

# Stata Recitation - Week 8 - Chi-squared tests and Labels

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## Key Ideas:

- Calculate statistics based on two variables: tab2 (chi2 option), corr, pwcorr
- Create and modify variable and value labels
- Search variable labels

## In class activity 1: Review Problems

Using the `citytemp.dta` example dataset.

Use a do-file to produce the output that you used to arrive at your answers.

Use comments before and after the command to document the question you are answering and the answer.

1. Generate a dummy variable, `hightempJan`, that is 1 for all cities with average January temperatures above 40 degrees and 0 for all those with average temperatures of 40 degrees or less.
2. How many cities have high January temperatures?
3. Create a bar graph showing mean cooling degree days and mean heating degree days, broken into two categories, for cities with high January temperatures and low January temperatures.
4. How many cities are in the “West” Census region and the “Mountain” Census division?

```
sysuse citytemp.dta, clear
```

```
*1
gen hightempjan = 0
replace hightempjan = 1 if tempjan > 40
replace hightempjan = . if tempjan == .
```

```
*2
tab hightempjan
* Ans: 353 cities
```

```

*3
graph bar (mean) heatdd (mean) coolddd, over(hightempjan)

*4
tab region
tab region, nolabel
tab division
tab division, nolabel
count if region == 4 & division == 8
*Ans: 61 cities in both the "West" Census region and the "Mountain" Census division

```

## Discrete/Categorical variables : Two-way tabulation and Pearson's chi-2 test

### Two way tabulation

Produce counts of number of observations in each cell of a two-way table.

### Examples

```

clear
sysuse nlsw88.dta
tab2 race married

```

- First variable goes in rows, second variable goes in columns.
- This is important when you have a variable with many categories:

```

tab2 age married
tab2 married age

```

- Many different options with tab:

```

help tab2

```

- We've seen the missing option with one-way tabulations:

```

tab2 union married
tab2 union married , m

```

- Look at total number of observations for these two tables.
- Compare with Obs number from summarize:

```

sum married union

```

## Important

- We are moving into commands that take data from multiple variables
- If an observation has missing data for any of the variables, that observation is dropped from the calculation.
- With some commands, like `tab2`, we can avoid that behavior. But that will not be possible for other commands.

## More options for `tab2`

- `column` : Gives percentage breakdown of row category within each column.

```
tab2 race union, column
tab2 race if union==0
tab2 race if union==1
```

- `row` : Gives percentage breakdown of column category within each row.

```
tab2 race union, row
tab2 union if race==1
tab2 union if race==2
tab2 union if race==3
```

- `cell` : Gives percentage of observations in each cell.

```
tab2 race union, cell
```

- `expected` : Gives the expected number of observations in each cell based on marginal distributions of each variable

```
tab2 race union, row column
```

- expected number of observations in the white, nonunion cell:

```
display 0.7204*0.7545*1878
tab2 race union, expected
```

## Report Chi2 test statistic:

- Test for independence of two categorical variables:
- This will be covered in class, but you should know how to calculate and find test statistic.

```
tab2 race union, chi2
```

- test statistic: Pearson  $\chi^2(2) = 13.0814$
- P-value:  $\Pr = 0.001$
- Components of  $\chi^2$  test statistic can be reported using option: `cchi2`
- Students should read through these options after learning about the Chi-2 test in class.

## In class activity 2

Using the “high school and beyond” dataset from UCLA by this command:

```
use http://www.ats.ucla.edu/stat/stata/notes/hsb2
```

Use a do-file to produce the output that you used to arrive at your answers.

Use comments before and after the command to document the question you are answering and the answer. **Interpret the result with comments.**

1. Test whether the average writing score (write) differs significantly from 50.
2. Test whether the mean for write is the same for males and females.
3. Is there any relationship between the type of school attended and gender?

```
*1
```

```
ttest write=50
```

```
* ANS: The mean of the variable write for this particular sample of  
* students is 52.775, which is statistically significantly different  
* from the test value of 50.
```

```
* We would conclude that this group of students has a significantly  
* higher mean on the writing test than 50.
```

```
*2
```

```
ttest write, by(female)
```

```
* ANS: The results indicate that there is a statistically significant  
* difference between the mean writing score for males and females  
* (t = -3.7341, p = .0002).
```

```
* In other words, females have a statistically significantly higher  
* mean score on writing (54.99) than males (50.12).
```

```
*3
tab2 schtyp female, chi2

* ANS: These results indicate that there is no statistically significant
* relationship between the type of school attended and gender
* (chi-square with one degree of freedom = 0.0470, p = 0.828).
```

## Labels

- Three types of labels, data set, variable, and values

```
help label
```

## Variable Labels

- Show up in variable window
- Show command syntax in help file
- Example from previous recitation: “‘ clear sysuse nlsw88.dta

```
gen weekwage = wage*hours label variable weekwage “Ave. Weekly Pay”
```

- Changes can also be made in the Variables Manager `Data > Variables Manager`
- Remember to put the resulting "label" command into your do-file.

```
generate agesq = age^2
```

- Use the variables manager to label, then add label to do-file.

```
label variable agesq “Age Squared”
```

- A very useful function when you start working with large data sets
- `lookfor`: searches variable names and labels

```
lookfor age
```

## ### Data Set Labels

- Data set label is similar to variable label, but applies to entire data set.
- Show syntax in help file
- Data labels show up when a data set is opened and in the describe command.
- Useful when you have to save a modified version of your data.

- Label and save modified data label data “Modified data set from recitation 6” save “nls88 - recitation 6.dta”
- Reopen data to demonstrate data label clear use “nls88 - recitation 6.dta”
- Data label can also be seen with describe describe, short “

### Value Labels

- Value labels are more complicated than data or variable labels
- Value labels are defined and exist independently of variables
- Show value labels using describe and labelbook
- Individual labels can be listed:

```
label list occlbl
```

### Labeling values is a two-step process

1. define label
2. apply label to variable

### Labeling in action

```
* Create an indicator called tenure20 for people with 20 or more years tenure.
gen tenure20=0
replace tenure20=1 if tenure>=20
replace tenure20=. if tenure==.
```

```
* Label variable
label variable tenure20 "Tenure of 20 or more years"
```

```
* Create value label
label define tenure20lbl 0 "Less than 20 years" 1 "20 or more years"
```

```
* Apply value label
label values tenure20 tenure20lbl
```

```
tab tenure20
```

- Value label management can be done with the “Manage Value Labels” dialogue box:

- Data > Data utilities > Label utilities > Manage value labels
- Applying value labels to variables can be done in the Variable Manager
- As always, commands should be recorded in do-file
- Another example from last weeks problem set:
- Create an indicator variable called `once_married`, for people who were once married, but are not currently married

```
gen once_married=0
replace once_married=1 if married==0 & never_married==0
replace once_married=. if married==. | never_married==.

* Label variable and values
label variable once_married "Once married, but not currently married"
label define once_marriedlbl 1 "Once married" 0 "Never or currently married"
label values once_married once_marriedlbl
```

#### Encode/decode

- Changing between strings and labels
- A categorical variable exists as a string and needs to be changed to a number.
- Or the other way around.

help encode

- See examples in help file and manual.