

## The Median Test — Analysis of k-Between-Group Data with a Quantitative Response Variable

**Application:** To compare the medians of a quantitative response variable (which is either ordinal, not normally distributed or from a small sample) obtained from 2 or more groups.

**Research Hypothesis:** The researcher hypothesized that Coop stores would have the most fish on display, chain stores would display the least, and private pet stores would display an intermediate amount.

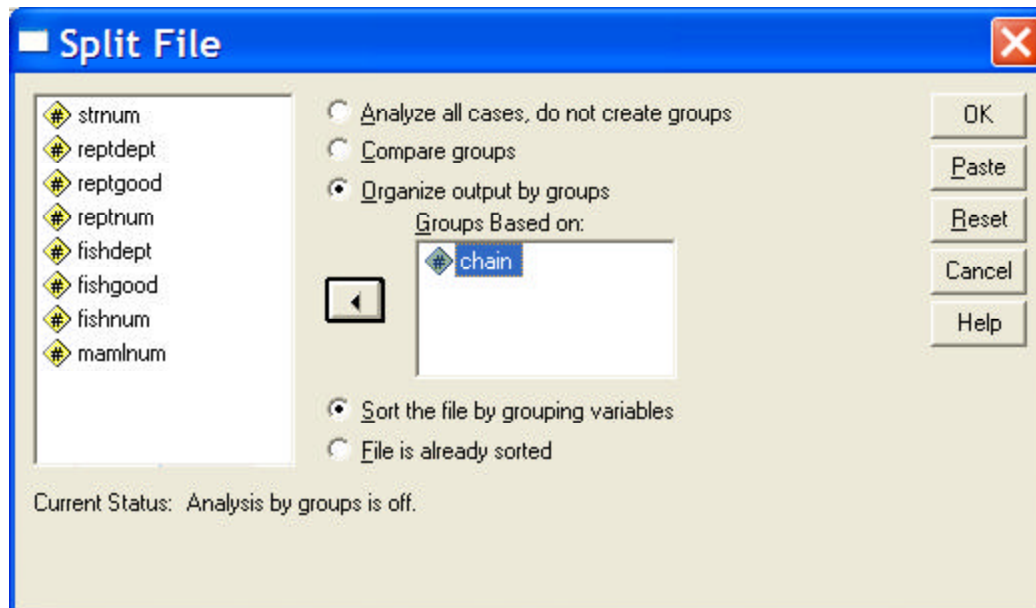
**H<sub>0</sub>:** The three different types of pet shops have the same median number of fish displayed

### Step 1 -- Getting the Univariate Statistics

SPSS has no convenient way of getting nonparametric univariate stats for separate groups. What we have to do is to “split” the file into two subfiles, based on the grouping variable. Then we can get the nonparametric univariate statistics for each group. Then we have to “un-Split” the file.

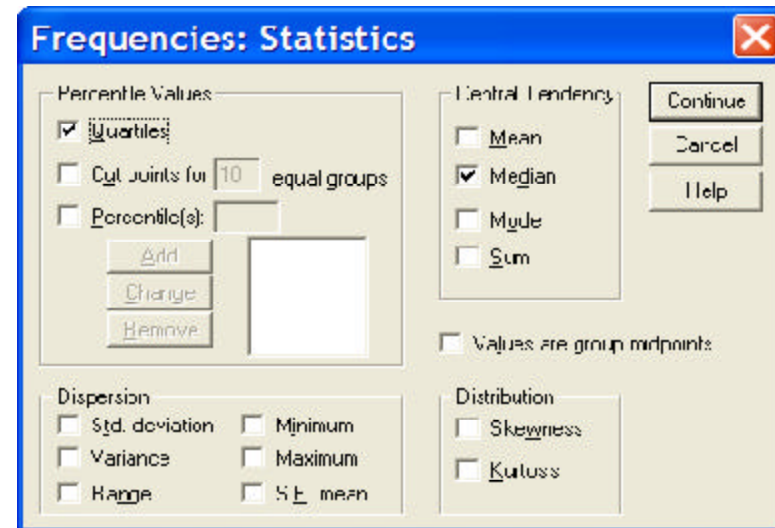
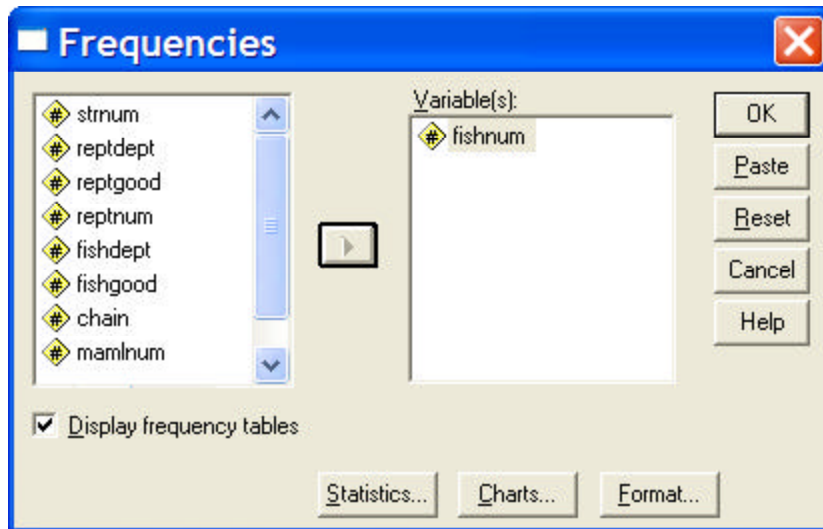
#### Data → Split File

- click “Organize output by groups”
- highlight the grouping variable (IV) and click the arrow to move it into the “Groups based on” window



**Analyze/Statistics → Summarize → Frequencies**

- highlight the response variable and click the arrow button
- Click “Statistics” — check “Quartiles” and “Median”



**SPSS Output:**

**‘type of store’ = ‘chain store’**

**Statistics<sup>a</sup>**

‘number of fish at store’

N	Valid	5
	Missing	0
Median		20.00
Percentiles	25	12.00
	50	20.00
	75	21.50

a. ‘type of store’ = ‘chain store’

**‘type of store’ = ‘privately owned’**

**Statistics<sup>a</sup>**

‘number of fish at store’

N	Valid	3
	Missing	0
Median		17.00
Percentiles	25	17.00
	50	17.00
	75	24.00

a. ‘type of store’ = privately owned

**‘type of store’ = ‘coop’**

**Statistics<sup>a</sup>**

‘number of fish at store’

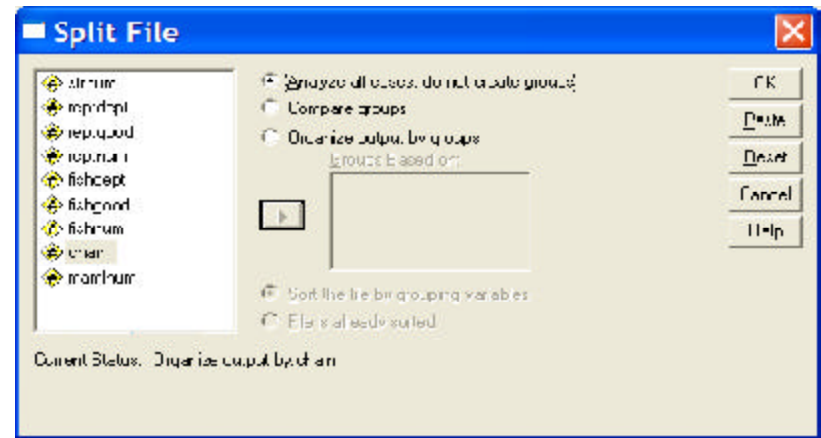
N	Valid	4
	Missing	0
Median		35.00
Percentiles	25	31.25
	50	35.00
	75	40.25

a. ‘type of store’ = coop

**Step 2: Obtain the comparison of the two groups.**

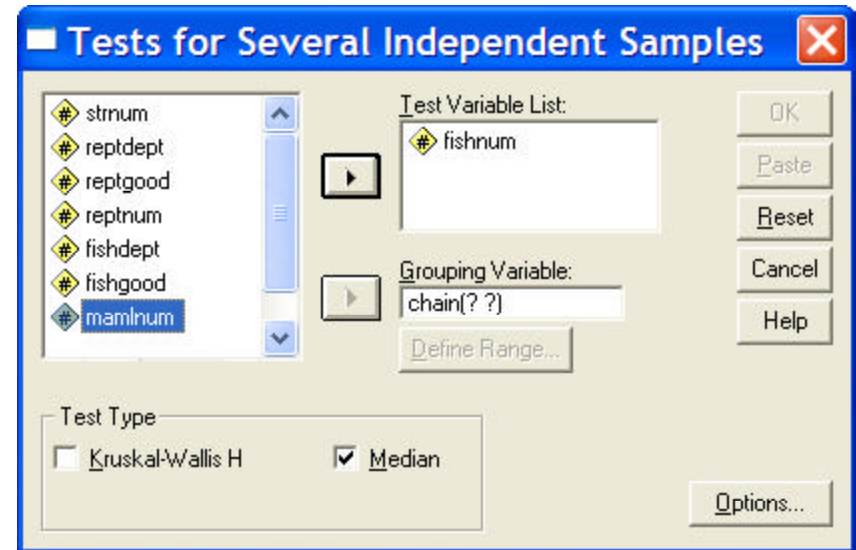
**Data → Split File**

- click “Analyze all cases. Do not create groups.”



**Analyze/Statistics → Nonparametric Tests → K Independent Samples**

- highlight the quantitative response variable and click the arrow to move it to the “Test Variable List” window
- highlight the grouping variable (IV) and click the arrow to move it to the “Grouping Variable” window
  - click the “Define Groups” button -- enter the lowest and highest value gave the groups and click “continue”
- be sure the “Median Test” is checked



**Output:**

**Frequencies**

	'type of store'		
	'chain store'	privately owned	coop
'number of fish at store' > Median	1	1	4
<= Median	4	2	0

**Test Statistics<sup>a</sup>**

	'number of fish at store'
N	12
Median	21.50
Chi-Square	6.133 <sup>a</sup>
df	2
Asymp. Sig.	.047

a. 6 cells (100.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.5.

b. Grouping Variable: 'type of store'

There is a significant effect. However, since there are three groups, we do not know the specific pattern of that effect unless we complete pairwise comparisons among those three groups.

The results reported below were obtained using this method, which is shown on the next page.

Pairwise follow-up analyses use the Median Test to compare each pair of conditions.

**Comparing groups 1 and 2 (Chain vs. Private)**

**Analyze/Statistics → Nonparametric Tests → K Independent Samples**

- highlight “Grouping Variable” window
- click the “Define Groups” button -- change the “3” in the “maximum” window to “2”

**Test Statistics<sup>a</sup>**

	'number of fish at store'
N	8
Median	18.50
Exact Sig.	1.000

a. Grouping Variable: 'type of store'

**Comparing groups 2 and 3 (Private vs. Coop)**

**Analyze/Statistics → Nonparametric Tests → K Independent Samples**

- highlight “Grouping Variable” window
- click the “Define Groups” button -- enter “2” as the minimum and “3” as the maximum

**Test Statistics<sup>a</sup>**

	'number of fish at store'
N	7
Median	31.00
Exact Sig.	.143

a. Grouping Variable: 'type of store'

No difference between chain (1) and private (2) stores.

There is no difference between private (2) and coop (3) stores -- though there was with the more powerful Kruskal-Wallis test

There is a difference between chain (1) and coop (was 3, now is 0) stores.

**Comparing groups 1 and 3 (Chain vs. Coop)**

In order to compare groups 1 & 3, we have to first recode group 3 (coop stores) to have a value of 0. Then ask for a comparison between groups 1 and 0 (which is really 3 - coop stores).

**Data → Select Cases → K Independent Samples**

- click “If condition is satisfied” button
- click the “If” button to open the “Select Cases: If” window
  - highlight the grouping variable and click the arrow to move it into the working window
  - type “≠ 2” in the window after the name of the grouping variable and press “continue” (this tells the computer to use only cases with a grouping variable score that is not 2)

**Analyze/Statistics → Nonparametric Tests → K Independent Samples**

- highlight “Grouping Variable” window
- click the “Define Groups” button -- enter “1” as the minimum and “3” as the maximum (since there is no cases in group “2” this will make a comparison of groups 1 and 3)

**Test Statistics<sup>b</sup>**

	'number of fish at store'
N	9
Median	22.00
Chi-Square	9.000 <sup>a</sup>
df	1
Asymp. Sig.	.003

a. 4 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.8.

b. Grouping Variable: 'type of store'

**Reporting the Results:**

The number of fish displayed at each type of store is summarized in Table 1. There were significantly different distributions of the number of fish displayed among the three types of stores (using the Medial Test,  $p = .047$ ). Pairwise comparisons using the Median test ( $p = .05$ ) revealed that, as hypothesized, Coop stores displayed more fish than Chain stores. However, contrary to the hypothesis, there was no other differences among the different types of pet stores.

Table 1.  
Quartile values for the number of fish displayed by each of the three types of stores

Number of Fish displayed	Store Type		
	Chain Store	Priately Owned	Coop Store
Median	20.00	17.00	35.00
1st Quartile	12.00	17.00	31.25
3rd Quartile	21.50	22.50	40.25