

## SURVEY OF THE PURCHASING POWER OF HOUSEHOLDS CONCERNING CERTAIN MILK PRODUCTS

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### Abstract

*The information about the food products has been organized in a created relational database. It has been extracted from the web site of the Bulgarian National Statistical Institute. The paper surveys the purchasing power of households concerning certain milk products (milk, yoghurt, white cheese and yellow cheese) in Bulgaria for the period 2005-2019. These data are searched from the database tables. Subsequently, they have been processed and analyzed. The percentage change in the purchasing power of households concerning each product for current year in comparison with the previous year has also been calculated. The results showed that a process of almost continuous decrease of the purchasing power of households concerning milk was observed for 2007-2011. A gradual growth of this indicator is obtained during 2012-2019. Approximately the same dependences were established for the purchasing power of households concerning yoghurt in the considered period. An increasing tendency of the studied indicator for the white cheese was observed in the interval 2015-2019. A similar situation is obtained for the purchasing power of households concerning yellow cheese for 2012-2019.*

**Key words:** analysis, database, milk products, Bulgaria

### INTRODUCTION

In the past few decades there has been a revolution in computing and communications, and all indications are that technological progress and use of information technology will continue. The revolution in information and communication technology has changed not only our lives but also the way how people do business [3].

The World Wide Web is a vast and rapidly growing source of information [2]. There are many repositories on the Web that provide statistical data [1]. Organizations gather increasingly large and complex data sets each year [5]. Some of them can be structured in relational databases. A database is an organised collection of related data [9]. Data are processed to get information. Information is used for making decisions which lead to actions [9]. The current work considers some of these exposed problems.

The aim of the article is to survey the purchasing power of households concerning four milk products (milk, yoghurt, white cheese and yellow cheese) in Bulgaria. The

considered period includes 15 years time interval from 2005 to 2019.

### MATERIALS AND METHODS

Data related to food products have been published on the web site of the National Statistical Institute [7], [8]. They have been extracted and organized in a created relational database [4]. This database has been expanded. As a result, it contains the following table schemes:

- Categories (id\_category, category);
- Food products (id, id\_category, food product);
- Type of foods (id\_foods, type, id\_product);
- Quantities\_Prices (id, year, average price, measure, quantity, id\_foods);
- Household purchasing power (id, year, measure, quantity, id\_foods)
- Non-food products (id, non-food product, id\_category);
- Kinds\_non-food products (id, kinds, id\_non-food products);
- Distribution\_households (id, year, measure, average price, quantities average per 100 households, id\_kinds).

Updating the database is done each year, and the respective new records are entered into the listed tables. The relationships between the tables are of type one-to-many.

The object of study in the paper is the information about purchasing power of households concerning the indicated milk products. These data have been searched from several fields located in different database tables (Fig. 1). Subsequently, they have been stored in a separate Excel file and have been analyzed. In this connection the following variables have been calculated:

- Differences -  $D_i$  and  $D_{i,j+1}$

$$D_i = d_{i_{max}} - d_{i_{min}}$$

where:  $d_{i_{max}}$  and  $d_{i_{min}}$  - the highest and the lowest value of the examined indicator for each product,  $1 \leq i \leq 4$ ;

$$D_{i,j+1} = v_{i,j+1} - v_{ij}$$

where:  $v_{i,j+1}$  and  $v_{ij}$  - the value of the indicator for current and previous year,  $1 \leq j \leq 14$ ;

- Variable -  $L_{i,j+1} = \frac{v_{i,j+1} * 100}{v_{ij}} - 100$

where:  $L_{i,j+1}$  - percentage change in the purchasing power of households concerning each product for current year in comparison with the previous year.

ID	year	measure	quantity
16	2005	kg	1948
17	2006	kg	2096
18	2007	kg	1978

Fig. 1. Presentation of the information from the created database  
 Source: Data from National statistical Institute [7, 8].

The Microsoft Excel program [6] has been used for the data processing. The obtained results have been presented in tabular or

graphical form and the relevant conclusions have been drawn.

## RESULTS AND DISCUSSIONS

Information about purchasing power of households (average per capita) concerning four milk products (milk, yoghurt, white cheese and yellow cheese) in Bulgaria has been extracted from several database tables. In the case, they are the following: Categories; Food products; Type of foods; Household purchasing power.

The results of the calculations showed that a process of almost continuous decrease of the studied indicator for milk was observed in the interval from 2007 to 2011 with one exception in 2009. The situation with the purchasing power of households concerning the indicated product was quite different over the next eight years. A gradual growth of this considered indicator is obtained during the mentioned period. The calculated difference  $D_1$  is 1,227 litres. The columns in figure 2 present the data on purchasing power of households about milk (shown on the primary vertical axis), whereas the line represents the data for the mentioned indicator concerning yoghurt (shown on the secondary vertical axis).

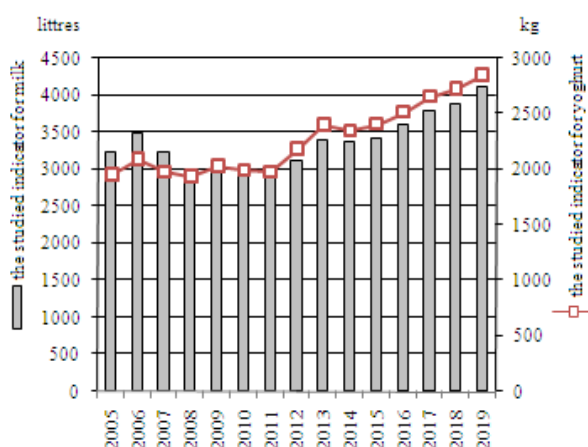


Fig. 2. Analysis of the data for 15 years period  
 Source: Data from the National Statistical Institute [7, 8].

Approximately the same dependence was established for purchasing power of households concerning yoghurt in the years

between 2005 and 2019. Conditionally, this interval could be divided on two subintervals. The first of them includes 2005-2011. The indicator marked a certain decline in this period. It is about 120 kg. The second subinterval contains the years 2012-2019, where the increase of the studied indicator is 665 kg. In this case, the calculated variable  $D_2$  is 916 kg.

This study showed that the purchasing power of households concerning white cheese changed continuously in the period 2005-2014. A reduction was established in four nonconsecutive years 2007, 2010-2011 and 2014, while a growth was registered in 2006, 2008-2009 and 2012-2013 (Fig. 3). The increase pace is significantly slower over the last 5 years of the investigated time interval. An interesting fact should be noted: the purchasing power of households concerning white cheese for 2013 and 2019 remained almost the same. The obtained variable  $D_3$  for the considered data is 167 kg.

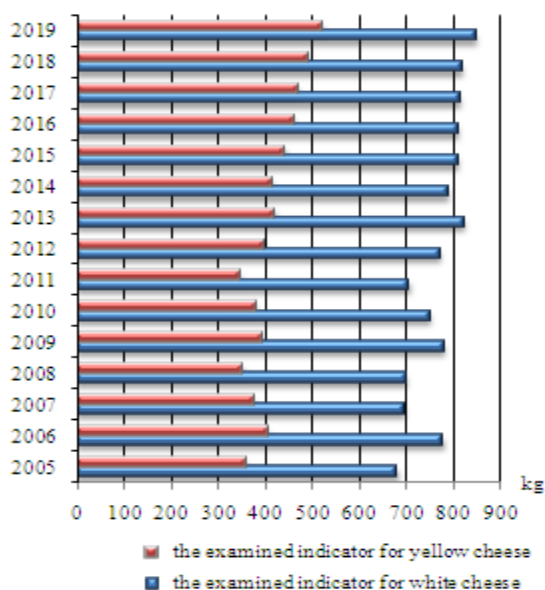


Fig. 3. The change of the indicator for the time interval 2005-2019

Source: Data from the National Statistical Institute [7, 8].

The situation is quite different for this surveyed indicator about yellow cheese. A reduction of the purchasing power of households for the indicated product was observed in the time interval 2007-2008, as well as 2010-2011. In the case, it was 52 kg

during the first two listed years and 45 kg for the second presented two years. The period from 2012 to 2019 is characterized with a steady growth of the considered indicator (Fig. 3). At the end of the mentioned interval the increase was about 126 kg. The purchasing power of households concerning yellow cheese is the highest during 2019 and the lowest in 2011. The calculated value of the variable  $D_4$  is 175 kg.

This work also analyzes the percentage change in the purchasing power of households concerning each product for current year in comparison with the previous year. As can be seen from table 1, the highest value of the indicator  $L_{ij+1}$  ( $i=1, j=12$ ) for the studied data about milk is 8.38%. The obtained difference  $D_{ij+1}$  ( $i=1, j=12$ ) is 261 liters (Table 2).

Table 1. Percentage change ( $L_{ij+1}$ ) of the purchasing power of households about each examined product during the indicated time interval

Year	Milk	Yoghurt	White cheese	Yellow cheese
2006	7.98	7.60	14.31	13.20
2007	-6.99	-5.63	-10.71	-7.44
2008	-8.23	-2.17	0.87	-5.90
2009	3.71	4.86	11.60	11.11
2010	-5.76	-1.76	-4.18	-2.78
2011	-0.75	-0.87	-5.82	-9.01
2012	8.30	10.63	9.53	14.20
2013	8.38	9.86	6.48	6.36
2014	-0.52	-2.29	-3.97	-1.64
2015	1.64	2.57	2.57	6.79
2016	5.22	4.48	-0.14	4.01
2017	5.28	5.64	0.47	2.28
2018	2.59	2.57	0.83	4.42
2019	5.75	4.63	3.38	6.30

Source: Own calculations on the basis of data from the National Statistical Institute [7, 8].

During 2012, as compared to 2011, the purchasing power of households concerning yoghurt was significant. The obtained value of the variable  $L_{ij+1}$  ( $i=2, j=11$ ) is 10.63%. The calculated variable  $D_{ij+1}$  ( $i=2, j=11$ ) is 210 kg. The highest value of the mentioned difference was established in 2013. It was 216 kg. The percentage change of the variable  $L_{ij+1}$  ( $i=3, j=1$ ) for surveyed data concerning white cheese was relatively higher during 2006. In the case, it was 14.31%. At the same time the difference  $D_{ij+1}$  ( $i=3, j=1$ ) is 97 kg (table 2). A similar situation was observed for the

examined indicators about yellow cheese in 2012. The calculated values of the variable  $L_{ij+1}$  ( $i=4, j=11$ ) is 14.20%, and the obtained difference  $D_{ij+1}$  ( $i=4, j=11$ ) is 49 kg.

Table 2. The obtained results for the variable  $D_{ij+1}$

year	indicator $D_{1j+1}$ for milk /litres/	indicator $D_{2j+1}$ for yoghurt /kg/	indicator $D_{3j+1}$ for white cheese /kg/	indicator $D_{4j+1}$ for yellow cheese /kg/
2006	257	148	97	47
2007	-243	-118	-83	-30
2008	-266	-43	6	-22
2009	110	94	81	39
2010	-177	-36	-33	-11
2011	-22	-17	-43	-34
2012	239	210	67	49
2013	261	216	50	25
2014	-18	-55	-33	-7
2015	55	60	20	28
2016	178	108	-1	18
2017	190	142	4	10
2018	98	68	7	21
2019	223	126	28	31

Source: Own calculations on the basis of data from the National Statistical Institute [7, 8].

## CONCLUSIONS

The information related to food products has been organized in a created relational database. It has been extracted from the web site of the Bulgarian National Statistical Institute.

The current paper surveys the purchasing power of households (average per capita) concerning four milk products (milk, yoghurt, white cheese and yellow cheese) in Bulgaria. These data have been searched from several fields located in different tables of the presented database. Subsequently, they have been processed and analyzed. The percentage change in the purchasing power of households concerning each product for current year in comparison with the previous year has also been calculated and discussed. The considered time interval includes the period 2005-2019. As a result of this study, the following conclusions can be drawn:

- A process of almost continuous decrease of the purchasing power of households concerning milk was observed from 2007 to 2011. The situation is quite different for 2012-2019. A gradual growth of this indicator is

obtained during the indicated period. Approximately the same dependences were established for the purchasing power of households concerning yoghurt in the years between 2005 and 2019;

- The calculations showed that this examined indicator for white cheese is changed continuously during 2005-2014. An increasing tendency of the indicator was observed for the last 5 years of the time interval;

- A reduction of the purchasing power of households for the yellow cheese was established in 2007-2008 and 2010-2011. The period 2012-2019 is characterized with a steady growth of the considered indicator.

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