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EVALUATION OF THE AVERAGE CONSUMPTION OF FOOD PRODUCTS AND ITS NUTRITIONAL VALUE IN POLAND

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Abstract. Balanced nutrition is the foundation of good health. Inadequate intake of the main nutrients leads to many diseases. Assessing the consumption of these nutrients is critical in taking action to improve the health of the population. The aim of this study was to analyse the average consumption of food products and its nutritional value in the Polish population. The nutritional assessment of the main nutrients in an average Pole's diet was carried out by means of the Dieta 6D program. The data concerning the consumption of specific food products was taken from the Polish Central Statistical Office, Institute of Agricultural and Food Economics and many branch reports. Among different groups of food products village bread, full-fat milk, milk, chicken breast meat, sandwich ham, tomatoes, apples, rapeseed oil, water and beer were the most consumed in the group of bread, milk beverages, meat, processed meat, vegetables, fruits, plant oils, non-alcoholic and alcoholic beverages, respectively. The Polish diet provides a sufficient amount of the main nutrients – protein, fat, carbohydrates (14.2, 29.8, 49.1% energy of the diet, respectively), but there are some deficiencies (fiber – 73% of the recommended intake), and an excessive supply of other ingredients (energy in women – 130%, proteins in men and women, 140% and 167%, respectively, sugar – 19.5% energy of the diet, saturated fatty acids – 10.8% energy of the diet). The average trans fatty acids intake per day is 0.99 g (0.38% energy of the diet). Summing up, the percentage of protein, fat and carbohydrates in the diet of an average Pole meets the standards recommended by European Food Safety Authority. The diet provides an insufficient amount of fiber. The consumption of sugar, calories in both sexes, saturated fatty acids is too high. Trans fat consumption has decreased when compared to previous reports.

Key words: Poland, diet, trans fatty acids, saturated fatty acids, sugars, nutrition.

Introduction. Formulation of the problem

One of the main causes of death in Europe is leading an unhealthy lifestyle, including following an improper diet. Diseases of the circulatory system, such as ischemic heart disease and cerebrovascular disease are the most frequent cause of death. They are associated with high blood pressure, high cholesterol, diabetes and low physical activity [1,2]. According to statistical yearbooks, the number of deaths in Poland as a result of cardiovascular diseases concerned 35% of all deaths in men and 42% in women in 2015 [3,4]. According to the Eurostat report, 5.1 million people died in the European Union in 2016, of which 1.8 million as a result of cardiovascular disease (heart attacks and strokes), which accounts for 36% of all deaths [1,2]. According to a report in Europe, 627,000 people died of complications of diabetes and glucose intolerance, of which over 21,000 in Poland [5].

Nutrition is a fundamental element of a properly functioning body. Over the years, the diet regime has been subjected to individual factors. The development and analysis of average consumption in a large group can be very helpful in assessing the quality of nutrition, not only of individuals, but also of entire populations. This approach allows the development of steps that should be aimed at improving people's quality of life by reducing the number of diet-related diseases.

Due to the high dynamics of the changes in nutrition in recent years, in our opinion, it was necessary to carry out an analysis assessing the average nutritional value of Pole's diet, including nutrients which have not been assessed for, at least, several years like in case of trans fatty acids [6].

Analysis of recent research and publications

In many EU countries, the analysis of the average intake of nutrients has been done. One of the examples is "Live Well for Life", evaluating the nutritional value of the diet of the French, Swedes, and Spaniards [6], or the study of Whitton et al. [7] on the British population. In Poland, the most recent results of such research were

published six years ago [8,9]. The survey results confirm that there is an extremely high prevalence of hyperlipidaemia, hypertension, obesity, metabolic syndrome and diabetes, which affect the high mortality rate in the Polish population. It was pointed out that lifestyle, including nutrition, has an impact on the incidence of civilisation diseases, because of an improper diet with too many calories and too high a sodium intake, and too low a fibre supply [8]. Analysis of dietary habits and the occurrence of diet-related diseases in individual countries can be inspiring in the context of nutritional recommendations. An interesting example is France where the incidence of cardiovascular disease is lower than in Poland, which may be due to a different nutrition model (Mediterranean diet), even though we can notice high fat consumption there. In the case of French, the quality of the consumed fat – mainly vegetable fats rich in n-3 and 6 fatty acids – affects positively circulatory system functioning decreasing the incidence of cardiovascular disease [6,10].

The **purpose** of this research was to assess the average nutritional value of Pole's diet. For this purpose, it was necessary to achieve the following *objectives*:

1. Analysis of the average consumption of food products in the Polish population.
2. Analysis of the average intake of macronutrients such as proteins, fats and carbohydrates in an average Pole's diet.
3. Analysis of the selected nutrients such as sugars and some fatty acids in the diet of an average Pole.

Research materials and methods

The analysis of the average daily nutritional value was made using the Dieta 6D program (Institute of Food and Nutrition, Warsaw, Poland). The analysis of the nutritional value of the diet was carried out separately for men and women assuming that average statistical woman and man in Poland is 41.9 and 38.6 years old, their body weight is 65 and 83 kg, height is 164 and 177 cm, respectively, and their physical activity is moderate [11-14].

Consumption in the GUS (Polish Central Statistical Office) and IERiGŻ (Institute of Agricultural and Food Economics) balance sheets is developed using the balance method: production increased by imports, reduced by exports as well as losses and losses of agricultural products at producers and in turnover, taking into account the change in inventories at producers and at trade units. Data applies to the entire population of 0–99 years. Some studies have assessed consumption among groups between 15–65 years of age. The study assessed the average consumption per average consumer. The results given as average do not include gender.

It was assumed that alcohol consumption refers to adults; an average egg weight is 65 g; citruses were represented by oranges, lemons, grapefruits and tangerines, with a 25% share each; juices were represented by apple, orange, vegetable, grapefruit, multi-fruit with a 23.1, 24.5, 17.1, 8, 27.3% share, respectively [15]; 26% of consumers of wheat bread choose the whole-grain type and the rest white bread [16,17]; in the case of rye bread, 67% of consumers choose brown bread and 33% white bread; confectionery products were rolls with poppy seeds, donuts, rolls with cheese and challah; "mixed minced meat" is the pork neck and shoulder (50% each); "other meat" is game (mostly rabbit); processed meats were divided according to proportions 2/3 – ham, 1/3 sausages; "other meat preparations" is pate; offal is head cheese, liver, black pudding (1/3 each); among groats: buckwheat, barley, semolina, millet share is 41, 32, 18 and 8% respectively [18].

Data on the consumption of specific food products by Poles [3-4, 15-40] were converted into daily consumption of individual products per person, assuming that the population in Poland is 38,430,000 [4].

Results of the research and their discussion

Based on the analysis of the daily consumption of the food products are listed in Tables 1 and 2. In Table 1 the most consumed product were potatoes. Among non-starchy vegetables, tomato was the most consumed product. Apples, beer, chicken breast meat, rapeseed oil, village bread and 3.2% milk were the most consumed in the group of fruits, beverages, meats, plant oils, confectionery, grain and dairy products, respectively (Table 2).

Table 1 – Consumption of vegetable, mushroom and been products per day by an average Polish citizen

Product	g/day	Product	g/day	Product	g/day
Tomato paste 30%	0.7	White cabbage	8.9	White beans, dry seeds	2.3
Bound vegetable salad	0.5	Sauerkraut	5.6	Boiled peas	3.8
Garden vegetable salad	2.6	Cauliflower	4.1	Broad bean	0.1
Lettuce	3.6	Broccoli	0.8	Boiled soybeans	0.8
Celery	5.5	Tomato	27.3	Walnuts	3.5
Spinach (fresh)	0.5	Cucumber	17.4	Hazelnuts	1.2
Red pepper	3.6	Fermented cucumber	15.1	Pickled red peppers	4.3
Boiled potatoes	114	Carrot	16.1	Canned green peas	4.3
Chips	49	Beetroot	6.9	Pickles	4.3
Pepper chips	2.5	Onion	14.8	Canned corn	4.3
Cultivated mushroom	7.4	Radish	4.4	Ketchup sauce	2.6

Table 2 – Consumption of fruits, beverages, meats, fats, confectionery, grain and dairy products per day by an average Polish citizen

Grain products	g/day	Fruits	g/day	Meat, fats and oils	g/day
Wholemeal rye bread	6.6	Apples	35.5	Bacon	1.15
Rye white bread	3.2	Sweet cherries	3.6	Lard	1.15
Wheat bread	23.1	Cherries	3.6	Margarine	11.5
Graham bread	8.1	Plums	3.7	Rapeseed oil	10.4
Village bread	148	Peaches	6	Sunflower oil	1.4
Rusks	1.3	Strawberries	6.9	Soybean oil	0.85
Donuts	5.1	Blackcurrants	0.55	Olive oil	0.33
Buns with cheese	5.1	Raspberries	2.5	Coconut oil	0.43
Buns with poppy seeds	5.1	Grapes	12.5	Safflower oil	0.43
Ornamental Challahs	5.1	Oranges	7.5	Linseed oil, cold pressed	0.43
Wheat flour, type 550	22	Tangerines	7.5	Palm oil	0.43
Double egg noodles	12.5	Grapefruit	7.5	Beef class I	2.96
White rice	5.3	Bananas	18.7	Veal, shoulder	0.3
Buckwheat	1.7	Pears	3.6	Boiled pork	43.7
Pearl barley	1.3	**Beverage**	**ml/day**	Skinless chicken breast meat	44.7
Semolina (Wheat groat)	0.77	Apple drink	3.7	Skinless turkey breast meat	6.9
Millet	0.33	Apple juice	3.7	Mutton, shoulder	0.66
Cornflakes with sugar and vit.	4.6	Orange drink	3.9	Veal, shoulder	0.66
Buckwheat flour	0.08	Orange juice	3.9	Rabbit, carcass	0.3
Millet flour (millet)	0.08	Grapefruit juice	2.6	Sandwich ham	34
Corn flour	0.08	Multifruit juice from domestic fruit	8.7	Regular sausage	17
Rye flour, type 580	0.08	Carrot juice	5.5	Chicken breast ham	5.9
Confectionery		Mineral water	161	Baked pate	9.9
Sugar	33.2	Fruit flavoured carbonated drinks	78	Fried (pork) liver	2.7
Peach jam	0.8	Cola beverages	30	Black headcheese	2.7
Strawberry jam	0.8	Energy drinks	12	Chicken black pudding	2.7
Black currant jam	0.8	Vodka	12.4	**Dairy products**	
Bee honey	1	Wine	22.8	3.2% milk	65.1
Milk chocolate	6.6	Beer	384	2% milk	36.2
Irises, fudges	1.4			Whole milk powder	0.66
Jelly beans	1.4			Natural yogurt 2% fat	17.4
Hard candies	1.4			Edam cheese	13.5
Snickers bar	1.4			Semi-fat cottage cheese	14.5
Champagne delicacies	1.4			Sour cream 12% fat	11.8
Milk-fruit ice cream	8.2			Kefir 2% fat	8.6
				Buttermilk 0.5% fat	7.9
				Butter	9.2
				Boiled eggs	24.9

The average daily intake of all nutrients was determined and compared with the European Food Safety Authority (EFSA) recommendations, as presented in Tables 3 and 4. Tables 3 and 4 show that the average intake of fat, particularly fatty acids, carbohydrates and energy covers the EFSA recommendations in the range of 85% to 115% of the proposed standards. The intake of nutrients that meet adequate intake (AI) standards in the range of 85 to 99% can be considered as significant coverage, but still insufficient. For some nutrients, intake was considered as appropriate even if the recommended intake was exceeded.

Table 3 – Nutritional value of an average Pole's diet vs Average Requirement (AR), Population Reference Intake (PRI), Adequate Intake (AI) and Reference Intake (RI) standards for adults recommended by EFSA (EFSA, 2017, EFSA 2019).

Ingredient	Unit	Daily intake	EFSA Recommendations - Men	EFSA Recommendations - Women
Energy	kcal	2330	2221 (AR)	1791 (AR)
Water	g	1400	2500 (AI)	2000 (AI)
Total protein	g	82 (14.2% E)	58.1 (0.83 g/ kg) or 12-20% E (PRI)	49.8 (0.83 g/ kg) or 12-20% E (PRI)
Fat	g	78 (29.8% E)	20-35% E (AI)	20-35% E (AI)
Total carbohydrates	g	299 (49.1% E)	45-60% E(RI)	45-60% E (RI)
Alcohol	g	(6,9% E)	-	-
Trans fat	g	0.99 (0.38% E)	as little as possible	as little as possible

* - depends on the amount of phytates consumed

- - no recommendation

Table 4 – Selected nutrients and their participation in an average Pole's diet vs Adequate Intake (AI) standards for adults recommended by EFSA (EFSA, 2017).

Nutrient	Consumption g/d	kcal	% energy/day	EFSA recommendations
Sugars	113.6	454	19.5	-
Saturated fatty acids	27.9	251	10.8	as little as possible
Monounsaturated fatty acids	31.3	282	12.1	-
Polyunsaturated fatty acids	14.1	127	5.45	-
n-3 fatty acids	2.91	26	1.12	-
n-6 fatty acids	14.5	130	5.58	-
Linoleic acid - LA - the main n-6 fatty acid	11.5	103	4.4	4% E (AI)
Alfa-linolenic acid - ALA - the main n-3 fatty acid	2.20	20	0.86	0.5% E (AI)
AA (arachidonic acid) C 20:4	0.17	1.5	0.06	-
EPA (eicosapentaenoic acid) C20:5	0.10	0.9	0.03	250 mg EPA + DHA/day (AI)
DHA (docosahexaenoic acid) C 22:6	0.15	1.35	0.05	
Palmitic acid C16:0	14.5	131	5.7	-

- - no recommendation

The results show that the average dose of some nutrients exceeds the proposed EFSA standards. This application concerns energy of 2330 kcal/day, which covers the EFSA standard (AR) in 104% and 130% respectively for men and women, protein 82 g/day which covers the EFSA standard (PRI) in 140% and 167% respectively for men and women, saturated fatty acids 27.9 g/day, which is 10.8% E, when EFSA recommends consumption as little as possible, trans fat 0.99 g/day, when EFSA standards suggest consumption as little as possible, sugars 113.6 g/day, which gives 19.5% E.

Some ingredients are consumed in low quantities. This application concerns fiber 18.2 g/day which covers the EFSA standard in 73%.

The EFSA expert panel proposed alpha-linolenic acid (ALA) intake at the level of 0.5% E, based on the lowest estimated intake in various population groups of European countries that do not cause symptoms of deficiency. The intake of ALA in Poland is 2.2 g/day, which covers 0.86% of the average daily energy intake, fulfilling in this way the EFSA recommendations. In the case of linoleic acid (LA), the EFSA recommends intake at the level of 4% E. In an average diet, a Pole consumes 11.5 g of LA per day, which gives 4.4% of energy/day. There is a negative, beneficial relationship between LA intake and LDL cholesterol levels in the blood, while at the same time, a beneficial relationship for HDL cholesterol can be seen. There is also evidence that the intake of linoleic acid reduces blood triacylglycerol. LA represents n-6 fatty acids, excess of which can be harmful. Although there are no official recommendations concerning the n-6/n-3 fatty acids ratio, some scientists suggest that the best ratio is in the range of 5:1–10:1 [41]. In the case of Pole's diet, n-6/n-3 fatty acids ratios are within this range.

The intake of EPA + DHA is 250 mg/day, which meets the EFSA recommendations. n-3 fatty acids show a beneficial effect on risk factors concerning cardiovascular disease, a reduction in the level of triacylglycerols, platelet aggregation or blood pressure. EPA + DHA intake from 250 to 500 mg/day reduces the risk of death from coronary heart disease and sudden cardiac death [42].

Unfortunately, the unfavourable consumption of certain nutrients can be pointed out in the diet of an

average Pole, because the intake of some ingredients significantly exceeds EFSA recommendations or meets them to a low degree, as presented in the following sections.

Energy demand is considered as the amount of energy expressed in MJ or calories that the body needs to balance energy expenditure associated with metabolic processes, weight maintenance and all physical activity. According to EFSA, a person with anthropometric parameters of an average Polish woman and man needs 9.3 MJ/day (men) and 7.5 MJ/day (women), which is 2221 and 1791 kcal, respectively [11,42].

The calorie intake in the diet for men is at a fairly appropriate level and meets 105% of the average energy requirements. However, in the case of women, it is in excess; 130% of the average energy requirements. Since average woman consumes fewer calories than an average man, this excess may be not correct when we analyse the calorie value for an average person. However, in the case of men, even 5% more calories above energy needs can be a problem in the long-term perspective. Chronic intake of an increased amount of energy leads not only to obesity, but also to diseases associated with it, such as diabetes, atherosclerosis, ischemic heart disease or hypertension [43].

According to EFSA data, over the past 20 years, the average energetic value of diets in the adult population ranged from 1688 to 3657 kcal for men and from 1373 to 2725 for women [11,42]. According to the WOBASZ II study, the average calorie values of Pole's diet was 1678 and 2317 kcal for women and men, respectively [8]. The caloric value of the average diet of a Pole in 2001 and 2011 was 2803 and 2328 kcal/day, respectively [44]. The 2330 kcal/day which was estimated in this study means that the decreasing trend in calorie value of the Pole's diet has stopped.

The current intake of saturated fatty acids (SFA) in the Polish diet is 10.8 % of energy (Table 4). According to Waśkiewicz [9] the share of saturated fatty acids in the daily energy requirement does not exceed 10% only in the case of 18.6% of men and 23.3% of women in the Polish population. This is due to the consumption of a large quantity of products containing SFA such as butter, lard, fatback, pastry, cheese, fatty meats, offal and fried food [9]. Such an intake of SFA can be considered as too high, and in a long term perspective, dangerous for one's health. The EFSA suggests the lowest possible consumption of this ingredient, however, according to Polish standards, it is recommended to consume SFA up to a maximum of 6% of daily energy intake in order to protect the cardiovascular system against the development of diseases [11]. This means that the intake of SFA in this study exceeds the recommendations by 81%. Not all studies support such recommendations. Zhu et al. [45] published a meta-analysis showing that total fat and SFA intake were not associated with a higher risk of cardiovascular disease, especially in American and European populations. Only in the Asian population was high SFA intake associated with higher cardiovascular diseases (CVD) prevalence. The study sensitivity analysis showed that no individual study out of 56 had an excessive influence on the studied effect. There was no significant relationship between dietary SFA intake and CVD risk, as no evidence was found of a linear correlation between SFA intake and CVD risk [45]. According to the 2017 EFSA report, there is a dose-dependent relationship between saturated fatty acid intake and total and LDL cholesterol. There is also evidence that a reduced intake of saturated fatty acids is associated with a reduced number of cardiovascular events [42].

According to EFSA standards, the average woman and man should have an intake of 49 and 58 g protein/day, respectively (Table 3). In this case, the Polish diet with 82 g protein/day covers the protein requirements with a 40 and 67% surplus for men and women, respectively [42]. A slightly increased intake of protein is not harmful to health, and may even be reasonable. This is due to differences in physical activity and diets (diets based on vegetable protein with a deficiency of essential amino acids). However, intake of much higher doses of this ingredient promotes hypercalciuria (osteoporosis), acidosis and the formation of kidney stones [11].

The protein content in the average daily food ration in 2001 and 2011 was 86 and 76 g/day, respectively. According to the recommendations of that time, a protein intake of 85–100 g/day was suggested [8]. Thus, it can be seen that the current intake of these nutrients does not differ significantly from previous years. Protein intake has changed in the long run, which is confirmed by the report assessing the intake of this ingredient in 1961-1963 and 2001-2003 when Poles consumed 97.2 and 99.3 g/day, respectively [46].

The EFSA recommends the lowest possible intake of trans fats. This study shows that the average trans fatty acids (TFA) intake per day is 0.99 g (Table 3), which can be considered a health-safe level [42]. The average intake of trans fats in Europe is 1.2–6.7 g/day, which corresponds to 0.5–2.1% of the caloric intake [47]. Karbowska and Kochan [48] estimated that the average intake of TFA in Poland was 2.8–6.9 g/day. According to the study carried out by Niedźwiecka et al. [47], high consumption of trans fats in the diet resulted from food products available on the Polish market. The authors point out that besides margarine, the products with relatively the highest levels of TFA are frozen fries, filled chocolates, microwave popcorn, instant sauces, and yeast cakes. Recently, the content of TFA in food products in Poland has decreased [49] and according to the database of the Polish Institute of Food and Nutrition in Warsaw, most products contain very low levels of TFA [50].

Recommendations published by opinion-forming institutions encouraging low consumption of trans fats are very well justified. TFA intake contributes to the development of many cardiovascular diseases [51]. For example, Stender et al. [52] showed that consumption of up to 5 g of trans fat per day increases the risk of coronary heart disease by 25%. A recent meta-analysis, which summarised 24 studies, showed that the dietary intake of TFA is associated with a risk of CVD, depending on the dose. The ingestion of TFA may increase the risk of mortality and coronary heart disease. TFA promote inflammation, while dietary restrictions reduce the number of LDL cholesterol molecules and CVD risk markers. High TFA intake leads to an increase in total and LDL cholesterol, as well as a decrease in HDL cholesterol. Some studies also confirm that high TFA intake may impair insulin sensitivity and increase C-reactive protein levels [45].

Consumption of sugars in the Pole's diet is 113.6 g (454 kcal) per day (Table 4), which gives 19.5% of daily consumed energy (E). EFSA standards do not recommend a specific level of sugar intake, however, they indicate that many Member States recommend consumption below 10 E%, as it is in the case of Poland. Obviously, 19.5 E% exceeds this threshold. Such a sugar intake means that almost half of the carbohydrates consumed as part of the Poles' diet are sugars. This is correlated with low fibre intake (Table 3). High sugar intake may result from the frequent consumption of sugar-sweetened beverages and highly processed products. This leads to tooth decay and increased body weight. A negative relationship between high sugar intake and low dietary intake of micronutrients was also noted. According to the EFSA, the consumption of sugars above 20 E% may increase serum triglycerides and cholesterol concentrations, and disturb carbohydrate metabolism [42]. On the other hand, The American Heart Association (AHA) recommends an average sugar intake of approximately 100 and 150 kcal per day for women and men, respectively, which means 25 and 37.5 g/day. The current intake by average Pole exceeds this standard, giving 454 and 302% coverage for women and men, respectively. Strict recommendations may be justified. A meta-analysis of Morenga et al. [53] focused on the effect of dietary sugar on lipids and blood pressure, summarising 40 analyses involving 1699 subjects, of which 39 trials focused on the effect of sugar supply on the lipids and 12 trials related to the effect on blood pressure. This study provided evidence that high sugar intake is associated with increased triglycerides, total cholesterol, LDL cholesterol, and blood pressure. The effect was particularly evident in subjects with increased body weight. The highest probability of deviations from the norm of the above mentioned parameters was noted with an excessive intake of fructose. Its excess in the diet resulted from a high consumption of sweetened beverages. Fructose intake in excessive amounts increases the fat content in the liver, which causes an increase in triglycerides and cholesterol in the blood. The low efficiency of fructose metabolism reduces nitric oxide synthesis and impairs the endothelial function of blood vessels. This leads to stimulation of the renin-angiotensin system, which can cause increased blood pressure. Finally, it was noted that the effect of sugar intake on blood lipids and blood pressure is relatively small (excluding people with overweight and obesity), however, reducing their intake can have a beneficial effect on reducing the risk of cardiovascular disease.

Fibre intake by Poles is insufficient, and meets just 73% of the standard recommended by EFSA [42]. Unfortunately, from year to year, fibre intake is gradually decreasing. In 2000, it was 29.5 g/day, decreasing to 28.3 g/day in 2005, and then to 25.4 g/day in 2009 [54]. As the authors of that study point out, this results from decreased consumption of cereal products, fruits, and vegetables. On the other hand, the growing share of highly processed products on the market is observed. An average Pole, guided by a low price, more and more often chooses food products free of dietary fibre, but attractive for consumers because of their taste and easy accessibility [44]. Fibre intake in France, Sweden and Great Britain is also below recommended levels [6,7].

McRae [55] suggests that people consuming 25–38 g/day of dietary fibre can significantly reduce the incidence of and mortality from cardiovascular disease. A high intake of this ingredient reduces LDL cholesterol, blood pressure and inflammation, which decreases the likelihood of developing CVD, type 2 diabetes and some cancers. Besides, adequate intake of fibre helps to maintain normal body weight [42].

Conclusions

1. Polish people consume a lot of potatoes, tomatoes, apples, chicken meat as well as pork. They drink a lot of beer and consume a lot of sugar. Among dairy products they prefer full fat milk instead of reduced fat milk, they consume rather margarine than butter. Among plant oils, Polish people definitely prefer rapeseed oil.
2. The percentage of protein, fat, and carbohydrates including sugars in the diet of an average Pole meets the standards recommended by EFSA, however sugars and protein intake is higher than necessary.
3. The Polish diet provides an insufficient amount of fibre and harmful excess energy as well as saturated fatty acids.
4. Intake of trans fatty acids is not very high and has decreased throughout the years.

5. Nutritional deficiencies of some nutrients and excess intake of others in the diet of an average Pole is similar to what can be observed in other European countries.

References

1. Eurostat. Causes of death statistics. Cited 2019 Oct 18. Available from: https://ec.europa.eu/eurostat/statistics explained/index.php?title=Causes_of_death_statistics
2. Eurostat. Causes and occurrence of deaths in the EU. 2019 Jul 16 [cited 2019 Oct 18]. Available from: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20190716-1?inheritRedirect=trueandredirect=%2Feurostat%2F.
3. Central Statistical Office. Dostawy na rynek krajowy i konsumpcja niektórych dóbr konsumpcyjnych na mieszkańca w 2016 roku [Supplies to the domestic market and consumption of some consumer goods per capita in 2016]. Warsaw, Central Statistical Office of Poland – signal development, 2017.
4. Central Statistical Office. Rocznik demograficzny Polski [Demographic Yearbook of Poland]. Warsaw, Central Statistical Office of Poland, 2017.
5. Kalbarczyk WP. Cukrzyca – gdzie jesteśmy? Dokąd zmierzamy? [Diabetes - where are we? Where are we heading?]. Warsaw, The Healthcare Institute, 2018.
6. Van Dooren C, Kramer G. Food patterns and dietary recommendations in Spain, France and Sweden. Live Well for LIFE. WWF-UK, 2012 Apr.
7. Whitton C, Nicholson SK, Roberts C, Prynne CJ, Pot GK, Olson A, et al. National Diet and Nutrition Survey: UK food consumption and nutrient intakes from the first year of the rolling programme and comparisons with previous surveys. Br J Nutr. 2011 Dec;106(12):1899-914. https://doi.org/10.1017/S0007114511002340
8. Drygas W, Niklas AA, Piwońska A, Piotrowski W, Flotyńska A, Kwaśniewska M, et al. Multi-centre National Population Health Examination Survey (WOBASZ II study): assumptions, methods, and implementation. Kardiol Pol. 2016;74(7):681-90. https://doi.org/10.5603/KP.a2015.0235
9. Waśkiewicz A, Szcześniewska D, Szostak-Węgierek D, Kwaśniewska M, Pająk A, Stepaniak U, et al. Are dietary habits of the Polish population consistent with the recommendations for prevention of cardiovascular disease? - WOBASZ II project. Kardiol Pol. 2016;74(9):969-77. https://doi.org/10.5603/KP.a2016.0003
10. European Health of All dabase (HFA-DB), WHO Europe. Age-standardized death rate due to cardiovascular disease. Cited 2019 Nov 11. Available from: http://www.euro.who.int/en/data-and-evidence/database/european-health-for-all-family-of-databases-hfa-db.
11. Jarosz M. Normy żywieniowe dla ludności polskiej [Nutrition standards for the Polish population]. Warsaw, Wyd. IŻŻ, 2017.
12. Ludwinek-Zarzeka I. Polacy wysocy, a Polki szczupłe i zgrabne? Niekoniecznie. Te grafiki odkrywają prawdę o sylwetkach różnych narodowości [Tall Poles and slim and shapely Polish women? Not necessarily. These graphics reveal the truth about the silhouettes of different nationalities]. Gazeta.pl [Internet]. 2016 Aug 9 [cited 2019 Dec 19]. Available from: https://kobieta.gazeta.pl/kobieta/56,107881,20505246,polacy-wysocy-a-polki-szczuple-i-zgrabne-niekoniecznie-te.html.
13. Puls Biznesu [Internet]. PAP. GUS: statystyczny Polak jest po 40 roku życia [GUS: a statistical Pole is just over 40 years old]; 2017 Jul 22 [cited 2019 December 19]. Available from: https://www.pb.pl/gus-statystyczny-polak-ma-nieco-ponad-40-lat-866977
14. Rynekaptek.pl [Internet]. PAP. Ranking wzrostu – gdzie są Polacy? [Growth ranking: where are the Poles?]; 2016 Jul 27 [cited 2019 December 19]. Available from: http://www.rynekaptek.pl/po-godzinach/ranking-wzrostu-na-ktorym-miejscu-sa-polacy,15181.html
15. Strojewska I. Spożycie owoców, warzyw i ich przetworów oraz soków na świecie, w Unii Europejskiej i w Polsce. [Consumption of fruit, vegetables and their preparations and juices in the world, in the European Union and in Poland]. Warsaw, IERiGŻ-PIB, 2013.
16. Retail360.pl [Internet]. Za co Polacy kochają pieczywo? 2017 Dec 7 [cited 2019 December 19]. Available from: https://retail360.pl/za-co-polacy-kochaja-pieczywo/.
17. Szajner P. Popyt na żywność – stan i perspektywy [Demand for food - state and perspectives]. Warsaw, IERiGŻ-PIB, 18, 2017.
18. Lubię Kaszę. Wyniki badań nt. spożycia kaszy. [Internet]. cited 2019 Feb 12. Available from: http://www.lubiekasze.pl/wyniki-badania-nt-spozycia-kaszy.
19. Central Statistical Office. Rocznik statystyczny rolnictwa 2014 [Statistical Yearbook of Agriculture 2014]. Warsaw. Warsaw, Central Statistical Office, 2014.
20. Central Statistical Office. Wyniki produkcji roślinnej w 2016 roku [Plant Production Results in 2016]. Warsaw, Central Statistical Office Agriculture Department, 2016.
21. Ciemieniewska H, Krygier K. Orzechy – charakterystyka technologiczna. [Tree nuts - technological characteristics]. Przem Spoż. 2018;66(12):26–29.
22. Drywień M, Hamułka J, Górnicka M, Wawrzyniak A, Frąckiewicz J, Woźniak A, et al. Spożycie produktów fermentowanych. Badania ankietowe kobiet. [Consumption of fermented products. Women's surveys]. Przem Spoż. 2018;72(2):36–39. https://doi.org/10.15199/65.2018.2.5
23. Kociubińska M. Rynek napojów bezalkoholowych w Polsce [Non-alcoholic beverages market in Poland]. Hurt & Detal [Internet]. 2015 Apr 15 [cited 2019 Feb 14];4(110):[about 12pp.]. Available from: http://www.hurtidetal.pl/article/art_id,12650-60/rynek-napojow-bezalkoholowych-w-polsce/
24. Ilow R, Regulska-Ilow B, Misiewicz D, Różańska D, Kowalisko D, Biernat J. Ocena spożycia warzyw i owoców w grupie 50-letnich mieszkańców Wrocławia. [Assessment of fruit and vegetable intake among the 50-year-old population of Wroclaw]. Rocz Panstw Zakl Hig. 2011;62(3):301–306.
25. Nosecka B. Polski i światowy rynek wybranych owoców, warzyw i ich przetworów [Polish and global fruit and vegetables market]. Warsaw: IERiGŻ-PIB, 2017.
26. Mroczek R. Przetwórstwo produktów roślinnych w Polsce w latach 2010–2015 [Processing of plant products in Poland in 2010-2015]. Warsaw: IERiGŻ-PIB, 2016.
27. Kondratowicz-Pietruszka E, Białek J. Współczesny rynek tłuszczów ze szczególnym uwzględnieniem obrotu towarowego tłuszczami roślinnymi. [The Contemporary Oil Market with a Focus on Plant Oil Trading]. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Krakowie. 2013;918:51–69.
28. Nosecka B. Zbiory, popyt i opłacalność produkcji wybranych jagód (truskawki, maliny, czarne porzeczki) [Harvest, demand and profitability of production of selected berries (strawberries, raspberries, blackcurrants)]; 2011 Mar 4 [cited 2019 Jan 11]. Available from: https://docplayer.pl/63772372-Nosecka-zbiory-zapotrzebowanie-i-oplacalno-acalnosc-produkcji-wybranych-owocow-w-jagodowych-truskawki-maliny-porzeczki-czarne-r.html.

29. Portal Spożywczy [Internet]. Puls Biznesu. Polacy chętniej sięgają po szpinak [Poles are more eager to reach for spinach]; 2014 Aug 29 [cited 2019 January 11]. Available from: http://www.portalspozywczy.pl/owoce-warzywa/wiadomosci/polacy-coraz-chetniej-siegaja-po-szpinak,104627.html
30. Portal Spożywczy [Internet]. Powstało stowarzyszenie promocji brokułów. Powód? Niskie spożycie w Polsce [The Broccoli Promotion Association was established. Reason? Low consumption in Poland]; 2016 Jan 28 [cited 2019 January 11]. Available from: http://www.portalspozywczy.pl/owoce-warzywa/wiadomosci/powstalo-stowarzyszenie-promocji-brokulow-powod-niskie-spozycie-w-polsce,124701.html
31. Rejman K, Kowrygo B, Laskowski W. Ocena struktury spożycia żywności w Polsce w aspekcie wymogów zrównoważonej konsumpcji. [Evaluation of the structure of food consumption in Poland in the context of demands of sustainable consumption]. J Agro Rural Develop. 2015;3(37):503–512. https://doi.org/10.17306/JARD.2015.53
32. Żołnierkiewicz J. Seler korzeniowy – uprawa, siew, sadzenie i wymagania [Root celery – cultivation, sowing, planting, and requirements]. Rynek-Rolny.pl [Internet]. cited 2019 Jan 11. Available from: http://www.rynek-rolny.pl/artykul/seler-korzeniowy-uprawa-siew-sadzenie-i-wymagania.html.
33. Seremak-Bulge J. Rynek mleka – stan perspektywy [Milk market – State and perspectives].Warsaw, IERiGŻ-PIB, 51, 2016.
34. Seremak-Bulge J. Zmiany cen detalicznych przetworów mlecznych oraz spożycie mleka po akcesji do Unii Europejskiej. [Changes in retail prices of dairy products and consumption of milk in Poland after the accession to the EU]. Roczniki Naukowe Ekonomii Rolnictwa i Rozwoju obszarów wiejskich. 2016;103(3):53–65.
35. Szajner P. Rynek mięsa – stan i perspektywy [Meat market – status and prospects]. Warsaw, IERiGŻ-PIB, 53, 2017.
36. Szajner P. Rynek owoców i warzyw – stan i perspektywy [Fruit and vegetable market - condition and prospects]. Warsaw, IERiGŻ-PIB, 51, 2017.
37. Szajner P. Rynek ryb – stan i perspektywy [Fish market – condition and perspectives]. Warsaw: IERiGŻ-PIB, 27, 2017.
38. Szajner P. Rynek zbóż – stan i perspektywy [Cereal market – condition and perspectives].Warsaw: IERiGŻ-PIB, 2017.
39. Tereszczuk M. Rynek napojów bezalkoholowych w Polsce [Non-alcoholic beverages market in Poland]. Przem spoż. 2018;72(8):12–15.
40. Maciejuk A. Rynek pieczarek [Meadow mushroom market]. WIOM – Warzywa i Owoce Miękkie [Internet]. 2017 Nov 17 [cited 2019 Jan 11]. Available from: http://www.warzywaiowoce.pl/articles/bazar-i-hurt/rynek-pieczarek/.
41. Jang H, Park K. Omega-3 and omega-6 polyunsaturated fatty acids and metabolic syndrome: A systematic review and meta-analysis. Clin Nutr. 2020 Mar;39(3):765–773. https://doi.org/10.1016/j.clnu.2019.03.032
42. EFSA. Dietary Reference Values for nutrients Summary report. DRVs summary report. EFSA supporting publication 2017: 2017;14(12). https://doi.org/10.2903/sp.efsa.2017.e15121
43. Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, DC: The National Academies Press, 2005.
44. Laskowski W. Wartość odżywcza diety Polaków i jej zmiany [Nutritional value of Poles' diet and its changes]. Współczesne kierunki działań prozdrowotnych. WSIiZ, 2015:57–72.
45. Zhu Y, Bo Y, Liu Y. Dietary total fat, fatty acids intake, and risk of cardiovascular disease: a dose-response meta-analysis of cohort studies. Lipids Health Dis. 2019 Apr 6;18(1):91. https://doi.org/10.1186/s12944-019-1035-2
46. Kwasek M. Trendy w konsumpcji żywności w krajach Unii Europejskiej [Trends in food consumption in European Union countries]. Warsaw, IERiGŻ-PIB, 2010.
47. Niedźwiecka J, Kapka-Skrzypczak L, Michalak-Majewska M. Zwyczaje żywieniowe związane z konsumpcją produktów stanowiących źródło kwasów tłuszczowych trans – implikacje zdrowotne wysokiego spożycia. [Nutritional habits related to consumption of products being a source of trans fatty acids – health implication]. Med Og Nauk Zdr. 2013;19(3):385-388.
48. Karbowska J, Kochan Z. Trans-kwasy tłuszczowe a ryzyko choroby wieńcowej. [Trans-fatty acids - Effects on coronary heart disease]. Pol Merkur Lekarski. 2011 Jul;31(181):56–9.
49. Okręglicka K, Mojska H, Jarosz M, Jarosz A. Skład kwasów tłuszczowych w tym izomerów trans nienasyconych kwasów tłuszczowych w wybranych tłuszczach spożywczych dostępnych w Polsce. [Fatty acid composition, including trans isoforms in selected food fats available on Polish market]. Żyw Człow Metabol. 2017;44(1):5–17.
50. National Health Program. Content of trans fatty acids in foodstuffs, E-base. cited 2019 Dec 19. Available from: https://www.izomery.izz.waw.pl/
51. Mozaffarian D, Aro A, Willett WC. Health effects of trans-fatty acids: experimental and observational evidence. Eur J Clin Nutr. 2009 May;63(2):5–21. https://doi.org/10.1038/sj.ejcn.1602973
52. Stender S, Dyerberg J, Astrup A. High levels of industrially produced trans fat in popular fast foods. N Engl J Med. 2006 Apr;354(15):1650–2. https://doi.org/10.1056/NEJMc052959
53. Te Morenga LA, Howatson AJ, Jones RM, Mann J. Dietary sugars and cardiometabolic risk: systematic review and meta-analyses of randomized controlled trials of the effects on blood pressure and lipids. Am J Clin Nutr. 2014 Jul;100(1):65–79. https://doi.org/10.3945/ajcn.113.081521
54. Górecka D, Janus P, Borysiak-Marzec P, Dziedzic K. Analiza spożycia błonnika pokarmowego i jego frakcji w Polsce w ostatnim dziesięcioleciu w oparciu o dane GUS. [Analysis of consumption of dietary fiber and its fractions in Poland in the last decade based on the statistical yearbook data]. Probl Hig Epidemiol. 2011;92(4):705–708.
55. McRae MP. Dietary fiber is beneficial for the prevention of cardiovascular disease: an umbrella review of meta-analyses. J Chiropr Med. 2017 Dec;16(4):289–299. https://doi.org/10.1016/j.jcm.2017.05.005