



THE VIEWS OF POZNAŃ STUDENTS REGARDING LIMITING MEAT CONSUMPTION

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Received 28.10.2024, Revised 15.08.2025, Accepted 16.09.2025

Abstract

Research background: Sustainable development encompasses both environmental and social issues. Due to the need to reduce greenhouse gas emissions, it will also be necessary to reduce the production and consumption of the most carbon-intensive products, which include meat.

Purpose: The aim of this study is to investigate the attitudes of students attending Poznań universities towards limiting meat consumption.

Research methodology: A survey was conducted in the form of an online questionnaire. A total of 873 respondents took part in the survey, including 575 (65.9%) women, 287 (32.9%) men and 11 (1.2%) others/did not wish to specify. Due to the overrepresentation of respondents from one of the universities, the results refer to the surveyed group and are not representative of students of Poznań. Correspondence Analysis (CA) was incorporated to enhance drawing conclusions from the obtained results and to visualize the relation between categorical variables.

Results: The survey showed that surveyed students limit their meat consumption to a greater extent (56.8%) than the national average (39%). Based on the correspondence analysis it was concluded that the size of the town of origin was not crucial in this respect. On the other hand, when CA was conducted on University affiliation it revealed two strong relations- University of Art's students tend to abstain from meat consumption while those studying at Technical University declare high meat consumption more frequently than the study population. Large gender differences could also be observed – among women, as many as 66.4% of respondents limited their meat consumption, while among men it was only 31.9%. The most important reasons for limiting meat consumption were concern for the environment (52.7%) and the desire to reduce animal suffering (49.0%).

Novelty: Main novelty of the study encompasses surveying respondents on issues relating to both human health, the state of the environment and ethics, as well as taking into account their interests and predispositions, represented by their university choice.

Keywords: meat, limiting consumption, environmental concern, health concern, limiting meat consumption

JEL classification: D12, Q01

Introduction

The global economy is facing major challenges associated with sustainable development, which encompasses both environmental and social issues (Rogall, 2010; Jackson, 2017; Klein, 2018; Hickel, 2020). While a considerable part of the discussion on sustainability to date has concerned mostly fossil fuels or the overuse of natural resources, as the topic has entered the mainstream discussion with the formulation of the 2015 Sustainable Development Goals (SDGs) (UN, 2022), it is also beginning to cover previously less popular issues. One such issue is the subject of excessive meat production and consumption and the impact of this on both the natural environment and human health (Migdał, 2007; Gerber et al., 2013; Richi et al., 2015; Steel, 2020). Embedding research in buyer behaviour and environmental protection is essential for understanding the impact of consumer choices on sustainability and shaping future policies to address global challenges like climate change and public health. In the face of growing climate problems and the spread of lifestyle-related civilisational diseases, the need to take sustainability principles into account becomes ever more urgent. Therefore, it seems particularly important to study the level of awareness of the younger generation, which in the near future will have a key influence both on political choices and the shaping of relevant legislation, as well as on consumer choices.

For the above reasons, the aim of this paper is to investigate the attitudes of surveyed students at Poznań universities towards limiting meat consumption. This type of research seems to be important for the emergence of some policy recommendations for shaping responsible consumption. Therefore, the study formulates sub-objectives consisting of:

- identifying the respondents' level of meat consumption reduction,
- identifying the differences in the level of meat consumption reduction and reasons for reduction among students of different universities, of different genders, or coming from towns of different sizes,
- identifying the main reasons for respondents limiting their meat consumption

The first part of the paper constitutes a literature review and presents an analysis of global trends relating to meat consumption. The second part will be devoted to the characteristics of the methodology and assumptions of the survey conducted among university students in Poznań on their attitudes towards limiting meat consumption. The third part will present the findings. In the last part conclusions and recommendations are formulated.

1. Global trends relating to meat consumption – a literature review

Animal source foods (ASF) such as meat, milk and eggs provide a high-quality source of ingredients and micronutrients (e.g. iron, zinc and vitamin B12). As such, they are believed to have contributed to the evolution of the human brain and social behaviour of homo sapiens (McHenry, Coffing, 2000; Milton, 2003; Smil, 2018). ASF were also a growing part of the food supply in Western and developing countries throughout the 20th Century (McRae et al., 2005). From the 1960s to 2010, per capita milk consumption almost doubled in developing countries, meat consumption tripled and egg consumption increased fivefold (Burlingame et al., 2010, p. 84). This was largely related to rising incomes and urbanization which influenced an increase in demand among many least developed countries (LDCs) – especially those that perceive the consumption of animal products as a marker of social status (Pica-Ciamarra, Otte 2009).

At the same time, despite their high nutritional value, over-consumption of animal products contributes to the rise of certain problems – the first group of which concerns human health. According to most dietary guidelines, consumption of meat for an average adult should not exceed the equivalent of about 30 kg per year (PHE, 2016; EAT-Lancet Commission, 2019; MFAFD, 2021). However, in many developed countries, annual per capita meat consumption is a multiple of this value; in 2017 it was 151 kg in Portugal, 146 kg in the United States and 99 kg in Poland (Our World in Data, 2017), which contributes to the rise of lifestyle related

civilisational diseases, such as cardiovascular diseases, type 2 diabetes and colorectal cancer (Migdał, 2007; Richi et al., 2015; WCRF, 2021; Szczebyło et al., 2022). Therefore, the prevailing view in literature is that meat consumption – particularly of red and highly processed meat – should be severely reduced (Richi et al., 2015; Mroczek et al., 2018; WCRF, 2021; WHO, 2021). There is also growing evidence that the widespread use of non-therapeutic antibiotics in animals may be facilitating the development of antibiotic resistance in humans, as up to 70% of these are ‘medically important’ antibiotics (i.e. commonly used in human medicine) (Martin, Thottathil, Newman 2015). With the recent experience of the COVID-19 pandemic, therefore, a growing number of voices can be heard advocating the use of alternative methods to keep livestock healthy, such as reducing cage farming and attending to the psychological wellbeing of farm animals (ATSOA, 2022).

The second group of issues related to meat consumption is associated with a negative impact on the environment. Unless countermeasures are taken, it is predicted that land devoted to meat production will need to increase by 30–50% by 2050, contributing to a drastic decline in biodiversity (Machovina, Feeley, Ripple, 2015). This is particularly relevant in relation to deforestation in the Brazilian Amazon, which between 1978 and 2011 reached up to 80% due to the conversion of forests to pasture (Tobar-López et al., 2019), posing one of the greatest challenges to global conservation goals (Skidmore et al., 2021). CO₂ emissions connected to meat production are yet another crucial aspect. In 2013, animal husbandry accounted for 14.5% of total global carbon dioxide emissions (Gerber et al., 2013, p. 15). Meanwhile, in case of the lack of action to reduce global CO₂ emissions by 2030, global warming will be made impossible to stop at 1.5 C above pre-industrial times (Rogelj et al., 2018). Exceeding these levels will contribute, among other things, to rising sea levels, warming and acidification of the oceans, the occurrence of longer and more intense droughts, which will put crops, wildlife and freshwater resources at risk (WWF, 2021). The resulting losses to the global economy from climate change could reach as much as 1.9 trillion USD per year by 2100 (Sanderson, O'Neill, 2020). Meat production also involves the usage of huge amounts of fresh water – for instance, producing 1 kg of beef involves the consumption of 14,500 litres of water (Hoekstra, Heek, 2017). According to some projections, if global demand for fresh water is not reduced, the world's supply might become fully exploited before 2100, with the possibility of severe drinking water shortages that may ultimately lead to armed conflicts (Meadows, Randers, Meadows, 2004). Finally, meat production is extremely energy inefficient – for example, in the case of beef, only 1.9 per cent of the energy (calories) inputted as feed is effectively converted into animal product (Alexander et al., 2016). Consequently, although beef provides humanity

with around 2 per cent of the calories, up to 60 per cent of total arable land is indirectly used for its production (Attenborough, 2021).

Meat consumption may also be a subject to some moral considerations, which date back to ancient Greece. While Plato criticised the consumption of meat in economic terms – as it was considered a luxury, requiring more land and wars to acquire it (Plato, 2017) – Aristotle already considered animals as sentient beings, endowed with memory and imagination (Grabowska, 2014). However, human benefits were still valued more highly than their welfare. In this sense, Aristotle's arguments went even further than those of St Thomas Aquinas, who advocated only to refrain from 'excessive cruelty' towards animals (St Thomas Aquinas, 1985). For the modern age, however, Descartes' theories emerged as the dominant ones. According to his tenet of "I think, therefore I am", Descartes reasoned that since animals lack the capacity for thought, they are essentially "machines" that are incapable of experiencing pain or suffering (Descartes 1981). Echoes of his arguments can be seen, for example, on industrial poultry farms, where average space per hen does not exceed 0.03 m² – while about 0.46 m² is needed for one to lie comfortably (Foer, 2013). Additionally, between 1935 and 1995, genetic alteration caused the typical broiler's weight to increase by 65%, its lifespan to be cut short by 60%, and its nutritional needs to be reduced by 57% (Grabowska, 2014). As a result, up to 90% of them experience apparent bone problems, which contribute to their chronic pain (Stinger, Mason 2012). Therefore, the practice of industrial animal husbandry, which involves keeping animals in cages or excessively small enclosures, appears increasingly irrational and cruel. The idea of default livestock, which states that animals should be raised in free-range conditions and fed with crop residues or food leftovers, becomes one of the key arguments cited by proponents of reducing meat consumption. However, this would require a drastic reduction in the number of farm animals compared to industrial farming (Steel, 2021).

While the literature extensively discusses both the benefits and concerns surrounding the consumption of animal-source foods (ASF), particularly in terms of human health, environmental sustainability, and ethical considerations, less is known about how these issues are perceived by different demographic groups. Understanding consumer awareness and attitudes towards meat consumption, especially among younger generations, is crucial for developing effective strategies to promote sustainable consumption patterns. In the literature, no information can be found regarding the exact amount of meat consumed among students. This gap in the literature has motivated the authors to conduct the present study, which aims to explore the attitudes of Poznań university students – a key demographic likely

to influence future policy and consumption trends – towards limiting meat consumption in the context of both health and environmental concerns.

Until recently, calls to reduce meat consumption have fallen on deaf ears – from the 1950s to 2015, global meat production more than doubled in value (Petrovic et al., 2015). One of the main questions occurring in consumer awareness studies to date has therefore been “is reducing meat consumption even realistic?”. In 2011 in a Denmark study respondents chose “5–6 times a week” as the most frequent answer (35%) to a question of how often do they eat meat for lunch, and the answers did not correlate with education (Dagevos, Voordouw, 2013). On the other hand, in a 2018 US study as many as 66% of respondents declared limiting their meat consumption to some extent – which showed a positive correlation with age and education (Neff et al., 2018). However, given the fact that the US consumes some of the highest amounts of meat per capita, it can be assumed that the declared limitation is not sufficient. A 2019 Australia study showed that 88% of the respondents regularly consumed meat, and the most common response was eating meat “4–6 times a week”. Only 29% of respondents were aware of the negative environmental impact of meat production (Marinova, Bogueva 2019). In a 2020 study among Polish students 42% of respondents declared to limit their meat consumption. The main important arguments in this regard were environmental concern (35%) and concern for animals (32%). Industrial meat production and its negative environmental impact was acknowledged by 46% of the respondents (Borusiak, Kucharska 2020). A 2021 study among Polish millennials aged 25–40 showed, that while only 32% of the respondents limited their meat consumption, 59% were aware of its negative environmental and health impact (Szczebyło et al., 2022).

Bearing in mind the issues raised so far, it seems interesting to explore the level of awareness about the consequences of meat consumption of a young Polish well educated generation, who is an important group for the future implementation of sustainable development solutions in European Union Member States (European Commission, 2019).

Another issue to consider is the type of university that the students attend. In relation to the groups of issues raised (concern for one’s own health and the environment) it can be presumed that personal predisposition, character or interests will play an important role here. This observation is often used within behavioural economics; for instance, it has been proven that students of economics have a noticeably higher level of egoism than students of other subjects (Marwell, Ames, 1981; Thaler, 2015). Sports students, on the other hand, are statistically more aware of the impact of their lifestyle on their health, which manifests itself in increased physical activity and a conscious choice of diet (Jakubiec et al., 2015; Cicchella,

Vecenane, Usca, 2022). Hence, it can be assumed that there will also be differences in attitudes towards limiting meat consumption depending on the university the students attend.

The remainder of this paper focuses on the methodology and results of a survey on Poznań university students' opinions on limiting meat consumption in the context of the aforementioned patterns.

2. Research methodology

The survey was conducted in the form of an online questionnaire (Computer-Assisted Web Interview; CAWI), addressed to students of Poznań universities. The choice of the target group for the survey was based on two issues. Firstly, in the light of the aforementioned patterns, it was decided that young and educated people – i.e. students – might be most important for the future of economic policy-making in the EU member states. Secondly, due to the survey's ability to obtain responses, the authors' city of residence was chosen, which made it possible to use their own networks of acquaintances to distribute the questionnaires.

A total of 873 respondents took part in the survey, including 575 (65.9%) women, 287 (32.9%) men and 11 (1.2%) others/did not wish to specify. This means that women are somewhat over-represented, as in 2021 the percentage of women attending tertiary education in Poznań was 58.44% and the percentage of men was 41.56% (BDMP, 2022) – however, this may be related to a greater interest in the topic of sustainability and reducing meat consumption by women, a fact that will be verified when analysing the survey results. Due to the distribution method of the questionnaires, the sample selection was random using the snowball method (Schroeder, Bartosik-Purgat, Mruk 2013). Due to the overrepresentation of PUEB students in the survey, caution should be taken when extrapolating the survey results to all of the students in Poznań.

In 2021, the survey population of Poznań university students was 104,729 (BDMP, 2022), which means that a sample size of $N = 873$ defines it at the 95% confidence level, with a margin of error of $\pm 3.3\%$ (CSR, 2012). A comparison was also made between the quantitative structure of the student population of Poznań universities and the sample of survey respondents (Table 1).

The quantitative structure of the survey sample differs slightly from that of the population, which is due to the limited possibilities of obtaining responses and the willingness of respondents from specific universities to cooperate. The Poznań University of Economics and Business is also over-represented, while the Poznań University of Technology is under-represented. Although this constitutes a certain limitation of the survey, the target of obtaining

at least 50 responses from each university was achieved. The universities were also selected to cover a broad range of academic disciplines and the total number of students at the universities included in the survey represents over 75% of the total number of students in Poznań.

Table 1. Comparison of the quantitative structure of the student population of Poznań universities¹ with the sample of survey respondents

University	Number of students in 2020/2021	Percent of Poznań students	Number of respondents	Percent of respondents
University of Economics and Business	7,619	7.3	296	33.9
Adam Mickiewicz University	35,051	33.5	275	31.5
University of Arts	1,388	1.3	77	8.8
University of Technology	15,882	15.2	62	7.1
University of Life Sciences	7,984	7.6	59	6.8
University of Medical Sciences	7,335	7.0	52	6.0
University of Physical Education	3,569	3.4	52	6.0
Total	78,828	75.3	873	
Students in Poznań	104,729			

Source: AWF (2022); BDMP (2022); PP (2021); UAM (2021); UAP (2021); UEP (2021); UMP (2021); UPP (2021).

The survey questionnaire consisted of nine single- and multiple-choice questions, which were based on the methodology used in the previous studies on the topic (Borusiak, Kucharska, 2020; Hązła, Michowska, 2022). The first two questions were metric in nature and related to locality of origin and gender (the question on age was omitted due to the homogeneity of the study population in this aspect). The next questions referred to the impact of excessive meat consumption on human health and the environment as perceived by the respondents. They asked about: frequency of meat consumption, limiting meat consumption, arguments for limiting meat consumption, perceptions of the impact of meat and meat-free diets on health, and the environment.

In order to improve on the analysis process, a binary correspondence analysis has been used. The method allows to present table of counts of two categorical variables in the form of a plot. After calculating the conditional probabilities of each row and column of such a table and applying a Singular Value Decomposition (SVD) we are able to assign each category of the

¹ They represent the majority (7 out of 8) of the public universities in Poznań, which are attended by the largest number of students, thus allowing for the most effective overview of the population (the remaining 17 non-public universities enroll less than 1/4 of the students in Poznań). The only one missing is Ignacy Jan Paderewski Academy of Music in Poznań due to difficulties in obtaining survey responses, which stems from its relatively low student count (less than 1,000), see (Kuratorium Oświaty w Poznaniu, 2021).

two variables a set of coordinates and create a perception map (biplot). (Greenacre, 2010). Such a visualization allows for simpler recognition of often unobvious relations in data. The most important factor in correspondence analysis interpretation is inertia – the point’s distortion from the relative centre of gravity. Categories that fall close to the “0; 0” coordinates (low inertia) do not differ a lot depending on the other variable’s value. Categories with higher inertia levels and their relation with second variable’s categories should be analysed based on distance between the points. It is crucial that conclusions should be drawn based on the position of one category from one variable relative to the position of all categories from another. The proximity of two point’s is not enough to asses a relation, high level of inertia and point visibly leaning away from different points of the other category are decisive. A categorical analysis was conducted using the *ca R* package (Nenadic, Greenacre, 2007; R Core Team, 2013).

3. Findings

Respondents were asked to specify the frequency with which they eat meat. A summary of their responses by gender is shown below in Table 2. It can be observed that the results differ significantly between the sexes, with the most frequently chosen answer by women being ‘2–5 times a week’ (38.1%) and by men ‘more than 5 times a week’ (45.6%). Women also had a nearly three times lower percentage of respondents eating meat ‘more than 5 times a week’ (17.9%) than men (45.6%). Men, on the other hand, had the lowest percentage of responses ‘1–5 times a month’ (3.6%) representing moderate/often meat consumption, which allows us to presume that they prefer clear positions – i.e. they either eat meat without restriction or not at all. Those who declared themselves neither male nor female were most likely to answer ‘never/rarely’ (36.4%), and were also least likely to answer ‘more than 5 times a week’ (9.0%).

Table 2. Frequency of meat consumption by respondents according to gender (%)

Specification	Less than once a month or never	1–5 times a month	2–5 times a week	More than 5 times a week
Overall	18.3	15.5	37.1	29.1
Women	23.3	20.7	38.1	17.9
Men	19.5	3.6	31.3	45.6
Other/did not wish to specify	36.4	36.4	18.2	9.0

Source: authors’ own elaboration.

The results reveal significant gender differences in meat consumption habits, with women generally reporting more moderate intake compared to men, who tend to consume meat more frequently. Additionally, respondents who identified themselves as neither male nor female were more likely to limit or avoid meat entirely, indicating a possible higher awareness of or sensitivity to environmental and ethical issues within this group.

Table 3. Frequency of meat consumption by respondents by place of residence (%)

Specification	Less than once a month or never	1–5 times a month	2–5 times a week	More than 5 times a week
Overall	18.3	15.5	37.1	29.1
Village	17.9	15.8	39.6	26.7
City of up to 50,000 inhabitants	17.6	17.6	32.9	31.9
City of 50–500,000 inhabitants	19.8	11.0	39.0	30.2
City of over 500,000 inhabitants	17.4	31.4	23.5	27.7

Source: authors' own elaboration.

The correspondence analysis below (Figure 1) indicates the existence of two relations. Residents of cities up to 50,000 inhabitants are more likely to eat meat more than 5 times a week, while people coming from towns/villages chose the option of “2–5 times a week” more often than the other groups. Although it must be pointed out that neither of those relations is a strong one. It was also confirmed that the answer “never” is not associated with place of residence. It can therefore be concluded that the size of the locality of residence is not as significant a variable as gender in the case of the frequency of meat consumption.

Significant differences can be observed in the declared frequency of meat consumption between universities. Students at the University of Economics and Business (9.8%) and the University of Physical Education (11.5%) were least likely to declare eating meat “never or less than once a month”, while the corresponding percentage was highest for Adam Mickiewicz University (24.4%) and the University of Arts (41.6%). At the same time, students at the University of Arts (16.9%) and Adam Mickiewicz University (24.0%) were the least likely to declare meat consumption “more than 5 times a week”, while students at the University of Economics and Business (32.8%) and especially the University of Technology (50.8%) were the most likely. If the assumption of an equal number of male and female respondents in each university is made, this differentiation is lower, however still substantial. While the Poznan University of Arts and Adam Mickiewicz University would still consume meat the least often,

some changes appear in universities with the highest meat consumption, as those with the highest percent of students consuming meat more than five times a week would be now the University of Life Sciences and the University of technology.

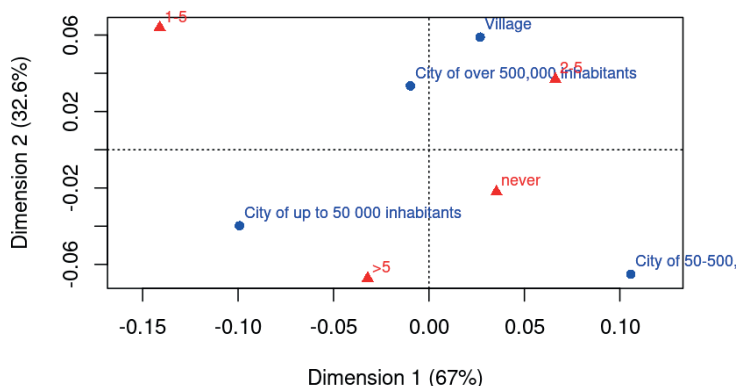


Figure 1. Correspondence analysis of meat consumption by respondents by place of residence

Source: authors' own elaboration, *ca R* package.

The university attended by the respondents was used as a further criterion for dividing the responses regarding frequency of meat consumption (Table 4).

Table 4. Frequency of meat consumption by respondents by university (%)

Specification	Less than once a month or never	1–5 times a month	2–5 times a week	More than 5 times a week
University of Economics and Business	9.8	13.9	43.6	32.8
Adam Mickiewicz University	24.4	14.9	36.7	24.0
University of Arts	41.6	24.7	16.9	16.9
University of Technology	15.9	11.1	22.2	50.8
University of Life Sciences	15.3	20.3	35.6	28.8
University of Medical Sciences	13.5	21.1	40.4	25.0
University of Physical Education	11.5	7.7	50.0	30.8

Source: authors' own elaboration.

According to the correspondence analysis (Figure 2) the answers of students of 5 of the 7 universities are not strongly associated with any of the frequencies, although it can be observed that Students from the University of Economics and Business (PUEB) and the University of Physical Education (PUPE) tend to choose answers associated with high

consumption (“2–5” and “5>”) while students of Adam Mickiewicz University (AMU) lean towards answers associated with reductionism (“1–5”, “Less than once a month or never”).

There are two visible tendencies – respondents from the University of Arts (PUA) display a strong tendency for choosing the “Less than once a month or never” answer, whereas studying at the University of Technology (PUT) is associated with eating meat more than 5 times a week.

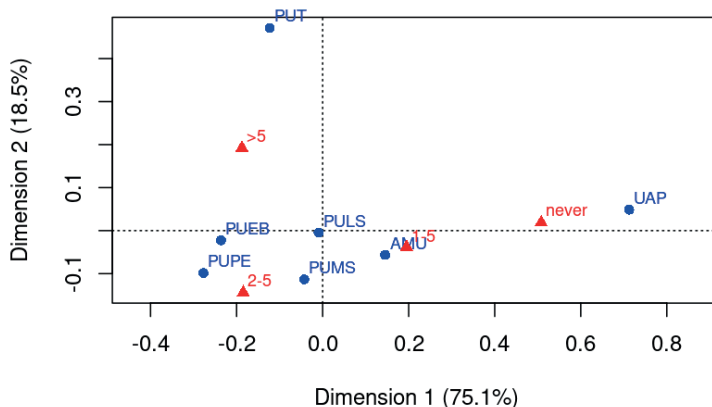


Figure 2. Correspondence analysis of meat consumption by respondents by university

Source: authors' own elaboration, *ca R* package.

The observed differences in meat consumption among students from various universities may be explained by the values emphasized at each institution. Students at the University of Economics and Business and the University of Physical Education, for example, may be more focused on efficiency, performance, and physical health, which could lead to higher meat consumption as part of an easy to balance, protein-rich diet. On the other hand, students from Adam Mickiewicz University and the University of Arts, where fields of study may emphasize humanities, environmental awareness, and ethical considerations, are more likely to adopt a reductionist approach to meat consumption. The strong tendency among the University of Technology students to consume meat frequently could be linked to the practical and technical nature of their studies, where lifestyle habits may be shaped more by convenience or routine rather than ethical concerns. Therefore, these consumption patterns may reflect not only personal preferences but also the broader cultural and educational values associated with each academic institution.

Respondents were then asked to state whether they try to limit their meat consumption. The majority of respondents agreed (56.8%), but the results differed significantly between the

sexes (Table 5). 64.4% of women and only 31.9% of men limit their meat consumption, as well as 81.8% of those not declaring themselves to be either women or men.

Table 5. Percentage of respondents limiting meat consumption by gender (%)

Specification	Limiting meat consumption	Not limiting meat consumption
Overall	56.8	43.2
Women	66.4	33.6
Men	31.9	68.1
Other/did not wish to specify	81.8	18.2

Source: authors' own elaboration.

This means that with a survey sample close to the actual gender parity found in Poland (51.6% women and 48.4% men) (Poland in Numbers, 2021), only 49.7% of respondents would limit their consumption. However, this still means that the survey population is restricting meat consumption to a much greater extent than the national average of 39% in 2021 (Filip, 2021).

If the data analysed are limited to the answers given by people identifying themselves as male or female (Table 6), the probabilities of a person of a certain sex limiting their meat consumption can be calculated.

Table 6. Number of respondents limiting meat consumption according to gender

Specification	Limiting meat consumption	Not limiting meat consumption
Women	382	193
Men	105	182

Source: authors' own elaboration.

If "A" is an event that a female student limits meat consumption and "B" is an event that a male students limit theirs, then:

$$Odds(A) = \frac{382 / 575}{1 - 382 / 575} \approx 1.98, Odds(B) = \frac{\frac{105}{287}}{1 - \frac{105}{287}} \approx 0.57$$

This allows to calculate the odds ratio of AB which is:

$$\theta(AB) \approx \frac{1.98}{0.57} \approx 3.43$$

Meaning that, according to the collected data, female students are 3.43 times more likely to limit their meat consumption than the male students. The obtained results confirm previous observations regarding the significance of gender in the approach to limiting meat consumption. The data analysis reveals that differences in behaviours related to meat reduction may be significantly associated with the respondents' gender.

Table 7 shows the responses to the question regarding limiting meat consumption by size of the place of residence. As in the case of the frequency of meat consumption, a relatively smaller effect of the size of the place of residence on limiting meat consumption can be observed. The percentage of respondents trying to limit their meat consumption oscillates between 53.4% and 56.8%, with the only significant deviation from this pattern being in the category of towns/cities with up to 50,000 inhabitants, where the corresponding percentage was 61.6%.

Table 7. Percentage of respondents limiting meat consumption by place of residence (%)

Specification	Limiting meat consumption	Not limiting meat consumption
Overall	56.8	43.2
Village	56.7	43.3
City of up to 50,000 inhabitants	61.6	38.4
City of 50–500,000 inhabitants	56.6	43.4
City of over 500,000 inhabitants	53.4	46.6

Source: authors' own elaboration.

Table 8. Percentage of respondents limiting meat consumption by university (%)

Specification	Limiting meat consumption	Not limiting meat consumption
University of Economics and Business	51.4	48.6
Adam Mickiewicz University	62.2	37.8
University of Arts	80.5	19.5
University of Technology	39.7	60.3
University of Life Sciences	59.3	40.7
University of Medical Sciences	51.9	48.1
University of Physical Education	48.1	51.9

Source: authors' own elaboration.

The university attended by the respondents was used as a further criterion to divide the responses (Table 8). As in the case of the question relating to the frequency of meat consumption, clear differences can be observed in the declared limitation of meat consumption. Among the

Poznań universities, limiting meat consumption is indicated least often by students of the University of Technology (39.7%) and most often by students of Adam Mickiewicz University (62.2%) and the University of Arts (80.5%). Once again the differentiation between universities with focus on technical and on humanistic subjects is clearly visible.

Respondents were also asked to identify which arguments influence their decision to limit meat consumption (Table 9). Overall, the most important reasons were found to be ecological/environmental aspects (52.7%), and the desire to reduce animal suffering (49.0%), while the least important aspect was financial (17.3%). Significant gender differences could also be observed; among women, only half as many respondents (16.1%) as among men (31.4%) declared that their decision to reduce meat consumption was not influenced by any arguments. For women, the desire to reduce animal suffering was also found to be of much importance (56.1%), while only 34.3% of men found this issue to be relevant. For those declaring themselves neither female nor male, both environmental aspects and the desire to reduce animal suffering proved to be the most important (63.6%), while financial issues were the least important (18.2%).

Table 9. Percentage of respondents by gender limiting their meat consumption due to specific arguments, by gender (%)

Argument	Overall	Women	Men	Other/did not wish to specify
None	24.2	16.1	31.4	18.2
Improving health and well-being	41.0	43.1	36.0	27.3
Ecological/environmental aspects	52.7	63.3	45.1	63.6
Desire to reduce animal suffering	49.0	56.1	34.3	63.6
Financial considerations	17.3	17.1	17.7	18.2

Source: authors' own elaboration.

Responses to the questions concerning reasons for limiting meat consumption were also divided according to the university attended by the respondents (Table 10). Students at the University of Arts (11.7%) had the smallest percentage of respondents whose decision to limit meat consumption was not influenced by any arguments, and students at the University of Economics and Business (30.7%) had the largest percentage. Students at Adam Mickiewicz University were most likely to limit their meat consumption due to a desire to improve their health (55.3%), and students at the Poznań University of Technology were least likely to do so (30.2%). Environmental aspects and the desire to reduce animal suffering were found to be most important for students at the University of Arts (83.1% and 76.6% respectively) and least important for students at the University of Economics and Business (42.6% and 38.0%

respectively). As the correspondence between the city of residence and the questionnaire results were not significant, they are not analysed more deeply within this paper.

Table 10. Percentage of respondents by gender limiting their meat consumption due to specific arguments, by university* (%)

Argument	PUEB	AMU	PUA	PUT	PULS	PUMS	PUPE
None	30.7	21.5	11.7	30.2	22.0	15.4	23.1
Improving health and well-being	41.9	55.3	48.1	30.2	40.7	38.5	42.3
Ecological/environmental aspects	42.6	56.0	83.1	47.6	54.2	59.6	46.2
Desire to reduce animal suffering	38.0	41.1	76.6	38.1	50.8	57.7	42.3
Financial considerations	12.0	18.9	13.0	14.3	18.6	21.2	13.5

* PUEB – Poznań University of Economics and Business, AMU – Adama Mickiewicz University, PUA – Poznań University of Arts, PUT – Poznań University of Technology, PULS – Poznań University of Life Sciences, PUMS – Poznań University of Medical Sciences, PUPE – Poznań University of Physical Education.

Source: authors' own elaboration.

Finally, respondents were asked to compare meat-free and traditional diets in terms of their impact on human health and affordability, which can help identify potential barriers to reducing their meat consumption (Table 11). Although the majority of respondents (52.6%) do not have an opinion on the subject, the percentage of those who consider a meat-free diet to be healthier (39.4%) is almost five times higher than the percentage who disagree (8.0%). When it comes to their perceived affordability, 42.6% of respondents have no opinion on which diet is more expensive. However, 26.6% of respondents agree with the statement that meat-free diets are more expensive than traditional diets – a comparable figure to the percentage of respondents disagreeing with this statement being (30.8%).

Table 11. Respondents' opinions on meat-free and traditional diets (%)

Opinion	Agree	No opinion	Disagree
A meat-free diet is healthier than a traditional diet	39.4	52.6	8.0
A meat-free diet is more expensive than a traditional diet	26.6	42.6	30.8
I can financially afford to go on a meat-free diet	63.0	17.8	19.2

Source: authors' own elaboration.

Although the majority of respondents do not have an opinion on the price differences between meat-free and traditional diets, as many as 63.0% believe that they could financially afford to switch to a meat-free diet. 19.2% of respondents disagree with this statement and

17.8% have no opinion. Therefore, it can be concluded that financial issues are not a significant barrier to reducing meat consumption among students. Hence, an appropriate educational policy will have an important role to play, pointing out the potential benefits for both human health and the environment of limiting meat consumption.

Conclusions

The main aim of this paper was to investigate the attitudes of surveyed students at Poznań universities towards limiting meat consumption. It has been shown that the negative effects of excessive meat consumption concern both the environment and human health.

A survey of Poznań university students showed that students limit their meat consumption to a greater extent (56.8% of respondents) than the national average (39%). Large gender differences could be observed, namely among women, as many as 66.4% of respondents limited their meat consumption, while among men it was only 31.9% (among those declaring themselves neither women nor men: as many as 81.8%). This translates into the fact that female students are 3.43 times more likely to limit their meat consumption than the male students. Declarations on limiting meat consumption also differed between universities – among students at the University of Technology, only 39.7% declared this, while among students at the University of Arts as many as 80.5%. The most important reasons for limiting meat consumption by students at Poznań universities were concern for the state of the environment (52.7%) and the desire to reduce animal suffering (49.0%). On the other hand, the size of the place of residence was not crucial in this respect – despite some deviations (61.6% of those limiting their meat consumption in towns/cities up to 50,000), in most cases the percentage of those limiting their meat consumption was close to the average value of the survey. For the majority (63.0%) of respondents, switching to a meat-free diet would also not pose a financial problem.

The main novelty of the study encompasses surveying respondents on issues relating to both human health, the state of the environment and ethics, as well as taking into account their interests and predispositions, represented by their university choice, which can help in tailoring the adequate educational policies. Thus, the scope of the research has been broadened compared to previous studies (Borusiak, Kucharska, 2020; Hązła, Michowska, 2022), which mainly dealt with the perceived environmental impact of meat consumption by respondents. Meanwhile, concern for one's own health may be an even more important reason for limiting meat consumption (Malek, Umberger, Goddard, 2019).

Future research should take into account the insights made in this paper, covering differences in consumer preferences towards meat between students of different genders and those attending universities representing different fields of study. Therefore, informational and educational policies relating to limiting meat consumption could be tailored with the above differences in mind.

Hence, it can be concluded that there is a high level of awareness among the surveyed Poznań university students regarding the harmfulness of excessive meat consumption, so if the attitudes of students in most Polish cities would be similar, then limiting meat consumption to the recommended amounts should not pose to many difficulties for younger generations. In the face of growing climate problems in the 21st century, this is good news because the current level of meat production exceeds the regenerative capacity of the planet and should be reduced to a more sustainable level (Hickel, 2020, p. 217; Steel, 2021). Indeed, the 'From Farm to Fork' food strategy adopted by the European Union mentions, among other things, the pursuit of a sustainable food system. In the context of meat production and consumption, this means promoting less meat consumption, in particular beef and pork (European Commission, 2020).

On the basis of the above observations, it therefore seems reasonable to make some recommendations that could support educational policy on the issues raised throughout the paper. Firstly, taking into account the broader context of issues related to excessive meat consumption, it will be worth supporting NGOs and other grassroots movements raising public awareness of sustainable development, which will help to build co-responsibility for global problems among the public. Secondly, it may be important to promote consumer education, covering both the basics of dietetics, a discussion on meat substitutes and the impact of meat over-consumption on human health and the environment. Elements of the above could appear in the syllabuses of subjects such as biology or social studies, benefiting society as a whole by tackling obesity and other civilizational diseases.

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Citation

Hązła, M., Michowska, K., Cudnik, E. (2025). The Views of Poznań Students Regarding Limiting Meat Consumption. *Folia Oeconomica Stetinensia*, 25(2), 115–137. DOI: 10.2478/fofi-2025-0025.