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# REGIONAL DIVERSIFICATION IN THE CONSUMPTION OF FRESH FRUIT, VEGETABLES AND THEIR PROCESSED PRODUCTS IN POLAND

Key words: consumption, fruit, vegetables, processed fruit products, processed vegetable products, voivodships

ABSTARCT. The main goal of the study was to determine the degree of diversity and trends of changes in the consumption of major groups and species of fruit and vegetables and their processed products in households in individual voivodships in Poland between 2008 and 2017. The coefficient of variation and the sigma-convergence technique were used to identify the level and changes in the diversity of consumption. The medium-term rate of change was used to determine trends in the consumption of the groups of products under study in individual voivodships. The analysis was based on secondary data from the Central Statistical Office. The volume of consumption was expressed as kg per capita per annum. There were regional differences in consumption – they were bigger in the consumption of vegetables and processed fruit products. During the period under analysis, the differences in the consumption of most of the fruit groups tended to decrease, whereas the differences in the consumption of vegetables tended to increase. The most pronounced increase in regional diversity was observed in the consumption of processed fruit and vegetable products. The largest amounts of fruit were consumed in the Masovian Voivodship, whereas the most vegetables were consumed in the Lublin and Świętokrzyskie voivodships. The lowest consumption of fruit and vegetables as well as clear downward trends were found in the Greater Poland, Warmian-Masurian, Silesian, Pomeranian and Kuyavian-Pomeranian voivodships. These regions were characterised by particularly unfavourable changes in the consumption of species and groups of fresh fruit and vegetables, mostly produced in Poland, such as apples, soft fruit, and cabbage.

## INTRODUCTION

Vegetables and fruits are sources of various valuable substances such as vitamins, fibre, mineral salts and antioxidants, which significantly reduce the risk of many diseases due to the fact that they have very low energy value, nutritionists recommend them to control body weight [Kunachowicz et al. 2000, Jarosz 2010, Boeing et al. 2012]. According to the World Health Organisation, at least 400 g of fruit and vegetables should be consumed in 5 portions every day, including 3 portions of vegetables [WHO 2008]. This recommendation is not fully met in Poland. As results from statistics, in 2018, the daily consumption of fresh fruit and vegetables in Polish households did not exceed 250 g per capita. If processed fruit and vegetable products and potatoes are included, daily consump-

tion amounted to about 380 g, so it is still lower than the minimum recommended level. Apart from that, there is another unfavourable trend – for several years the consumption of fresh fruit and vegetables has been decreasing. It is the consumption of vegetables that has been decreasing particularly rapidly [Filipiak 2014, Jąder 2015, Bugała et al. 2017]. The structure of the consumption of fresh fruit and vegetables and their processed products is changing in Poland. As far as fruits are concerned, the consumption of apples is decreasing, but this is to a certain extent offset by the increasing consumption of exotic fruit and processed fruit products. As far as vegetables are concerned, the consumption of all major species is decreasing, especially cabbage and beetroots. However, the consumption of processed vegetable products is increasing [Nosecka 2019]. The unfavourable trends in the consumption of fruit and vegetables are a premise to investigate the determinants of these changes. According to reference publications, the supply and prices as well as consumer income, education, job status, family type and place of residence are the most important socioeconomic factors affecting the consumption of food products, including fruit and vegetables [Niemczyk 2006, Kusińska 2011, Łangowska-Szcześniak, Bobrowska 2011, Anyakee, Ogunba 2013, Florkowski et al. 2015]. Of the factors listed above, the diversity in the consumption of vegetables is most strongly influenced by the biological type of the family – the consumption of vegetables per capita tends to decrease as the number of children in the family increases [Murawska 2018]. Also, the biological type of family considerably determines the structure of vegetable consumption [Jąder 2015]. The consumption of fruit is chiefly determined by consumer income, which primarily affects the structure of fruit consumption. Wealthier people tend to consume larger amounts of relatively expensive fruits, such as avocado, mango, and imported apples [Zmarzlicki et al. 2014]. However, it is necessary to stress the fact that despite the general decrease in fruit consumption, this level tended to increase in households characterised by higher economic status [Gheribi 2012]. The region and voivodship where consumers live are slightly less important, although they are still statistically significant [Murawska 2018]. As Lidia Gunerka et al. [2014] and Roman Kulikowski [2007] indicated, given the concentration of horticultural crops in some regions, the consumption of some groups of fruit and vegetables is likely to exhibit particularly high regional diversity. Therefore, the aim of this study was to determine the degree of diversity and trends in the consumption of major groups and species of fruit and vegetables and their processed products in households in individual voivodships in Poland.

## MATERIAL AND METHODS

The analysis of the consumption of fruit and vegetables and their processed products was based on secondary data published by the Central Statistical Office in "Household Budgets" (pol. Budżety gospodarstw domowych) [GUS 2009-2018]. The diversity of consumption in individual voivodeships, groups of fresh fruit and vegetables as well as their processed products between 2008 and 2017 was determined by calculating the coefficient of variation for the average level of their consumption between 2008 and 2017. The average level of consumption was calculated as the arithmetic mean. As the coefficient of variation is a relative measure, i.e. dependent on the arithmetic mean, it enabled the comparison of regional differentiation of the consumption of individual groups of fruit

and vegetables. The sigma-convergence technique was used to analyse changes in the diversity of consumption over time. This type of convergence occurs when differences between regions tend to decrease – in this case these were differences in the consumption of fresh fruit and vegetables and their processed products. Standard deviation is the most common measure of sigma convergence. The standard deviation of logarithms of the quotient of the consumption of fruit and vegetables and their processed products in each voivodship and average consumption in the whole country were used to assess convergence processes. The medium-term rate of change was calculated to illustrate trends in fruit and vegetable consumption in individual voivodships between 2008 and 2017. The analysis covered the groups and species of fresh fruit and vegetables and their processed products listed in statistics, as they had the largest share in the consumption structure. The volume of consumption was expressed as kg per capita per annum.

## CONSUMPTION OF FRESH FRUITS AND PROCESSED FRUIT IN INDIVIDUAL VOIVODSHIPS

The comparison of the levels of regional diversity in the consumption of three groups of fresh fruit: apples, exotic fruits and soft fruit, showed that they were very similar. Between 2008 and 2017, the coefficients of variation for average consumption amounted to 11.95%, 12.6% and 11.3%, respectively. There was a slightly greater deviation (18.1%) in the consumption of processed fruit products (Table 1). The analysis of changes in the diversity of fresh fruit consumption between 2008 and 2017 showed that the convergence of voivodships, i.e. the levelling of differences in consumption, decreased slightly (Figure 1). However, as far as the consumption of apples is concerned – the fruit which had the largest share in the consumption structure – the levelling of differences tended to increase. This trend was particularly noticeable between 2015 and 2017. The indicator referring to the consumption of exotic fruits also exhibited a steady decreasing tendency. Its value changed from 0.13 to 0.10, which pointed to a systematic increase in convergence. It is noteworthy that these fruits were characterised by the smallest annual fluctuation in the diversity of consumption. As far as the consumption of soft fruit is concerned, convergence decreased slightly during the entire period. However, as was the case with apples, the standard deviation decreased in the last two years again. When it comes to the consumption of processed fruit products, there was a fairly noticeable decrease in convergence, which indicated increasing diversity of consumption. Between 2008 and 2017, the highest consumption of fresh fruit and processed fruit products was noted in the Mazowieckie Voivodship, where it reached an average level of 46.9 kg per capita per annum (pcpa) (Table 1). The lowest consumption of fresh fruit and processed fruit products was noted in the Wielkopolskie Voivodship, i.e. 38.3 kg pcpa. It was mainly caused by a very low consumption of fresh fruit. Among the species and groups of fresh fruit under study, the largest amounts of apples were consumed in most voivodships. The highest consumption of apples was noted in the Świętokrzyskie Voivodship. The smallest amounts of apples, were consumed in the Śląskie, Pomorskie, Wielkopolskie, Kujawsko-Pomorskie and Dolnośląskie voivodships. The consumption of exotic fruits, i.e. mostly bananas and citruses, was different.

The consumption of exotic fruits was greater than the average in six voivodships, i.e. Dolnośląskie, Śląskie, Zachodniopomorskie, Mazowieckie, Lubelskie and Pomorskie. It is noteworthy that except for the Mazowieckie Voivodship, these were also the regions where the consumption of exotic fruit was higher than the consumption of apples. On the other hand, in the regions where the consumption of exotic fruits was the lowest, mainly the Lubelskie and Podkarpackie Voivodships, the consumption of apples was greater than average. Thus, it is possible to conclude that, in most regions, the consumption of apples was opposite to the consumption of exotic fruit. As far as the consumption of fresh berries is concerned, the Lubelskie Voivodship was the leader, where an average inhabitant consumed as much as 7.2 kg per year. The lowest consumption of soft fruit, i.e. below 5.0 kg pcpa was noted in the Wielkopolskie, Śląskie, Warmińsko-Mazurskie and Kujawsko-Pomorskie voivodships. The consumption of apples and berries was noticeably influenced by their production. In 2017, 48.2% of apples was harvested in the Mazowieckie Voivodship, which was a leading consumer of these fruits. The Lublin Voivodship, which had the highest share in the production of berries, i.e. 45.6%, was also the biggest consumer of these fruits [GUS 2018]. There was high regional diversification in the consumption of processed fruit products. The highest consumption, 2.3 kg pcpa was noted in the Mazowieckie Voivodship, whereas the lowest consumption, i.e. only 1.2 kg pcpa was noted in the Świętokrzyskie Voivodship. The consumption of over 2 kg pcpa was also noted in six other voivodships. It is noteworthy that these were mostly the same regions where the consumption of exotic fruit was the highest, whereas the consumption of apples was the lowest. At this point, it is possible to notice a relation between the structure of consumption of fresh fruit and processed fruit products and level of income. According to the Central Statistical Office [GUS 2019], in 2018, the highest disposable income was generated in the Mazowieckie, Pomorskie, Śląskie, Zachodniopomorskie and Dolnośląskie voivodships. At the same time, these voivodships were characterised by the highest consumption of exotic fruit and processed products. It is necessary to stress the fact that among the groups under analysis they had the highest prices, which translated into higher consumption in wealthier regions.

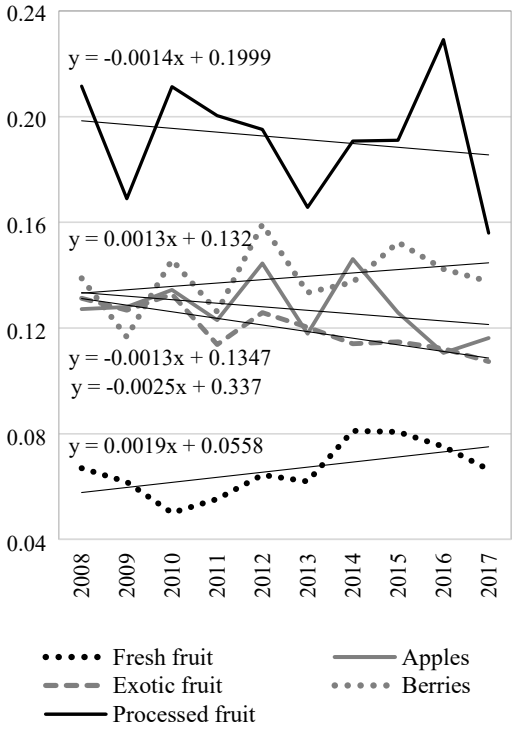


Figure 1. Sigma-convergence coefficient of consumption of fruit and processed fruit products (per capita per annum) of voivodships in 2008-2017

Source: own calculations based on Central Statistical Office data [GUS 2009-2018]

Table 1. Level, changes and diversity of fresh fruit and processed fruit product consumption in Polish households in 2008-2017

| Voivodships | Fresh fruit | | Apples | | Exotic fruit | | Berries | | Processed fruit | |
|---|---|---|---|---|---|---|---|---|---|---|
| | average in 2008-2017 | average annual rate of change | average in 2008-2017 | average annual rate of change | average in 2008-2017 | average annual rate of change | average in 2008-2017 | average annual rate of change | average in 2008-2017 | average annual rate of change |
| | kg pcpa | % | kg pcpa | % | kg pcpa | % | kg pcpa | % | kg pcpa | % |
| Grand total | 40.7 | 0.1 | 14.0 | -2.4 | 13.3 | 3.1 | 5.4 | -2.2 | 1.8 | 2.0 |
| Dolnośląskie | 41.2 | 1.0 | 12.7 | -1.8 | 15.0 | 4.1 | 5.4 | -2.2 | 2.1 | 3.8 |
| Kujawsko-Pomorskie | 38.1 | 0.6 | 12.6 | -2.3 | 12.6 | 3.7 | 4.8 | 1.7 | 1.7 | 1.5 |
| Lubelskie | 40.9 | 0.3 | 16.0 | -0.6 | 10.4 | 3.8 | 7.2 | -1.8 | 1.5 | 2.5 |
| Lubuskie | 42.5 | -0.4 | 13.5 | -4.2 | 14.4 | 2.6 | 5.3 | -2.8 | 2.1 | 2.4 |
| Łódzkie | 42.7 | -0.2 | 15.4 | -2.9 | 13.0 | 4.2 | 5.7 | -2.2 | 1.7 | 1.5 |
| Małopolskie | 40.3 | -1.1 | 16.0 | -3.0 | 12.2 | 2.6 | 5.3 | -4.2 | 1.4 | 1.7 |
| Mazowieckie | 44.8 | -0.8 | 15.2 | -2.8 | 14.5 | 2.5 | 5.9 | -2.8 | 2.3 | 0.6 |
| Opolskie | 41.4 | -0.2 | 13.4 | -2.2 | 13.7 | 1.9 | 5.9 | -1.9 | 1.9 | 0.7 |
| Podkarpackie | 37.9 | -0.2 | 15.7 | -3.5 | 10.5 | 5.1 | 5.0 | -3.9 | 1.4 | 3.8 |
| Podlaskie | 42.0 | -0.7 | 15.8 | -3.6 | 12.8 | 2.6 | 5.4 | -2.5 | 2.0 | 1.3 |
| Pomorskie | 40.5 | 1.0 | 12.0 | -2.2 | 14.4 | 3.5 | 5.6 | -1.3 | 2.2 | 2.4 |
| Śląskie | 38.7 | 1.5 | 11.8 | -0.2 | 14.8 | 2.8 | 4.6 | -2.3 | 2.0 | 3.2 |
| Świętokrzyskie | 41.4 | 0.2 | 17.0 | -1.0 | 11.9 | 4.3 | 5.0 | -1.3 | 1.2 | 5.5 |
| Warmińsko-Mazurskie | 38.3 | -1.2 | 13.6 | -5.6 | 12.4 | 2.0 | 4.7 | -4.2 | 1.7 | 3.7 |
| Wielkopolskie | 36.8 | -0.8 | 12.3 | -3.4 | 12.3 | 3.1 | 4.4 | -2.1 | 1.6 | 2.3 |
| Zachodniopomoskie | 43.8 | 2.3 | 13.7 | -0.8 | 14.8 | 4.4 | 5.9 | 2.3 | 2.1 | 2.5 |
| Coefficient of variation [%] | 5.5 | | 11.9 | | 11.3 | | 12.6 | | 18.1 | |

Source: own calculations based on Central Statistical Office data [GUS 2009-2018]

Another important point of the analysis was the identification of changes in the consumption of individual groups of fruit. Between 2008 and 2017, the domestic consumption of fresh fruit was fairly balanced and exhibited a slight upward trend. However, there were big differences in consumption in individual voivodships. The highest average annual growth of 2.3% was noted in the Zachodniopomorskie Voivodship. The biggest decrease in consumption was observed in the Warmińsko-Mazurskie and Małopolskie voivodships. There were downward trends in the consumption of apples in all voivodships, but it decreased the most in the Warmińsko-Mazurskie Voivodship, i.e. by 5.6% on average, i.e. by 0.8 kg per capita. Unlike the consumption of apples, the consumption of exotic fruit increased in all the regions and the highest average annual increase in the consumption of these fruits was observed in the Podkarpackie Zachodniopomorskie, Świętokrzyskie, Łódzkie and Dolnośląskie voivodships. The consumption of berries decreased in almost all voivodships, at the fastest rate in the Warmińsko-Mazurskie and Małopolskie voivodships. There were clear upward trends in the consumption of processed fruit products, but individual regions differed noticeably in the growth rate. The fastest average annual growth was observed in the Świętokrzyskie Voivodship and the slowest in the Mazowieckie and Opolskie voivodships.

## CONSUMPTION OF FRESH VEGETABLES AND PROCESSED VEGETABLES IN INDIVIDUAL VOIVODSHIPS

The values of the coefficients of variation indicating regional diversity in the consumption of fresh vegetables were much greater than those referring to the consumption of fruit. The largest deviations from the average value were noted mainly for domestic vegetable species, i.e. cabbage (19.2%), cucumbers (18.4%) and carrots (16.9%) (Table 2). The consumption of tomatoes in individual voivodships was characterised by the lowest diversity – between 2008 and 2017, the coefficient of variation in average consumption amounted to 10.8%. There were similar deviations in the average consumption of processed vegetable products. Between 2008 and 2017, diversity in the consumption of fresh vegetables tended to increase, as was indicated by the function of the standard deviation trend (Figure 2). A decrease in the convergence of voivodships was also observed in most of the major species in the consumption structure. The most noticeable, systematic increase in diversity was noted in the consumption of tomatoes, where the standard deviation increased from 0.10 to 0.13. The consumption of cabbage and carrots was also characterised by a decrease in convergence. The opposite trend was only observed for one species – cucumbers. The standard deviation decreased slightly from 1.1 to 1.2. There was a noticeable decrease in convergence referring to the consumption of processed vegetable products – standard deviation increased from 0.08 to 0.11. Between 2008 and 2017, the largest amounts of fresh vegetables and processed vegetable products, were consumed in the Świętokrzyskie, Lubelskie and Zachodniopomorskie voivodships, whereas the smallest amounts, i.e. below 100 kg pcpa were consumed in the Wielkopolska Voivodship (Table 2). Two voivodships were characterised by much higher consumption – every year the inhabitants of the Lubelskie and Świętokrzyskie voivodships consumed, on average, 62.0 and 60.7 kg per capita, respectively. The smallest amounts of vegetables, i.e. less than

45 kg pcpa, were consumed in the Pomorskie, Wielkopolskie and Śląskie voivodships. Among fresh vegetables, tomatoes were consumed in the largest amount in all voivodships – on average 9.9 kg pcpa. This level was exceeded in the Łódzkie, Mazowieckie, Świętokrzyskie, Lubelskie and Podlaskie voivodships. It is noteworthy that the biggest difference between voivodships with the highest and lowest consumption levels was observed for this vegetable species. The average annual consumption of cabbage and carrots was the same, i.e. 6.2 kg per capita. Most cabbages, i.e. over 8 kg pcpa, were consumed in the Podkarpackie, Opolskie and Lubelskie voivodships, whereas the least in the Pomorskie Voivodship. The highest average annual consumption of carrots per capita was observed in the Świętokrzyskie, Lubelskie and Podlaskie voivodships. The highest annual consumption of processed vegetable products was noted in the North – in the Pomorskie, Kujawsko-Pomorskie and Zachodniopomorskie voivodships. It is noteworthy that, in most cases, the voivodships where the consumption of processed vegetable products was lower than average were leaders in the consumption of fresh vegetables. The Greater Poland Voivodship was an exception, because the level of consumption of both fresh vegetables and processed vegetable products was below the national average. During the decade under analysis, the level of consumption of fresh vegetables in Polish households decreased on average by 0.7% every year, i.e. by 0.3 kg. Similarly to fruit consumption, there were differences between voivodships in the trends and dynamics of changes. However, in this case, these differences were even bigger. There were decreasing tendencies observed in most voivodships. The biggest decrease in consumption, i.e. about 2.5%, or about 1 kg pcpa, was noted in the Warmińsko-Mazurskie and Wielkopolskie voivodships. During the decade under analysis, the consumption of all major vegetable species decreased, and the biggest decrease was observed in the consumption of cabbages. The consumption of cabbages in Poland, which amounted to 3.7% on average, decreased in all regions. The consumption of processed vegetable products in all the regions increased. The fastest increase in consumption was observed in: the Świętokrzyskie, Pomorskie, Podlaskie, Kujawsko-Pomorskie and Śląskie voivodships.

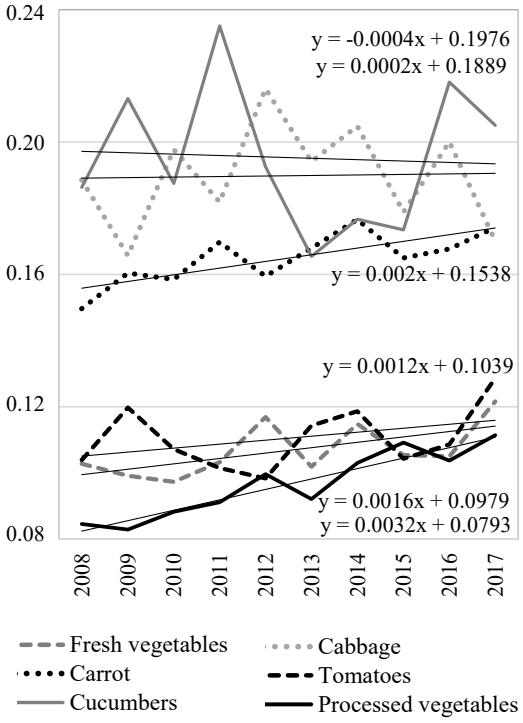


Figure 2. The sigma-convergence coefficient of consumption vegetables and processed vegetable products (per capita per annum) of voivodships in 2008-2017

Source: own calculations based on Central Statistical Office data [GUS 2009-2018]

Table 2. Level, changes and diversity of fresh vegetables and processed vegetable product consumption in Polish households in 2008-2017

| Voivodships | Fresh vegetables | | Cabbages | | Carrots | | Tomatoes | | Cucumbers | | Processed vegetables | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | average in 2008-2017 | average annual rate of change | average in 2008-2017 | average annual rate of change | average in 2008-2017 | average annual rate of change | average in 2008-2017 | average annual rate of change | average in 2008-2017 | average annual rate of change | average in 2008-2017 | average annual rate of change |
| | kg pcpa | % | kg pcpa | % | kg pcpa | % | kg pcpa | % | kg pcpa | % | kg pcpa | % |
| Grand total | 51.0 | -0.7 | 6.2 | -3.7 | 6.2 | -1.3 | 9.9 | -0.8 | 6.6 | -2.0 | 10.1 | 2.1 |
| Dolnośląskie | 52.0 | -0.2 | 6.1 | -3.7 | 6.2 | -2.0 | 9.6 | -0.7 | 5.9 | -1.1 | 10.9 | 2.3 |
| Kujawsko-pomorskie | 46.6 | 0.4 | 4.8 | -1.7 | 5.7 | 0.2 | 9.4 | -1.1 | 6.0 | -0.2 | 10.2 | 2.9 |
| Lubelskie | 62.0 | 0.4 | 8.4 | -2.6 | 7.9 | 0.6 | 10.8 | 0.0 | 10.1 | -2.1 | 9.0 | 2.4 |
| Lubuskie | 53.0 | -1.3 | 7.3 | -4.3 | 5.6 | -2.9 | 9.9 | -2.4 | 6.8 | -2.0 | 10.4 | 3.2 |
| Łódzkie | 54.7 | -0.7 | 5.9 | -5.7 | 6.0 | -1.1 | 12.1 | -0.6 | 6.6 | -1.0 | 9.8 | 2.2 |
| Małopolskie | 50.1 | -1.4 | 6.1 | -3.5 | 6.8 | -1.5 | 8.6 | -2.2 | 6.5 | -3.3 | 8.7 | 0.5 |
| Mazowieckie | 53.5 | -0.7 | 5.4 | -4.1 | 6.0 | -1.2 | 11.7 | -1.0 | 7.2 | -1.6 | 10.6 | 0.7 |
| Opolskie | 55.1 | -1.2 | 8.4 | -3.7 | 6.1 | -1.5 | 9.3 | -0.7 | 7.6 | -3.2 | 9.6 | 2.4 |
| Podkarpackie | 55.2 | -1.1 | 8.7 | -4.8 | 6.9 | -0.6 | 9.3 | -0.3 | 7.3 | -2.6 | 8.3 | 1.9 |
| Podlaskie | 52.1 | -0.2 | 6.6 | -2.7 | 7.3 | -1.8 | 10.2 | -0.1 | 8.2 | -1.8 | 9.4 | 3.2 |
| Pomorskie | 44.2 | 0.0 | 4.6 | -3.2 | 5.2 | -0.5 | 9.3 | 0.4 | 5.7 | -2.1 | 10.9 | 3.2 |
| śląskie | 44.7 | -0.1 | 5.8 | -3.2 | 5.2 | -0.8 | 8.6 | 0.2 | 4.8 | -2.5 | 11.5 | 2.8 |
| Świętokrzyskie | 60.7 | -0.5 | 6.7 | -3.9 | 9.2 | -2.6 | 11.6 | 0.0 | 8.1 | 0.3 | 9.8 | 3.2 |
| Warmińsko-mazurskie | 47.9 | -2.5 | 5.9 | -3.4 | 6.5 | -3.7 | 9.6 | -2.4 | 6.9 | -4.9 | 9.1 | 1.6 |
| Wielkopolskie | 44.3 | -2.4 | 5.6 | -4.1 | 4.9 | -3.3 | 9.0 | -2.4 | 5.5 | -4.4 | 9.8 | 0.9 |
| Zachodniopomorskie | 54.8 | 0.4 | 6.2 | -3.3 | 6.6 | -0.6 | 10.6 | 0.4 | 6.9 | -1.5 | 10.8 | 1.8 |
| Coefficient of variation [%] | 10.4 | | 19.2 | | 16.9 | | 10.9 | | 18.4 | | 9.1 | |

Source: own calculations based on Central Statistical Office data [GUS 2009-2018]

## SUMMARY

The decreasing consumption of fresh fruit and vegetables in Poland is a premise to identify and investigate the conditions affecting these changes. The level and structure of the consumption of fruit and vegetables and their processed products are influenced by factors related to the consumers' region of residence. Statistical analysis showed that, between 2008 and 2017, there was diversity in the level of consumption of fruit and vegetables and their processed products in individual voivodships, measured as kg per capita per annum. The consumption of vegetables was characterised by greater deviations from the average national level, as was indicated by a greater value of the coefficient of variation. There was a particularly noticeable diversity in the consumption of mostly domestic vegetables, i.e. cabbage, cucumbers and carrots. There were smaller deviations from the average value in the fruit group. They were more equal in individual fruit groups and species. The consumption of processed fruit products was characterised by greater diversity than the consumption of processed vegetable products. The consumption of fruit, especially exotic fruit, was characterised by greater convergence, i.e. the levelling of differences in consumption in individual voivodships. The consumption of most vegetable species exhibited the opposite trend, i.e. an increase in diversity in consumption. There was a similar trend observed in the consumption of processed fruit products. In the analyzed period, fresh fruit consumption was the lowest in the Wielkopolskie Voivodship and the highest in the Mazowieckie Voivodship. The consumption of vegetables, dominated in the Lubelskie and Świętokrzyskie voivodships, while the lowest results were recorded in the Pomorskie Voivodship. Considering the growing diversity of fruit and vegetable consumption, especially from domestic production, is necessary to find possibilities to handle domestic fruit and vegetable production, it was important to identify the regions with the highest and lowest consumption of products mainly produced in Poland. It was particularly important to identify the apples and berries. The highest consumption of these fruits was noted in the south and east of Poland, i.e. in the Świętokrzyskie, Lubelskie, Małopolskie, Podkarpackie, and Podlaskie Voivodships, whereas the lowest consumption was noted in the Wielkopolskie Voivodship and northern regions, i.e. in the Pomorskie, Kujawsko-Pomorskie and Warmińsko-Mazurskie voivodships as well as in Górny and Dolny Śląsk. The level of consumption of these fruits is related to the volume of production. The highest consumption was noted in voivodships where the largest amounts of these fruits are produced. This worrying trend was particularly dynamic in the Wielkopolskie, Warmińsko-Mazurskie and Małopolskie voivodships. The highest consumption of fresh vegetables was observed in the same voivodships where the consumption of fresh fruit, especially apples and soft fruit, was high. The structure of consumption of fresh vegetables in individual voivodships was not so strongly diversified as fruit consumption. The regional diversification in the consumption of processed vegetable products was also smaller. The consumption of fresh vegetables decreased in almost all regions. As was the case with apples and berries, the biggest decrease was noted in the Wielkopolskie, Warmińsko-Mazurskie and Małopolskie voivodships. To sum up, it is necessary to note that the level of fruit and vegetable consumption was particularly low in several voivodships, and the trends and dynamics of changes are very unfavourable and worrying. Above all, it was the Wielkopolskie Voivodship. Although it is a region of rela-

tively high significance in domestic fruit and vegetable production, the consumption of all major species and groups of fruit and vegetables was lower than the national average and exhibited a downward trend, except for the consumption of exotic fruit and processed fruit products. Other regions that deserve attention are the Warmińsko-Mazurskie Voivodship, mainly due to unfavourable trends in consumption, as well as the Śląskie, Pomorskie and Kujawsko-Pomorskie voivodships. It seems necessary to analyse the determinants of low levels of fruit and vegetable consumption in these regions in more detail. It is also necessary to constantly monitor consumption and intensify actions to support the consumption of fresh fruit, vegetables and their processed products.

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## REGIONALNE ZRÓŻNICOWANIE KONSUMPCJI OWOCÓW I WARZYW ORAZ ICH PRZETWORÓW W POLSCE

Słowa kluczowe: konsumpcja, owoce, warzywa, przetwory owocowe, przetwory warzywne, województwa

ABSTRAKT

Głównym celem opracowania jest określenie stopnia zróżnicowania i kierunków zmian konsumpcji najważniejszych grup i gatunków owoców oraz warzyw, a także ich przetworów, w poszczególnych województwach w Polsce, w latach 2008-2017. Przy użyciu współczynnika zmienności oraz techniki sigma-konwergencji zidentyfikowano poziom i zmiany zróżnicowania konsumpcji. Natomiast tendencje w spożyciu badanych grup produktów w poszczególnych województwach określono wykorzystując średniookresowe tempo zmian. Analizę oparto na danych wtórnych, pochodzących z GUS. Stwierdzono regionalne zróżnicowanie konsumpcji, przy czym było ono większe w przypadku warzyw i przetworów owocowych. W analizowanym okresie różnice w spożyciu większości badanych grup owoców zmniejszały się, a w przypadku warzyw zwiększały. Najbardziej wyraźny wzrost regionalnego zróżnicowania stwierdzono w przypadku konsumpcji przetworów owocowych i warzywnych. Najwięcej owoców spożywano w województwie mazowieckim, a warzyw w województwach lubelskim i świętokrzyskim. Najniższą konsumpcję, zarówno owoców jak i warzyw oraz wyraźne tendencje malejące, stwierdzono w województwie wielkopolskim, a także w województwach warmińsko-mazurskim, śląskim, pomorskim i kujawsko-pomorskim. W tych regionach szczególnie niekorzystne były zmiany dotyczące konsumpcji gatunków i grup świeżych owoców i warzyw pochodzących głównie z rodzimej produkcji, w tym jabłek, owoców jagodowych i kapusty.

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