Document Description

The following document contains a description of the commands and their context.

This formatting provides a brief description of the commands and the context of the entire exercise. It informs you about the next steps to be performed in the exercise.

This formatting provides instructions to be performed. These instructions are mandatory. Proper names are italicized in this section. Formula fragments, such as function names, partial cell addresses, and operators (e.g., **IF**, **A1:B3**), are always bold and uppercase.

This formatting indicates the context for the current exercise element as well as more detailed information about additional options. Here you are given the description and effects of executing other available commands. Proper names *in this section are not be italicized. Formula fragments, such as function names, partial cell addresses, and operators (e.g., **IF**, **A1:B3**), are always bold and uppercase.*

Formulas to be entered are written in the following format:

```
Cell where formula should be entered = Formula to be entered
```

This format always indicates that you should go to the cell with the given address (before the equal sign), and then enter the equal sign and the formula itself in the formula bar or inside the cell.

Exercise 1

In this exercise, we will use previously learned and new MS Excel features from various categories. We well also explore alternative ways to solve previously discussed problems.

Download the data file.

In a web browser, go to the Medical University of Bialystok website (umb.edu.pl/en). From the menu, select the "University" tab and navigate to "Faculty of Medicine". Select the "Units" field and click the "Department of Biostatistics and Medical Informatics" link. From the "Education" menu, select "Information Technology". Under "MS Excel 3", click the "payroll.xlsx" link. Depending on the web browser you and its settings, the file may be saved in the default folder (e.g., Downloads) or elsewhere. You may also be asked to specify the destination folder. Save or move the downloaded file to your folder and open it in MS Excel.

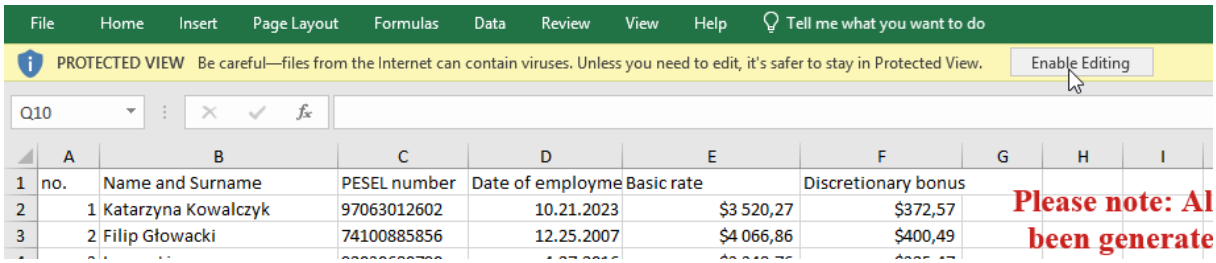


Fig. 1. Enabling editing

It may happen that the downloaded file is opened in protected mode. In this case, to unlock the ability to edit it [Fig. 1], click the *Enable Editing* button located on the yellow bar. The "payroll.xlsx" file, in the "Data" spreadsheet, contains information collected from a group of 1,000 employees at a certain company.

All the persons included in the spreadsheet are between 19 and 75 years old, and on the date of employment they were all over 18 years old. The columns whose values depend on these two aforementioned columns may therefore differ in content.

Note: the columns containing the PESEL number and the date of employment may contain data that differ from what is shown in the screenshots.

Calculate the difference in years between the current year and the year of employment for each employee.

Enter the names of the columns whose values are to be calculated, adjusting their width accordingly:

```
G1="Years difference"
H1="Employment anniversary"
I1="Full years of work"
```

To calculate the difference in years between the current year and the year of employment, we need to subtract the year of employment from the current year. For this purpose, we will use the following two functions from the *Date & Time* category: **YEAR** and **NOW**. Enter the following formula:

```
G2=YEAR(NOW())-YEAR(D2)
```

If the current cell format is *Date*, we need to change it to *General* and then copy the formula down.

The presented method of calculating years of work is correct if it is assumed that matters related to, for example, bonuses, benefits, etc., at a given company are calculated based on the ***difference in years between the current year and the year of employment****. However, if the company bases these factors on the* ***number of full years of work****, then you will also need to take into account the day and month of employment.*

Calculate the number of full years of work for each employee.

We begin by determining the next employment anniversary date for each employee in the current year. Remember to include February 29th in leap years – this date is converted to February 28th in non-leap years. Enter the following formula:

```
H2=IFERROR(DATE(YEAR(NOW()),MONTH(D2),DAY(D2)),DATE(YEAR(NOW()),2,28))
```

Since the function returns a number, change the format of cell **H2** to *Short Date* and copy the formula down.

Using the **NOW** function, we can determine whether the current date is earlier than the next employment anniversary date for any given person. If the employment anniversary is still to come in a given year, then we must subtract 1 from the difference in years between the current year and the year of employment. The result of the comparison is a logical value that can be converted to a numeric value, to be used in the following formula:

```
I2=G2-(NOW()<H2)
```

Copy the formula down. We can see that for some employees, the number of full years of work is different from the difference in years between the current year and the year of employment [Fig. 2].

G2 =YEAR(NOW())-YEAR(D2)

	A	B	C	D	E	F	G	H	I
1	no.	Name and Surname	PESEL number	Date of employme	Basic rate	Discretionary bonus	Years difference	Employment anniversary	Full years of work
2	1	Katarzyna Kowalczyk	97070112603	10.22.2023	$3 520,27	$372,57	2	22.10.2025	1
3	2	Filip Głowacki	74100985853	12.26.2007	$4 066,86	$400,49	18	26.12.2025	17
4	3	Ignacy Lis	92030780797	4.28.2016	$3 348,76	$325,47	9	28.04.2025	9
5	4	Jola Błaszczyk	69101750669	4.5.2014	$4 608,50	$457,83	11	05.04.2025	11
6	5	Dominika Jasińska	63120382601	8.24.1998	$4 902,34	$438,37	27	24.08.2025	27
7	6	Elżbieta Woźniak	63010722102	11.30.2002	$4 633,04	$365,38	23	30.11.2025	22
8	7	Jagoda Sawicka	85070547305	7.9.2012	$4 111,30	$474,05	13	09.07.2025	13
9	8	Magdalena Andrzejewska	70020489563	1.30.1990	$3 144,71	$492,15	35	30.01.2025	35
10	9	Bolesław Maciejewski	97013020417	8.17.2018	$4 201,20	$465,99	7	17.08.2025	7
11	10	Cezary Szczepański	65110585458	10.16.1986	$3 877,10	$378,71	39	16.10.2025	38
12	11	Adela Ziółkowska	05211210749	3.24.2025	$3 366,95	$481,85	0	24.03.2025	0
13	12	Konstanty Rutkowski	72073121999	4.11.2014	$3 183,23	$316,32	11	11.04.2025	11
14	13	Dagmara Jaworska	80102082061	9.9.2017	$4 360,39	$477,66	8	09.09.2025	8
15	14	Daria Pietrzak	99112269960	3.9.2022	$3 501,05	$410,17	3	09.03.2025	3

Fig. 2. Calculated years of work for the employees

Calculate the income of each employee.

In workplaces, the amount of salary bonuses is often based on an employee's length of service. The methods for calculating bonuses and their rates may vary depending on the company.

In this exercise, it is assumed that each employee receives a 1% bonus for each year of work, with a limit set at 20%. This means that after 20 years of work, the bonus amount remains constant.

Companies use a number of additional forms of employee remuneration. A typical one is the so-called discretionary bonus, whose amount is determined individually. It is also included in the present exercise.

To calculate income, we will use the already familiar **MIN** function. If an employee has been employed for less than 20 years, we will multiply 0.01 (corresponding to one percent) by the number of years of work, and then increase the basic rate by the calculated value. If an employee has been employed for more than 20 years, the bonus will be capped at 20% – we will then multiply the basic rate by 1.2. In both cases, a discretionary bonus will be added. The column name and the resulting formula is as follows:

```
J1="Income"
J2=E2*(1+MIN(I2,20)%)+F2
```

Copy the formula down.

Determine each employee's year of birth.

As per the specific nature of the PESEL number (https://www.gov.pl/web/gov/czym-jest-numer-pesel), the first two digits encode the last two digits of the person's year of birth, the next two digits encode the month, and the next two digits encode the day of birth.

Enter the following column names:

```
K1="Third digit of the PESEL number"
L1="The first two digits of the year of birth"
M1="Year of birth"
```

*The **VALUE** function converts a text string representing a number to a number. It is located in the* Text *category (also on the* Formulas *tab, in the* Function Library *section) and takes one argument, which is a string representing a number. As a result, the **VALUE** function returns that number. This action converts the data type from text to number.*

The first two digits of an employee's year of birth are determined by the third digit of the PESEL number. Enter the following formula and copy it down:

```
K2=VALUE(MID(C2,3,1))
```

The rules for determining the first two digits of the year of birth are provided in another sheet, named the "PESEL Dictionary".

*Note: the sheet name can be written before the cell address, separated by an exclamation point. For example, **Sheet1!A1** refers to cell **A1** in the worksheet named "Sheet1". If the sheet name consists of several words separated by a space, enclose the entire name in single quotes.*

Enter the following values:

```
'PESEL Dictionary'!B2="Third digit"
'PESEL Dictionary'!C2="The first two digits of the year of birth"
'PESEL Dictionary'!B3=0
'PESEL Dictionary'!C3=19
'PESEL Dictionary'!B4=2
'PESEL Dictionary'!C4=20
```

```
'PESEL Dictionary'!B5=4
'PESEL Dictionary'!C5=21
'PESEL Dictionary'!B6=6
'PESEL Dictionary'!C6=22
'PESEL Dictionary'!B7=8
'PESEL Dictionary'!C7=18
```

As we remember from previous tasks, when formulas are copied to adjacent cells, the addresses within such formulas change according to the direction of copying. This can be blocked by inserting a $ sign directly before the part of the address that must remain unchanged.

Note: the last argument of the ***VLOOKUP*** *function (*Range_lookup *or* Row*) is a logical value (i.e., it accepts only two values:* ***TRUE*** *(synonym – 1) or* ***FALSE*** *(synonym – 0)), indicating whether the search should be performed for an approximate or an exact match. In the case of an approximate match, the search value is rounded down to the nearest value in the dictionary. In the present case, it is an even number.*

Calculate the first two digits of the year of birth using the dictionary and the third digit of the PESEL number. Enter the following formula:

```
L2=VLOOKUP(K2,'PESEL Dictionary'!B$3:C$7,2,TRUE)
```

Copy the formula down.

The last two digits of the year of birth are also the first digits of the PESEL number. Calculated the year of birth using the following formula, then copy it down:

```
M2=L2*100+VALUE(LEFT(C2,2))
```

Determine the employees' date of birth.

Enter the following column names:

```
N1="Month of birth"
O1="Day of birth"
P1="Date of birth"
```

The ***MOD*** *function returns the remainder of a division. It is located in the* Mathematics category *(*Math & Trig *group on the* Formulas tab*, in the* Function Library *section) and takes the following two numeric arguments: the* dividend *and the* divisor.

The month of birth is the remainder after dividing the number obtained from the third and the fourth digit of the PESEL number by 20. Enter the following formula and copy it down:

```
N2=MOD(VALUE(MID(C2,3,2)),20)
```

The date of birth is encoded by the 5th and the 6th digit of the PESEL number. Enter the formula and copy it down:

```
O2=VALUE(MID(C2,5,2))
```

The ***DATE*** *function belongs to the* Date and Time *category (also on the* Formulas *tab in the* Function Library *section) and takes the following three arguments:* Year, Month, and Day, *and returns the date corresponding to these arguments.*

In the last step, use the **DATE** function to obtain the full date of birth:

```
P2=DATE(M2,N2,O2)
```

The effect of the performed operations can be seen on [Fig. 3].

I	J	K	L	M	N	O	P
Full years of work	Income	Third digit of the PESEL number	The first two digits of the year of birth	Year of birth	Month of birth	Day of birth	Date of birth
1	$3,928.04	0	19	1997	7	6	7/6/1997
17	$5,158.72	1	19	1974	10	14	10/14/1974
9	$3,975.62	0	19	1992	3	12	3/12/1992

Fig. 3. Columns containing the components necessary to determine the date of birth

Determine the employee's gender based on their PESEL number.

In the Polish system, gender is encoded in the penultimate digit of the PESEL number. The rule is as follows: if it is an even digit, the PESEL is assigned to a woman (NOTE! 0 is an even number – in accordance with mathematical rules); otherwise (i.e., if the penultimate digit is an odd number), the PESEL belongs to a man.

Enter the following column names:

```
Q1="The tenth digit of the PESEL number"
R1="Sex"
```

*The **ISEVEN** function belongs to the* Information *category (also found on the* Formulas *tab in the* Function Library *section) and takes one argument (*Number*). The function returns **TRUE** if the number is even and **FALSE** if it is odd. There is also a similar function, i.e., **ISODD()**, that tests whether a given number is odd.*

In one of the previous exercises, gender was determined based on the fact that Polish female names usually end with an "a". The method presented in this exercise, however, is more reliable because it is based on a certain assumption (i.e., the coding of individual digits of the PESEL number is unambiguous), unlike the previous case (i.e., many female names of foreign origin do not end with an "a").

The PESEL identifier consists of 11 digits, so its penultimate digit is in position 10. Therefore, we will determine the 10th digit of the PESEL number and check whether it is even or odd. To do this, we will use the **IFEVEN** function. Enter the following formulas and copy them down:

```
Q2=VALUE(MID(C2,10,1))
R2=IF(ISEVEN(Q2),"female","male")
```

[Fig. 4] presents the result of the introduced changes.

P	Q	R
Date of birth	The tenth digit of the PESEL number	Sex
7/6/1997	0	female
10/14/1974	5	male
3/12/1992	9	male
10/22/1969	6	female

Fig. 4. An employee's gender

Exercise 2

In this exercise, we will create a title slide for the presentation.

Proper presentation of various topics is an extremely important element necessary for the success of any endeavor. When preparing a presentation, it is important to define its purpose and understand the preferences, predispositions, and experience of the target audience. This approach helps in selecting the right content and ensures that it is received as intended. Audiences usually have certain expectations, usually before the presentation even begins. Therefore, the appropriate choice of vocabulary and terminology used when describing the issues discussed is crucial. A good presentation should engage the listener and relate to their experiences. Presentation time is also crucial. It is often strictly limited, so every effort should be made to adhere to the set limit.

MS PowerPoint was created by Forethought. From the outset, its creators envisioned this software as a tool that would support presenters. Version 1.0 was released for a fee on April 20, 1987. Shortly thereafter, Microsoft acquired Forethought to rapidly develop its own presentation software. Versions 2.0 and later were incorporated into the Microsoft Office suite. History has proven these were the right steps. By 1992, the application had already sold one million copies, and sales have since grown exponentially. Currently, its market share among all presentation software is estimated at 95%. MS PowerPoint has already left a lasting legacy in society, across personal, academic, and commercial domains. The current version of MS PowerPoint runs on most commercial and non-commercial operating systems.

The following exercises involve creating a presentation that makes use of a number of additional effects, including text boxes, simple geometric shapes and diagrams, stylized WordArt text, graphics in the form of photos, tables, charts, links, and animations.

The presentation will be created in a format consistent with the conventions adopted for scientific conferences during which research results are presented. For the same reason, the presentation will focus on a hypothetical scientific study and include data and their analysis leading to specific conclusions.

Create the title slide of a presentation.

The title slide of a presentation given at a scientific conference usually includes its title (it may also include a subtitle), the author's name and surname, their affiliation, the name of the conference, etc.

When creating the title of a presentation, make sure it best reflects the primary goal of the study whose results are being presented (most importantly: the purpose of the study, the impact of the study, conclusions drawn from the discovered relationships, etc.). In other words, the title should not concern secondary, technical aspects of the study (e.g., measurements, analyses, etc.). The subtitle, however, can be slightly longer and more detailed.

Start MS PowerPoint. To create a presentation without a theme, left-click on the *Blank Presentation* option [Fig. 5].

Save the presentation file to your folder. Remember to periodically save your work as we complete the exercises.

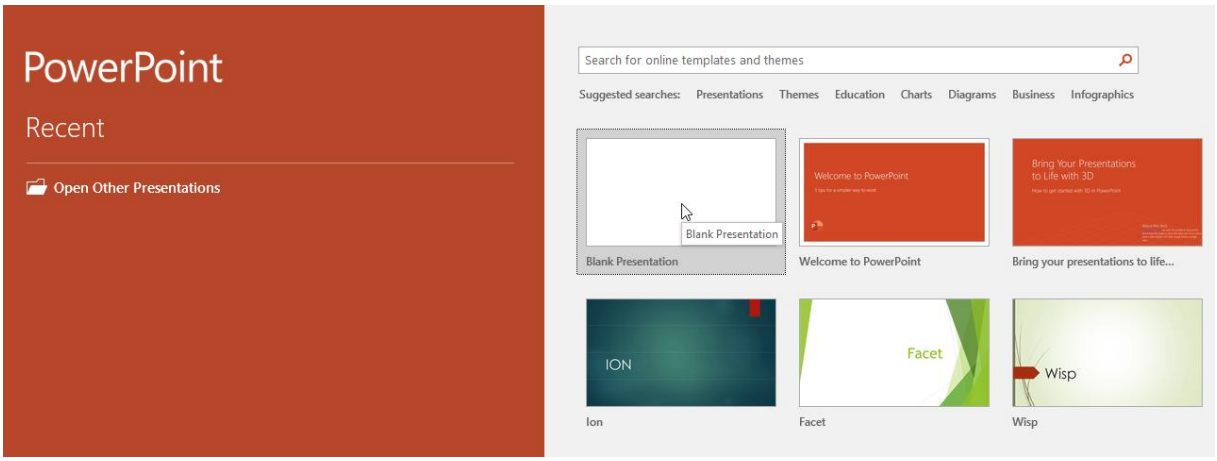


Fig. 5. Selecting a blank presentation

To choose the appropriate view, make sure the *Normal* button is selected in the *Presentation Views* group on the *View* tab. If it is not, click on it [Fig. 6].

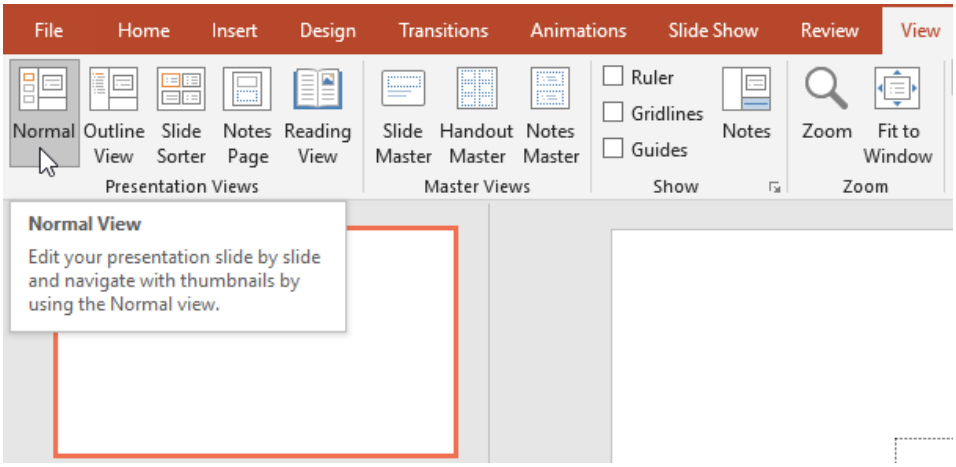


Fig. 6. *Normal* view selection

Currently, the presentation consists of a single, blank slide with the "Title Slide" layout. We will complete the slide with the following title: "Potential Markers of Liver Damage in People Consuming Alcohol" and the following subtitle: "Analysis of Selected Biochemical Parameters" [Fig. 7].

Modify the background of the title and subtitle areas by selecting the appropriate color from the *Home* tab in the *Drawing* group and clicking the *Shape Fill* drop-down menu button. For the title area fill, select *Blue, Accent 5, Lighter – 40%*. For the subtitle, select *Blue, Accent 5, Lighter – 60%*.

To change the presentation background, use the *Format Background* button in the *Customize* group on the *Design* toolbar. In the *Format Background* dashboard, select the *Picture or Texture Fill* option. Select *Blue Tissue paper* [Fig. 8]. Since we want to apply the selected background to all slides, after selecting the appropriate options, click the *Apply to All* button.

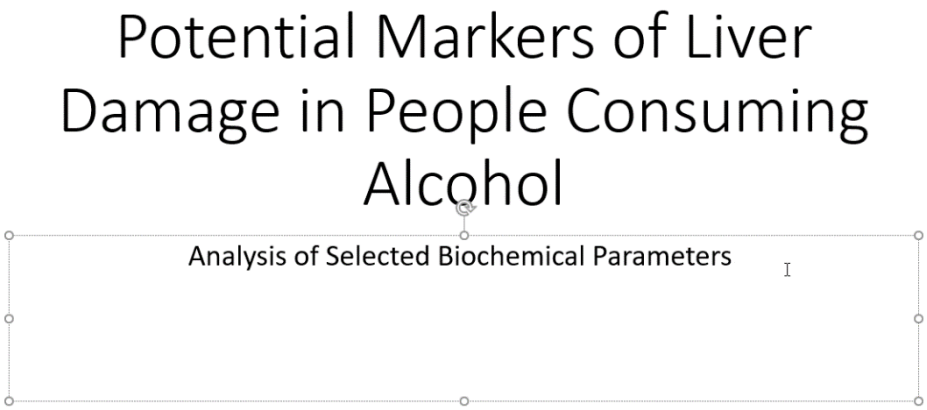


Fig. 7. Title and subtitle

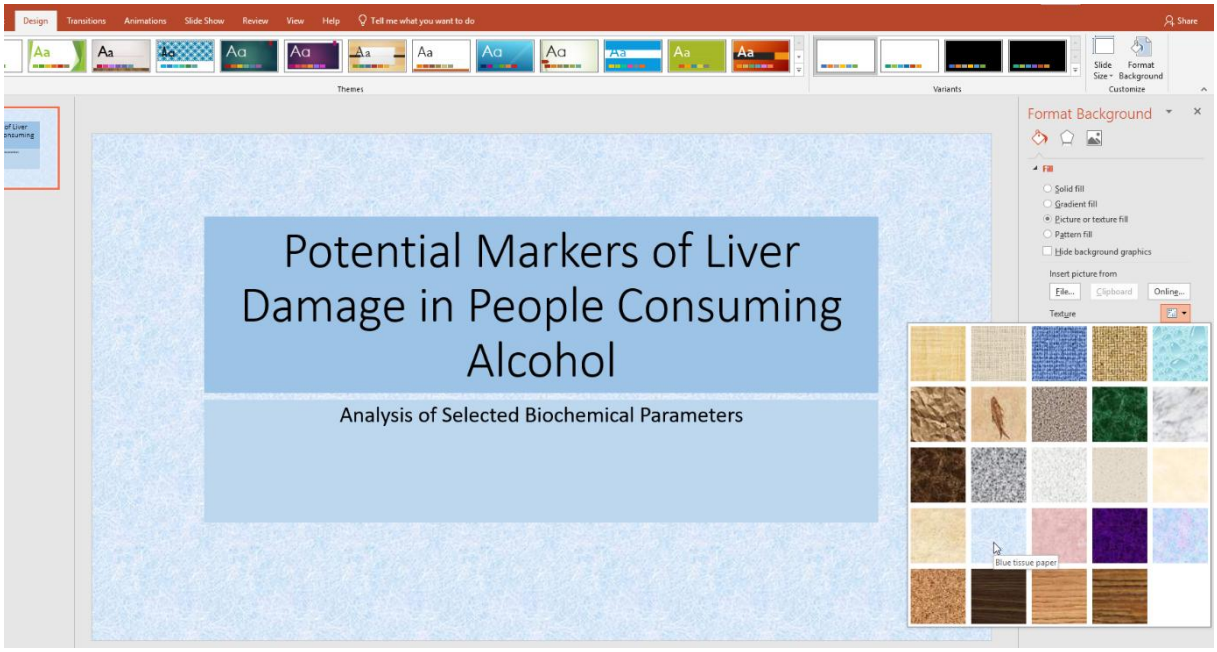


Fig. 8. Changing the slide background

Select the "Potential markers of liver damage in people who consume alcohol" text and add a shadow effect using the *Text Shadow* option located on the *Home* tab in the *Font* section [Fig. 9].

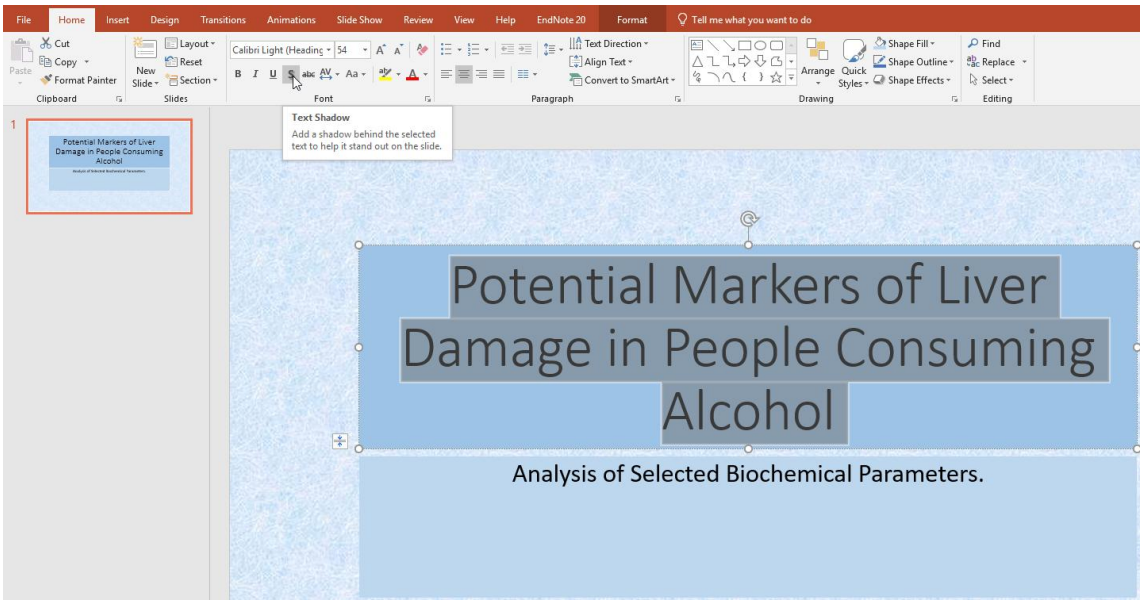


Fig. 9. Adding a shadow effect

On the *Insert* tab, in the *Text* section, select the *Text Box* command. We will attach the following three text boxes to the slide:

- Above the title, enter the conference name, i.e., "National Hepatology Conference 'Addictions in Liver Diseases'". Adjust the size of the text box to the entered text and place the box in the center of the top of the slide.
- In the lower left corner, enter the date and place of the conference, i.e., "Bialystok, current date".
- In the lower right corner, enter the presentation author's name in the following format: "First name Last name".

Place the university logo in the bottom center of the slide (between the text boxes). The image in question can be found on the Department of Biostatistics and Medical Informatics website. From the "Education" menu, select "Information Technology". Under "MS Excel 3", click the "University logo" link. In the window that appears, right-click on the image and depending on your web browser, select the appropriate copy option:

- "Copy image" (Firefox, MS Edge, or Opera),
- "Copy graphics" (Chrome).

Insert the copied graphic into the slide. The final result is shown in [Fig. 10].

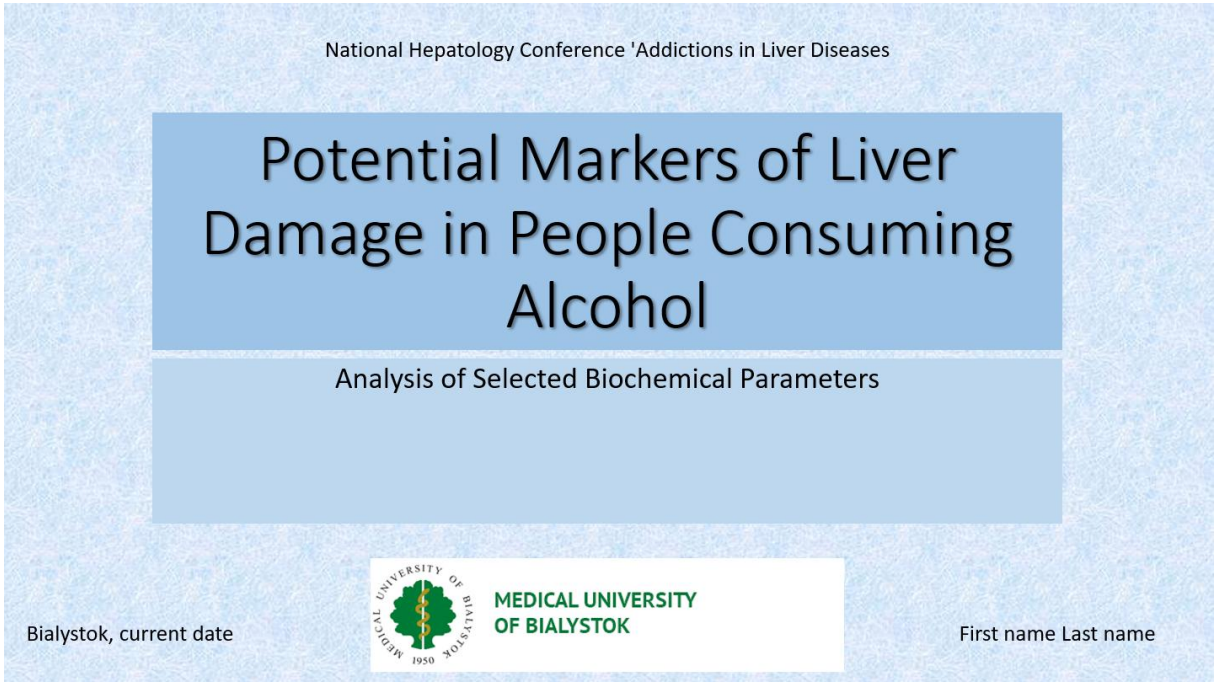


Fig. 10. The title slide

Exercise 3

In this exercise, we will create a slide with a table describing the variables contained in the database.

Note: from now on, we will be using MS Excel and MS PowerPoint interchangeably, so please pay attention to which application each task applies to (this is indicated in each exercise).

Download the data file.

In your web browser, go to the Medical University of Bialystok website. From the menu, select the "University" tab and navigate to "Faculty of Medicine". Select the "Units" field and click the "Department of Biostatistics and Medical Informatics" link. From the "Education" menu, select "Information Technologies". Under "MS Excel 3", click the "dataset.xlsx" link. Depending on the web browser you are using and its settings, the file may be saved in the default folder (e.g., Downloads) or elsewhere. You may also be asked to specify the destination folder. Save or move the downloaded file to your folder and open it in MS Excel. Go to the "Legend" spreadsheet.

In your presentation, create a new slide containing a table with data.

Go to MS PowerPoint. On the *Home* tab, in the *Slides* section, expand the menu next to the *New Slide* icon. From the expanded list, select the *Title and Content* theme [Fig. 11].

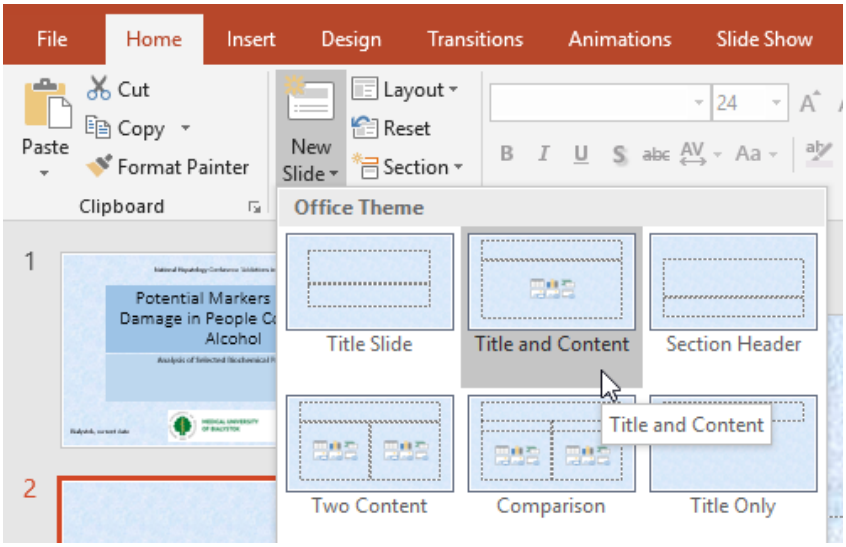


Fig. 11. Creating a new slide

Entitle the slide "Database Variables" and center it. To do this, select *Center* in the *Paragraph* section of the *Home* tab.

Click the text box below the slide title. Go to the *Insert* tab, locate the *Table* button, click it, and select *Insert Table…* [Fig. 12].

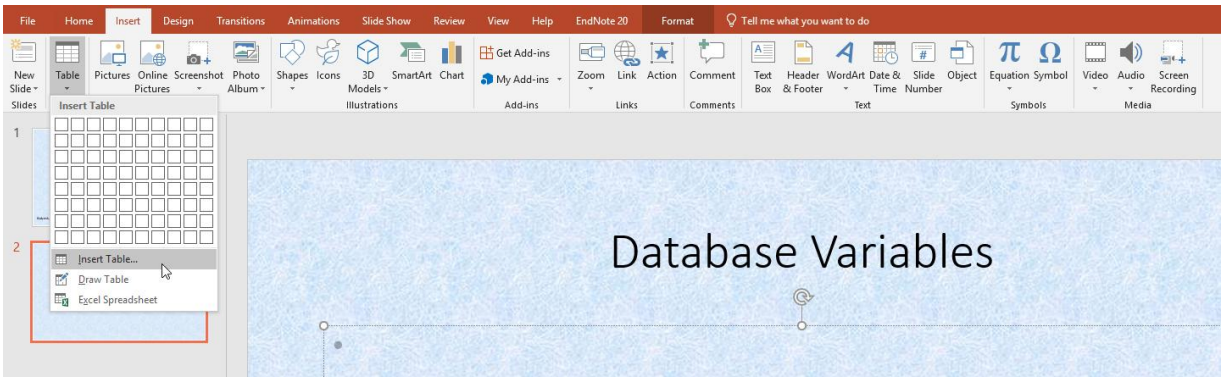


Fig. 12. *Insert Table...* command

In the new window, specify the number of columns (3) and rows (8). Confirm the settings by clicking *OK* [Fig. 13].

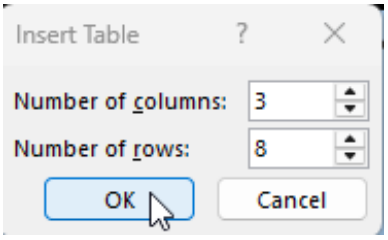


Fig. 13. *Insert Table* window

After inserting the table, click on it. This will cause two additional tabs to appear in the top menu, i.e., *Design* and *Layout*, which can be used to modify tables. In the first column of the table, select the first two rows, go to the *Layout* tab, and in the *Merge* section, click the *Merge Cells* button [Fig. 14]. Repeat the steps for the second and third column.

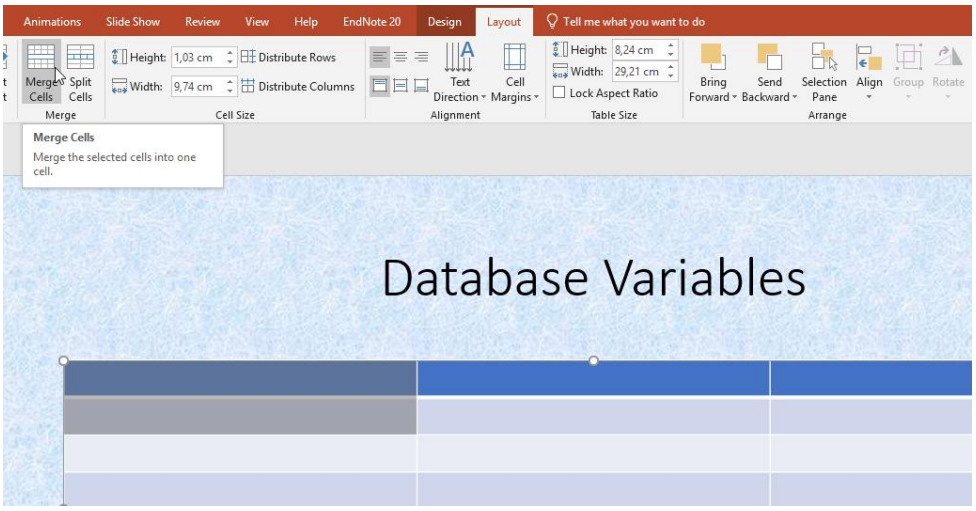


Fig. 14. Merging two rows of the first column

Entitle the first column "Variable", the second "Description", and the third "Meaning". Select the whole table and center each cell horizontally and vertically. To do this, select the *Center* and *Vertically Center* options in the *Alignment* section of the *Layout* tab [Fig. 15].

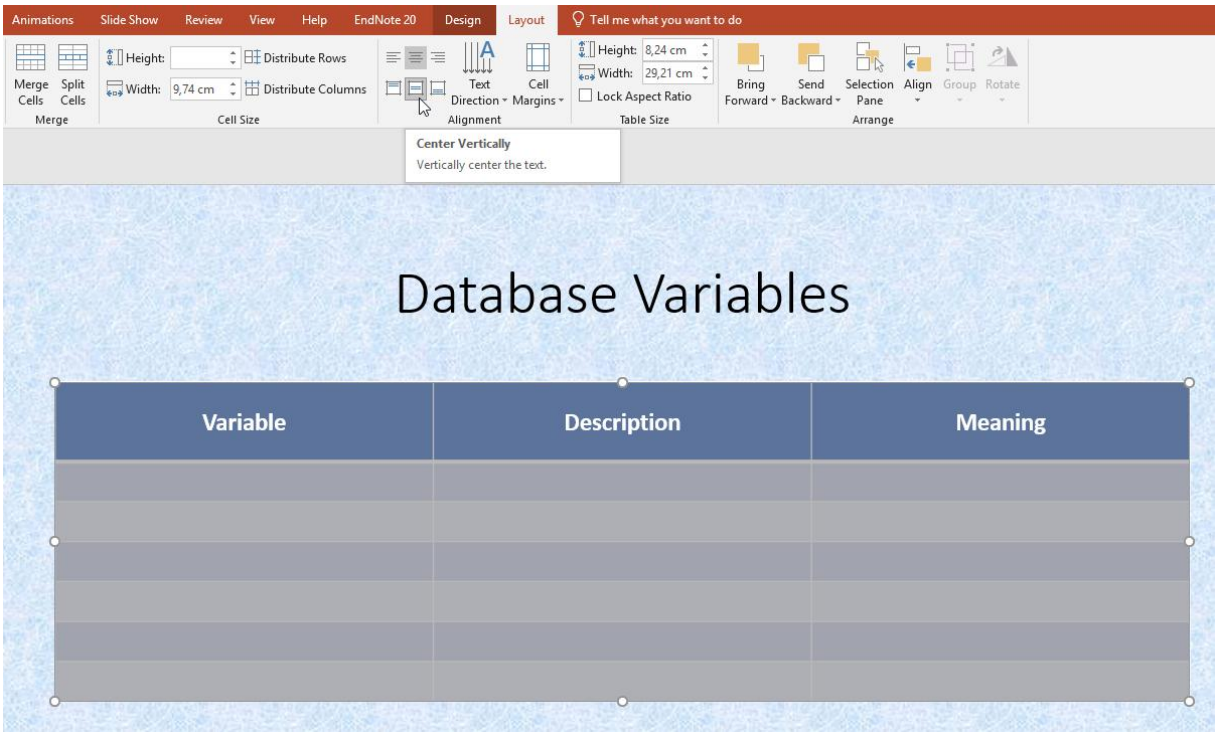


Fig. 15. Signed and centered table

Reselect the whole table. On the *Design* context tab, in the *Table Styles* section, locate the *Borders* button. Click the arrow located to its right and select *All Borders* from the drop-down menu [Fig. 16]. On the *Home* tab, in the *Font* section, change the font size to 12 points.

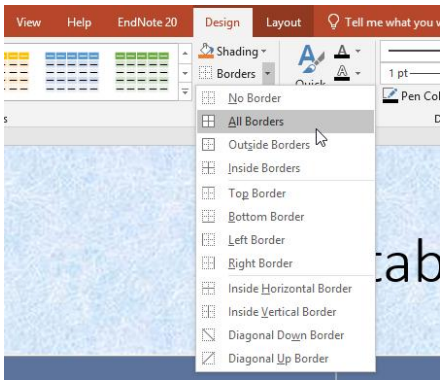


Fig. 16. Table with edge borders

Complete the table by copying the information from the "dataset.xlsx" file into the "Legend" sheet. Select the table together with the legend but without headers (i.e., range **A2:C7**). Paste the contents into the table in the presentation by selecting *Use Destination Styles (S)*. Finally, adjust the position of the table and its columns' widths so that the entire table fits on the slide [Fig. 17].

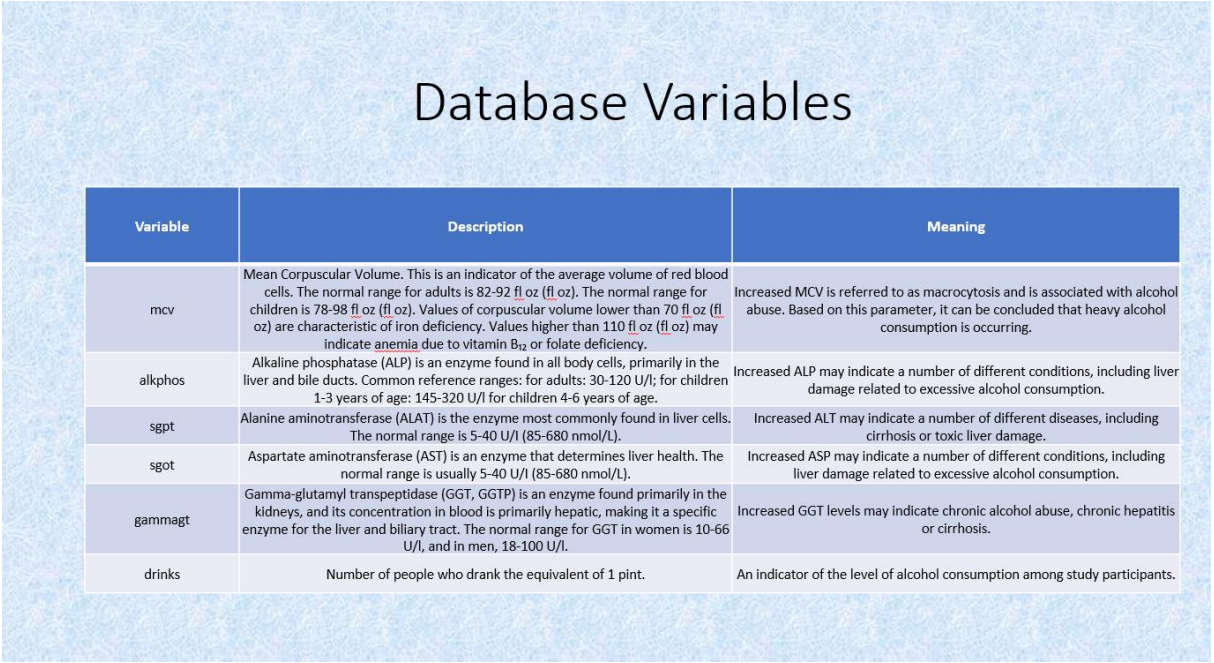


Fig. 17. The completed table

Exercise 4

In this exercise, we will calculate basic descriptive statistics to be included in the presentation.

We now have a presentation file prepared for further work. In the next exercises, we will analyze data using MS Excel and present the results in the presentation.

Calculate basic descriptive statistics.

In MS Excel, go to the "Data" sheet in the "Dataset.xlsx" workbook. To calculate basic descriptive statistics, we will use the *Data Analysis* add-in. Remember that in order to use it, we need to make sure it is enabled. Go to the *Data* tab and look for the *Data Analysis* button on the right. If the add-in is not enabled, proceed as described in in the instruction to the previous set of exercises.

In the *Data* tab, select *Data Analysis* and then the *Descriptive Statistics* tool. For *Input Range*, select all columns (including headers) except "ID". Select also the *Labels in First Row* option.

Set the output options by selecting the *New Worksheet Ply* checkbox, then enter the name of the sheet, i.e., "Descriptive Statistics", in the field next to the checkbox. Select *Summary Statistics* and click *OK* [Fig. 18].

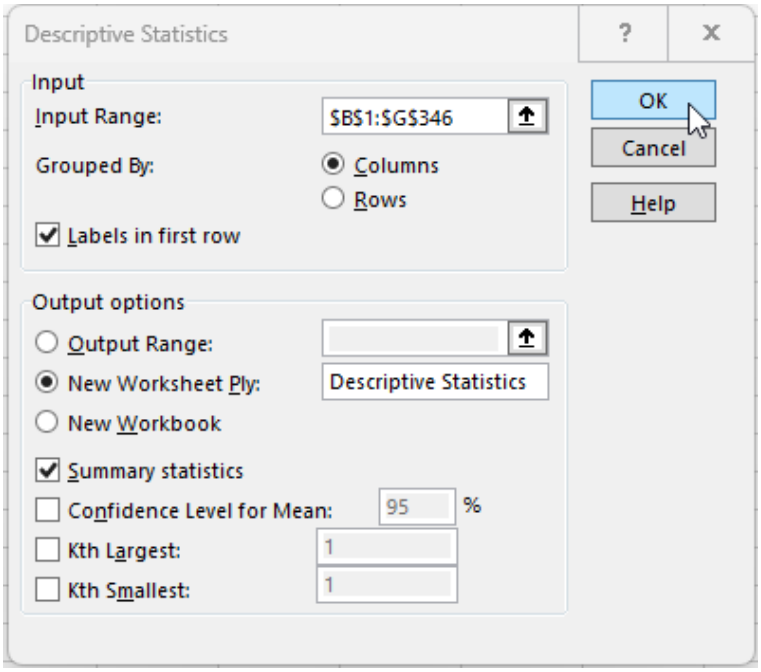


Fig. 18. *Descriptive Statistics* window

Format the sheet.

Format the results as follows:

- delete the second (empty) line,
- transfer the contents of the cells containing the variable names to the adjacent columns, which contain the values of the individual variables (e.g., move "mcv" from **A1** to **B1**),
- remove repeated statistic names in every second column (remembering to leave them in the first column),
- adjust the column width to the content,

- set the border setting to *All Borders*.

The resulting table can be seen in [Fig. 19].

	A	B	C	D	E	F	G
1		*mcv*	*alkphos*	*sgpt*	*sgot*	*gammagt*	*drinks*
2	Mean	90.15942029	69.8695652	30.4057971	24.6434783	38.284058	3.45507246
3	Standard Error	0.239477437	0.98780537	1.0505074	0.54185413	2.11339749	0.17970301
4	Median	90	67	26	23	25	3
5	Mode	91	63	20	20	14	0.5
6	Standard Deviation	4.448095975	18.3476703	19.5123089	10.0644937	39.2546162	3.33783526
7	Sample Variance	19.7855578	336.637007	380.730199	101.294034	1540.92489	11.1411443
8	Kurtosis	2.584957509	0.74788283	13.8139118	8.14016505	10.4767492	3.66338808
9	Skewness	-0.38843312	0.75366677	3.06349864	2.29307245	2.86609356	1.54381943
10	Range	38	115	151	77	292	20
11	Minimum	65	23	4	5	5	0
12	Maximum	103	138	155	82	297	20
13	Sum	31105	24105	10490	8502	13208	1192
14	Count	345	345	345	345	345	345

Fig. 19. Descriptive statistics

Add a new slide and place it in the presentation.

Go to MS PowerPoint. On the *Home* tab, in the *Slides* section, click the arrow located to the bottom right of the *New Slide* icon. From the drop-down menu, select the *Blank* theme [Fig. 20].

The window on the left side of the screen containing slide thumbnails serves, among other purposes, as a navigation tool. Clicking on any of the slides automatically takes the user to the slide in question (in the main part of the screen).

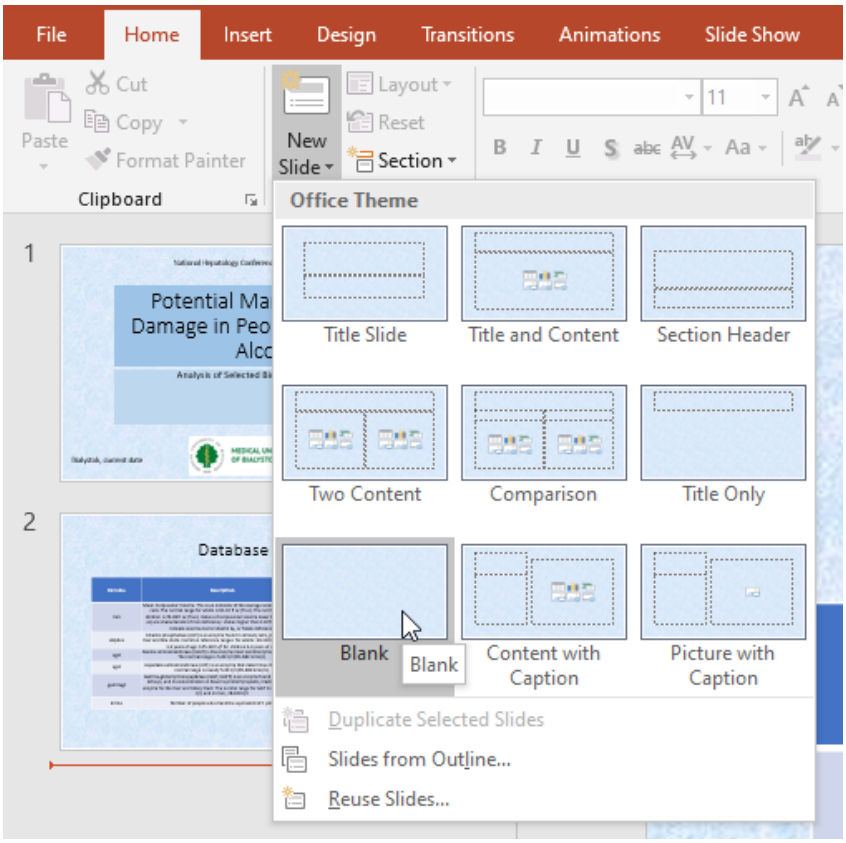


Fig. 20. *New slide* menu

Insert a table containing descriptive statistics into the presentation.

To create a dynamic link between the contents of a document (e.g., an MS Excel workbook) and the contents of an MS PowerPoint presentation, the link must be placed on the slide as an object. Inserting the contents as a linked or embedded object—as opposed to pasting it (e.g., by pressing Ctrl+V*)—allows the user to work with it in the same application in which it was originally created.*

Go to MS Excel. Select and copy the table containing the descriptive statistics. Right-click on the slide created in MS PowerPoint and select *Embed* from the menu [Fig. 21].

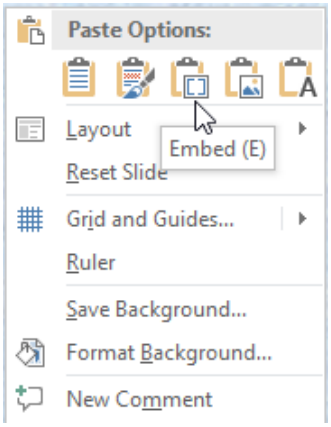


Fig. 21. *Embed* command

We can see that the inserted table is too small (and therefore illegible). To enlarge it (while maintaining the object's proportions), grab one of the corner markers and expand the table to fit the slide size.

Change the table fill using the *Shape Fill* command from the *Format* contextual tab in the *Shape Styles* section. Select *Gray, Accent 3, Lighter – 40%* [Fig. 22].

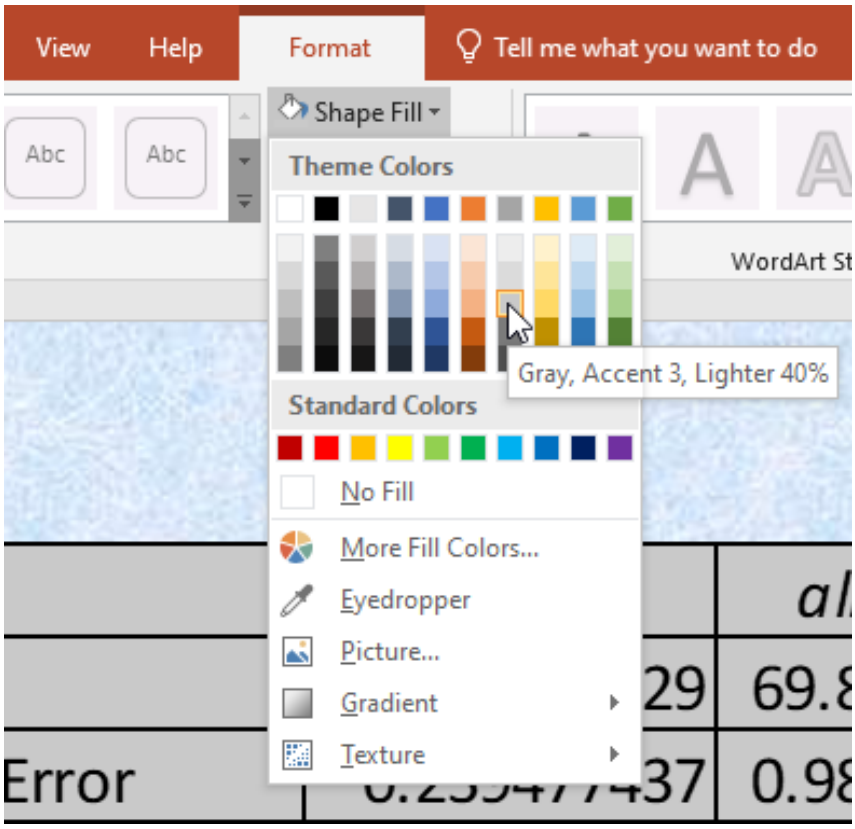


Fig. 22. Changing fill color

Exercise 5

In this exercise, we will create a slide containing graphics and add animations to it.

Additional graphics are a crucial component of a presentation. The skillful use of graphics (i.e., image files, WordArt, ClipArt, animations, etc.) can significantly enhance its reception and comprehension. The presenter can use them to adjust the pace of the presentation and gain a degree of control over the audience's attention. Additional graphics attract attention and can be used to introduce humor or interesting facts. They do not always have to contain substantive content. Graphics can also be used as break-ups between thematically different sections of a presentation, or as a tool that helps the audience relax during a presentation on a difficult topic.

Create a new slide with graphics.

We will now create a slide that would act as an interlude in the presentation, using an animation effect where the graphic enters from the left side of the screen and exits to the right. This simple solution makes it possible for us to have greater control over the pace of the presentation and the audience's attention.

Stay in MS PowerPoint. On the *Home* tab, in the *Slides* section, expand the menu next to the *New Slide* icon. From the drop-down list, select the *Blank* theme [Fig. 20].

The appropriate image to insert into the presentation is available on the Department of Biostatistics and Medical Informatics website. Click the "Statistics in Medicine.png" link. In the window that appears, right-click on the image and select the copy option appropriate for your web browser. Insert the copied image into the newly created slide.

Add animation.

Animation settings are available on the Animations *tab, in the* Animation *section. Clicking the arrow in the lower right corner of the section displays the available animation effects [Fig. 23]. These are divided into the following thematic groups:* Entrance, Emphasis, Exit, *and* Motion Paths. *The first and third options control the appearance and disappearance of objects. Emphasis is used to focus on a given object. The last option is used to move objects during presentation. The same options are available by selecting the* Add Animation *command in the* Advanced Animation *section.*

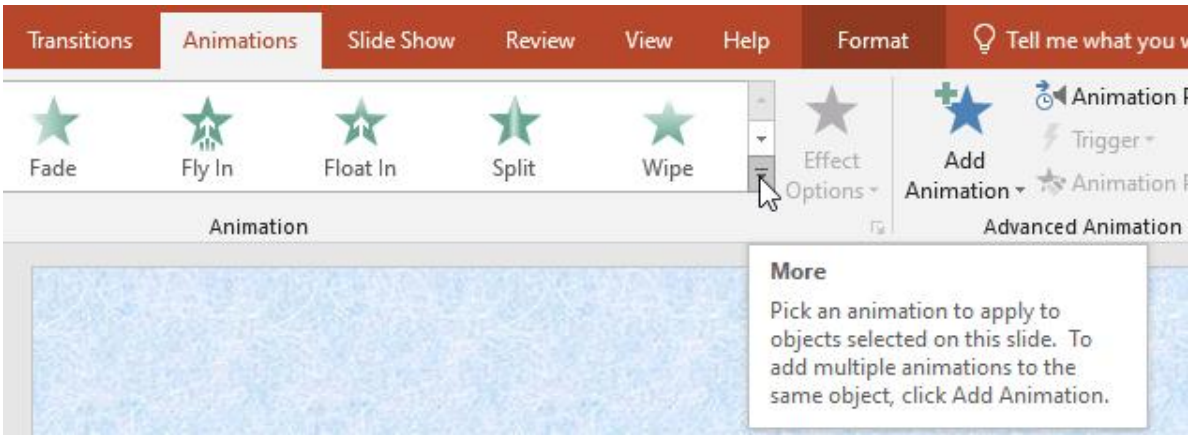


Fig. 23. Access to all animation effects

Select the graphic. In the *Animations* tab, in the *Animation* section, click the arrow in the lower right corner of the section [Fig. 23] and from the drop-down list in the *Entrance* group select the *Fly In* effect [Fig. 24].

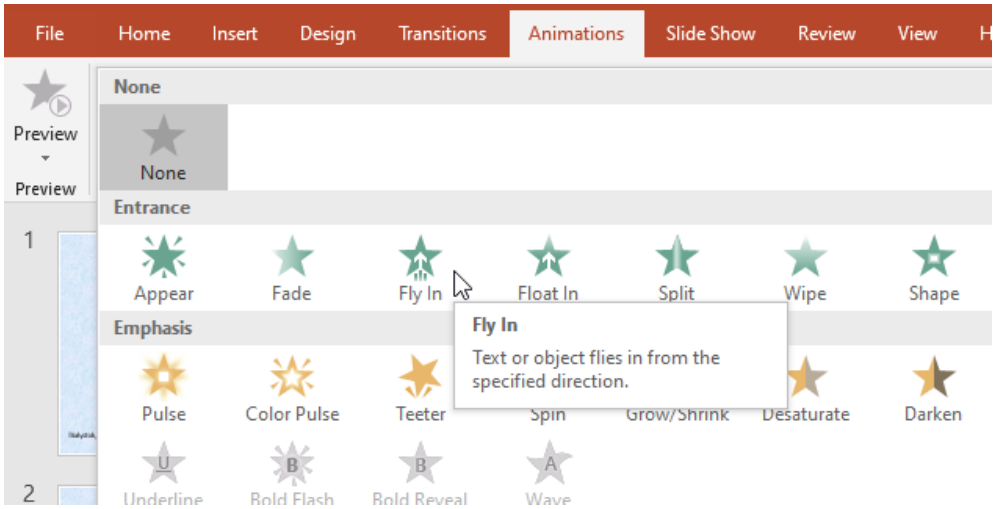


Fig. 24. Selecting the *Fly In* effect

Add another animation.

Since our slide is transitional in nature, the entrance effect will be accompanied by an appropriate exit animation.

If you want to add multiple effects to a single object, you can use the Add Animation *command. Selecting an effect from the* Animation *section replaces the currently selected animation.*

Select the graphic again and add another animation. In the *Animations* tab, in the *Advanced Animation* section, expand the *Add Animation* list [Fig. 25]. In the *Exit* group, select *Fly Out*.

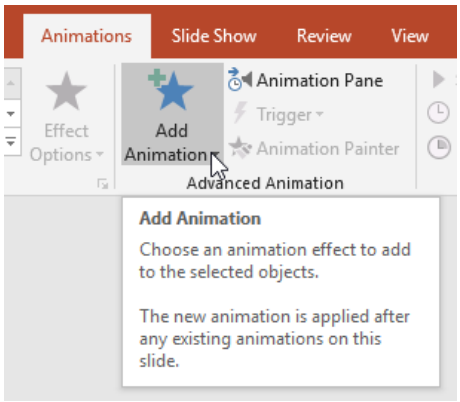


Fig. 25. Selecting the *Add Animation* command

Set the animation's timing.

After clicking the Add animation *button and selecting its type from the context menu, you will gain access to additional options in the* Advanced animation *and* Timing *sections that allow you to determine how the animation is to be activated (e.g., in the* Start *field, you can choose from among the following options:* On Click, With Previous, *or* After Previous*), its*

duration, and delay. You can also combine several different animations and change their order. Animations are arranged as specified in the Animation Pane *dashboard.*

On the *Animations* tab, in the *Advanced Animation* section, select the *Animation Pane* command. In the dashboard, select the first animation. Return to the *Animations* tab and set the *Timing* in the *Timing* section [Fig. 26]:

- Activating animation – the *After Previous* option in the *Start* selection box,
- Duration of the effect – set 02.00 in the *Duration* field.

Change the second animation's options in exactly the same manner.

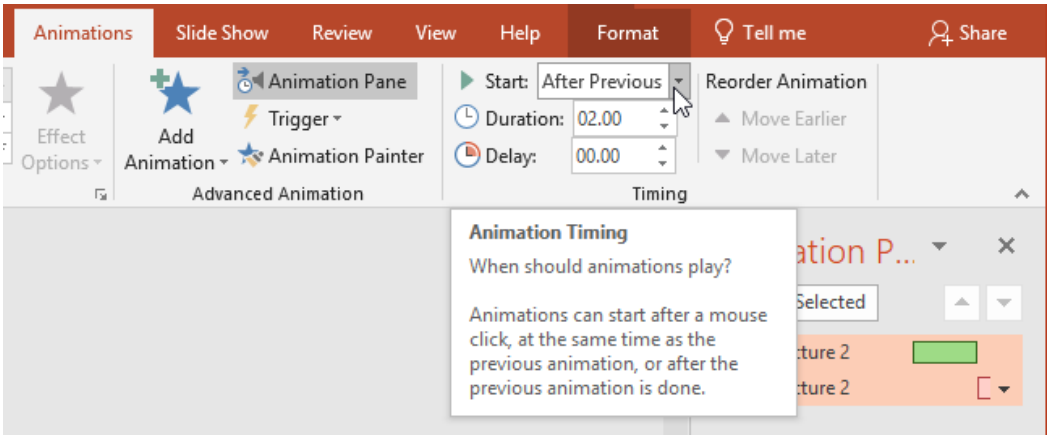


Fig. 26. *Fly In* animation timing

After selecting an animation, additional options will become available in the dashboard on the right (the downward-pointing arrow). Select the first animation, click the arrow on the right, and select *Effect Options…* from the drop-down menu [Fig. 27].

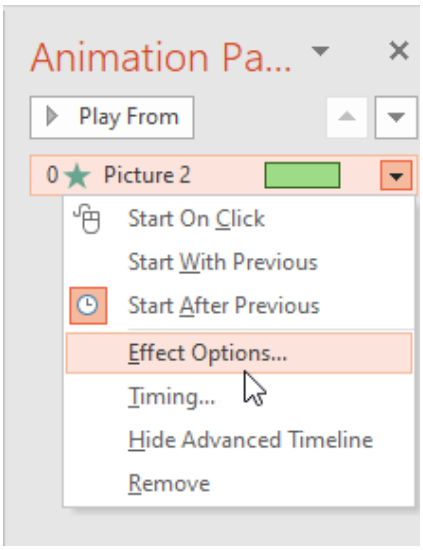


Fig. 27. *Effect Options...* command

In the *Fly In* window, on the *Effect* tab, in the *Settings* group, select the *From left* option from the *Direction* drop-down list [Fig. 28]. Similarly, set the *To Right* option for the second animation.

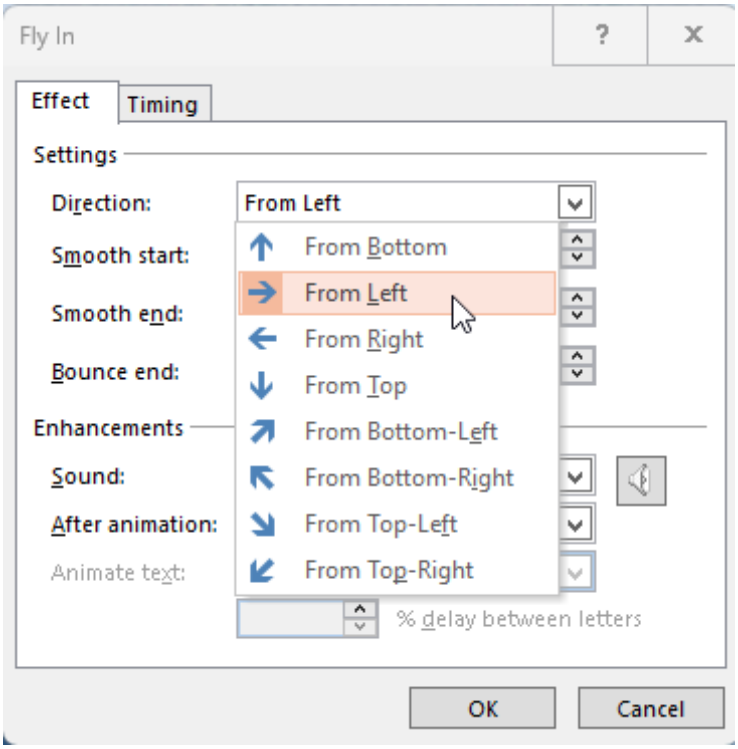


Fig. 28. *Fly In* window

Exercise 6

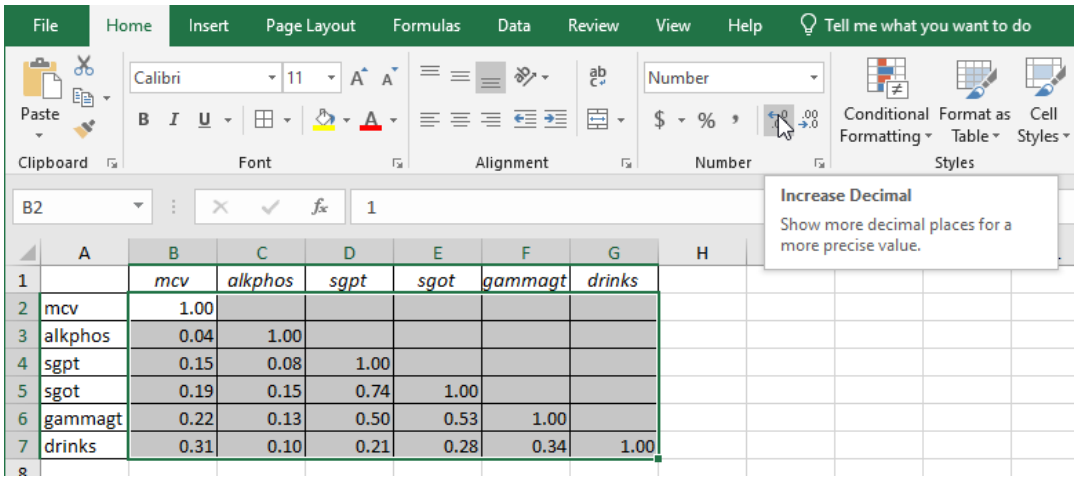
In this exercise, we will create a correlation matrix and a scatterplot for selected variables to be included in the presentation.

Calculate the correlation coefficient for selected variables.

In the MS Excel workbook, go to the "Data" sheet. On the *Data* tab, in the *Analysis* section, click the *Data Analysis* command. In the window that opens, select the *Correlation* command.

We will calculate the correlation coefficients for all the six variables from the "Data" sheet (without the "ID" column). Go to the *Input Range* edit box and select all columns, i.e., the **B1:G346** range. Select the *Labels in First Row* option and the *New Worksheet Ply* checkbox. In the field next to the checkbox, name the sheet "Correlation Matrix". Confirm by clicking the *OK* button.

In the "Correlation Matrix" sheet, select the obtained results and set the border to "All Borders". Select only the cells containing numeric values and set the results to be displayed to two decimal places [Fig. 29].



	A	B	C	D	E	F	G	H
1		*mcv*	*alkphos*	*sgpt*	*sgot*	*gammagt*	*drinks*	
2	mcv	1.00						
3	alkphos	0.04	1.00					
4	sgpt	0.15	0.08	1.00				
5	sgot	0.19	0.15	0.74	1.00			
6	gammagt	0.22	0.13	0.50	0.53	1.00		
7	drinks	0.31	0.10	0.21	0.28	0.34	1.00	

Fig. 29. Changing the display method

Add a new slide.

In MS PowerPoint, in the *Home* tab, in the *Slides* section, expand the menu located next to the *New Slide* icon. From the drop-down list, select the *Blank* theme [Fig. 20].

Insert the correlation matrix into the presentation.

Select and copy the table containing the calculated correlation coefficients. Right-click on the created slide and select *Embed* from the menu [Fig. 21]. Enlarge the inserted table and change the fill color in a similar manner to how the table containing descriptive statistics was formatted [Fig. 30].

	mcv	alkphos	sgpt	sgot	gammagt	drinks
mcv	1.00					
alkphos	0.04	1.00				
sgpt	0.15	0.08	1.00			
sgot	0.19	0.15	0.74	1.00		
gammagt	0.22	0.13	0.50	0.53	1.00	
drinks	0.31	0.10	0.21	0.28	0.34	1.00

Fig. 30. Correlation matrix inserted into the presentation

Create a scatterplot for the "sgpt" and "sgot" variables.

The resulting correlation matrix provides a general understanding of the relationships between variables. It can be seen that the highest correlation coefficient value—indicating a fairly strong correlation—occurs for the pair "sgpt" (ALT) vs. "sgot" (AST). In clinical contexts, these parameters are often used as markers of liver function, and an increase in one enzyme is often associated with an increase in the other—suggesting the existence of a true correlation between both parameters. Thus, what occurs in this case is a situation in which known scientific mechanisms are reflected in the data. This provides a well-grounded basis for further analysis of the relationships between the two variables, which will be performed in the following tasks by creating a scatterplot and plotting a trend line.

In the MS Excel workbook, go to the "Data" sheet. Select the "sgpt" and "sgot" columns. In the *Insert* tab, in the *Charts* section, select the first chart in the *Scatter* group. This creates a scatterplot showing the correlation between the "sgpt" and "sgot" variables.

Change the chart title to "Scatter Chart". Click the green plus symbol located in the upper right corner of the chart and select the *Axis Titles* and *Trendline* checkboxes [Fig. 31].

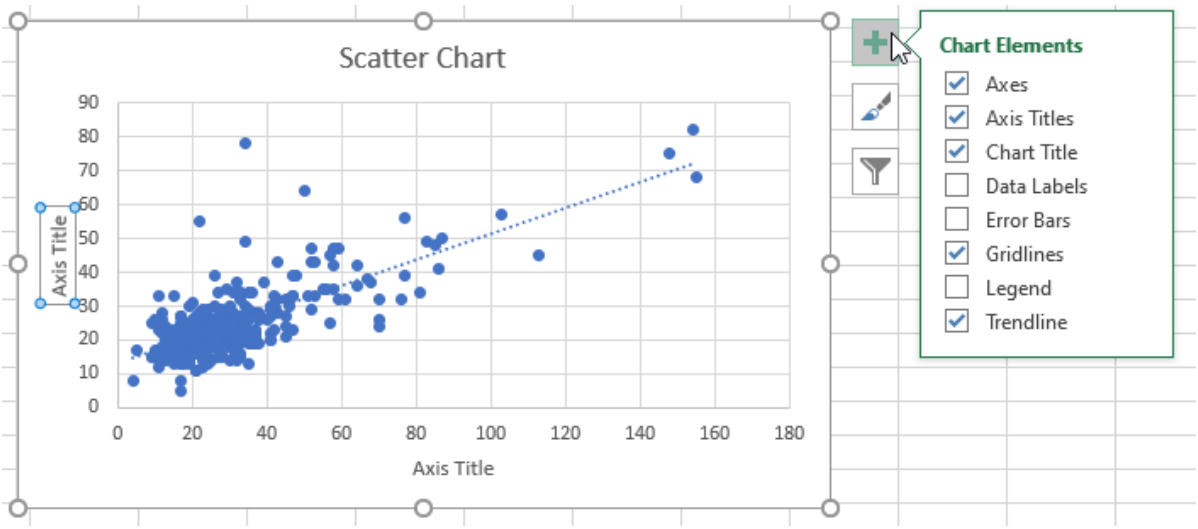


Fig. 31. Adding axis titles and trend lines

Change the title of the vertical axis to "Aspartate aminotransferase" and the horizontal axis to "Alanine aminotransferase".

Add its equation and the R-squared value to the trendline graph.

Double-click the trend line added to the chart. In the dashboard, select the following checkboxes: *Display equation on chart* and *Display R-squared values on chart*.

Change the color of the trend line to red.

To improve the visibility of the trend line, we will change its color to red. After executing the previous command, we are now in the *Format Trendline* dashboard. Go to the first tab, i.e., *Fill & Line*. Change the *Color* to *Red*, the *Width* to 2pt, and the *Dash Type* to *Solid*. The final result is shown in [Fig. 32].

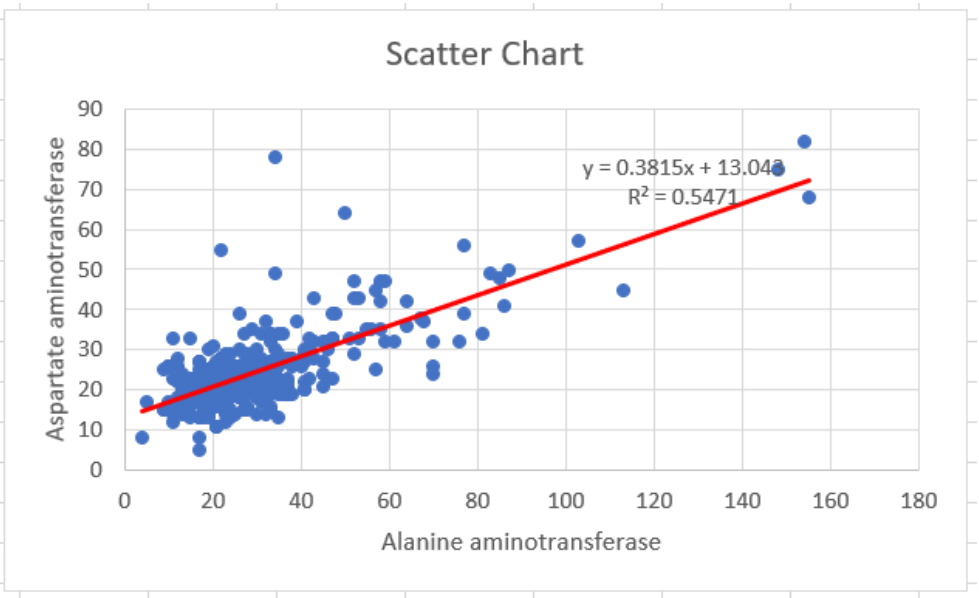


Fig. 32. The scatterplot

Add a new slide and insert a scatterplot into the presentation.

In MS PowerPoint, add a blank slide to the presentation. In the MS Excel worksheet, select and copy the scatterplot. Right-click on the created MS PowerPoint slide and select *Picture (U)* from the paste options menu. Enlarge the inserted chart [Fig. 33].

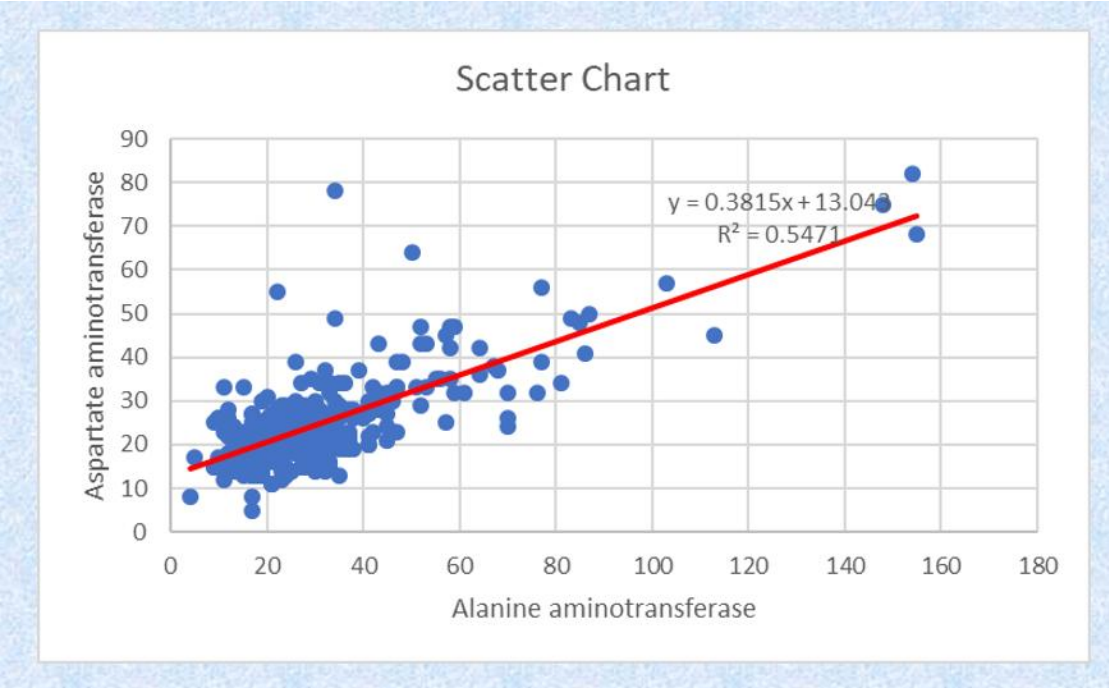


Fig. 33. The scatterplot included in the presentation

Exercise 7

In this exercise, we will divide the study group into four categories based on alcohol consumption and count the number of people in each group. We will present the results on a graph.

Designate the alcohol consumption categories.

In the MS Excel workbook, in the "Data" sheet, enter the name of the next column, in which the categories of alcohol consumption will be designated:

```
H1="Alcohol consumption"
```

Designate the categories according to the following ranges:

- 0 – people who do not consume alcohol,
- (0-4] – low alcohol consumption,
- (4-10] – average alcohol consumption,
- >10 – high alcohol consumption.

To determine the appropriate category, we will use a nested **IF** function. Enter the following formula and copy it down:

```
H2=IF(G2=0,"sobriety",IF(G2<=4,"low",IF(G2<=10,"average","high")))
```

In this manner, we have determined the categories of alcohol consumption that will be used for further analyses.

Count the persons according to the alcohol consumption categories.

In the "Data" sheet, create a table as shown in [Fig. 34].

J	K	L
Alcohol consumption	Frequency	Percentage
sobriety		
low		
average		
high		
Sum		

Fig. 34. Table to be created

We will do the counting using the **COUNTIF** function. Enter the following formula (remembering to lock the appropriate rows) and copy it to the remaining categories:

```
K3=COUNTIF(H$2:H$346,J3)
```

Sum the obtained values by entering the following formula:

```
K7=SUM(K3:K6)
```

Select the empty table cells in the "Percentage" column. Go to the *Home* tab and, in the *Number* section, change the number format to *Percentage*.

Calculate the percentage of persons in each of the categories by dividing the number of persons in each of the groups by the total number of persons. Enter the following formula, then copy it down:

```
L3=K3/K$7
```

Select the cells containing the percentage values and limit the display of decimal places so that the results do not contain any decimal places (*Home* tab, *Number* section, the *Decrease Decimal* command) [Fig. 35] shows the resulting table.

Note that after changing the display, the percentages do not sum up to a total of 100. This situation results from the rounding of numerical values (in this case, using the Decrease Decimal *command) and the fact that some of the values are rounded up, while others are rounded down, which may cause inaccuracies when these values are added.*

Alcohol consumption	Frequency	Percentage
sobriety	9	3%
low	231	67%
average	96	28%
high	9	3%
Sum	345	100%

Fig. 35. Table of counts and percentages

Present the results in the presentation as percentages on a doughnut chart.

When preparing a presentation, charts can be created in either MS PowerPoint or MS Excel. The general rule is that if you want to incorporate a large amount of data into a chart, it is better to create the chart in MS Excel and then copy it into the presentation. This is also the best method when the data change and you want the chart to always reflect the most current values. In such cases, when copying a chart, you should maintain its link to the original MS Excel file. For less complex charts, the capabilities of MS PowerPoint are more than sufficient.

Go to your MS PowerPoint file. Add a blank slide to the presentation. On the *Insert* tab, in the *Illustrations* section, select the *Chart* command [Fig. 36]. In the *Insert Chart* window, select the chart available in the *Sunburst* category [Fig. 37].

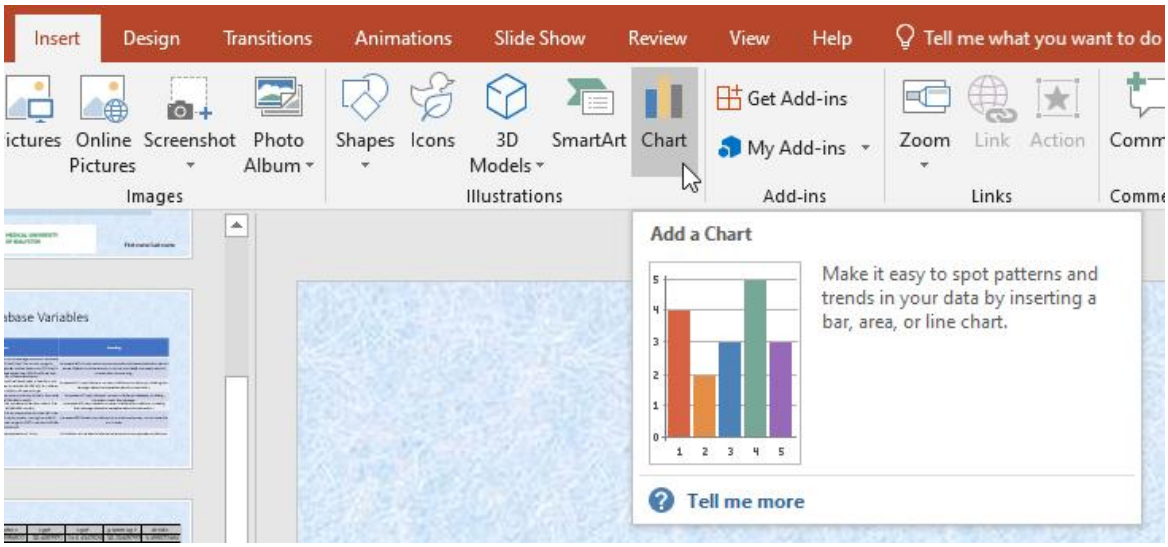


Fig. 36. *Chart* Command

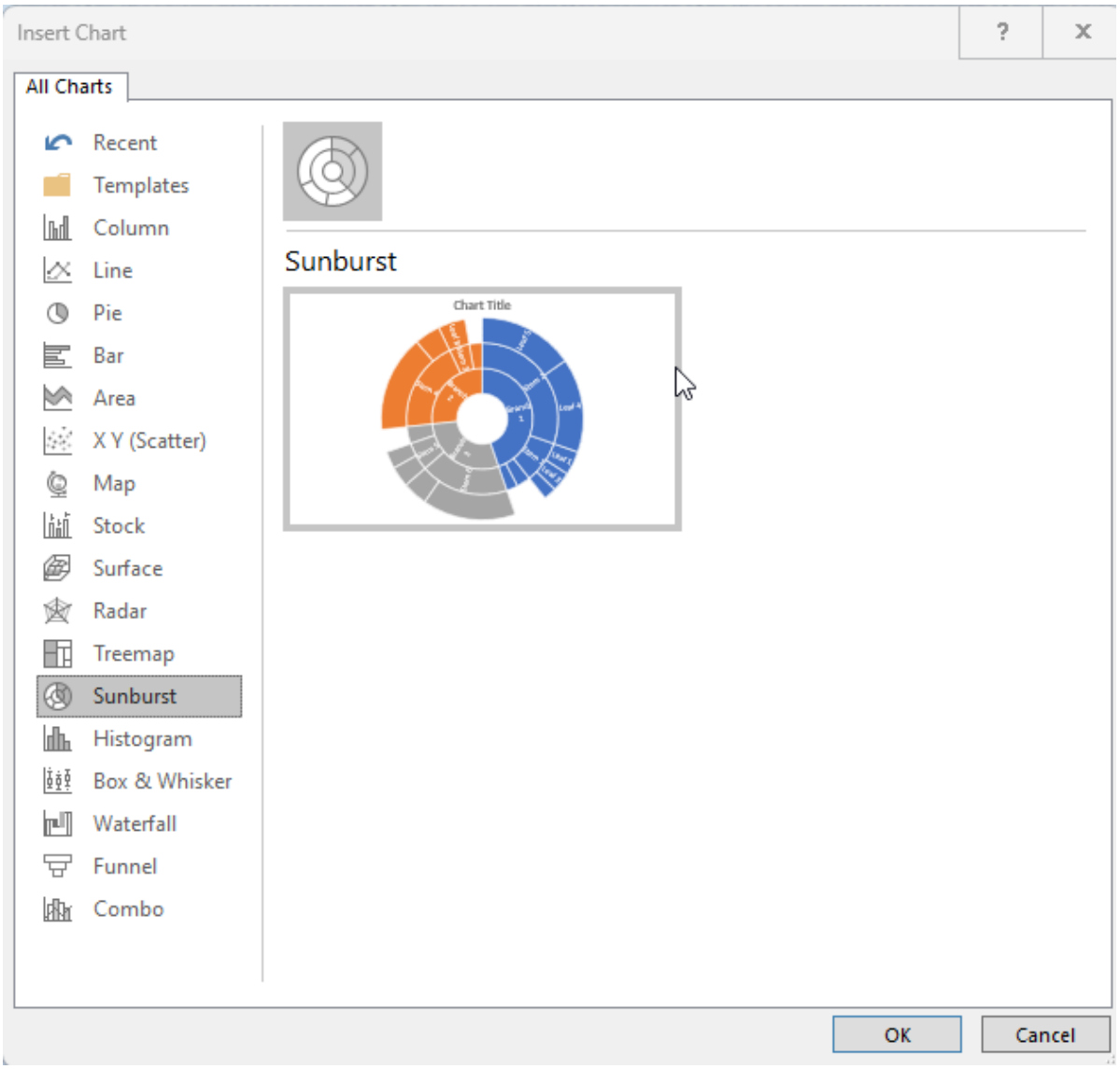


Fig. 37. *Sunburst* Chart

Once the selection is confirmed, a chart of the chosen type containing the default data is added to the slide. These data are accessible through a window resembling an MS Excel spreadsheet. Delete the second and third column (i.e., select columns **B** and **C**, right-click, and select *Delete*).

From the "Data" spreadsheet, copy the alcohol consumption category names and place them in column **A** (rows **2** through **5**). Then, delete rows **6** through **17**. Copy the corresponding percentage data for each category to the second column, entitled "Series 1" [Fig. 38]. When pasting the percentage data, a message will appear [Fig. 39] that needs to be confirmed by clicking *OK*. The copied cells contain formulas to be converted to numerical values.

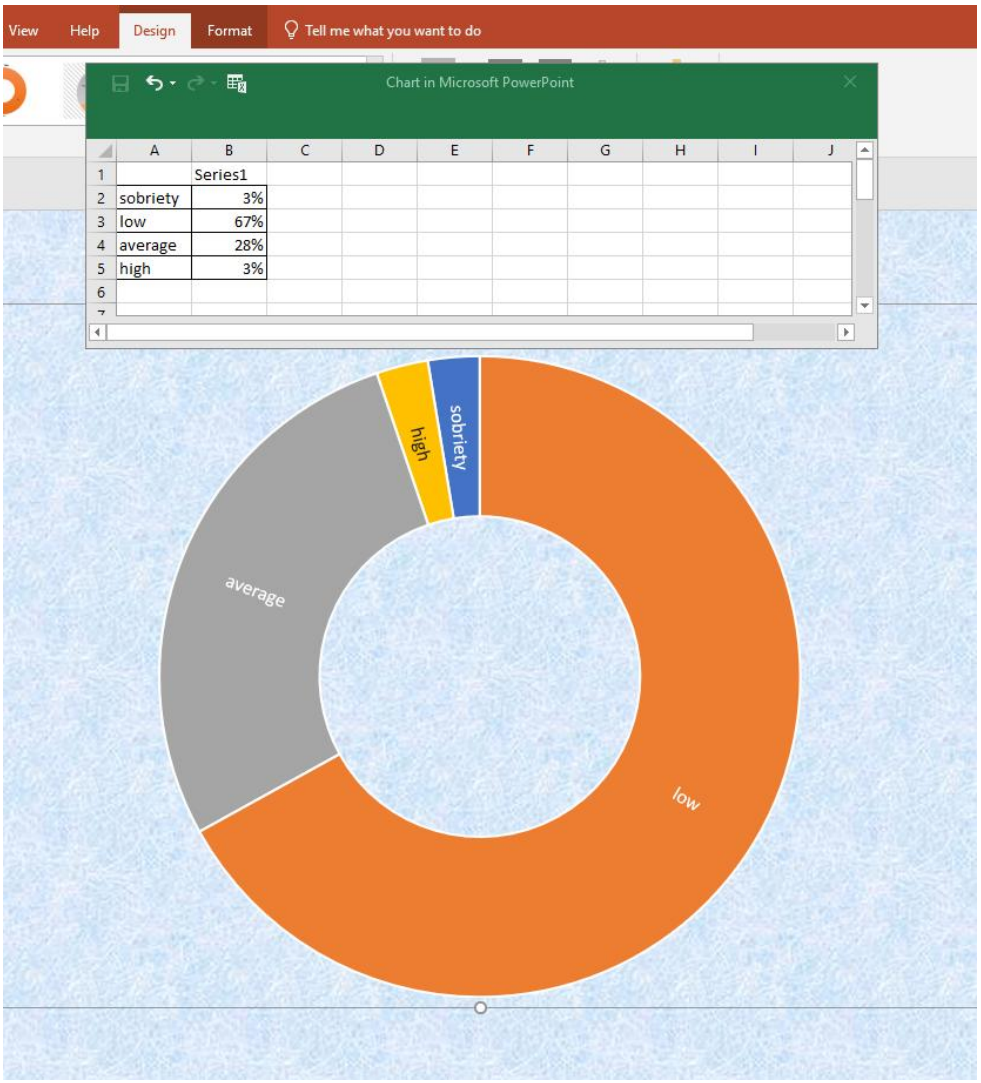


Fig. 38. Entering data into a chart

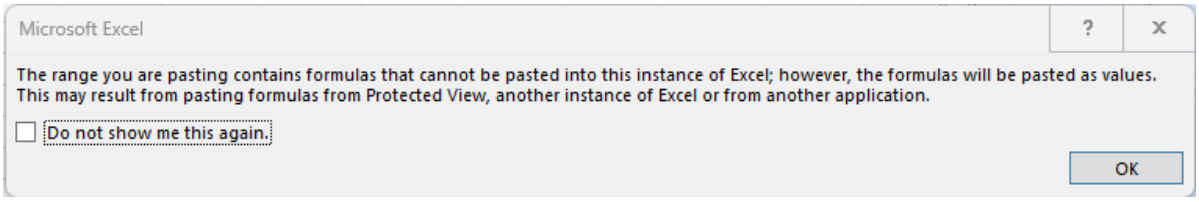


Fig. 39. Message that appears when data are pasted

After entering the data, close the spreadsheet window. Change the chart title to "Alcohol Consumption". Click the green plus symbol located in the upper right corner of the chart (if it is not visible, first click on the chart area), select the *Legend* checkbox, click the arrow located to the right of the *Data Labels* box, and select *More Data Label Options...* from the drop-down menu [Fig. 40].

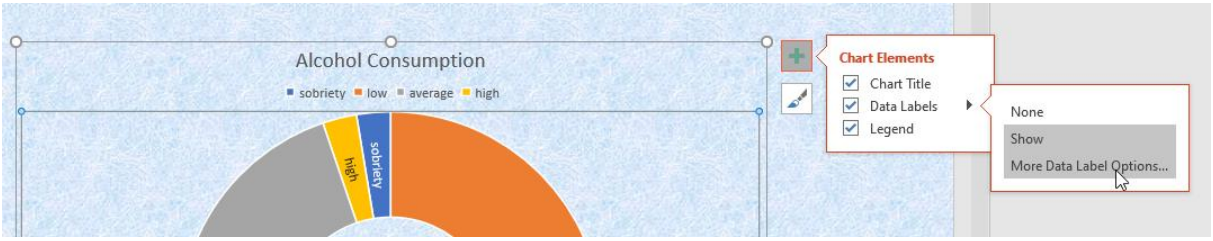


Fig. 40. *More Data Label Options...* command

In the *Format Data Label* dashboard, select the *Value* checkbox and deselect the *Category Name* checkbox [Fig. 41].

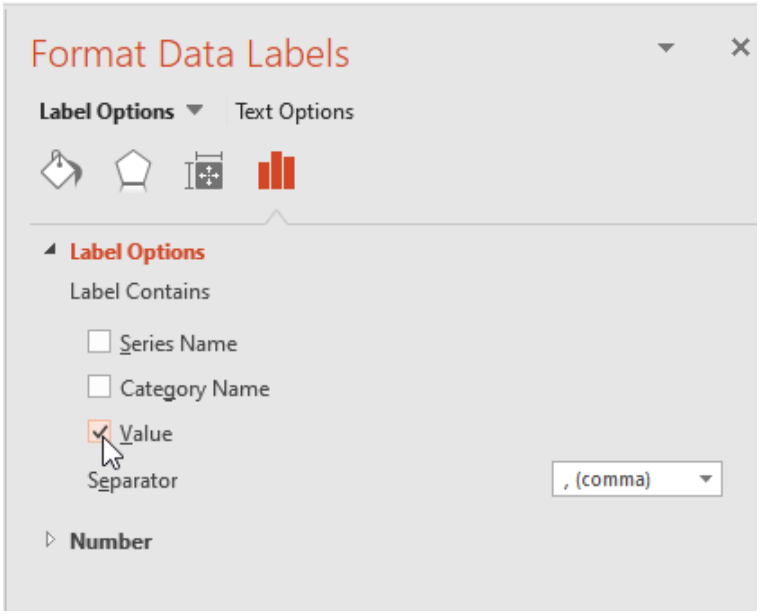


Fig. 41. *Format Data Labels* dashboard

Exercise 8

In this exercise, we will insert a box plot in the spreadsheet and include it in the presentation. Then we will add a slide to the presentation that will be a copy of the previously created slide.

A box plot (also known as a box-and-whisker plot) allows you to visualize a range of data information, such as the median, 1st quartile, 3rd quartile, maximum, and minimum. It also makes it possible to observe the level of dispersion and skewness of data, and identify outliers. Therefore, it is a very convenient tool that provides a range of important information needed for data analysis and inference.

In the MS Excel workbook, go to the "Data" sheet and copy column **H**, i.e., "Alcohol Consumption". Add a new sheet and name it "Boxplot". Paste the copied column by right-clicking it and selecting *Values (V)* [Fig. 42]). Copy the "mcv" column from the "Data" sheet into the second column of the "Boxplot" sheet.

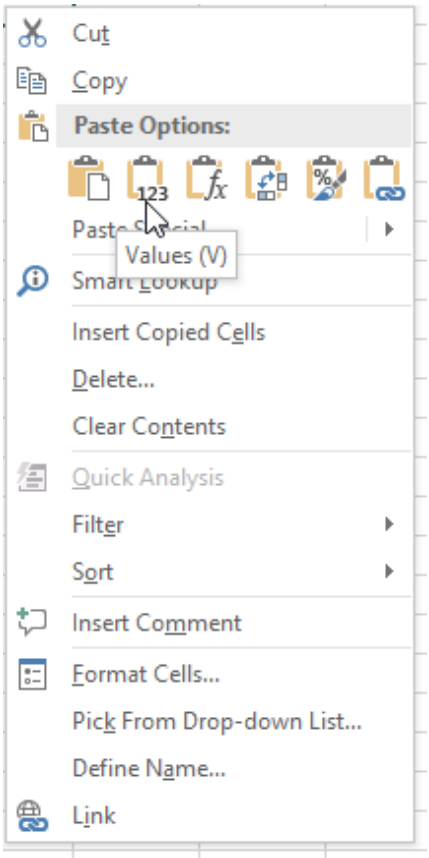


Fig. 42. *Paste Values* option

Select the copied data (including headers). On the *Insert* tab, in the *Charts* section, select *Recommended Charts*. In the *Insert Chart* window, go to the *All Charts* tab and select the chart available in the *Box & Whisker* category [Fig. 43].

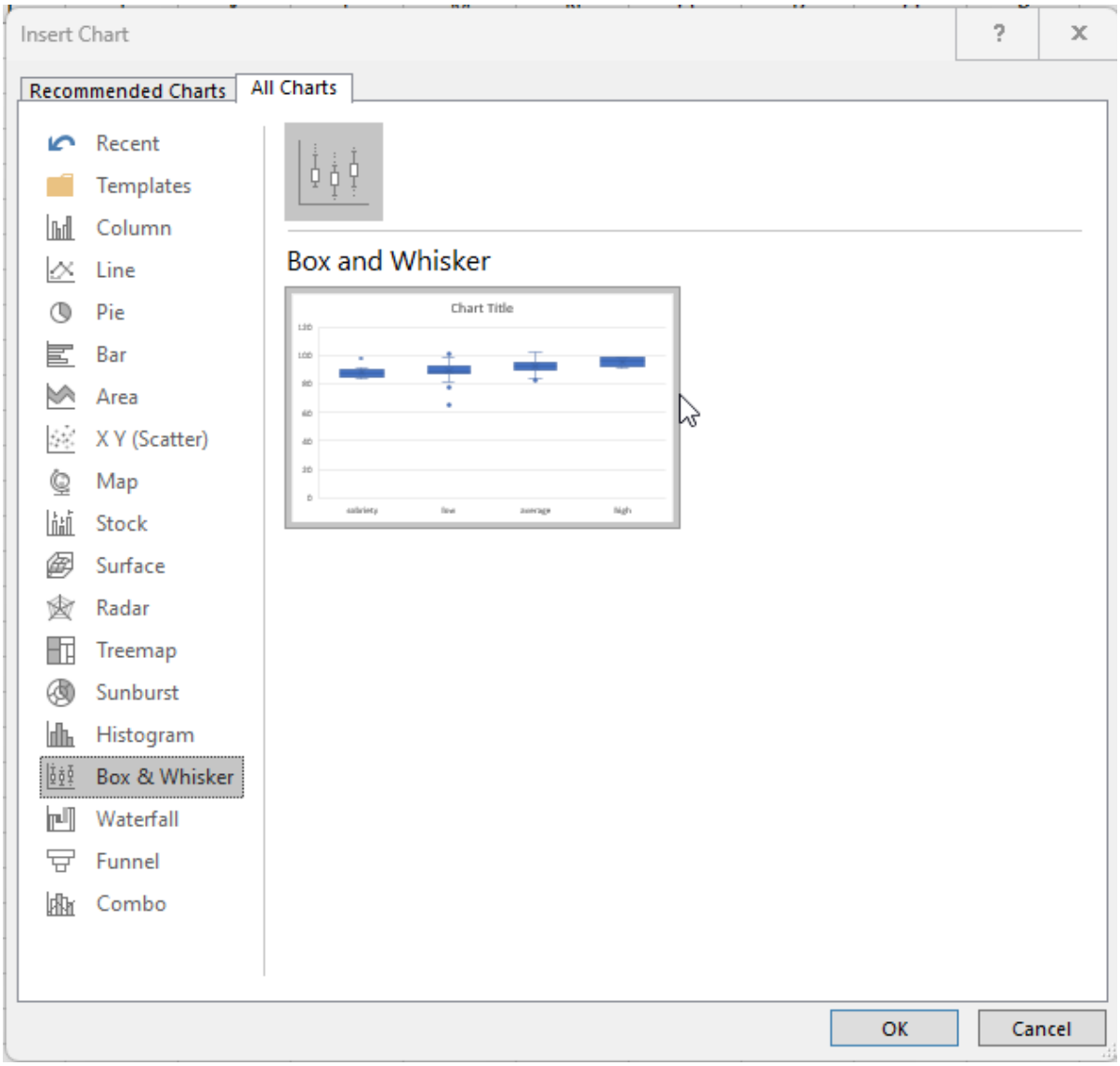


Fig. 43. *Box and Whiskers* chart

Change the chart title to "Mean Red Blood Cell Volume Index". Click the green plus symbol located in the upper right corner of the chart. Click the arrow located to the right of the *Axis Titles* box and select the *Primary Horizontal* option [Fig. 44]. Change the title of the horizontal axis to "Alcohol consumption".

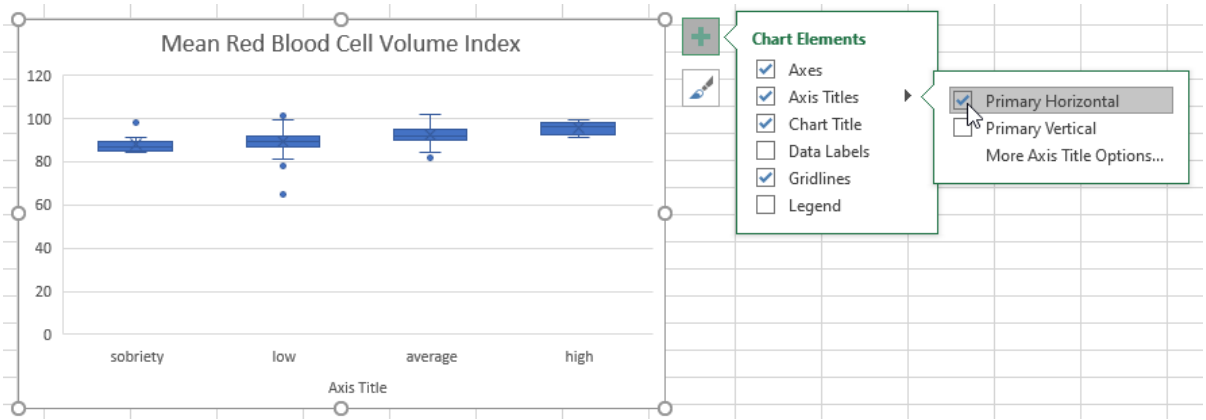


Fig. 44. *Primary Horizontal* option

To open the *Format Axis* dashboard, double-click the vertical axis. In the *Axis Options* section, set *Minimum* to 60 and *Maximum* to 105.

Add a new slide and insert the chart into the presentation.

In MS PowerPoint, add a blank slide to the presentation. Select and copy the chart from the "Boxplot" sheet. Right-click on the newly created slide and select *Picture (U)* from the paste options menu. Enlarge the inserted chart [Fig. 45].

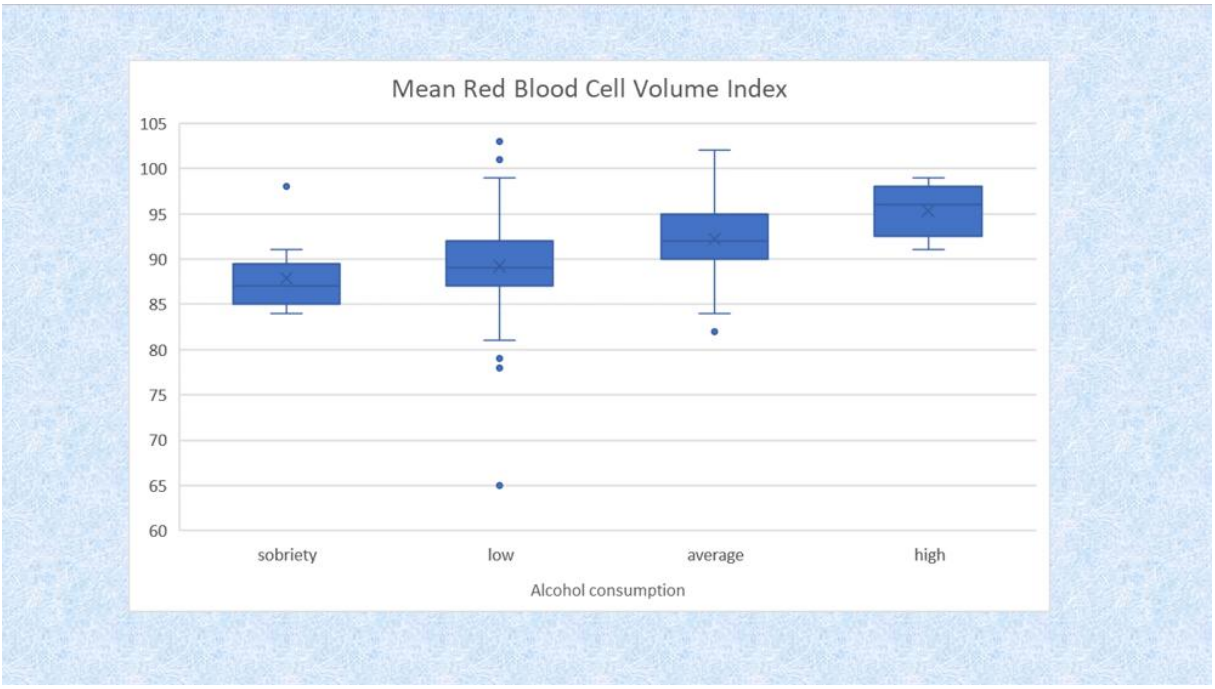


Fig. 45. The box plot inserted in the presentation

Duplicate the slide with graphics.

Right-click on the slide 4 thumbnail and select *Duplicate Slide* from the menu [Fig. 46]. Grab the copied slide's thumbnail and drag it to the end of the presentation. Notice that the copied slide is identical to the original, including the animations assigned to the graphics.

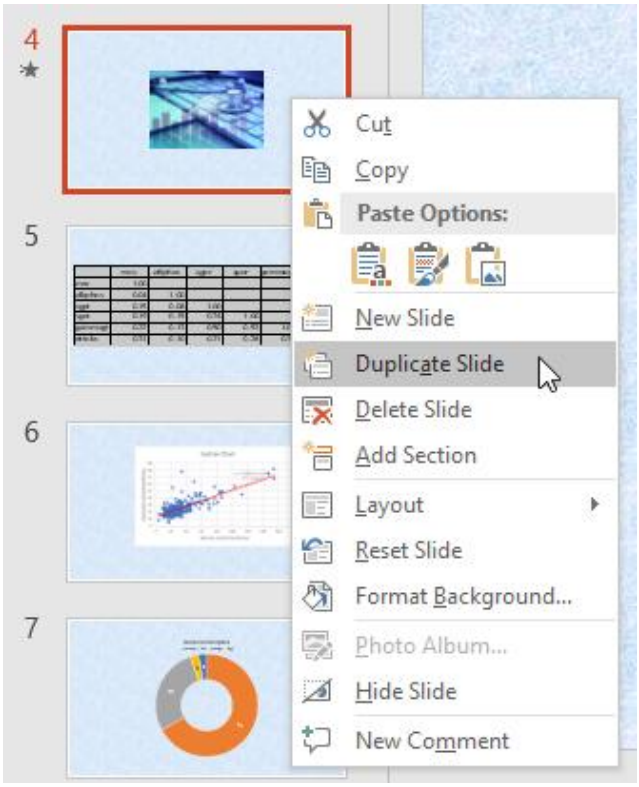


Fig. 46. *Duplicate Slide* command

Exercise 9

In this exercise, we will create the following slides to conclude the presentation: "Conclusion" and "Summary", as well as a slide containing the table of contents.

It is important to note that in our case, only some of the data are analyzed. This is not unusual, i.e., in the course of scientific research, it often so happens that not all the collected data are used. The reasons may vary: some data are collected incidentally, e.g., when a full standard test panel is performed, while others may be useful at a later stage of the study, etc. What data are analyzed depends primarily on the study's goals and the research hypotheses.

The results and conclusions of a study are not the same as the results of the calculations and analyses performed during the study. Conclusions must primarily relate to the study's objectives and the research hypotheses. Furthermore, the study's conclusions should be concise (i.e., focus on the general, not the specific) and expressed clearly and precisely.

Since our study was aimed at finding potential markers of liver damage, the main conclusion is as follows:

- The mcv parameter (mean corpuscular volume) can potentially be used as a marker of liver damage among people who consume alcohol.

Additionally, we state:

- Further studies should be performed to assess the predictive value of the mcv marker.

Create the conclusion slide.

In the *Home* tab, in the *Slides* section, expand the menu located next to the *New Slide* icon. From the drop-down list, select the *Title and Content* theme [Fig. 11].

Entitle the slide "Conclusions". Enter the first conclusion as text in the first bullet point:

- "The mcv parameter (mean corpuscular volume) can potentially be used as a marker of liver damage among people who consume alcohol."

As the second bullet point enter the following text:

- "Further studies should be performed to assess the predictive value of the mcv marker."

In addition to the main conclusions relating to the research hypothesis/objective of the study, several additional conclusions can be formulated to which the conducted analyses have led.

List the following further conclusions as the next bullet points:

- "The study showed that there is an approximately directly proportional relationship between the red blood cell volume index (mcv) and the amount of alcohol consumed."
- "The study confirmed the existence of a positive correlation between the sgpt (ALT) and sgot (AST) parameters, known from medical practice and literature data."
- "The study results suggest a relationship between alcohol consumption and the value of the mean red blood cell volume index."

While pasting the conclusions into an MS PowerPoint presentation, it can be noticed that at some point the text would no longer fit on the screen. However, the application has changed the font size automatically. This is a very useful feature of MS PowerPoint, which helps avoid the hassle of manually adjusting the font size to the page size.

Finally, the slide shown in is obtained [Fig. 47].

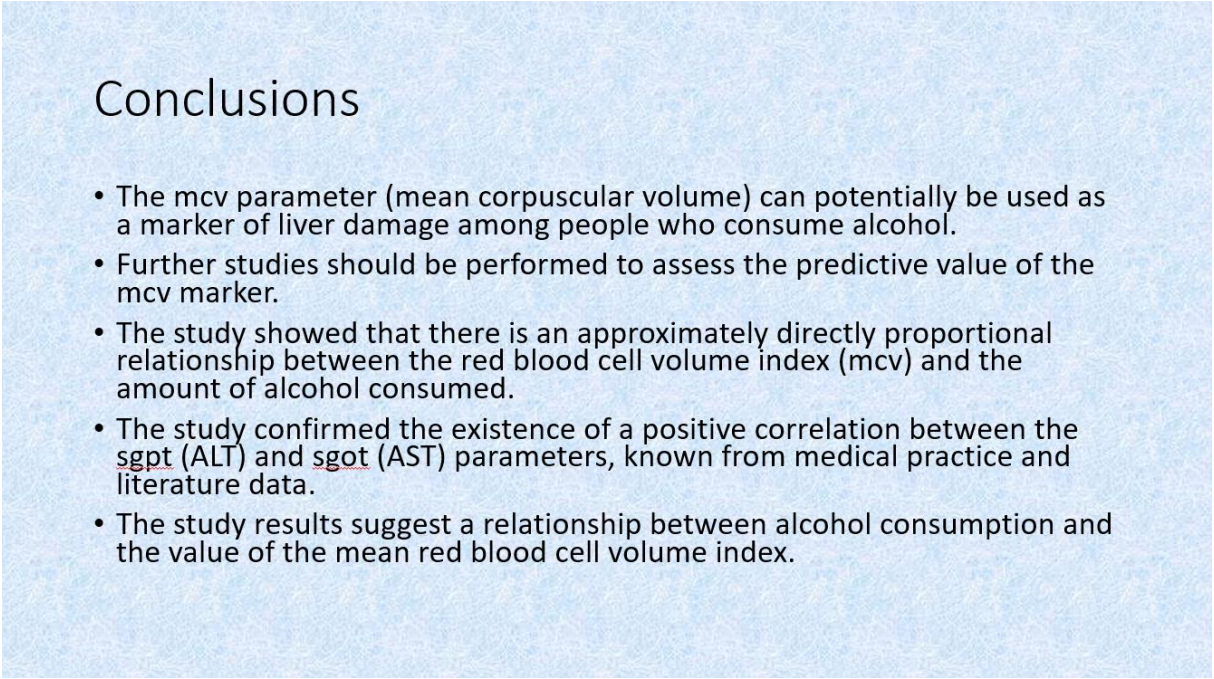


Fig. 47. The "Conclusions" slide

Create the summary slide.

The last slide will contain information summarizing the presentation. Similarly to the previous one, it should be based on the "Title and Contents" theme. Enter "Summary" as the title. In the subsequent sections of the presentation, enter: "Author:", "Faculty:", "Major:", and "Year of study". In the next sections, enter "Medical University of Białystok", followed by the current date in the "dd.mm.yyyy" format. Complete the aforementioned sections with your own information and the current date. In the last section, enter the data source as "Data source: BUPA Medical Research Ltd. database donated by Richard S. Forsyth". The resulting slide is presented in [Fig. 48].

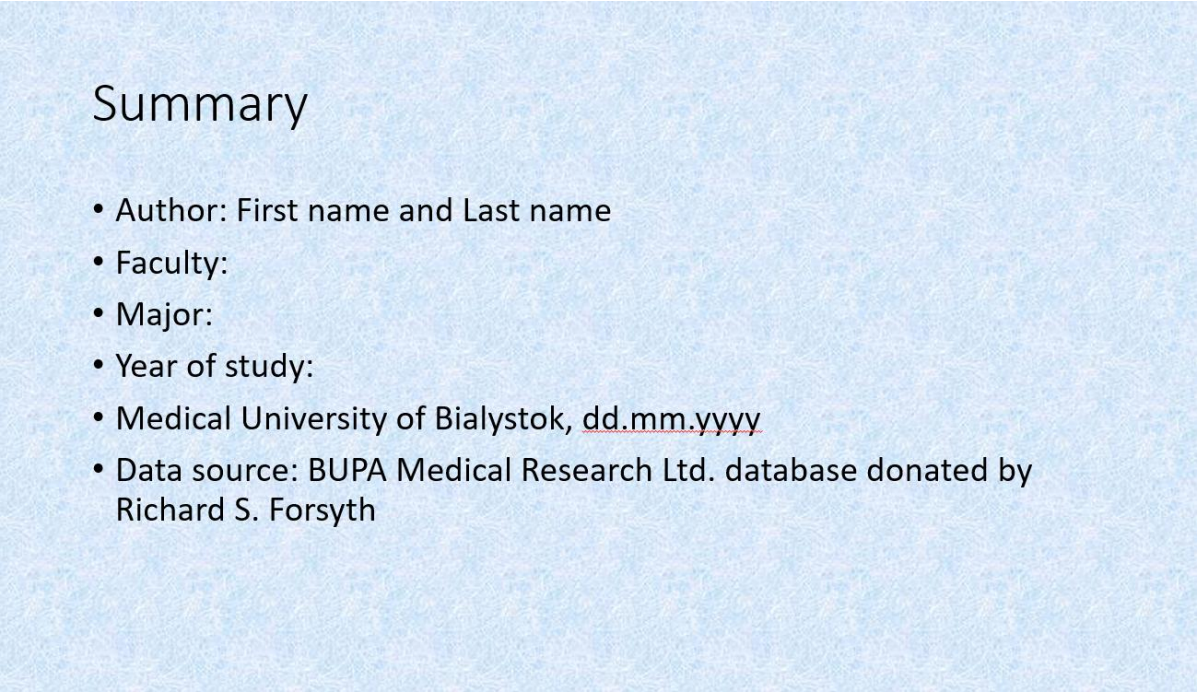


Fig. 48. The "Summary" slide

Citing the source(s) of data is a crucial element of any research study and of the presentation of results. Typically, a researcher presents and discusses studies which they have co-authored, in which case the data source is "Own research". Since the dataset in question came from an online source, a link to the source must be provided, ensuring that the data can be used under a free, open-source license.

Create the table of contents slide.

Since the table of contents should appear as the second slide, go to the first slide and insert a new *Title and Content* slide from there [Fig. 49].

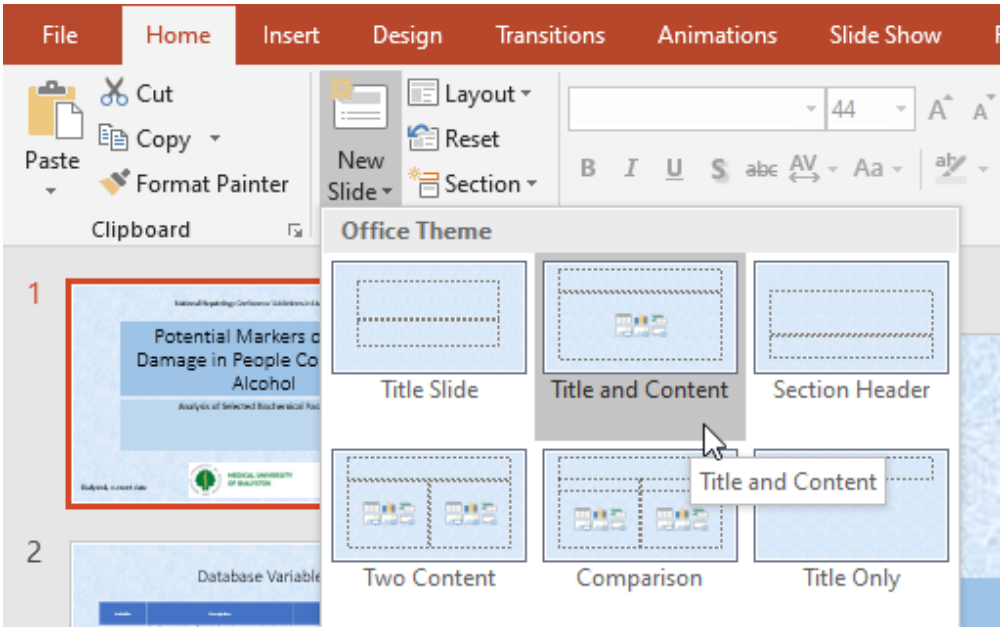


Fig. 49. Inserting the table of contents slide

We have created a new presentation slide, the second in the slide order. Enter "Table of Contents" as its title. In the following bullet points, enter (according to the slide layout in our presentation): "Database Variables", "Descriptive Statistics", "Correlations", "Scatterplot", "Alcohol Consumption", "Mean Red Blood Cell Volume" "Conclusions", and "Summary" [Fig. 50].

Fig. 50. The "Table of Contents" Slide

Exercise 10

In this exercise, we will insert slide numbering, add links connecting elements of the table of contents to their corresponding slides, insert a text box with a hyperlink to the table of contents, and set effects to be activated when switching slides.

Turn on slide numbering.

In MS PowerPoint, on the *Insert* tab, in the *Text* section, click *Header & Footer* [Fig. 51]. In the *Header & Footer* window, select the *Slide number* and *Don't show on title slide* checkboxes and click *Apply to All* [Fig. 52]. The slide number appears in the lower right corner on all slides except the title slide.

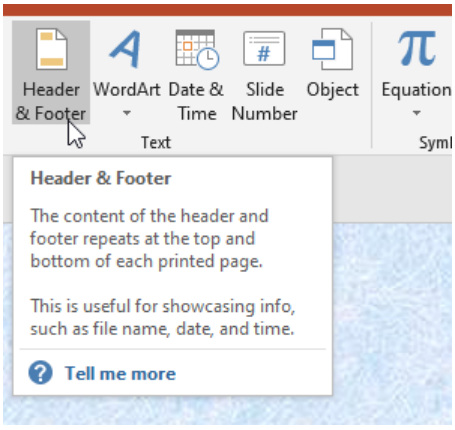


Fig. 51. *Header & Footer* command

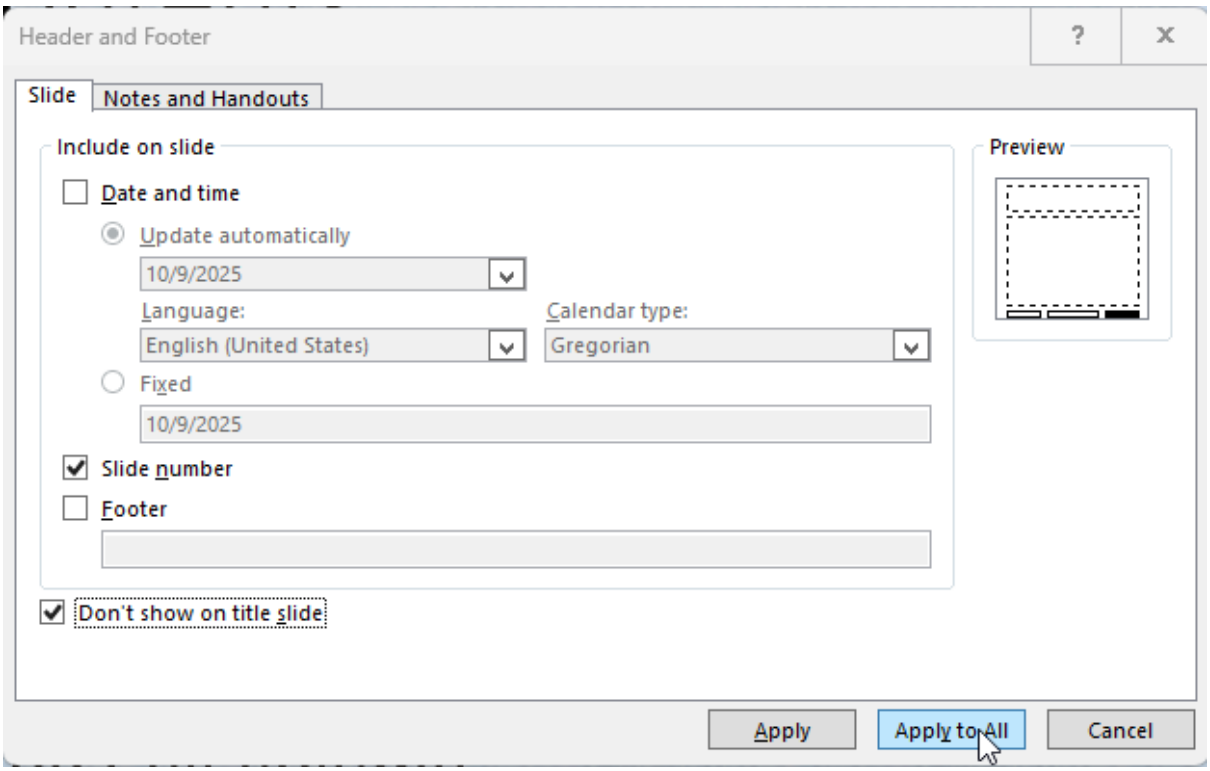


Fig. 52. The header and footer settings

In the table of contents, insert hyperlinks to the appropriate slides.

Go to the slide containing the table of contents. Select the text in the first section ("Database Variables"), go to the *Insert* tab, and in the *Links* section, select *Action* [Fig. 53].

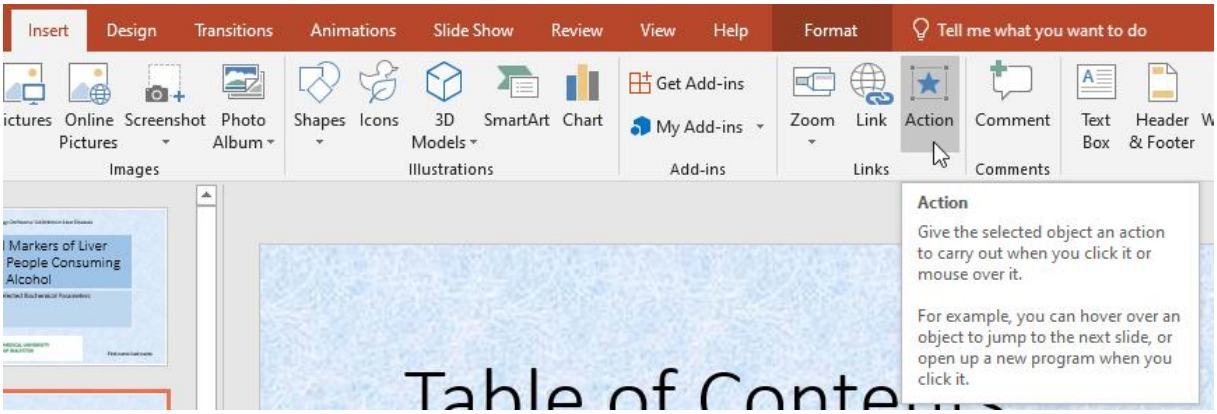


Fig. 53. *Action* command

In the *Action Settings* window, select the *Hyperlink to* option. Click the arrow located to the right of the "Next Slide" field and select *Slide...* from the list [Fig. 54].

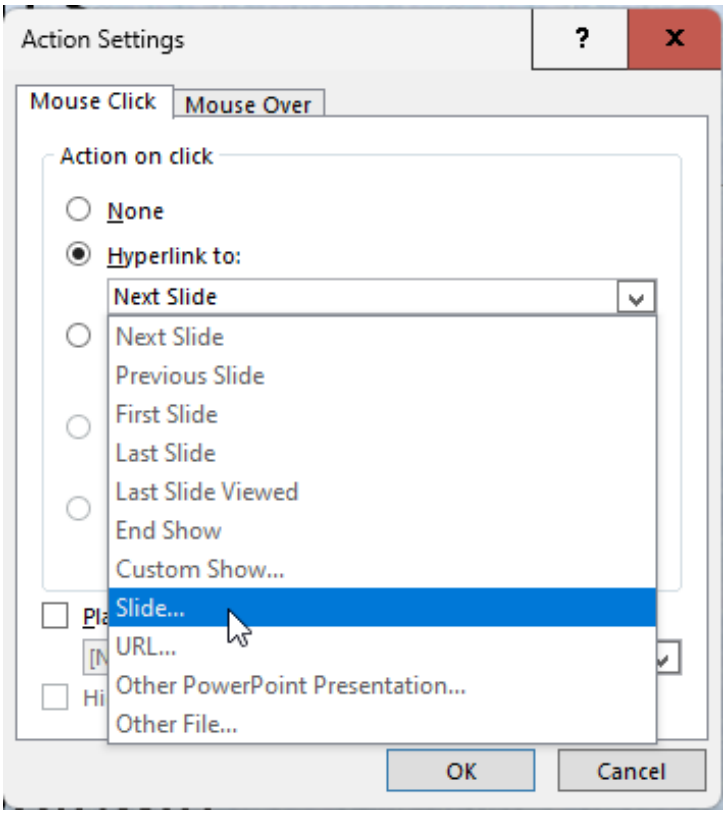


Fig. 54. *Action Settings* window

In the *Hyperlink to Slide* window, select the slide to which the selected text will link. Select "3. Database Variables" and click *OK* [Fig. 55]. Confirm the changes by clicking *OK* in the *Action Settings* window. Proceed similarly for the remaining items in the table of contents, setting hyperlinks to the appropriate slides.

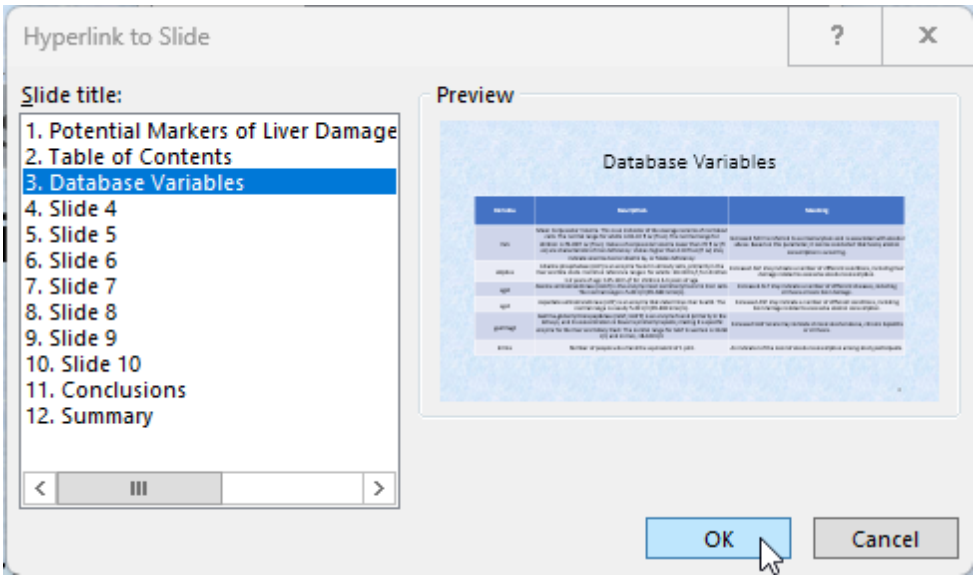


Fig. 55. *Hyperlink to Slide* window

Insert hyperlinked text boxes into the table of contents.

Move to slide number 3. In the lower left corner, insert a text box (*Insert* tab, *Text* section, *Text Box* command) with the following text: "Table of Contents". Select the "Table of Contents" text, go to the *Insert* tab, and click the *Action* button. Select *Hyperlink to* and select the *Slide…* option (in the same manner as when setting links in the table of contents). In the newly opened window, select the slide with the table of contents and confirm by clicking the *OK* button in both windows [Fig. 56].

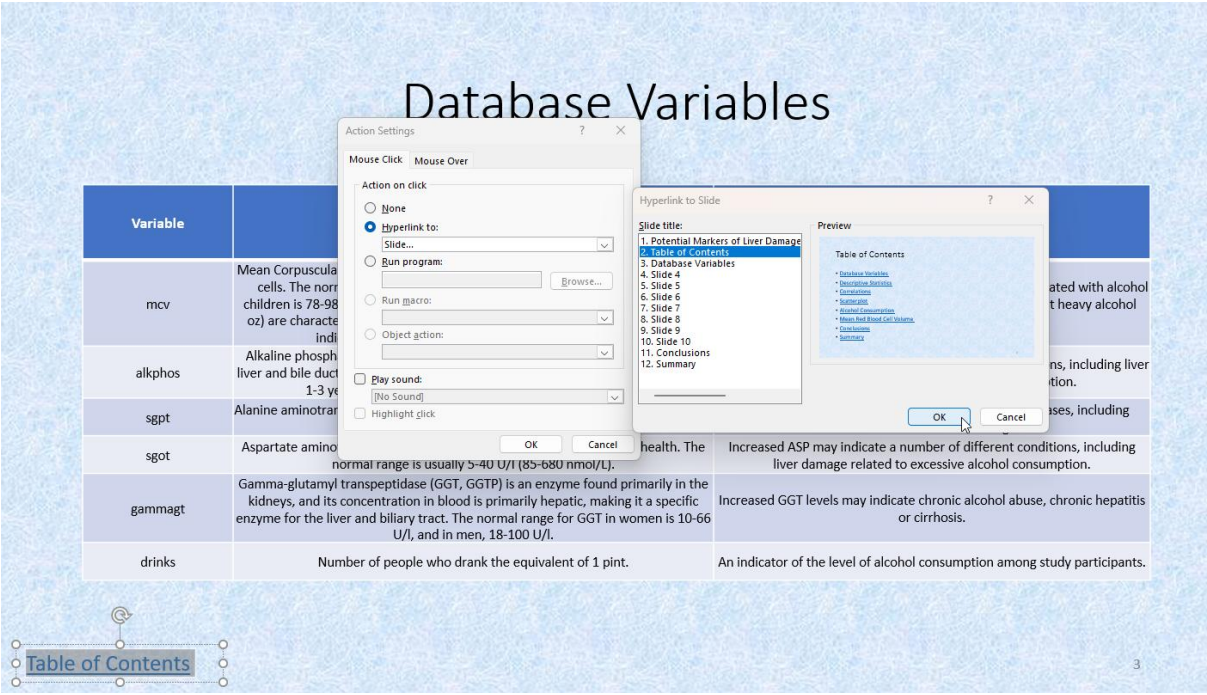


Fig. 56. Link to the table of contents

Click on the text box frame line (with the inserted hyperlink to the table of contents) to select the entire object (i.e., not the "Table of Contents" text only) and copy it. Paste the copied object to slides 4, 6-9, 11, and 12 (skipping the transition slides with graphics). When pasting

the object, select the *Use Destination Theme (H)* command or use the *Ctrl+V* keyboard shortcut, placing the object in the lower left corner of the slide. The pasted text box contains the inserted hyperlink.

Set transitions between slides.

Go to the *Transitions* tab, which allows us to choose the type of animation for each slide change. In the *Transition to This Slide* section, select the *Morph* effect [Fig. 57]. In the *Timing* section, in the *Advance Slide* group, select the *After*: checkbox. In the box located next to it, set the time to "00:05.00". Click *Apply to All* [Fig. 58].

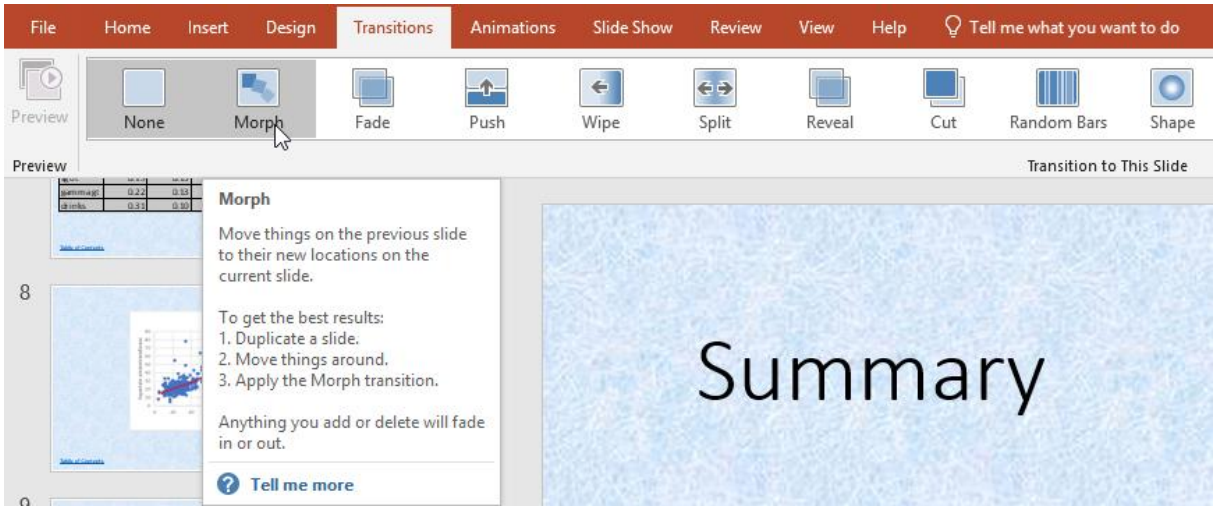


Fig. 57. Selecting a transition effect

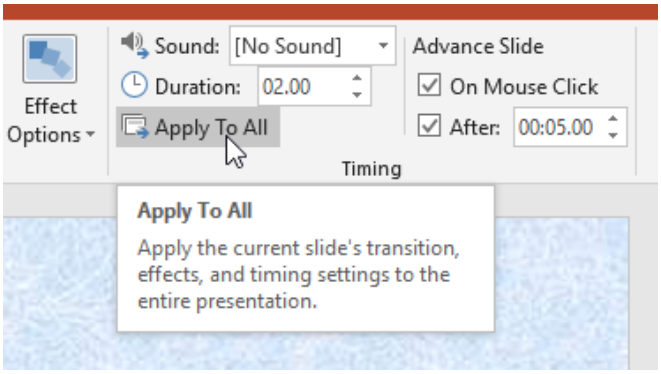


Fig. 58. *Timing* section

The transition effect and settings selected in the *Timing* section are applied to all slides in the presentation.

Finally, we can preview the presentation we have created. In the upper left corner, click *Start from Beginning* [Fig. 59] or use the *F5* keyboard shortcut.

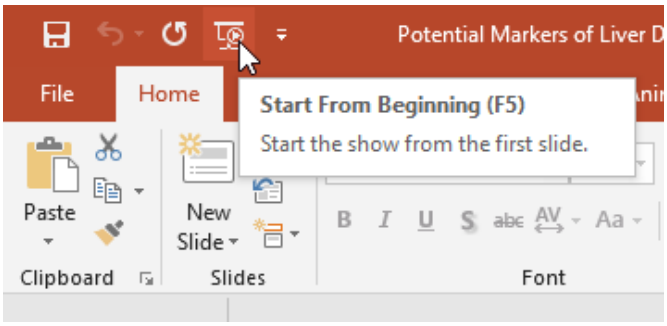


Fig. 59. The slide show