Simple Statistics with Excel

Aniko Szabo, PhD
Associate Professor of Biostatistics

Made possible by the

Clinical and Translational Science Institute (CTSI),

and the

Division of Biostatistics

Speaker Disclosure

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CME Evaluations!

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

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
- E

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 transformed value
- Refer to values by column/row: A3, B12
- Refer to ranges as topleft:bottomright A2:C4

	A	B	C	Contents of column C
1	Cholesterol	HDL	Ratio	
2	291	30	9.7	=A2/B2
3	209	27	7.7	=A3/B3
4	272	27	10.1	=A4/B4

formula auto-updates if copied

Descriptive statistics

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

	A	B
1		Group 1
2		Cholesterol (mg/dL)
3		291
4		209
5		272
6		293
7		302
8		304
9		
10		
11	AVG	278.50
12	SD(n−1)	35.9
13	SEM	14.7
14	N	6

=AVERAGE(B3:B8)
=STDEV(B3:B8)
=B12/SQRT(B14)
=COUNT(B3:B8)

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

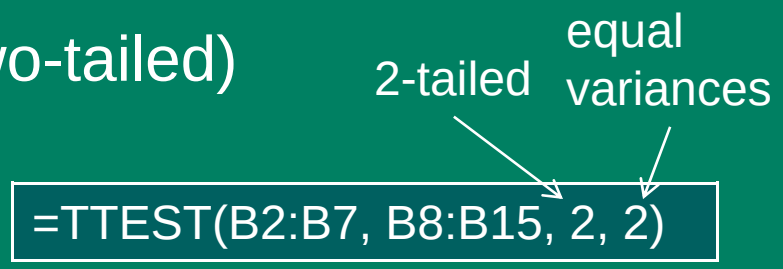
- Data Analysis Tool > Correlations
  - gives matrix of Pearson's correlation coefficient for a contiguous set of columns
  - no sample sizes, p-values
- CORREL function
  - will calculate correlation coefficient for any two columns
- Cannot compute Spearman correlation
  - The ranking tool and the RANK function give incorrect results for tied values

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



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)

Linear regression

- Data Analysis Tools > Regression
  - predictors (x variables) have to be in contiguous columns
  - no missing values allowed
  - do NOT run a regression through the origin
- In a scatter plot a trend line can be added with equation shown

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

Right tool for the right job

Excel is not the right tool for all but the simplest analyses

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
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Free Drop-In Consulting

- MCW/Froedtert/CHW:
  - Monday, Wednesday, Friday 1 – 3 PM @ Froedtert Pavilion-TRU (LL772A)
  - Tuesday, Thursday 1 – 3 PM @ Health Research Center, H2400
- VA: Monday, 9:30-10:30 am
  - VA Medical Center, Room 70-A 314-A
- Marquette: Tuesday, 8:30-10:30 am
  - School of Nursing, Clark Hall, Office of Research & Scholarship