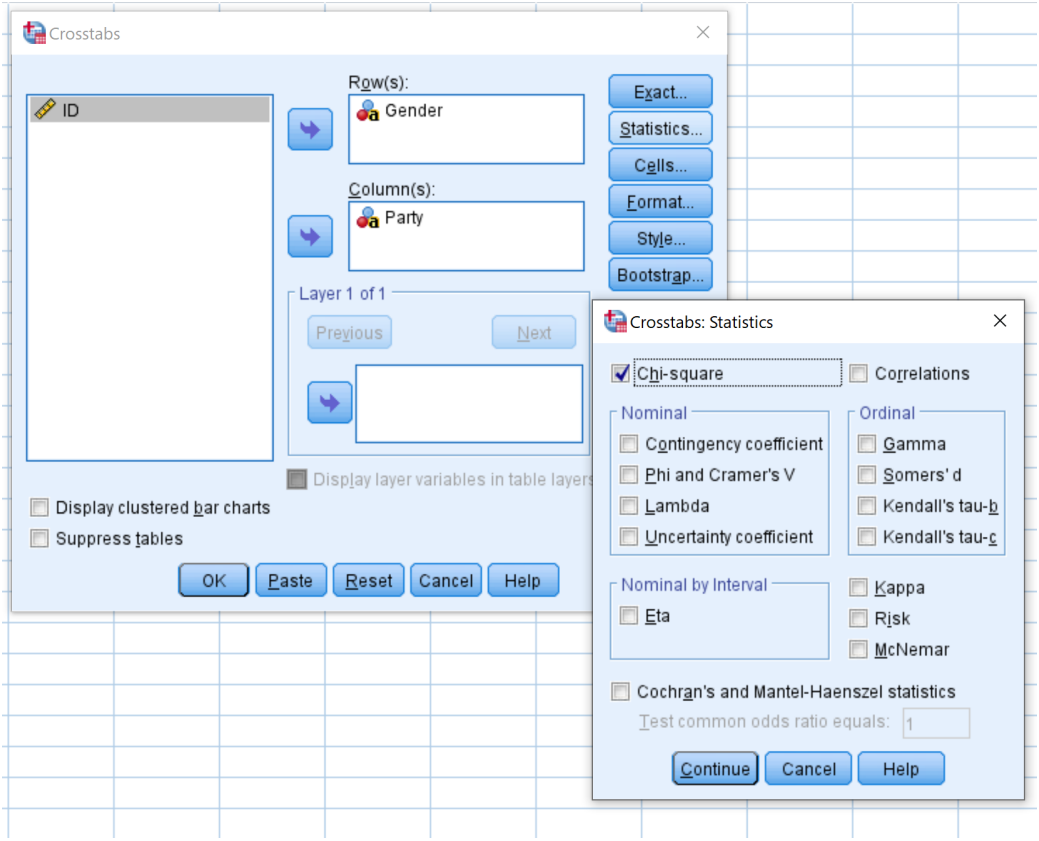
Step 2: Perform Fisher's Exact Test.

Begin by accessing the analysis menu: click the **Analyze** tab, hover over **Descriptive Statistics**, and then select **Crosstabs**. This opens the main dialog box for cross-tabulation analysis.

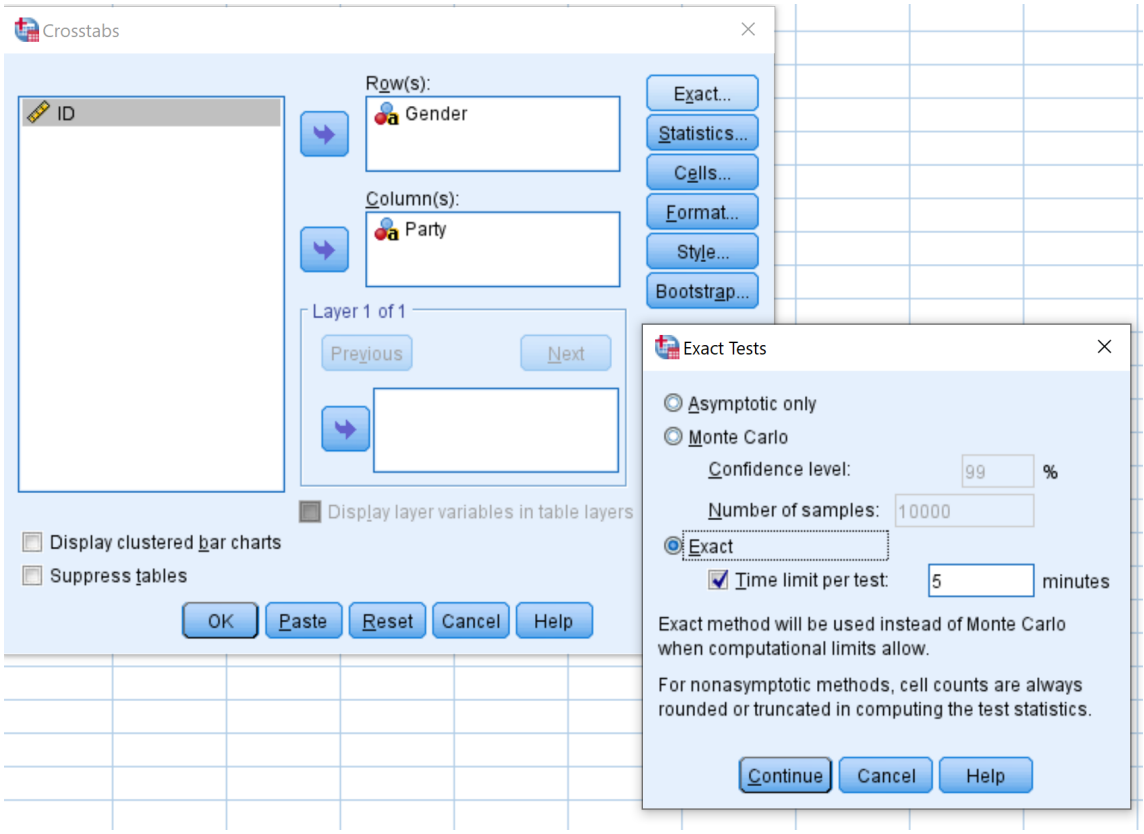


In the Crosstabs dialog box, assign the variables to their respective positions: drag the variable **Gender** into the box labeled Rows, and the variable **Party** into the box labeled Columns. The placement of variables (Row vs. Column) does not affect the statistical outcome, but consistent placement aids in interpretation.

Next, it is crucial to request the necessary statistical tests. Click the button labeled **Statistics**. Within the Statistics dialog box, ensure that the option next to **Chi-square** is checked. Although we are primarily interested in Fisher's Exact Test, selecting Chi-square is necessary because Fisher's test results are provided in the same output table when running the Crosstabs procedure. After checking the box, click **Continue**.



The final step in configuration involves explicitly requesting the exact test calculation. Click the button labeled **Exact**. In the ensuing dialog box, confirm that the radio button next to **Exact** is selected. This instructs SPSS to perform the computationally intensive exact calculation rather than relying solely on the Chi-square approximation. Click **Continue** to return to the main Crosstabs window.



Finally, with all settings confirmed, click **OK** in the main Crosstabs dialog box to execute the analysis and generate the output results.

Interpreting the Output and Drawing Conclusions

Upon clicking **OK**, SPSS will generate the output viewer containing several tables crucial for interpreting the results of the analysis.

Step 3: Interpret the Results.

The output will feature three primary tables, beginning with the Case Processing Summary, which verifies the number of valid and missing cases (0 missing in this instance). The subsequent table is the actual Crosstabulation, which visually reproduces the observed counts based on the variable assignments (Gender in rows, Party in columns).

The most important section is the third table, titled Chi-Square Tests, which contains the results for Fisher's Exact Test:

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Party	25	100.0%	0	0.0%	25	100.0%

Gender * Party Crosstabulation

Count

		Party		
		Democrat	Republican	Total
Gender	Female	8	4	12
	Male	4	9	13
Total		12	13	25

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.222[a]	1	.073	.115	.081
Continuity Correction[b]	1.944	1	.163		
Likelihood Ratio	3.293	1	.070	.115	.081
Fisher's Exact Test				.115	.081
N of Valid Cases	25				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.76.

b. Computed only for a 2x2 table

Within the section dedicated to Fisher's Exact Test, we are presented with two critical p-values:

Two-sided p-value: This value (0.115) tests the general hypothesis that the two variables are associated in any direction.
One-sided p-value: This value (0.081) is used when the researcher has a specific, directional hypothesis (e.g., females are significantly more likely to be Democrats than males).

The core premise of the statistical test is framed by the **null hypothesis**, which states that **gender and political party preference are independent** (i.e., there is no association). Since the research question is typically non-directional--we want to know if there is *an* association, not specifically which way--we rely on the **two-sided p-value**, which is 0.115.

To make a decision, we compare this p-value to the predetermined significance level (alpha, typically set at 0.05). If the p-value is less than 0.05, we reject the null hypothesis, concluding that

a significant association exists. In this case, 0.115 is **not less than 0.05**.

Therefore, based on the results of Fisher's Exact Test, we **do not reject the null hypothesis**. The analysis does not provide sufficient statistical evidence to conclude that there is a significant association between gender and political party preference among the students polled at this college. While the observed counts suggest a potential difference, the exact probability calculation indicates that this pattern could reasonably occur by random chance under the assumption of independence.