Simple Statistics with Excel

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Made possible by the

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and the

Division of Biostatistics

Institute *for*
Health and Society

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Please help us by filling out an evaluation even if you are not eligible for CME credit.

Outline

- Data entry
- Descriptive statistics
  - means
  - cross-tabulation
- Statistical inference
  - t-test
  - regression

Note: all specifics are for Excel 2007

Data Analysis Tools

- Many statistical analyses are available through the Data Analysis Add-in
- To install:
  - Office Button
  - Excel Options (button at bottom right)
  - Add-Ins tab
  - at bottom: Manage Add-Ins > Go…
- Will appear on the Data tab

Getting data into Excel

- Data can be
  - entered directly into Excel
  - imported from an existing file (text, Access)
  - imported from a Web-page
  - copy-pasted from Word, Acrobat, etc
    - if Excel puts it into one column, use the Text-to-Columns Wizard
- Many of these features are accessed through the Data tab

Data structure

- All data should be structured as a **list**:
  - – each cell contains one value
  - – each column contains one variable
  - – the physical arrangement, spacing, color, etc should not carry additional information
  - – each row contains information on one subject
  - – each row is self-contained
- Do not mix data with analyses
- Missing values should be empty cells

Converted to a list

- Each row is one experimental unit
- Group is repeated for every subject
- Variable names have no special characters
- Averages/standard deviations are not part of the data
- Missing values coded consistently
- Extra notations removed

1	291	30
1	209	27
1	272	27
1	293	27
1	302	24
1	304	23
2	386	19
2	208	24
2	250	21
2	246	24
2	214	29
2	292	20
2	326	9
2	399	18
3	311	22
3	248	37
3	279	n/a
3	256	22
3	215	26
3	334	26
3	240	30
4	249	21
4	252	26
4	237	27
4	231	23
4	311	24
4	197	n/a
4	269	33
4	252	33
4	294	33

Transforming data

- Use Excel formulas for calculations
  - any cell that starts with an “=“ sign is interpreted as a formula
- Create a new column for the tr24 375tf 27.984hed1 s

Descriptive statistics

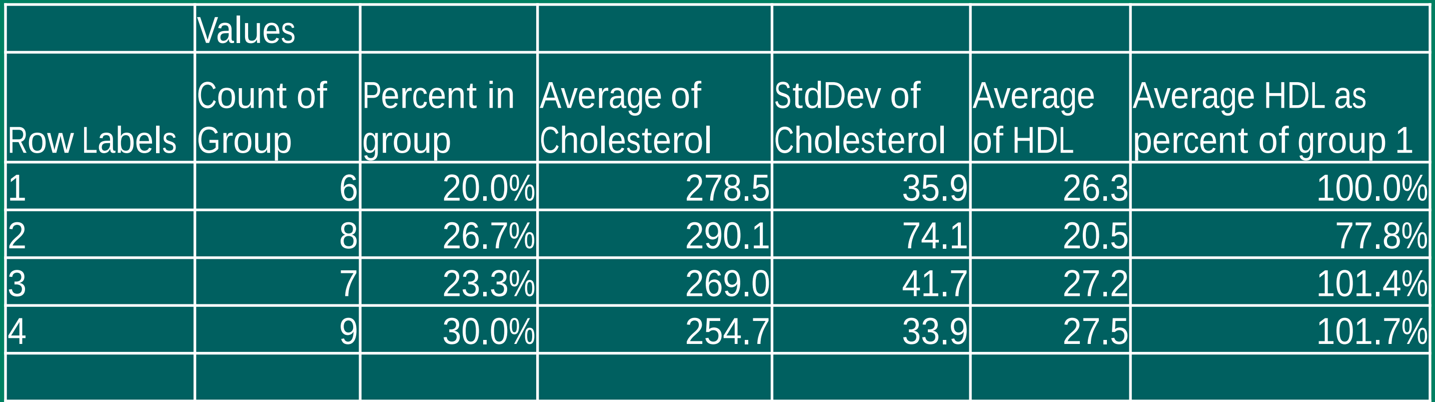
- Built-in functions can be used:
  - – AVERAGE
  - – MEDIAN
  - – STDEV
  - – “Insert function” on Formulas tab

Descriptive statistics

- In Data Analysis Tools: Descriptive statistics
  - – don’t put the result on the same page

Cross-tabulations

- Pivot tables give very good one- or multi-way tables
  - Can show frequencies, but also means, sums of one variable grouped by other variables
  - Found on “Insert” tab
  - Will update when “Refresh” is pressed



	Values					
Row Labels	Count of Group	Percent in group	Average of Cholesterol	StdDev of Cholesterol	Average of HDL	Average HDL as percent of group 1
1	6	20.0%	278.5	35.9	26.3	100.0%
2	8	26.7%	290.1	74.1	20.5	77.8%
3	7	23.3%	269.0	41.7	27.2	101.4%
4	9	30.0%	254.7	33.9	27.5	101.7%

Correlations

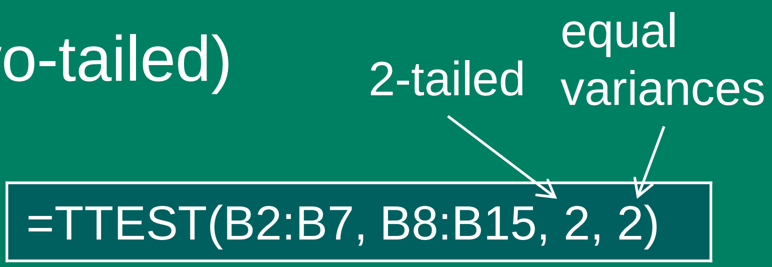
- Data Analysis Tool > Correlations
  - gives matrix of Pearson’s correlation coefficient for a contiguous set of columns
  - no sample sizes, p-values
- CORREL function
  - will calculate correlation coefficient for any two columns
- Cannot calcu

Statistical inference

- Essentially no support for categorical data analysis (confidence interval for proportion, chi-square test, etc)
- t-test, ANOVA, regression are available through Data Analysis Tools and/or functions
  - function can behave differently from add-in
  - have numerical instabilities, and should not be used for large problems

Two-sample t-test

- Requires values for each group to be contiguous
  - Data might have to be sorted
  - Excel tries to ensure that entire data row is sorted
- Data Analysis Tools > t-test: two-sample assuming equal/unequal variances
- TTEST function
  - gives only p-value (one- or two-tailed)
  - TYPE=2: equal variances
  - TYPE=3: unequal variances
- No confidence interval



2-tailed

equal variances

=TTEST(B2:B7, B8:B15, 2, 2)

Paired t-test

- Data Analysis Tools > t-test: paired samples
- TTEST function
  - gives only p-value (one- or two-tailed)
  - TYPE=1: paired
- Missing values are handled incorrectly by the Data Analysis Tool (but not the TTEST function)

ANOVA

- Balanced one- or two-way ANOVA available in Data Analysis Tools, but requires different data arrangement
- Unbalanced (or balanced) ANOVA can be run using the regression module: instead of Group, use G2, G3, and G4 as predictors

	A	B	C (formula)	C	D (formula)	D	E (formula)	E
1	**Group**	**Y**		**G2**		**G3**		**G4**
2	1	291	*=IF(A2=2,1,0)*	0	*=IF(A2=3,1,0)*	0	*=IF(A2=4,1,0)*	0
3	2	386	*=IF(A3=2,1,0)*	1	*=IF(A3=3,1,0)*	0	*=IF(A3=4,1,0)*	0
4	3	311	…	0		1		0
5	4	249		0		0		1
6	…	…						

Limitations of Excel

- Potential problems with analyses involving missing data
- Varying expectations regarding the arrangement of data
- Output scattered in many different worksheets, or all over one worksheet
- Output may be incomplete or may not be properly labeled
- No record of what you did to generate your results

Resources

- The Clinical and Translation Science Institute (CTSI) supports education, collaboration, and research in clinical and translational science: www.ctsi.mcw.edu
- The Biostatistics Consulting Service provides comprehensive statistical support www.mcw.edu/biostatistics.htm