OECD-COLEAD Fruit and Vegetables Industry Series
Session no 7 – Factors affecting consumer choices for fresh fruits and vegetables
Thursday 20 June 2024

Consumer Profiles for Sustainable Fruit and Vegetable Consumption in the European Union

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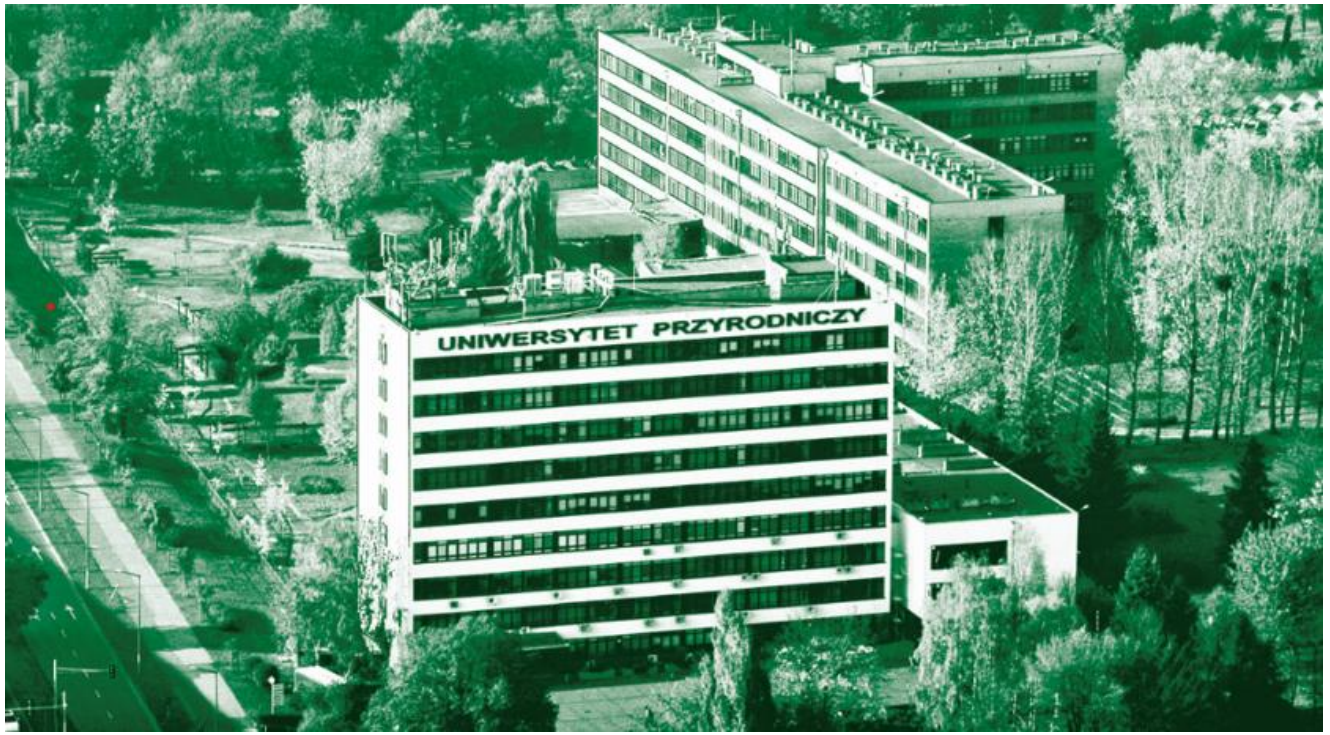

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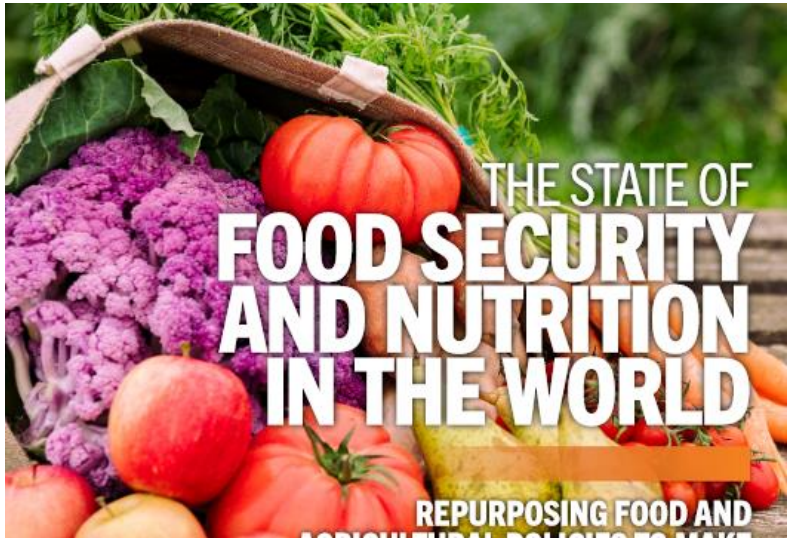
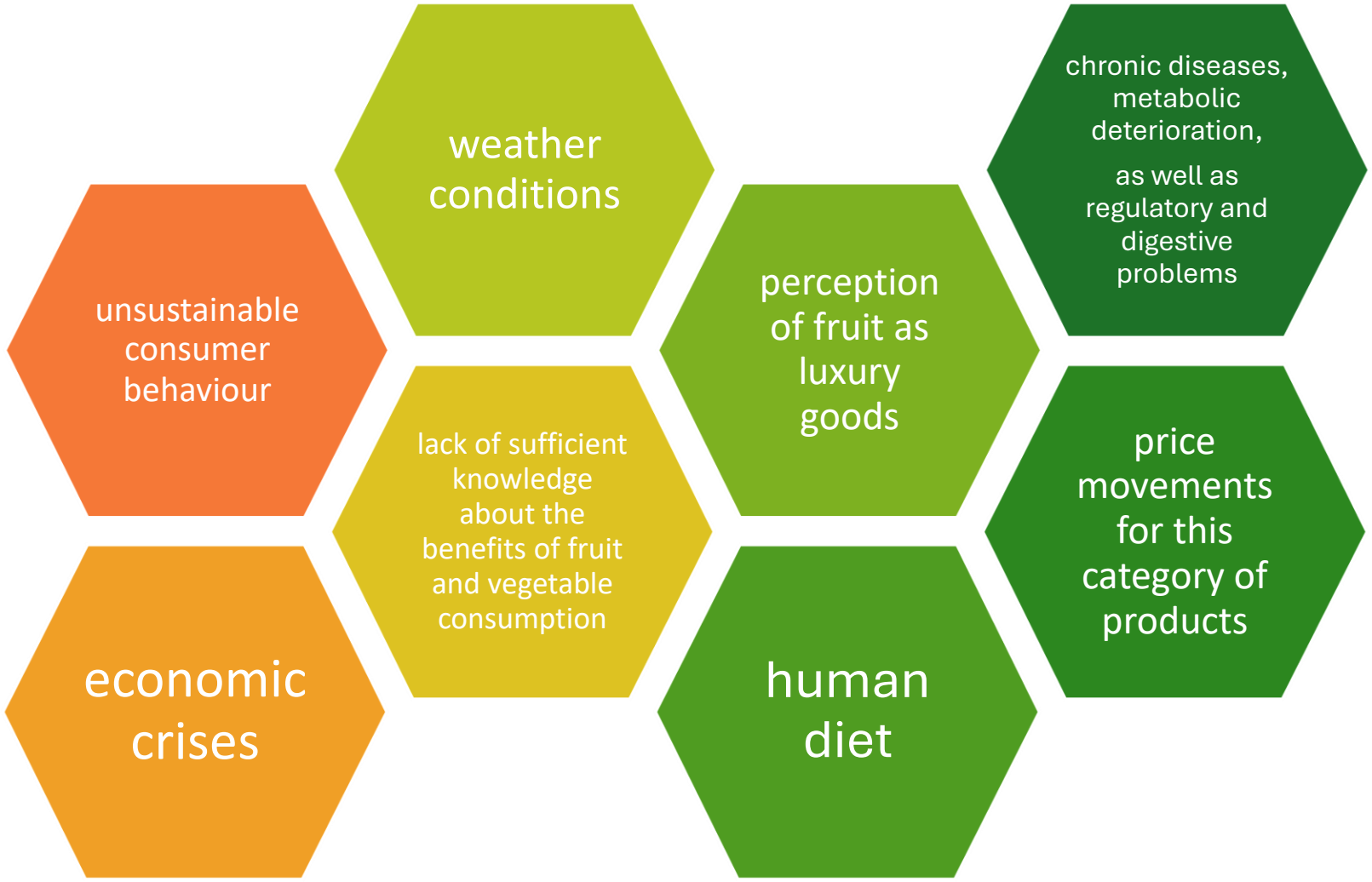
im. Jana i Jędrzeja Śniadeckich

The European Union considers the solution to the **problem of low consumption of fruit and vegetables as one of its priorities, and supports the development of the sustainable food consumption, including fruit and vegetables**



The reasons for this phenomenon



World Health Organization

FACT SHEET N°394 UPDATED AUGUST 2018

Healthy diet

KEY FACTS

- A healthy diet helps to protect against malnutrition in all its forms, as well as noncommunicable diseases (NCDs) such as diabetes, heart disease, stroke and cancer.
- Unhealthy diet and lack of physical activity are leading global risks to health.
- Healthy dietary practices start early in life – breastfeeding fosters healthy growth and improves cognitive development, and may have longer term health benefits such as reducing the risk of becoming overweight or obese and developing NCDs later in life.
- Energy intake (calories) should be in balance with energy expenditure. To avoid unhealthy weight gain, total fat should not exceed 30% of total energy intake *(1, 2, 3)*. Intake of saturated fats should be less than 10% of total energy intake, and intake of *trans*-fats less than 1% of total energy intake, with a shift in fat consumption away from saturated fats and *trans*-fats to unsaturated fats *(3)*, and towards the goal of eliminating industrially-produced *trans*-fats *(4, 5, 6)*.
- Limiting intake of free sugars to less than 10% of total energy intake *(2, 7)* is part of a healthy diet. A further reduction to less than 5% of total energy intake is suggested for additional health benefits *(7)*.
- Keeping salt intake to less than 5 g per day (equivalent to sodium intake of less than 2 g per day) helps to prevent hypertension, and reduces the risk of heart disease and stroke in the adult population *(8)*.
- WHO Member States have agreed to reduce the global population's intake of salt by 30% by 2025; they have also agreed to halt the rise in diabetes and obesity in adults and adolescents as well as in childhood overweight by 2025 *(9, 10)*.

OVERVIEW

Consuming a healthy diet throughout the life-course helps to prevent malnutrition in all its forms as well as a range of noncommunicable diseases (NCDs) and conditions. However, increased production of processed foods, rapid urbanization and changing lifestyles have led to a shift in dietary patterns. People are now consuming more foods high in energy, fats, free sugars and salt/sodium, and many people do not eat enough fruit, vegetables and other dietary fibre such as whole grains.

The exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs. However, the basic principles of what constitutes a healthy diet remain the same.

FOR ADULTS

A healthy diet includes the following:

- Fruit, vegetables, legumes (e.g. lentils and beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat and brown rice).
- At least 400 g (i.e. five portions) of fruit and vegetables per day *(2)*, excluding potatoes, sweet potatoes, cassava and other starchy roots.
- Less than 10% of total energy intake from free sugars *(2, 7)*, which is equivalent to 50 g (or about 12 level teaspoons) for a person of healthy body weight consuming about 2000 calories per day, but ideally is less than 5% of total energy intake for additional health benefits *(7)*. Free sugars are all sugars added to foods or drinks by the manufacturer, cook or consumer, as well as sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.
- Less than 30% of total energy intake from fats *(1, 2, 3)*. Unsaturated fats (found in fish, avocado and nuts, and in sunflower, soybean, canola and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard) and *trans*-fats of all kinds, including both industrially-produced *trans*-fats (found in baked and fried foods, and pre-packaged snacks and foods, such as frozen pizza, pies, cookies, biscuits, wafers, and cooking oils and spreads) and ruminant *trans*-fats (found in meat and dairy foods from ruminant animals, such as cows, sheep, goats and camels). It is suggested that the intake of saturated fats be reduced to less than 10% of total energy intake and *trans*-fats to less than 1% of total energy intake *(5)*. In particular, industrially-produced *trans*-fats are not part of a healthy diet and should be avoided *(4, 6)*.
- Less than 5 g of salt (equivalent to about one teaspoon) intake per day *(8)*. Salt should be iodized.

FOR INFANTS AND YOUNG CHILDREN

In the first 2 years of a child's life, optimal nutrition fosters healthy growth and improves cognitive development. It also reduces the risk of becoming overweight or obese and developing NCDs later in life.

Advice on a healthy diet for infants and children is similar to that for adults, but the following elements are also important:

- Infants should be breastfed exclusively during the first 6 months of life.
- Infants should be breastfed continuously until 2 years of age and beyond.
- From 6 months of age, breast milk should be complemented with a variety of adequate, safe and nutrient-dense foods. Salt and sugars should not be added to complementary foods.

PRACTICAL ADVICE ON MAINTAINING A HEALTHY DIET

Fruit and vegetables

Eating at least 400 g, or five portions, of fruit and vegetables per day reduces the risk of NCDs *(2)* and helps to ensure an adequate daily intake of dietary fibre.

Fruit and vegetable intake can be improved by:

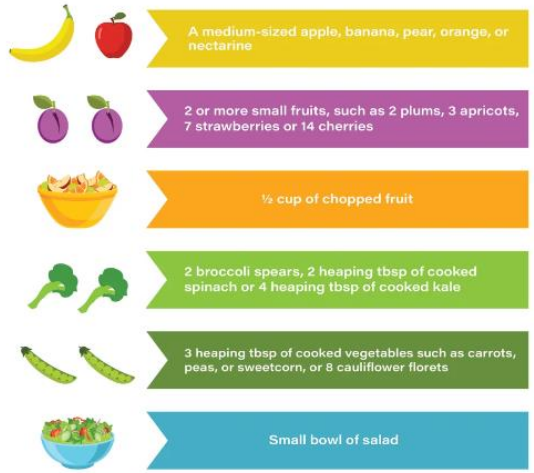
- always including vegetables in meals;
- eating fresh fruit and raw vegetables as snacks;

Official recommendations for fruit and vegetable consumption

Bridging the Gap to Healthier Living, a multi-market report from Juice Plus+ reveals that 75% of people don't think they eat the recommended amount of fresh fruit and vegetables on a daily basis.

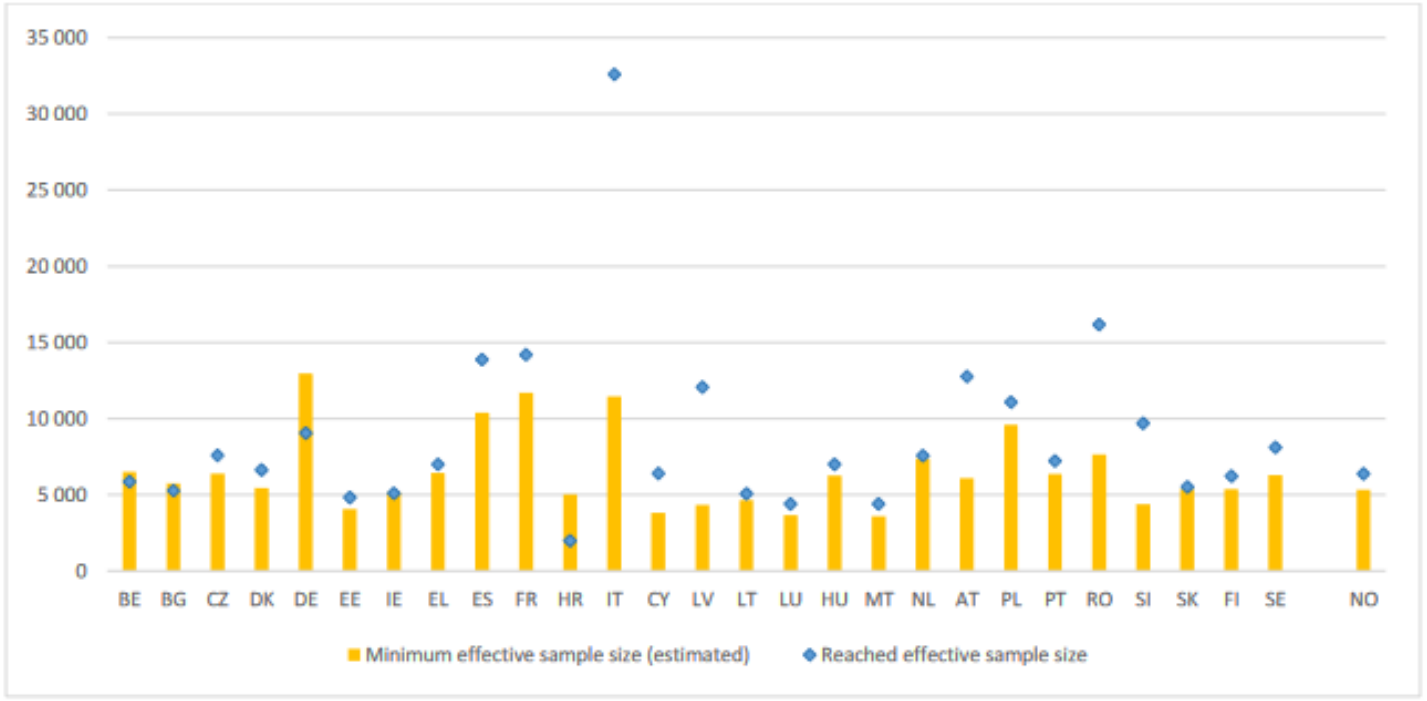
The World Health Organization recommends eating five 80-gram portions of fruit and vegetables (400 grams total) per day. What does this look like?

1 portion of 80g looks like one of the below:




LIGHT HOUSE PROJECT
NGO
FARMER
INSPIRING OTHERS
COMPANY
VIRTUAL COLLABORATION SPACE
BUILDING TRUST
COMING TOGETHER
MULTIPLE MEETINGS
TRAINING CHAMPIONS & CHANGE AGENTS
POLITICIAN
SCALING UP
CONSUMER
DEVELOP PATHWAYS FOR DELIVERY
SCIENTIST + INNOVATOR
VISION
MULTIPLE SOLUTIONS
REPLICABLE AROUND THE WORLD
. EQUITABLE
. CLIMATE NET ZERO
. NATURE POSITIVE
CO-CREATING A VISION
SUSTAINABLE FOOD SYSTEM

Figure 1. Minimum effective sample size and achieved effective sample size in EHIS wave 3



Note: Achieved sample size instead of achieved effective sample size for France, Malta and Romania

Total:
176 100

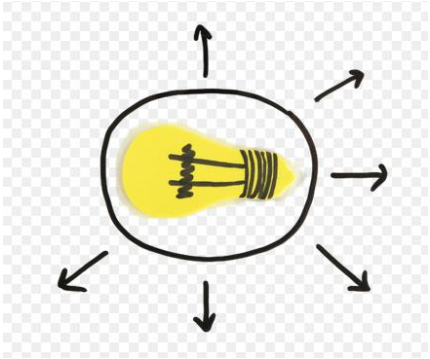
Sample size in the national EHIS wave 3

Table A2. Sample size in the national EHIS wave 3.

Country	Achieved Sample Size for HS3	Achieved Effective Sample Size for HS3	Minimum Effective Sample Size ([3])
AT	15,461	12,778	6104
BE	9644	5880	6502
BG	7540	5273	5738
CY	6156	6413	3829
CZ	7993	7612	6391
DE	23,001	9056	12,963
DK	6629	6629	5442
EE	4881	4833	4063
GR	8125	7004	6437
ES	22,072	13,882	10,390
FI	6251	6251	5384
FR ([1])	14,192	:	11,705
HR	5461	1986	5041
HU	5603	7004	6268
IE	7621	5115	5169
IT	45,962	32,597	11,449
LT	4923	5075	4648
LU	4504	4416	3661
LV	6033	12,066	4325
MT ([1])	4413	:	3583
NL	8194	7587	7376
PL	19,959	11,088	9603
PT ([2])	14,617	7236	6374
RO ([1])	16,186	:	7656
SE	9757	8131	6280
SI	9900	9706	4395
SK	5527	5527	5372

([1]) Information not available for the design effect of HS3 variable. In France, simulations showed during the construction of the new master sample, the design effect could be small, and the assumption was that 12,000 respondents would be sufficient to fulfil the precision requirements set by the regulation. ([2]) Average design effect calculated for HS3; at NUTS II level around 1.4; design effect calculated for HS3 at national level: 2.02. ([3]) Estimated by Eurostat using the formula from Annex II Precision requirements of Commission Regulation (EU) No 2018/255 of 19 February 2018, where a = 1200, b = 2800 and N is the population aged 15 or over residing in private households in million persons and rounded to three decimal digits (data for the 2019 reference year used in the computation, demo_pjanbroad). ':' Information not available. Source: Quality report of the third wave of the European Health Interview Survey 2022 edition, Statistical Reports, Luxembourg: Publications Office of the European Union, 2022, s. 19; https://ec.europa.eu/eurostat/documents/7870049/14937972/KS-FT-22-002-EN-N.pdf/40912c04-ac9d-012c-358e-111efe0a8976?t=1659613423879 (accessed on 20 October 2023).

The main goal was the identification of consumer profiles for sustainable fruit and vegetable consumption in the European Union taking into account selected demographic and socio-economic characteristics of consumers.



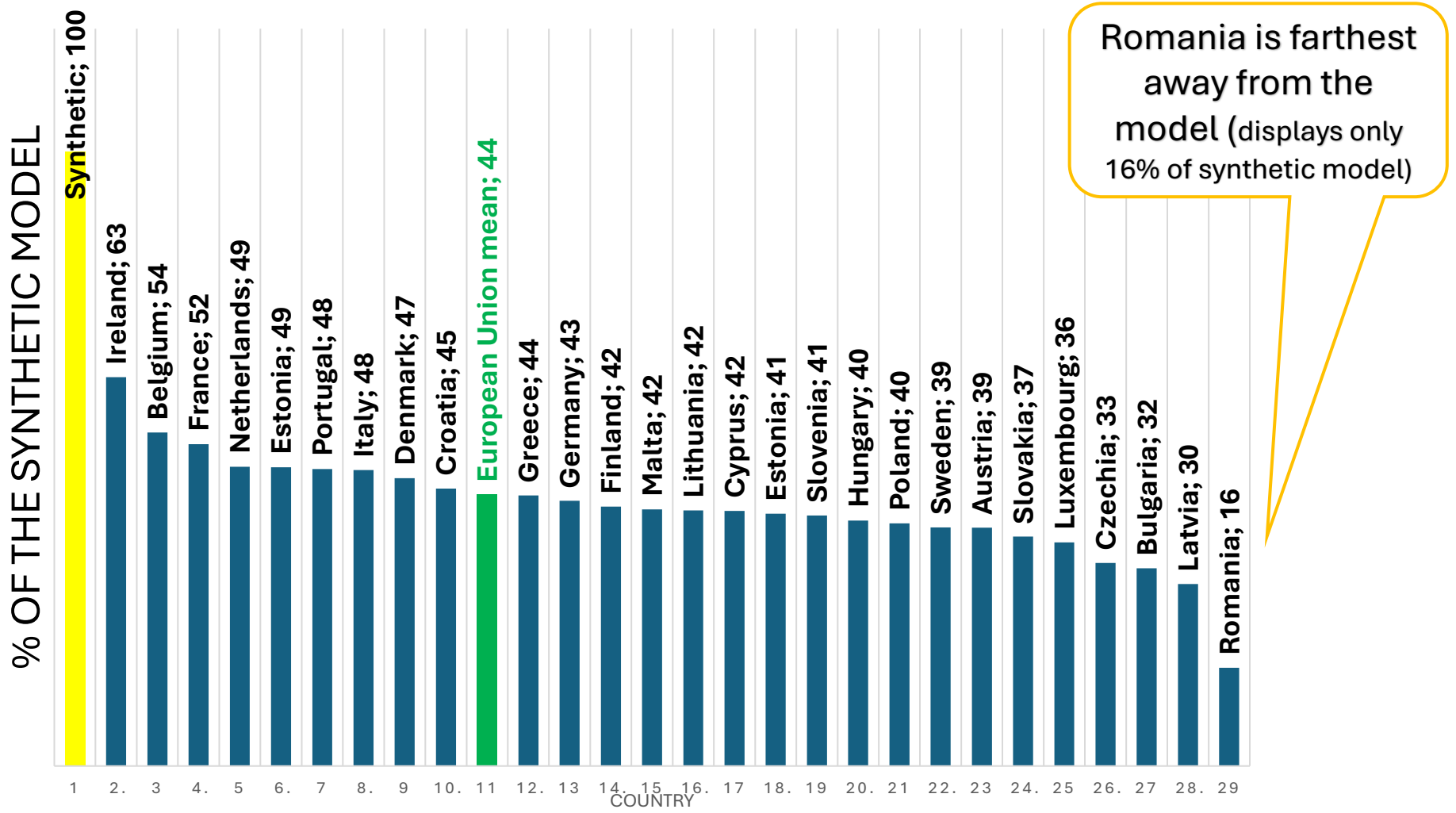
Method:

- Principal Component Analysis (PCA)
- Classical statistical model

Fruit and vegetable consumption pattern in Europe

- How far residents of the EU countries deviate from the **synthetic F&V consumption model (target)**

F&V consumer model (synthetic)
- 0 F&V portions – 0 %
- 1-4 F&V portions – 20 %
- 5 F&V portions – 80 %



Romania is farthest away from the model (displays only 16% of synthetic model)

Fruit and vegetable consumption pattern – data structure overwiev problem

- How to investigate the relative amount of F&V based on many variables and many factors each on two, three and more levels

	Levels (F&V daily intake)	Factor	Levels (consumer group)
27 European Union countries	0 portions	Gender	Females Males
		Age	From 15 to 24 years From 25 to 34 years From 35 to 44 years From 45 to 54 years From 55 to 64 years 65 years or over
		Education	Levels 0-2 Levels 3 and 4 Levels 5-8
		Income quintile	Q_first Q_second Q_third Q_fourth Q_fifth
	From 1 to 4 portions	...	...
	5 or more portions	...	...

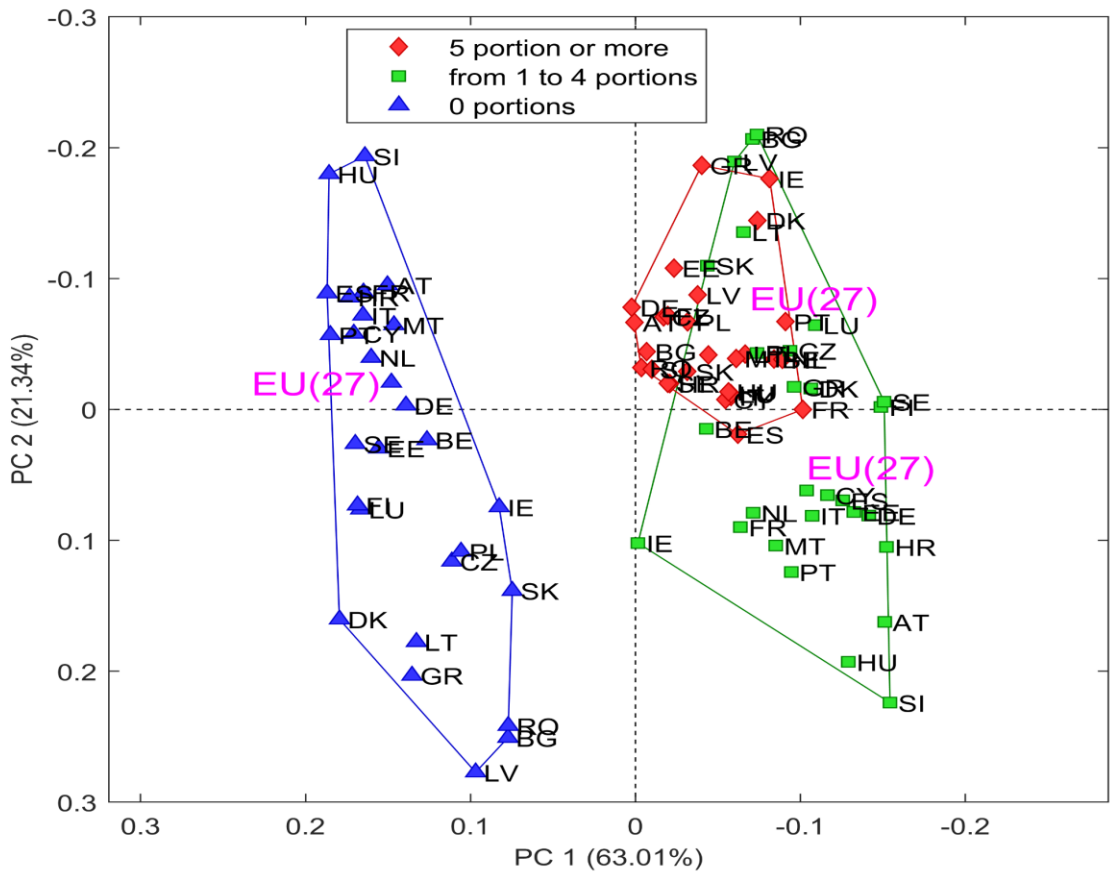
Variables	Levels
Daily consumption	0 portions
	From 1 to 4 portions
	5 or more portions
Frequency of fruit consumption	At once a day
	From 1 to 3 times a week
	From 4 to 6 times a week
	Never or occasionally
Frequency of vegetable consumption	At once a day
	From 1 to 3 times a week
	From 4 to 6 times a week
	Never or occasionally
Frequency of drinking pure fruit or vegetable juice	At once a day
	From 1 to 3 times a week
	From 4 to 6 times a week
	Never or occasionally

Data are not information, they are collected to extract information!!!

Perform a multivariate Principal Component Analysis (PCA) to overwiev data !!!

Factors affecting EU consumer choices – PCA model of portions

- *Objective :* assessing the homogeneity/heterogenity of the structure of the surveyed countries in terms of daily F&V consumption



target

target

The PC1 (which explains 63% of the explained variance) tell us that consumer profile is dominated by declared F&V portion; in different EU countries residents give similar answers;

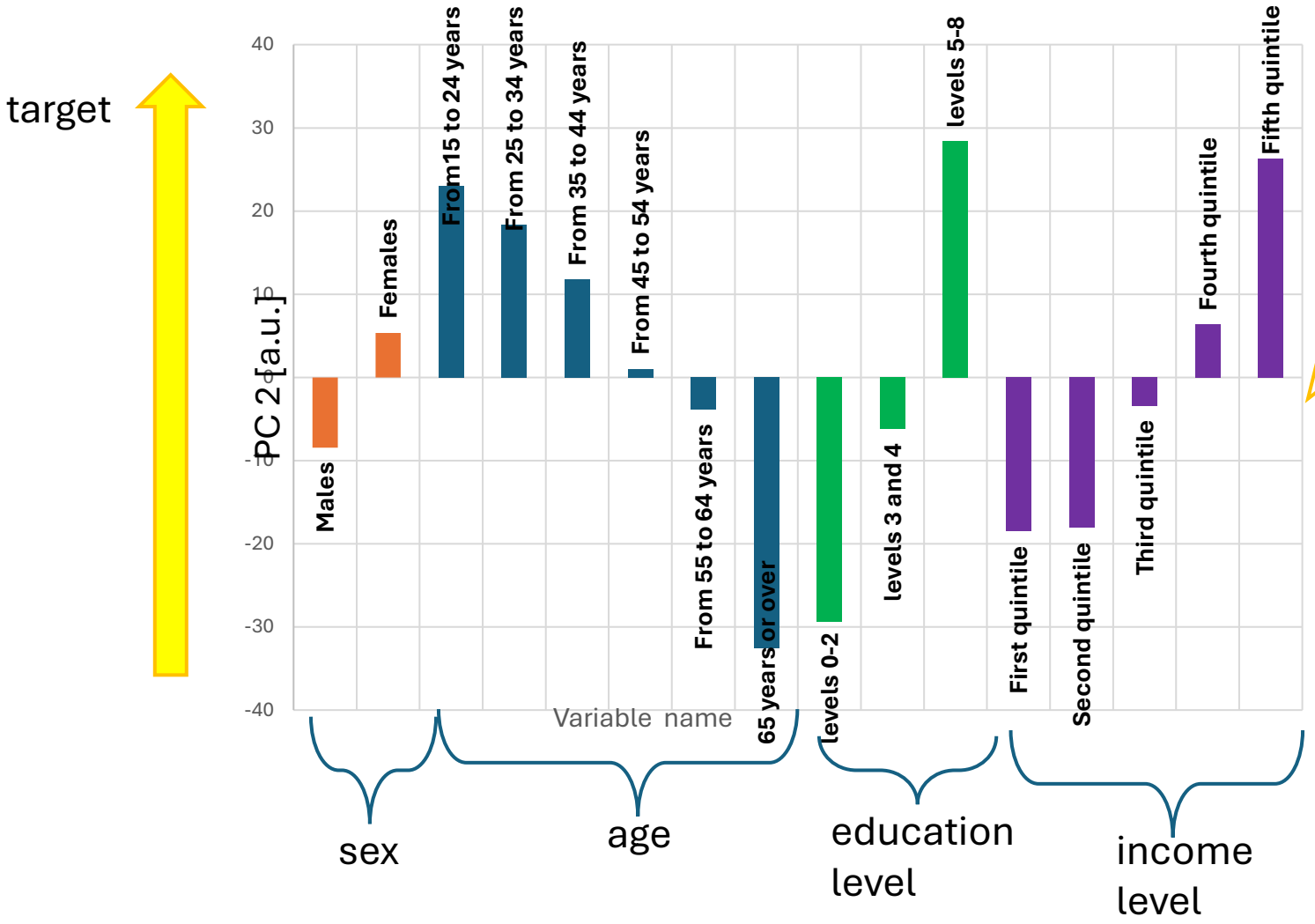
(all EU countries „0 portion" were on the left-hand side, „5 portion" and 1-4 portions on the right-hand side)

The most homogeneous group are consumers who declare 5 portion

Differences between EU consumers are displayed by PC2 (21% of the explained variance)

Factors affecting EU consumer choices – PCA model of portions

- *Objective :* assessing the strength of the impact of demographic (sex, age) and socio-economic (education, income) characteristics on fruit and vegetable (daily) consumption;

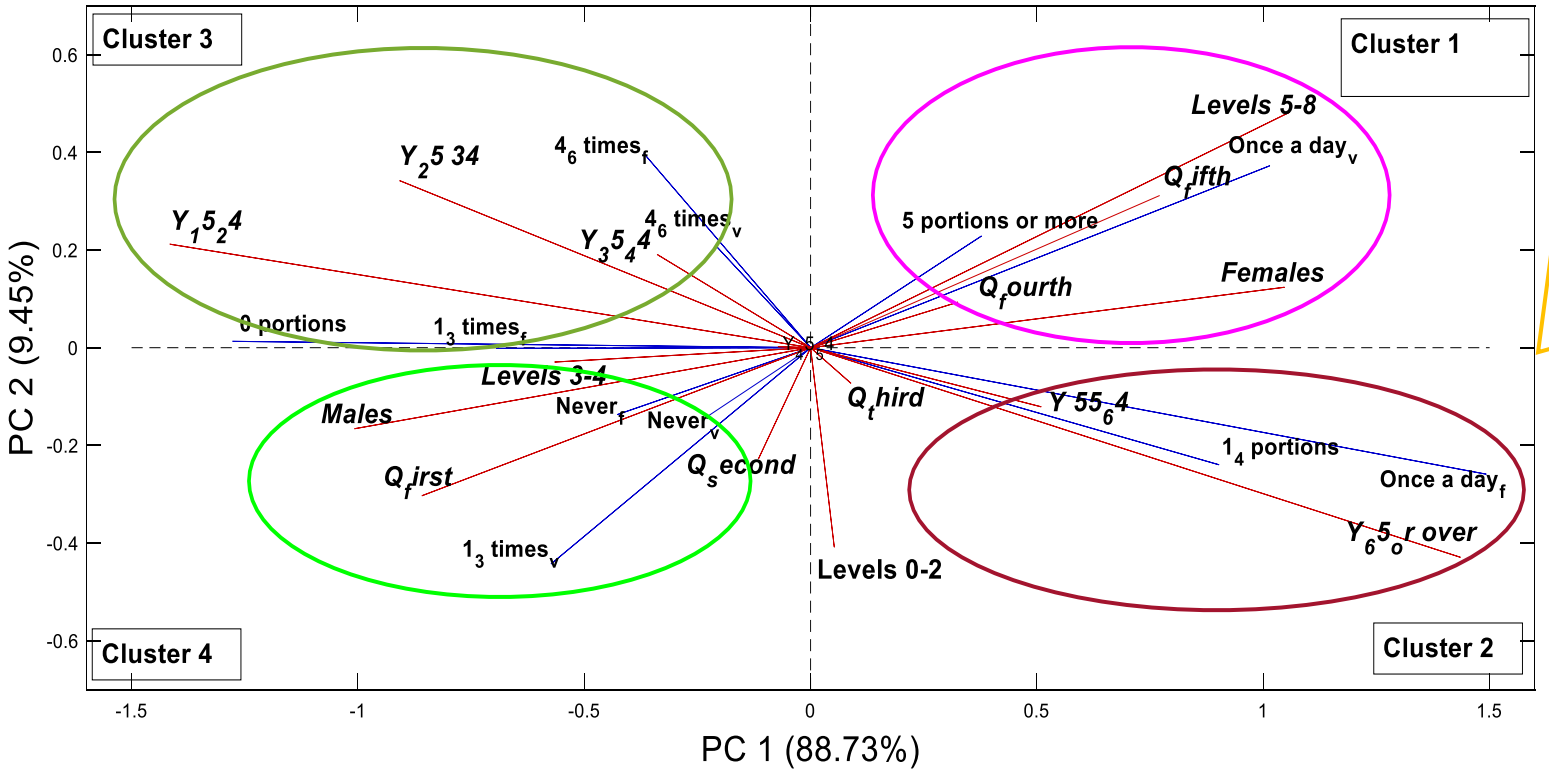


The PC2 tell us that:

- most important factors that favor F&V consumer sustainable profile are „levels 5-8" and „fifth quintile". Furthermore young people and females have relatively large values of the PC 2.
- „65 years or over" and „levels 0-2" represent low F&V daily consumption amount as they have the largest negative values of the PC2. Similarly „first and second quintile" and males have negative PC2.
- Variables of little importance lie near the origin. This also means that in these groups the EU residents have similar F&V consumer behaviors, thus they have low variance.

Factors affecting EU consumer choices – PCA model of frequency

Objective: creating consumer profiles of F & V consumption, and drawing attention to consumers who do not comply with WHO recommendations;

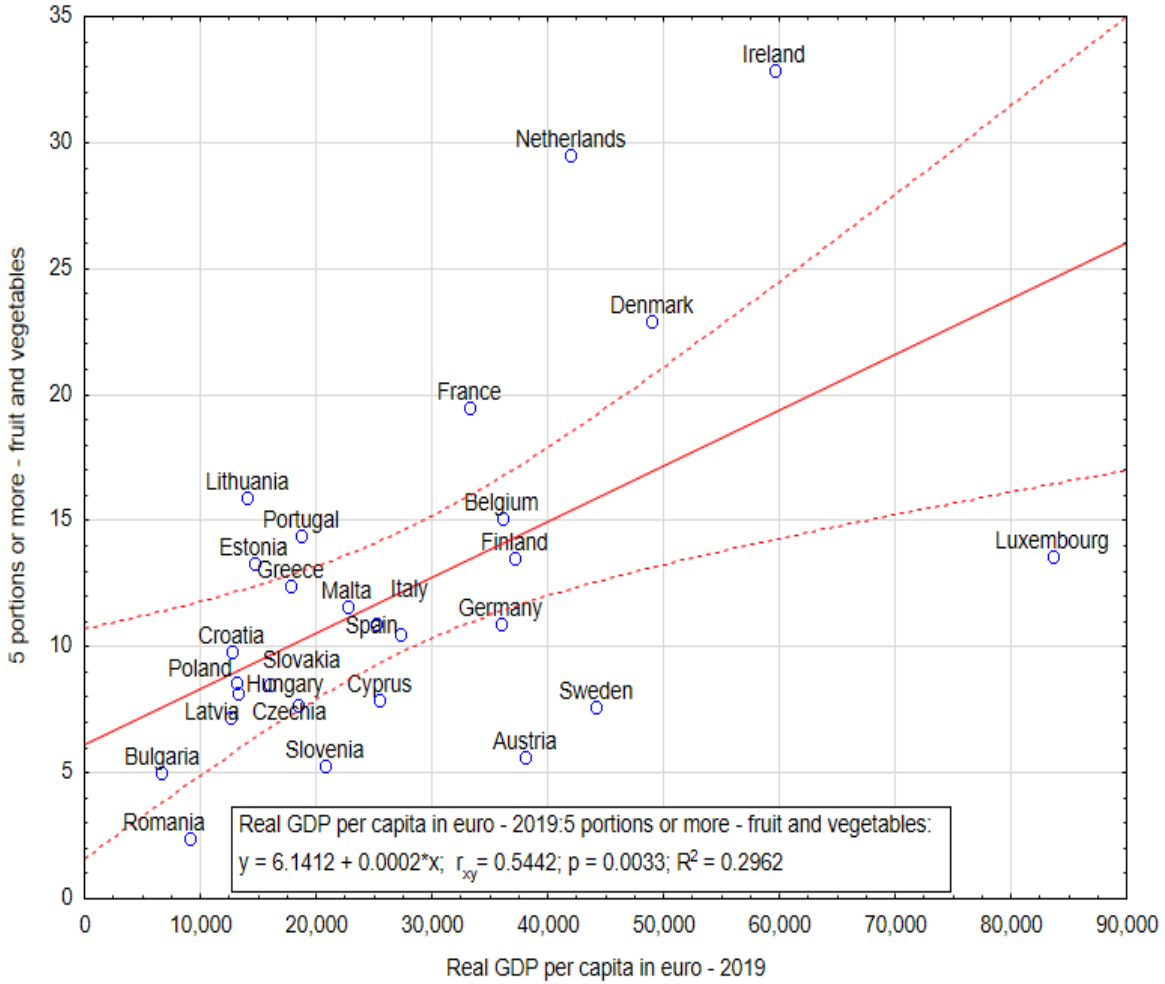


target

PCA model identifies four consumer profile:

- ❑ Cluster 1 (Females, education level 5-8, fourth-fifth income) declared 5 portions, once a day vegetable
- ❑ Cluster 2 (oldest consumers (55-65 year and over) declared 1-4 portions, once a day fruit
- ❑ Cluster 3 (younger consumers) declared 0 portions, 1-3 times fruit and 4-6 times F & V
- ❑ Cluster 4 (males, education levels 3-4, first and second income) most often declared never fruit and vegetable

Factors affecting EU consumer choices
- GPD per capita



- Positive correlation between declared 5 portion F&V and more and the real GPD per capita
- R^2=0.3 accounts for only 30% of the variability of the obtained responses "consumption of 5 servings and more of F&V a day", the remaining 70% are other factors, not related to the economic development of a country.

Fruit and vegetable consumption pattern in Europe

The conclusions that may be drown from the study are thus the following:

LESS — **TARGETED PATTERN** — **MORE**

- Man
- A person with secondary education
- People with low incomes
- Younger people
- People living in countries with a low level of economic development

- Woman
- A person with higher education
- High-income people
- Elder people
- People living in countries with a high level of economic development

What's next?

Care should be taken to **increase the amount of fruit and vegetables in the diet of the Europeans, increasing their consumption.**

Funds should be directed to **social marketing companies** that provide consistent messages in order to adopt **more healthy and sustainable practices.**

In developing public health policies and practices across Europe, **findings on the impact of demographic and socio-economic characteristics, regional affiliation, and national economic development and their effects on inequalities in fruit and vegetable consumption should be considered**.

A good strategy is the continuous **monitoring of consumer profiles**, paying attention to the amount and frequency of fruit and vegetable consumption, as well as focusing on actions aiming to increase their consumption.

What's next?

Care should be taken to **build good information and education campaigns in the EU countries, taking into account the need to adapt the content of messages to the different profiles of fruit and vegetable consumers.**

In the area of education and information strategies, it seems useful to **analyse if message senders use appropriate communication instruments and tools that take into account the needs of specific consumer groups** (e.g., younger and older age groups), **and, in particular, if the content of the messages created does not result in lower consumption of fruit or vegetables at the consumer level in households** (e.g., when it comes to encouraging to the consumption of leftovers).

It will also be interesting to **describe the nutritional quality and the environmental impact of self-selected diets of adult consumers in relation to, among other things, fruit and vegetable consumption.**

It could be further explored whether consumption of fruit and vegetables, following WHO recommendations, is associated with lower environmental impact.

*/ More communication on the advantages of fruit and vegetables is needed to change the dietary choices of individuals with low fruit and vegetable consumption.

*/ Given the advantages of fruits and vegetables for human health and the environment, such areas of research are worth exploring further.

EXMPLE: information campaign focusing on the production methods of fruit and vegetables with low environmental pressure (e.g., micro-irrigation of tomatoes) or based on non-chemical plant protection, could be considered; this would make it easier for consumers to choose the right products.

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Source: Goryńska-Goldmann, E.; Murawska, A.; Balcerowska-Czerniak, G. Consumer Profiles of Sustainable Fruit and Vegetable Consumption in the European Union. *Sustainability* 2023, *15*, 15512. https://doi.org/10.3390/su152115512

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Article

Consumer Profiles of Sustainable Fruit and Vegetable Consumption in the European Union

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Abstract: Despite the World Health Organization (WHO) advocating a healthy and balanced diet for consumers for many years, inadequate fruit and vegetable (FV) consumption remains a substantial issue with economic, social, environmental, and nutritional implications. This study aims to identify consumer profiles for sustainable fruit and vegetable consumption in the European Union, considering specific demographic and socio-economic factors. The analysis is based on data from the 2019 European Health Interview Survey (EHIS). This article provides a clear understanding of how gender, age, education level, income, and place of residence relate to sustainable FV consumption through a principal component analysis (PCA). By defining consumer profiles linked to sustainable and healthy FV consumption, the study aids in creating cohesive goals for promoting health within European society. The results of the PCA reveal four distinct consumer profiles and enhance our understanding of the factors influencing these profiles. These findings align with previous research, indicating that consumer profiles remain relatively consistent. According to the PCA classification, sustainable fruit and vegetable consumption is more prevalent among women, educated individuals, higher-income consumers, and those over 55 years old. In contrast, the opposite profile consists of consumers with lower income, younger and middle-aged individuals, men, and those with less than a high school education, highlighting the need for effective strategies to promote a healthier diet in this group. Countries with lower economic development, reflected in consumer incomes, deviate the most from the recommended "at least five portions of fruit and vegetables a day" consumption pattern, and do not exhibit a sustainable consumption model. Thus, continued monitoring of consumer profiles is essential, with a focus on both the quantity and frequency of fruit and vegetable consumption, as well as strategies aiming to increase their intake.

Keywords: consumer profile; fruit and vegetable; sustainable consumption; principal component analysis (PCA); relationship analysis

check for updates

Citation: Goryńska-Goldmann, E.; Murawska, A.; Balcerowska-Czerniak, G. Consumer Profiles of Sustainable Fruit and Vegetable Consumption in the European Union. *Sustainability* **2023**, *15*, 15512. https://doi.org/10.3390/su152115512

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1. Introduction

The European Union considers the solution to the problem of low consumption of fruit and vegetables as one of its priorities, and supports the development of the sustainable food consumption, including fruit and vegetables, as evidenced by the provisions of the European Green Deal, objectives of the Farm to Fork strategy [1,2], The State of Food Security and Nutrition in the World 2022 and 2021 report [3,4], and including the fruit and vegetable sector in Common Agriculture Policy (CAP) Strategic Plans in EU countries. The measures taken to counteract the low consumption of fruit and vegetables include actions supporting pro-health and rational nutrition initiatives, found among the national strategies aiming to improve health and reduce diseases, as well as in some global dietary

Meet the Expert

PhD Michał Gazdecki

economist and market researcher, currently employed at the Faculty of Economics, Poznań University of Life Sciences. His primary research interests revolve around distribution systems in the food and agricultural markets, with a particular focus on the application of network and relational approaches to the food sector. Additionally, he is actively involved in studying consumer behavior and sustainable consumption topics. The leader for the "Food Markets" project, which was established in 2012 and aims to address contemporary issues in food markets through the organization of scientific conferences [https://foodmarkets.pl/?lang=en]. Michał holds membership in several professional organizations such as the IMP-Group, Polish Scientific Society of Marketing, and Polish Association of Market and Opinion Researchers. He demonstrates active involvement in a diverse range of research projects centered around the food and food-services markets, making valuable contributions to the progression of knowledge within these fields.

PhD Elżbieta Goryńska-Goldmann

The author or co-author of around 100 original research papers or monographs in the field of economic consumption and food markets, including theoretical, methodological and empirical aspects of food consumer behaviour and the reactions of companies to changes in food consumption; deals with practical implementation of the concept of sustainable development and desired direction of changes in consumption; member of the Polish Economic Society, Polish Association of Agricultural and Agribusiness Economists, Polish Society of Nutritional Sciences, Polish Scientific Society of Marketing. Scientific activities focused on the behaviours and habits of food consumers as an important element of society's culture, analysis of the agri-food market, its entities and their innovativeness and competitiveness, and marketing analyses. Involved in national and international research projects related to participants in the agri-food sector. Co-founder of the "Food Markets" platform for the exchange of opinions between representatives of science and practice, as well as co-organizer of scientific conferences (https://foodmarkets.pl). Expert in cooperating with institutions and food market companies, providing opinions on innovation projects.

PhD Anna Murawska

doctor of economics, employed at the Faculty of Management at the Bydgoszcz University of Technology in Poland. Her scientific and research interests focus on the conditions and spatial differentiation of socio-economic development as well as the level and quality of life in Poland and other European Union member states. In recent years, she has devoted much attention to the issue of consumption of goods and services in the aspect of supporting sustainable development and sustainable consumption. Author and co-author of three monographs, about a hundred articles in scientific journals, chapters in monographs and in publications from international conferences. She presented her research at over 60 conferences and scientific seminars. A long-time member of the Association of Agricultural and Agribusiness Economists, the Association of Communication Engineers and Technicians of the Republic of Poland and the Polish Economic Society. He actively participates in research and analysis of consumer behavior in the field of rational, responsible and sustainable consumption.

PhD Grażyna Balcerowska-Czerniak

currently works at the Institute of Mathematics and Physics, Bydgoszcz University, Poland. Grażyna does research in Solid State Physics, Materials Physics and Chemo-informatics. Their current project is 'development of the chemometrics theory and methods'.

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