Data processing in life sciences

Microsoft Excel 2016

Lecture 2

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2018

Lecture bonus with Mentimeter

New bonus system

Two bonus points (1%) can be awarded in each lecture if:

1. Providing a valid **full name** at the Mentimeter test
2. >**3 correct answers** out of the 4 online test questions

Participation:

- Mobile devices with installed Mentimeter application
- Online device with internet access http://www.menti.com

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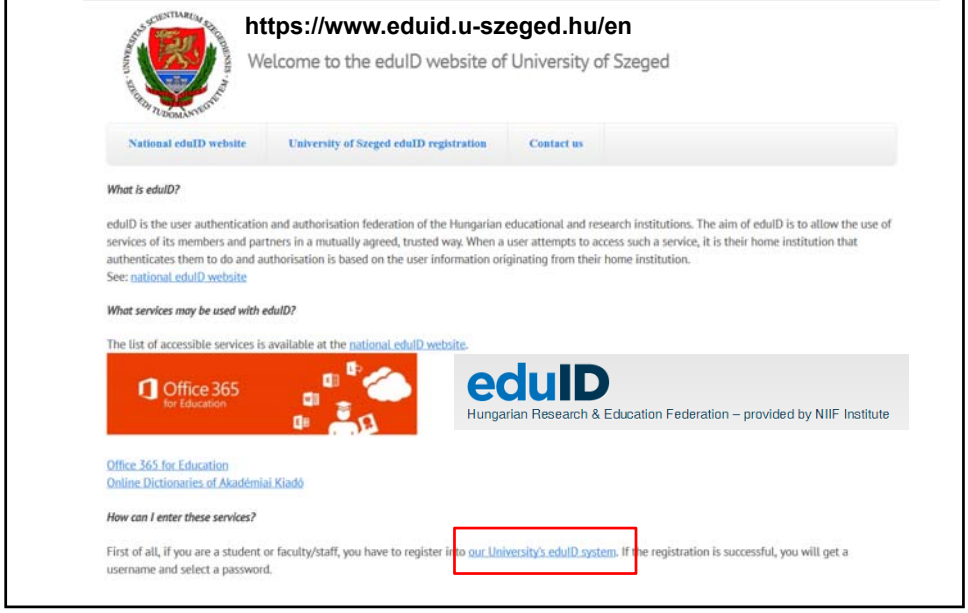

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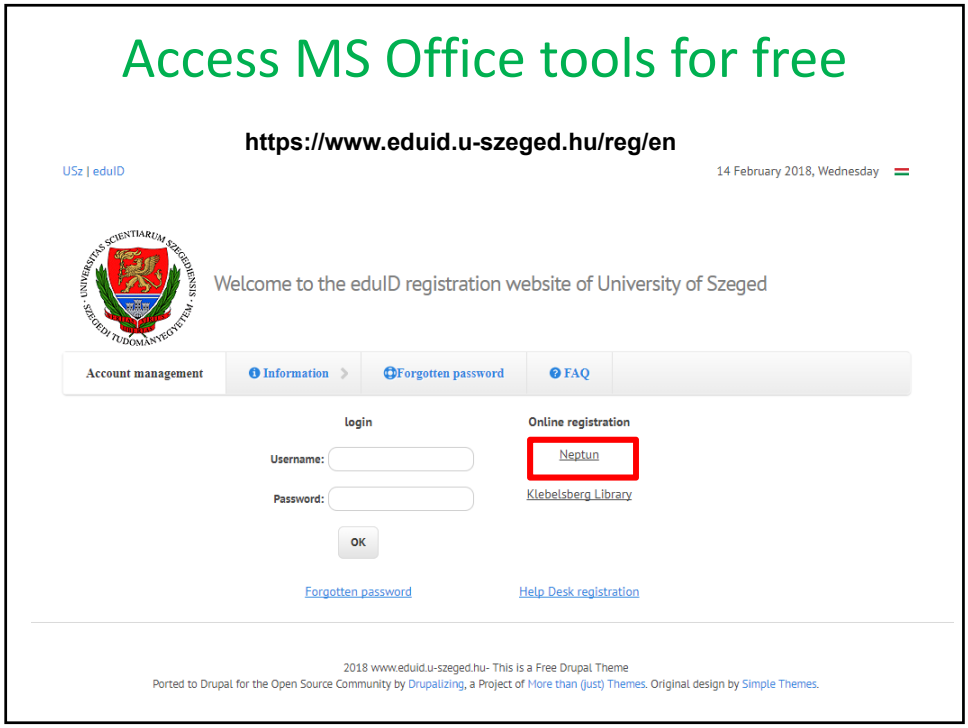

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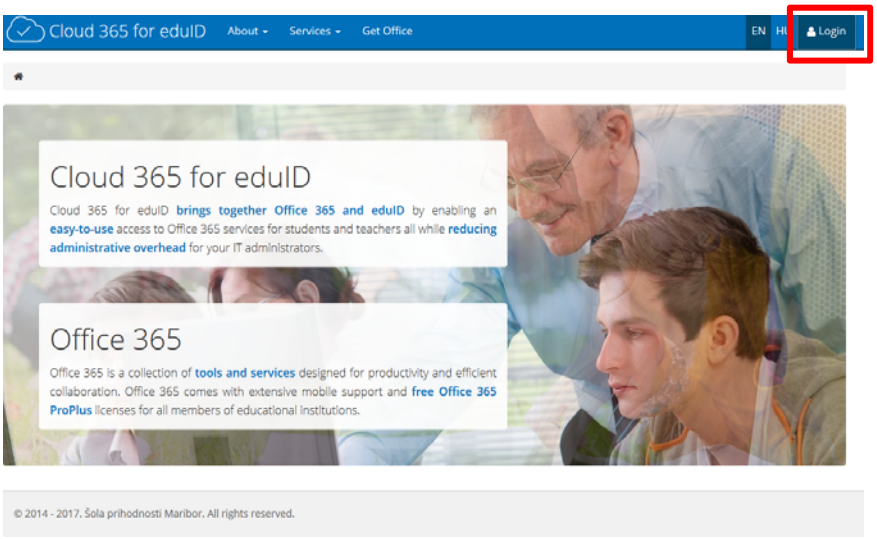

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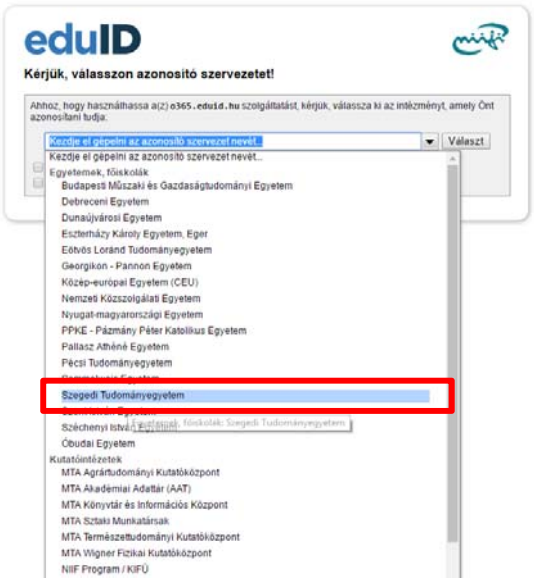

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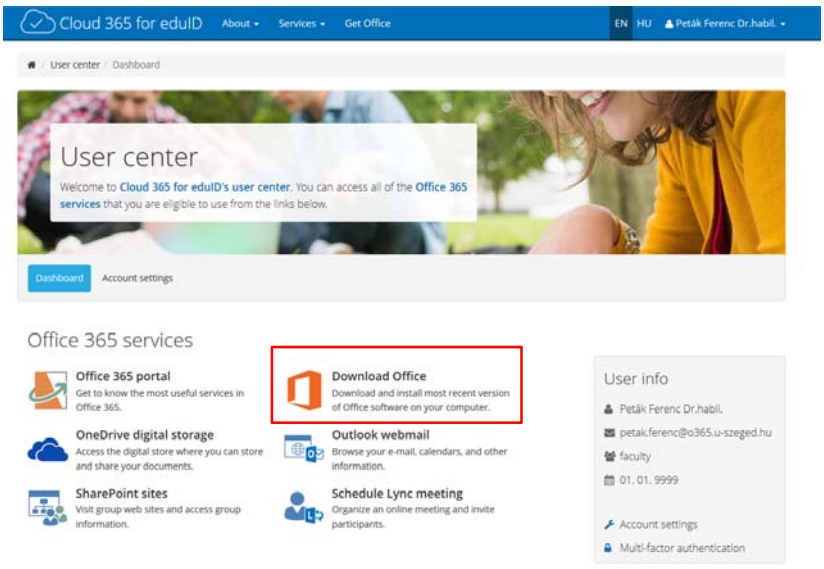

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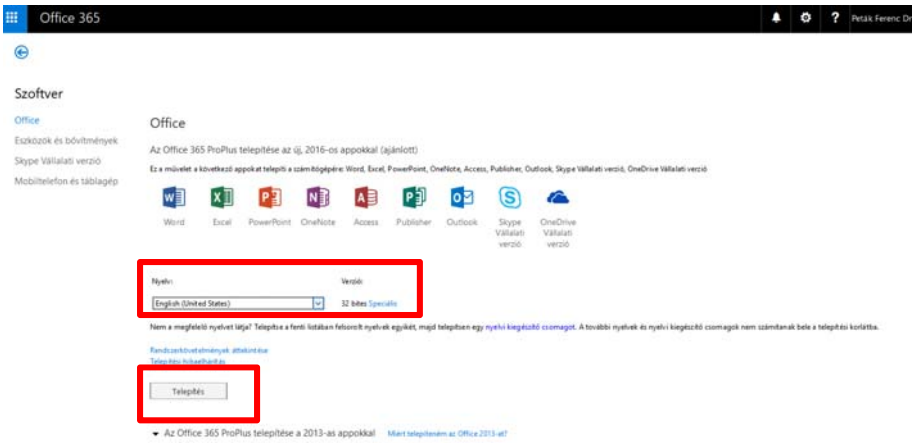


Main topics

1. Formula, reference types
2. Fill handle
3. Excel functions
4. Sorting and filtering
5. Charts
6. Pivot table, pivot chart

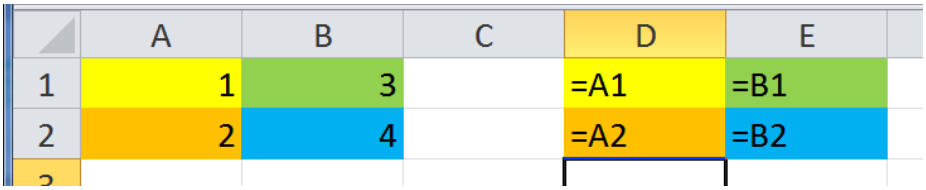
Entering formula – arithmetic operations

- The formula is a mathematical expression that calculates a value
- Formulas always begin with „**=**„ sign
- The order of precedence is a set of predefined rules – in accordance with elementary mathematics
- Operator symbols:
  - Arithmetic: **+ - * / ^ ( )**
  - Comparison: **= > >= < <= <>**
  - Text concatenate: **&**

"Those who can, do. Those who cannot, teach. Those who cannot teach, develop spreadsheets."

Reference types

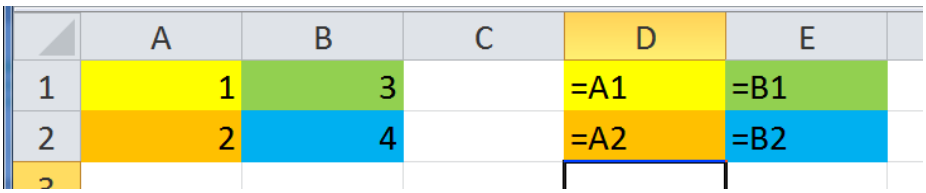
- **A reference identifies a cell or a range of cells on a worksheet**
  - **C13** - the cell in column C and row 13
  - **C1:D10** - the range of cells C1 through D10
  - **C1,D10** – C1 and D10 cells only!
  - **3:3** - all cells in row 3
  - **3:13** - all cells in row 3 through 13
  - **C:C** - all cells in column C
  - **Sheet2!C13** - refers to the worksheet named Sheet2
- References are **not case-sensitive**



	A	B	C	D	E
1	1	3		=A1	=B1
2	2	4		=A2	=B2

Reference types

- **Relative reference: e.g. A1, C3:D6**
  - Based on the relative position of the cell that contains the formula and the cell the reference refers to
  - **Copy → the reference automatically adjusts**

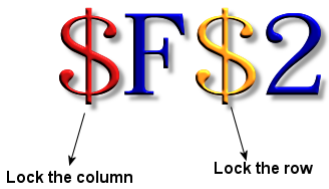


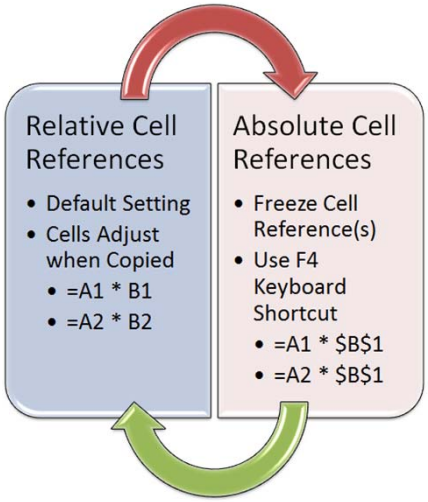
	A	B	C	D	E
1	1	3		=A1	=B1
2	2	4		=A2	=B2

Reference types

- **Absolute reference: e.g. $A$1, $C$3:$D$6**
  - Always refer to a cell in a specific location
  - **The absolute reference does not adjust**
- **Mixed reference: $A1, A$1**
  - Either an absolute column and relative row, or absolute row and relative column If you copy or fill the formula across rows or down columns, **the relative reference automatically adjusts**, and **the absolute reference does not adjust**
- Each push of **F4** will toggle the reference type

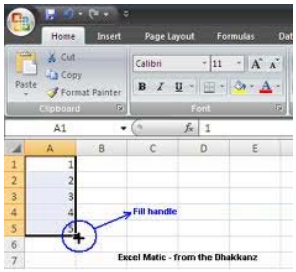
Absolute and relative references



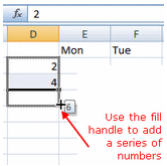


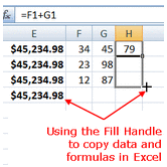
http://www.thecompanyrocks.com/

The fill handle



- **Small black dot or square in the bottom right corner of the active cell**
- The use of the fill handle depends on the active cell content:
  - If the active cell content is a number or text
    - Auto Fill other selected cells with the next items in the series
  - If the active cell content is a formula or function
    - Copy cell content to adjacent cells
- Use: click on it with the mouse pointer to drag select adjacent cells.
- Special use:
  - Double click: fill until the last cell on the left





Use Excel functions

- The Excel function is a predefined (built-in) formula for commonly used data processing
- General syntax of the Excel function:

=FunctDef(argument$_1$, argument$_2$ … argument$_n$)

Defines the function has to be performed
e.g. ***=average***
=count
=stdev

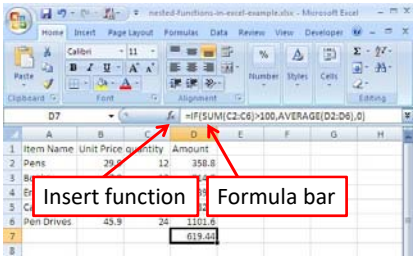
Numbers, text, cell references used by the function
Some arguments are optional
Some functions has no arguments

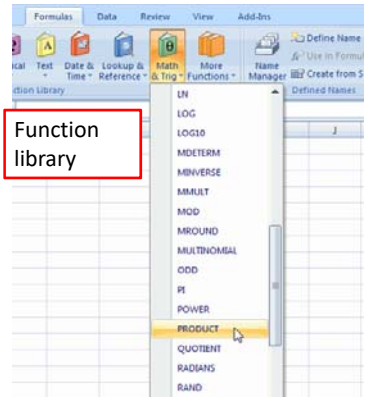
„There are two ways to develop error-free spreadsheets. Only the third one works. „

Use Excel functions

- Excel supplies more than 350 functions organized into 10 categories
  - Database, Date and Time, Engineering, Financial, Information, Logical, Lookup, Math, Text and Data and Statistical
- Entering a function:
  - Manual (typing) – risk for a mistake
  - Insert function button on the Formula bar
  - Furmulas tab – Function library group

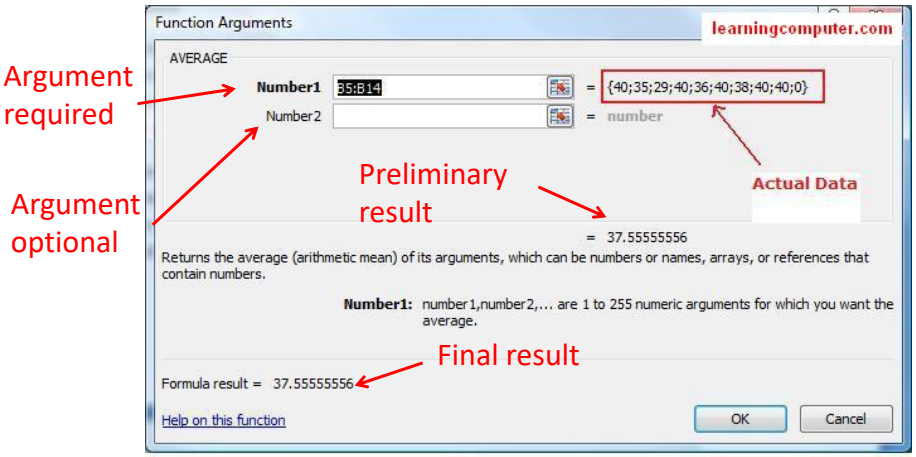
Recommended to avoid mistakes and have description





Use Excel functions

After selecting the appropriate function



Sorting, ranking

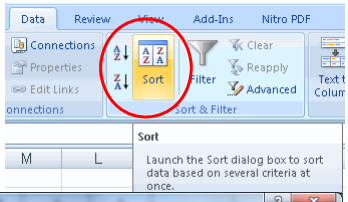
Why sorting?

- Easier to follow the sorted data
- Easier to find a specific information (name, group, treatment, outlier data, etc)
- Helps discovering data entry errors
- Excel help sorting in ascending (increasing) or descending (decreasing) orders

Sorting

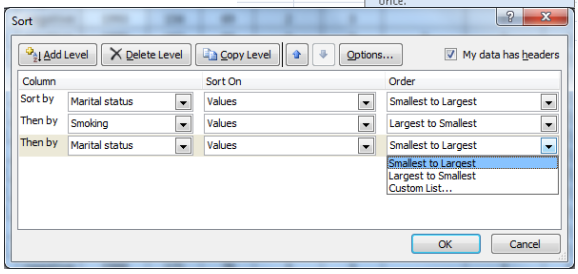
Before sorting: make sure: all data are selected, or a cell is selected within a continuous table!

Tip: a continuous table is sorted based on the category of the selected cell



Made in 2 steps:

1. Select data in the worksheet to be sorted (sorting will be based on the current column)
2. Data/Sort and Filter
   - Ascending
   - Descending order



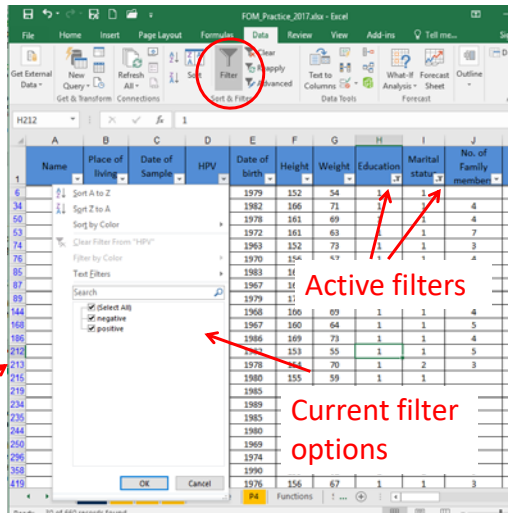
Filtering

- Working with a subset of data selected form the original data base
- A filtered range displays only the rows that meet the criteria
- Unlike sorting, filtering does not rearrange the data
- Temporarily hides the rows that are not intended to display

- Select the Filter option, from the Sort & Filter ribbon in the Data tab.

Filtering - Autofilter

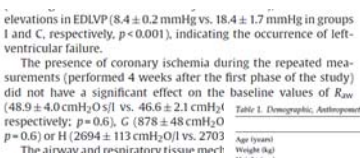
- Find and work with a subset of data
- After filtering
  - reapply a filter to get up-to-date results
  - clear a filter to redisplay all of the data.



Working with charts

Quantitative data in life sciences can be represented as:

Text


elevations in EDLVP (8.4 ± 0.2 mmHg vs. 18.4 ± 1.7 mmHg in groups I and C, respectively, $p < 0.001$), indicating the occurrence of left-ventricular failure.

The presence of coronary ischemia during the repeated measurements (performed 4 weeks after the first phase of the study) did not have a significant effect on the baseline values of R_{aw} (48.9 ± 4.0 cmH_2O s/l vs. 46.6 ± 2.1 cmH_2 respectively; $p = 0.6$), G (878 ± 48 cmH_2O $p = 0.6$) or H (2694 ± 113 cmH_2O/l vs. 2703

The airway and respiratory tissue mech

Table

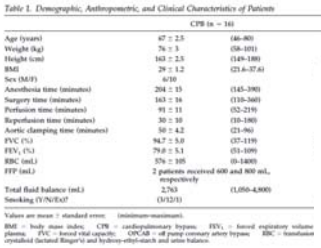


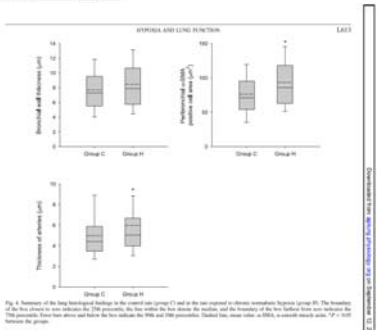
Table 1. Demographic, Anthropometric, and Clinical Characteristics of Patients

	CPB (n = 16)		OPCAB (n = 19)
Age (years)	67 ± 2.5	(46–80)	
Weight (kg)	76 ± 3	(58–101)	
Height (cm)	163 ± 2.5	(149–180)	
BMI	29 ± 1.2	(23.6–37.6)	
Sex (M/F)	6/10		
Anesthesia time (minutes)	204 ± 15	(145–390)	
Surgery time (minutes)	163 ± 16	(110–360)	
Perfusion time (minutes)	91 ± 11	(52–219)	
Reperfusion time (minutes)	30 ± 10	(10–180)	
Aortic clamping time (minutes)	50 ± 4.2	(21–96)	
FVC (%)	94.7 ± 5.0	(37–119)	
FEV_1 (%)	79.0 ± 5.1	(51–109)	
RBC (mL)	576 ± 105	(0–1400)	
FFP (mL)	2 patients received 600 and 800 mL, respectively		
Total fluid balance (mL)	2,763	(1,050–4,800)	
Smoking (Y/N/Ex)?	(3/12/1)		

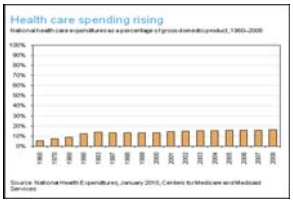
Values are mean ± standard error; (minimum–maximum).

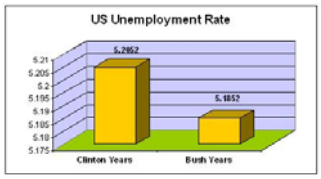
BMI = body mass index; CPB = cardiopulmonary bypass; FEV_1 = forced expiratory volume plasma; FVC = forced vital capacity; OPCAB = off pump coronary artery bypass; RBC = transfusion crystalloid (lactated Ringer's) and hydroxy-ethyl-starch and saline balance.

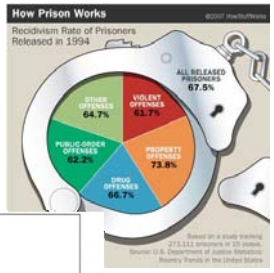
Chart

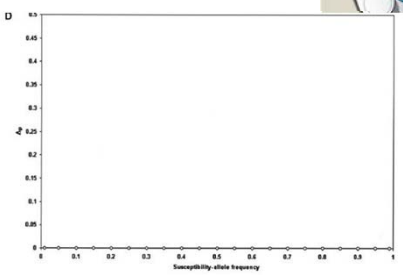


Keep your charts informative rather than decorative!







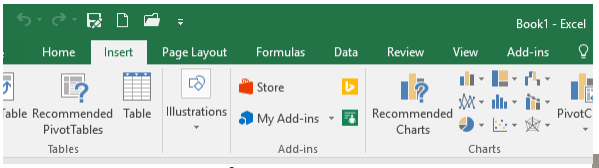


Wittke-Thompson et al, Am J Hum Genet 76: 967-986, Fig 1

"Effective is not the same as beautiful"

Working with charts

- A chart can be embedded in an existing worksheet or can be created on a separate worksheet
- Access: Insert tab/Charts



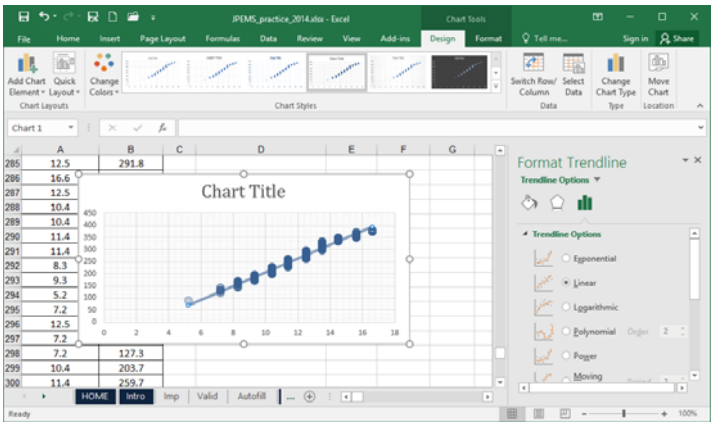
- Steps to create a chart:
  0. Think and plan!
  1. Select the data range (data series)
  2. Select chart type
  3. Insert chart at the specified location
  4. Choose chat options („*Layout*" and „*Design*" tabs)
  5. Change chart style, location, size

Working with charts

Trend and regression analyses if often performed in life sciences

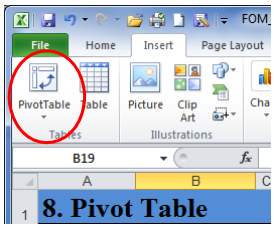
Adding trendline:

- Linear regression
  - Best fit line
  - Regression coefficient
- Curve fitting



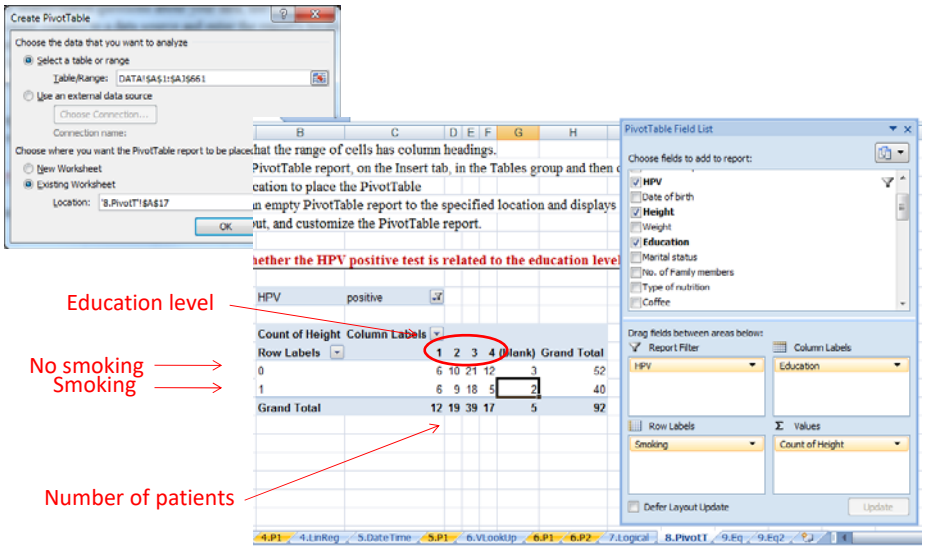
Pivot table

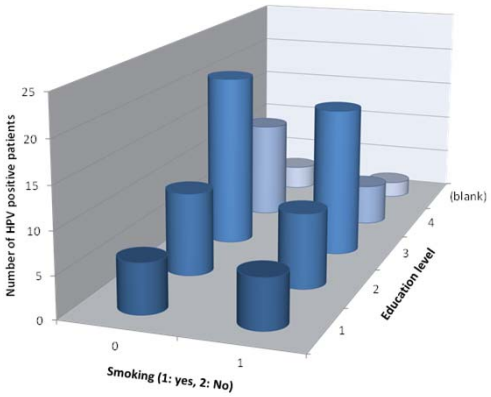
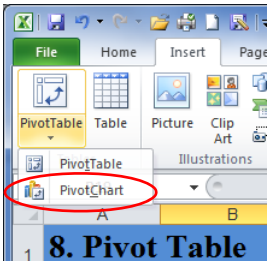
- Summarization tool found in data visualization programs such as **spreadsheets** or business intelligence software.
- To **analyze** numerical **data** in depth and to answer unanticipated questions
  - Lists data in categories
  - Computes summary statistics for those categories
  - Pivot chart to display output



Pivot table - Example

"Is HPV positive test related to the education level or smoking? "



Pivot chart - Example

"Is HPV positive test related to the education level or smoking? "