

The Influence of Understanding the Human Body System, Chemical Reactions, and Energy on Health Decisions and Eating Patterns in Society

Thoriqi Firdaus¹, Lisda Yasin Bakari², Nurul Hidayah³, Solehatun Munawaroh⁴, Restiyawati⁵, Umi Kalsum Djano⁶

¹Natural Science Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia

²School of Humanities and Languages, Faculty of Arts, Design, and Architecture, University of New South Wales, Sydney, Australia

³Chemistry, Faculty of Mathematics and Natural Sciences, Bandung, Institut Teknologi Bandung, Indonesia

⁴Agroindustrial Technology, Faculty of Agricultural Technology, Universitas Gadjah Mada, Yogyakarta, Indonesia

⁵Biology, Faculty of Biology, Universitas Gadjah Mada, Yogyakarta, Indonesia

⁶Physics Education, Faculty of Mathematics and Natural Science, Universitas Pendidikan Indonesia, Bandung, Indonesia

Korespondensi: thoriqifirdaus.2023@student.uny.ac.id

Abstrak

Rendahnya tingkat pemahaman masyarakat mengenai bagaimana tubuh manusia berfungsi akan memengaruhi pola makan dan keputusan kesehatan. Penelitian ini mengkaji pengaruh pemahaman masyarakat tentang sistem tubuh manusia, reaksi kimia, dan mekanisme energi terhadap keputusan kesehatan serta pola makan, dan peran faktor sosial-ekonomi dan dukungan sosial. Pendekatan yang digunakan adalah kuantitatif deskriptif korelasional dengan desain cross-sectional, melibatkan 328 responden yang dipilih menggunakan teknik stratified random sampling. Analisis data dilakukan dengan Structural Equation Modeling (SEM). Hasil penelitian menunjukkan bahwa faktor sosial-ekonomi berpengaruh moderat terhadap pola makan (0.285, p-value 0.002) dan keputusan kesehatan (0.369, p-value 0.050). Pemahaman tentang sistem tubuh berpengaruh positif terhadap pola makan (0.145, p-value 0.097) dan keputusan kesehatan (0.321, p-value 0.008), serta faktor sosial-ekonomi (0.345, p-value 0.001) dan lingkungan sosial (0.389, p-value 0.000). Pemahaman tentang reaksi kimia mempengaruhi pola makan (0.403, p-value 0.000) dan faktor sosial-ekonomi (0.245, p-value 0.001), meskipun pengaruhnya terhadap keputusan kesehatan (0.087, p-value 0.146) tidak signifikan. Pemahaman tentang energi berpengaruh terhadap faktor sosial-ekonomi (0.401, p-value 0.000), namun tidak berpengaruh signifikan terhadap pola makan (0.133, p-value 0.092) dan keputusan kesehatan (-0.071, p-value 0.633). Seluruh konstruk yang digunakan telah diuji dengan baik dalam hal validitas dan reliabilitas, dengan nilai SRMR yang lebih kecil menunjukkan kecocokan model yang baik dengan data. Segmentasi berbasis prediksi menunjukkan bahwa intervensi kesehatan yang disesuaikan dengan karakteristik segmen dapat lebih efektif dalam meningkatkan pola makan dan keputusan kesehatan. Temuan ini penting untuk merancang intervensi kesehatan masyarakat guna meningkatkan pola makan dan keputusan kesehatan.

Kata kunci: sistem tubuh, reaksi kimia, energi, keputusan kesehatan, pola makan

Abstract

The lack of public understanding regarding how the human body functions affects eating patterns and health decisions. This study examines the impact of public understanding of the human body system, chemical reactions, and energy mechanisms on health decisions, eating patterns, and the role of socio-economic factors and social support. The approach used is a descriptive correlational quantitative method with a cross-sectional design involving 328 respondents selected using stratified random sampling. Data analysis was conducted using Structural Equation Modeling (SEM). The results indicate that socio-economic factors moderately influence eating patterns (0.285, p-value 0.002) and health decisions (0.369, p-value 0.050). Understanding of the body system positively influences eating patterns (0.145, p-value 0.097) and health decisions (0.321, p-value 0.008), as well as socio-economic factors (0.345, p-value 0.001) and social environment (0.389, p-value 0.000). Understanding of chemical reactions influences eating patterns (0.403, p-value 0.000) and socio-economic factors (0.245, p-value 0.001), although its impact on health decisions (0.087, p-value 0.146) is not significant. Understanding of energy influences socio-economic factors (0.401, p-value 0.000) but does not significantly affect eating patterns (0.133, p-value 0.092) and health decisions (-0.071, p-value 0.633). All constructs used have been well tested for validity and reliability, with the smaller SRMR value indicating a good model fit to the data. Segmentation based on predictions shows that health interventions

tailored to segment characteristics can improve eating patterns and health decisions more effectively. These findings are crucial for designing public health interventions to improve eating patterns and health decisions.

Keywords: human body system, chemical reactions, energy mechanisms, health decisions, eating patterns

Introduction

The low level of public understanding regarding how the human body functions requires attention (Frayn, 2022; Snapir et al., 2017). This lack of understanding results in many individuals being unaware of the importance of healthy eating patterns and lifestyle habits that support bodily equilibrium (Pocock et al., 2018). Some individuals fail to comprehend how the digestive and metabolic processes work and how food consumption is transformed into the energy required by the body (Sherwood et al., 2004; Aldhalemi & Lahnob, 2024). This outcome affects unhealthy eating habits, such as high-calorie, low-nutrient foods, leading to long-term health issues (Mitra et al., 2023).

The issue of low public understanding of the human body, chemical reactions, and energy mechanisms is crucial to address, as it can directly impact the health quality of individuals and society. A proper understanding of how the body operates can raise individual awareness of the importance of healthy eating patterns and lifestyle habits that support long-term health (Mert-Biberoğlu et al., 2023). Without this understanding, individuals often make poor choices regarding food, physical activity, or other habits that increase the risk of chronic diseases such as obesity, diabetes, hypertension, and heart disease (Thompson, 2020; Kohler, 2024). This ignorance has the potential to reduce quality of life.

A lack of understanding of chemical reactions in the body is also significant because these reactions affect various vital processes in the body, such as digestion, nutrient absorption, and energy metabolism (Pocock et al., 2018; Stipanuk & Caudill, 2018). Individuals who do not understand the body's mechanisms for processing food and energy tend to neglect the importance of nutritional balance and choose foods that do not support their health (Godswill et al., 2020). As a result, individuals often make poor decisions when selecting food types or following an unhealthy lifestyle (Runo et al., 2020).

In addition to the low understanding of the human body, socio-economic factors also play a critical role in influencing eating patterns and health decisions. Low socio-economic status often hinders access to accurate health information and the resources necessary to establish healthy eating patterns (Lantz et al., 2001; Firdaus et al., 2022). Research shows that individuals with lower levels of education and limited income are more likely to consume fast food or processed foods that are more affordable (Eng et al., 2022; Marchese et al., 2022).

A non-supportive social environment can also be a barrier to optimal health decisions. Social support from family, friends, and communities plays a significant role in shaping an individual's healthy habits (Labrague, 2021). Without strong social support, individuals may struggle to make better choices regarding eating patterns or healthy lifestyle habits. All these factors interact, where ignorance leads to suboptimal health decisions, which may impact society's overall quality of life (Bandura, 2004).

In efforts to reduce diseases caused by poor eating habits and unhealthy lifestyles, many studies have shown that behavior change based on understanding the body and its health can prevent such diseases. Examples of diseases like obesity, type 2 diabetes, and coronary heart disease are conditions primarily influenced by lifestyle factors, including food choices and physical activity levels (Figuroa, 2022). According to data from the World Health Organization

(WHO), non-communicable diseases (NCDs) are often triggered by poor eating habits and lack of physical activity. More than 70% of global deaths are caused by NCDs, including heart disease, stroke, and diabetes (WHO, 2024). A better understanding of the human body system and the biological processes that occur within the body is important, as it can support effective behavior changes in disease prevention and the reduction of healthcare costs associated with chronic diseases (Sagastume et al., 2022).

The significance of this issue lies in the disparity of access to health information and resources available within society. Socioeconomic factors, education levels, and income significantly affect individuals' ability to obtain health information (Marmot, 2015). Research shows that lower economic groups often have limited access to health education, nutritious food products, and adequate healthcare services (Braveman & Gottlieb, 2014). These outcomes result in health behavior disparities among different social groups, as those with limited access are more vulnerable to chronic diseases linked to poor eating patterns (Darmon & Drewnowski, 2008). Addressing this understanding issue is important for individual well-being and a strategic step in reducing societal health disparities (Wilkinson & Pickett, 2010).

A study by Worsley (2002) highlighted the relationship between understanding body functions and healthy eating habits. This research demonstrated that individuals with a better understanding of how the body processes food and utilizes energy tend to be more selective in choosing healthier and more nutritious foods. Knowledge of biological processes such as metabolism and digestion can reinforce decisions to choose foods that support the body's overall health, as they are more aware of the long-term impact of food choices on health (Worsley, 2002).

Research highlights the significant role of knowledge in shaping healthier lifestyle habits. Wardle et al. (2000) found that a deeper understanding of the immune system encourages individuals to choose diets rich in vitamins, minerals, and antioxidants, enhancing body resilience. Similarly, Kolodinsky et al. (2007) demonstrated that awareness of how the body metabolizes food influences healthier eating choices, such as opting for complex carbohydrates. Furthermore, social and economic factors, as shown by Darmon & Drewnowski (2008), affect individuals' understanding of the relationship between diet and health, with those from higher socio-economic backgrounds having better access to nutritious food and healthcare. Social support, as Ball et al. (2010) observed, also contributes to healthier lifestyle choices by motivating individuals to maintain active habits. Additionally, Contento (2007) emphasized that community-based educational programs about the human body's functions and energy metabolism can significantly improve public health decisions and promote active participation in maintaining health.

The research to be conducted closely relates to previous studies that investigate the relationship between knowledge of the human body, biological processes, and health behaviors, but with a more specific focus on the interaction between understanding the human body system, chemical reactions in the body, and energy mechanisms that influence health decisions and eating patterns in society. Unlike many studies that focus on one factor or aspect of health, this research explores the multidimensional relationship between public knowledge of the human body, metabolism, and its influence on health behaviors and eating patterns, also considering moderating factors such as social and economic influences and social support.

One novelty of this study lies in its more comprehensive and integrated approach. This research focuses on one dimension of knowledge and combines several interrelated independent variables: understanding the human body system, chemical reactions, and energy, and how all of these contribute to health and eating decisions. This study aims to examine the influence of public

understanding of the human body system, chemical reactions, and energy mechanisms on their health decisions and eating patterns and to analyze the role of moderating factors such as socioeconomic status and social support in these relationships. This study aims to explore how understanding the biological processes occurring within the body can influence eating behavior and healthy lifestyle habits and to develop a more comprehensive analytical model using Structural Equation Modelling (SEM) to examine direct and indirect relationships among the involved variables.

Method

This study employs a quantitative approach with a descriptive correlational design to analyze the relationships between public understanding of the human body system, chemical reactions, and energy mechanisms with health decisions and eating patterns. The research design is cross-sectional, meaning data is collected simultaneously to depict the relationships between the variables under investigation (Setia, 2016). The sample for this study consists of Indonesian residents from the Madura Island region, aged 17-60, selected randomly using stratified random sampling techniques, ensuring diversity in groups based on age, gender, and education level, with a total of 328 respondents to ensure the validity of the results (Creswell & Creswell, 2017).

Data was collected through a questionnaire of several sections to measure understanding of the human body system, chemical reactions, energy, health decisions, eating patterns, socio-economic factors, and social support. The validity and reliability of the questionnaire were tested using expert reviews and Cronbach's alpha (Tavakol & Dennick, 2011). The measured sections were then used as independent, dependent, and moderating variables, as shown in Figure 1.

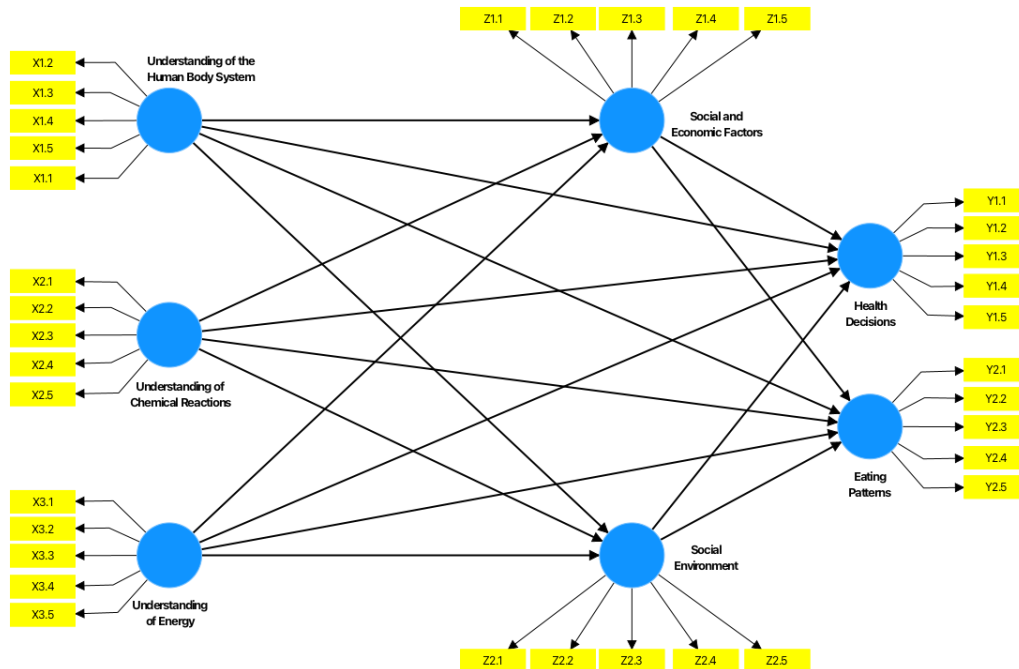


Figure 1 Research Framework (Source: SmartPLS)

Independent Variables (Exogenous)

X1: Understanding of the Human Body System

X2: Understanding of Chemical Reactions

X3: Understanding of Energy

Dependent Variable (Endogenous)

Y1: Health Decisions

Y2: Eating patterns

Moderating Variables

Z1: Social and Economic Factors

Z2: Social Environment

Once the data was collected, the research procedure involved data cleaning and validation to ensure the accuracy and completeness of the information. Data analysis was conducted using Structural Equation Modeling (SEM) with the SmartPLS software, which allows for modeling the relationships between variables and identifying both direct and indirect effects between understanding the human body and health behaviors (Sarstedt et al., 2021). SEM was used to test the measurement and structural models, examining convergent and discriminant validity and evaluating the goodness of fit to ensure the model's alignment with the data. Path analysis was also performed to test hypotheses regarding the relationships between variables.

This study adhered to ethical guidelines by obtaining informed consent from each respondent and ensuring the confidentiality of the collected data. With these clear procedures and structured methodology, this research is expected to significantly contribute to understanding the influence of human body knowledge on health decisions and eating patterns in society and provide a solid foundation for more effective health policies.

Result and Discussion

Path Analysis

Path analysis was used to illustrate the direct and indirect relationships between various variables influencing health decisions, eating patterns, and socio-economic factors within society. Path analysis is a statistical method that allows researchers to test and estimate causal relationships between the variables involved in the model (Lieras, 2005). Figure 2 displays the path analysis model used in this study, with each path representing the influence between constructs and the path coefficients indicating the strength and direction of the relationships between variables.

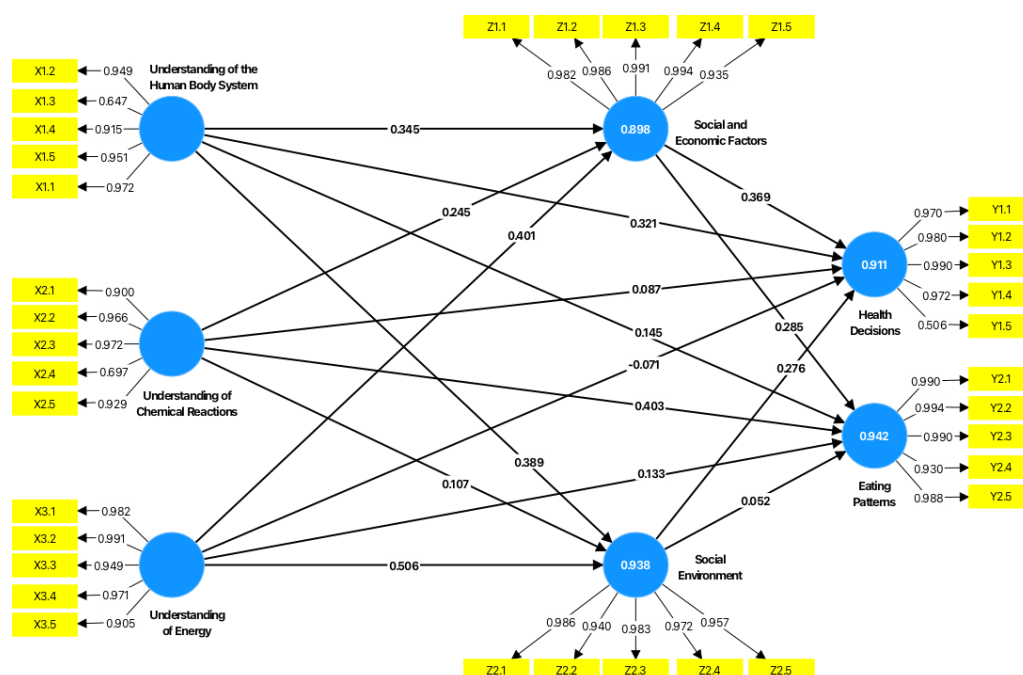


Figure 2. Path Analysis (Source: SmartPLS)

Based on Figure 2, a path coefficient of 0.285 indicates that socioeconomic factors positively influence societal eating patterns. This means that an individual's socio-economic conditions, such as income, education, and access to resources, play a role in determining eating patterns. People with higher socio-economic status tend to have better access to healthy food and healthcare facilities, enabling them to make healthier food choices. Although the effect is moderate, this finding highlights the importance of socio-economic factors in shaping societal eating habits.

The independent variables in this study include socio-economic factors, the social environment, and understanding of the human body system, chemical reactions, and energy. Socio-economic factors have a significant influence on societal health decisions, with a path coefficient of 0.369, indicating that better economic conditions improve an individual's ability to make healthier decisions related to lifestyle and healthcare. The social environment also plays a role, especially in health decisions, with a path coefficient of 0.276, demonstrating its influence on individuals' decisions related to lifestyle habits, such as food choices and exercise. Furthermore, the understanding of the human body system and chemical reactions positively impacts eating patterns, with path coefficients of 0.145 and 0.403, respectively, indicating that knowledge about the body's functioning encourages healthier food choices. However, the understanding of energy has a smaller influence on eating patterns (0.133) and health decisions (-0.071), suggesting its limited impact on these behaviors.

The moderating variables in this study include how understanding of the human body system, chemical reactions, and energy influences socio-economic factors and the social environment. The results show that the understanding of the human body system positively impacts socio-economic factors (0.345), suggesting that greater knowledge about health can lead to better socio-economic conditions. Chemical reactions, although it has a small impact on the social environment (0.107), plays a role in influencing socio-economic factors (0.245), indicating that understanding food's chemical interactions can influence healthier eating habits, which in turn affect economic aspects. The understanding of energy significantly influences the social environment (0.506), indicating that knowledge about energy balance can affect community interactions and social norms related to healthy lifestyles. This influence on the social environment is more pronounced than its effect on health decisions or eating patterns.

The dependent variables in this study include eating patterns, health decisions, and socio-economic factors. Eating patterns are notably influenced by understanding chemical reactions (0.403), which encourages healthier food choices based on how the body processes food. Although understanding the human body system has a smaller influence on eating patterns (0.145), it still plays a role in guiding healthier food choices. Health decisions are significantly shaped by socio-economic factors (0.369) and the social environment (0.276), while the influence of understanding chemical reactions (0.087) and energy (-0.071) on health decisions is minimal. Additionally, understanding energy has a positive influence on socio-economic factors (0.401), as individuals who understand energy management may make healthier lifestyle choices, impacting their economic conditions.

Construct Validity and Reliability

The analysis results in Table 1 highlight various indicators related to the validity and reliability of constructs within the research model. Each construct was tested using multiple measurement items evaluated based on loadings, weights, and various statistical indices such as Composite Reliability (CR), Cronbach's Alpha (CA), and Average Variance Extracted (AVE).

Table 1 Construct Validity and Reliability

Constructs	Items	Loadings	Weights	CA	CR	AVE
Understanding of the Human Body System	X1.1	0.972	0.246	0.933	0.954	0.801
	X1.2	0.949	0.240			

	X1.3	0.647	0.157			
	X1.4	0.915	0.226			
	X1.5	0.951	0.236			
Understanding of Chemical Reactions	X2.1	0.900	0.255			
	X2.2	0.966	0.230			
	X2.3	0.972	0.236	0.937	0.953	0.807
	X2.4	0.697	0.170			
	X2.5	0.929	0.216			
Understanding of Energy	X3.1	0.982	0.212			
	X3.2	0.991	0.216			
	X3.3	0.949	0.218	0.979	0.981	0.922
	X3.4	0.971	0.209			
	X3.5	0.905	0.186			
Social and Economic Factors	Z1.1	0.970	0.238			
	Z1.2	0.980	0.241			
	Z1.3	0.990	0.245	0.988	0.988	0.956
	Z1.4	0.972	0.237			
	Z1.5	0.506	0.118			
Social Environment	Z2.1	0.990	0.206			
	Z2.2	0.994	0.208			
	Z2.3	0.990	0.205	0.983	0.983	0.936
	Z2.4	0.930	0.198			
	Z2.5	0.988	0.205			
Health Decisions	Y1.1	0.982	0.201			
	Y1.2	0.986	0.202			
	Y1.3	0.991	0.204	0.933	0.975	0.816
	Y1.4	0.994	0.205			
	Y1.5	0.935	0.211			
Eating Patterns	Y2.1	0.986	0.207			
	Y2.2	0.940	0.208			
	Y2.3	0.983	0.206	0.989	0.989	0.958
	Y2.4	0.972	0.203			
	Y2.5	0.957	0.210			

The constructs in this study, including understanding of the human body system, chemical reactions, energy, socio-economic factors, social environment, health decisions, and eating patterns, all show excellent reliability and validity. For example, understanding the human body system has a high Composite Reliability (CR) of 0.954 and an Average Variance Extracted (AVE) of 0.801, indicating strong internal consistency and validity. Similarly, understanding chemical reactions and energy both have high CR values (0.953 and 0.981, respectively) and AVE values (0.807 and 0.922), confirming their reliability and validity. Socio-economic factors and the social environment also show strong reliability and validity, with CR values of 0.988 and 0.988 and AVE values of 0.956, indicating they accurately measure their respective constructs. Health decisions and eating patterns also show high reliability (CR values of 0.975 and 0.989) and validity (AVE values of 0.816 and 0.958). Overall, all constructs have high loading values, CR values above 0.9, and AVE values greater than 0.5, demonstrating that the measurement tools used in this study are reliable and valid, ensuring the accuracy of the findings regarding the relationships between public understanding and health-related factors.

Model Fit

Model fit evaluation in SEM analysis is crucial to ensure the proposed model aligns with the data. Table 2 presents the results of the model fit testing for two different models: the Saturated model and the Estimated model. SRMR (Standardized Root Mean Square Residual) and d_{ULS} (Unweighted Least Squares Distance) are based on two key indicators.

	Saturated model	Estimated model
--	-----------------	-----------------

SRMR	0.049	0.049
d_uls	1.491	1.520
d_G	n/a	n/a
Chi-square	∞	∞
NFI	n/a	n/a

SRMR is one of the model fit indices that measures the average difference between the observed data matrix and the estimated model. A smaller SRMR value indicates a better fit between the model and the data. In this table, the SRMR values for both the Saturated model and the Estimated model are 0.049, which means both have identical SRMR values. Generally, SRMR values below 0.08 indicate excellent model fit. Therefore, the saturated and estimated models can be considered an excellent fit for the data. This suggests that the proposed model successfully represents the data structure with reasonable accuracy and can be accepted from a model fit perspective.

d_uls measures the distance between the proposed and the saturated models, gauging how well the estimated model approximates the fully connected saturated model. The smaller the d_uls value, the better the model fit. For the Saturated model, the d_uls value is 1.491, while for the Estimated model, it is 1.520. Although the two models have a slight difference (1.491 vs. 1.520), this difference is relatively small and insignificant. This means that the estimated model is slightly less effective in matching the data than the saturated model. These results suggest that the estimated model effectively represents the data, even though some minor differences in model fit exist.

P-Values

The p-value results in Figure 3 and Table 3 can be interpreted to understand the various relationships between the variables in the model used. Each p-value indicates whether the relationship between two variables in the model is significant, with the commonly used significance level being 0.05. Below is the interpretation of the obtained p-value results.

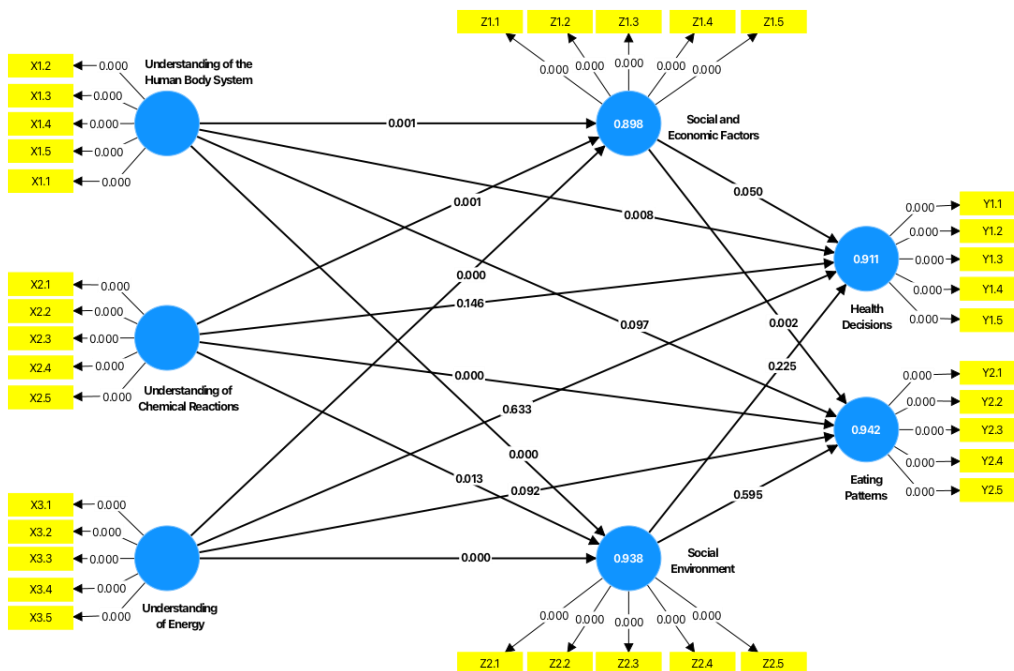


Figure 3 p-Values framework (Source: SmartPLS)

Table 3 p-Values data

	Original sample	Sample mean	Standard deviation	T statistics	P values
Social and Economic Factors → Eating Patterns	0.285	0.284	0.092	3.099	0.002
Social and Economic Factors → Health Decisions	0.369	0.375	0.189	1.957	0.050

Social Environment → Eating Patterns	0.052	0.061	0.097	0.532	0.595
Social Environment → Health Decisions	0.276	0.265	0.227	1.214	0.225
Understanding of the Human Body System → Eating Patterns	0.145	0.139	0.088	1.661	0.097
Understanding of the Human Body System → Health Decisions	0.321	0.324	0.121	2.661	0.008
Understanding of the Human Body System → Social and Economic Factors	0.345	0.338	0.103	3.348	0.001
Understanding of the Human Body System → Social Environment	0.389	0.388	0.077	5.066	0.000
Understanding of Chemical Reactions → Eating Patterns	0.403	0.403	0.090	4.472	0.000
Understanding of Chemical Reactions → Health Decisions	0.087	0.081	0.060	1.454	0.146
Understanding of Chemical Reactions → Social and Economic Factors	0.245	0.251	0.071	3.472	0.001
Understanding of Chemical Reactions → Social Environment	0.107	0.110	0.043	2.485	0.013
Understanding of Energy → Eating Patterns	0.133	0.131	0.079	1.683	0.092
Understanding of Energy → Health Decisions	-0.071	-0.062	0.149	0.478	0.633
Understanding of Energy → Social and Economic Factors	0.401	0.402	0.102	3.951	0.000
Understanding of Energy → Social Environment	0.506	0.504	0.082	6.135	0.000

Social and Economic Factors on Eating Patterns show an Original Sample value of 0.285, indicating a moderate positive influence of social and economic factors on eating patterns. With a T Statistics of 3.099 and a P-Value of 0.002, these results demonstrate that the relationship between socio-economic factors and eating patterns is significant at the 0.01 level. This influence suggests that changes in socio-economic factors can affect public eating patterns, and its impact is strong enough to be considered in policy decisions related to eating habits.

Social and Economic Factors on Health Decisions, with an Original Sample value of 0.369, indicate that socioeconomic factors positively influence health decisions. With a T Statistics of 1.957 and a P-Value of 0.050, this relationship is significant at 0.05. Although the effect is significant, the lower T Statistics value indicates that this relationship is weaker than the influence of socioeconomic factors on eating patterns. However, it remains important that socioeconomic factors play a role in public health decisions.

Social Environment on Eating Patterns, with an Original Sample value of 0.052, shows a minimal influence of the social environment on eating patterns. With a T Statistics of 0.532 and a P-Value of 0.595, this result is insignificant, meaning that the social environment does not strongly influence public eating patterns. This finding suggests that while social interaction may affect eating habits, other factors are more dominant in influencing eating patterns.

Social Environment on Health Decisions, with an Original Sample value of 0.276, indicates a small but positive influence of the social environment on health decisions. With a T Statistics of 1.214 and a P-Value of 0.225, this result is not significant. This indicates that the influence of the social environment on health decisions is weaker and not strong enough to be considered significant in determining health-related policies or decisions.

Understanding of the Human Body System on Eating Patterns, with an Original Sample value of 0.145, indicates a small positive influence of understanding the human body system on eating patterns. With a T Statistics of 1.661 and a P-Value of 0.097, this relationship approaches significance at the 0.10 level, meaning that while there is an influence, it is not strong enough to be considered significant at the 0.05 level. However, it still indicates that understanding the human body can affect eating patterns, although the influence is more petite.

Understanding of the Human Body System on Health Decisions, with an Original Sample value of 0.321, shows a moderate positive influence of understanding the human body system on health decisions. With a T Statistics of 2.661 and a P-Value of 0.008, this relationship is significant at the 0.01 level. This result suggests that the better an individual understands the human body, the more likely they are to make better health-related decisions.

Understanding of the Human Body System on Social and Economic Factors, with an Original Sample value of 0.345, shows a moderate positive influence of understanding the human body system on socio-economic factors. With a T Statistics of 3.348 and a P-Value of 0.001, this relationship is highly significant at the 0.01 level. This suggests that a better understanding of the human body can encourage individuals or groups to make better decisions related to their socio-economic well-being, such as choosing a healthy lifestyle that can improve their social and economic status.

Understanding the Human Body System in a Social Environment, with an Original Sample value of 0.389, shows a relatively strong positive influence of understanding the human body system on the social environment. With a T Statistics of 5.066 and a P-Value of 0.000, this relationship is highly significant at the 0.01 level. This result shows that understanding the human body can influence how individuals interact within their social environment, whether in sharing health knowledge or in behaviors within communities.

Understanding of Chemical Reactions on Eating Patterns, with an Original Sample value of 0.403, indicates a more substantial influence of understanding chemical reactions on eating patterns. With a T Statistics of 4.472 and a P-Value of 0.000, this relationship is highly significant at the 0.01 level. This suggests that understanding how chemical reactions affect the body significantly influences decisions regarding healthy eating patterns.

Understanding of Chemical Reactions on Health Decisions, with an Original Sample value of 0.087, shows a minimal influence of understanding chemical reactions on health decisions. This relationship is insignificant with a T Statistics of 1.454 and a P-Value of 0.146. This indicates that although there is some influence, it is small and not strong enough to affect health-related policies or decisions.

Understanding of Chemical Reactions on Social and Economic Factors, with an Original Sample value of 0.245, shows a moderate positive influence of understanding chemical reactions on social and economic factors. With a T Statistics of 3.472 and a P-Value of 0.001, this relationship is significant at the 0.01 level. This suggests that understanding chemical reactions can affect socio-economic decisions, such as consumption patterns or a healthy lifestyle that impacts social and economic status.

Understanding of Chemical Reactions in the Social Environment, with an Original Sample value of 0.107, indicates a small positive influence of understanding chemical reactions in the social environment. With a T Statistics of 2.485 and a P-Value of 0.013, this relationship is significant at the 0.05 level, although its influence is not as strong as the influence on eating patterns or social and economic factors. This suggests that an understanding of chemical reactions in the body may slightly influence how individuals interact in their social environment.

Understanding of Energy on Eating Patterns, with an Original Sample value of 0.133, shows a positive but small influence of understanding energy on eating patterns. With a T Statistics of 1.683 and a P-Value of 0.092, this relationship approaches significance at the 0.10 level. Although the influence is small, this result suggests that understanding energy can slightly affect eating habits.

Understanding of Energy on Health Decisions, with an Original Sample value of -0.071, shows a negative, albeit small, influence of understanding energy on health decisions. This relationship is insignificant, with a T Statistics of 0.478 and a P-Value of 0.633. This indicates that although understanding energy affects certain aspects of health, its influence on overall health decisions is minimal and insignificant.

Understanding of Energy on Social and Economic Factors, with an Original Sample value of 0.401, shows a significant favorable influence of understanding energy on social and economic factors. With a T Statistics of 3.951 and a P-Value of 0.000, this relationship is highly significant at the 0.01 level. This indicates that understanding energy can influence decisions about a healthier lifestyle, enhancing social and economic status.

Prediction-Oriented Segmen (POS)

The Prediction-Oriented Segmentation (POS) analysis results, as presented in Table 4, provide further insights into how the relationships between variables in the model function across two distinct segments. Table 4 highlights the original path coefficients and how each path coefficient varies between Segment 1 and Segment 2. These differences illustrate whether the relationships between variables differ across segments and indicate how specific factors influence behavior or perception within different groups.

Table 4. Prediction-Oriented Segmentation

	Original path coefficients	Segment1	Segment2
Social and Economic Factors → Eating Patterns	0.285	0.039	0.150
Social and Economic Factors → Health Decisions	0.369	1.267	-0.330
Social Environment → Eating Patterns	0.052	0.012	0.097
Social Environment → Health Decisions	0.276	-0.194	0.682
Understanding of the Human Body System → Eating Patterns	0.145	-0.028	0.319
Understanding of the Human Body System → Health Decisions	0.321	0.021	0.295
Understanding of the Human Body System → Social and Economic Factors	0.345	0.601	0.083
Understanding of the Human Body System → Social Environment	0.389	0.544	0.250
Understanding of Chemical Reactions → Eating Patterns	0.403	0.947	0.197
Understanding of Chemical Reactions → Health Decisions	0.087	-0.322	0.142
Understanding of Chemical Reactions → Social and Economic Factors	0.245	0.484	0.052
Understanding of Chemical Reactions → Social Environment	0.107	0.173	0.040
Understanding of Energy → Eating Patterns	0.133	0.032	0.257
Understanding of Energy → Health Decisions	-0.071	0.196	0.204
Understanding of Energy → Social and Economic Factors	0.401	-0.096	0.848
Understanding of Energy → Social Environment	0.506	0.292	0.703

The Prediction-Oriented Segmentation table reveals notable differences in how various factors influence eating patterns, health decisions, and socio-economic factors across two segments. In Segment 1, socio-economic factors have minimal impact on eating patterns (0.039) but significantly affect health decisions (1.267). In contrast, Segment 2 shows a slightly higher influence of socio-economic factors on eating patterns (0.150), but a negative impact on health decisions (-0.330). Social environment influences are minimal in both segments for eating patterns, with Segment 1 showing a very low influence (0.012) and Segment 2 slightly higher (0.097). However, the social environment has a positive impact on health decisions in Segment 2 (0.682) but a negative effect in Segment 1 (-0.194). Understanding the human body system has a minimal negative influence on eating patterns in Segment 1 (-0.028), but a positive effect in Segment 2 (0.319). Similarly, while it has a slight influence on health decisions in both segments (0.021 for Segment 1 and 0.295 for Segment 2), its effect on socio-economic factors is strong in Segment 1 (0.601) but minimal in Segment 2 (0.083). The human body system's influence on the social environment is strong in Segment 1 (0.544) and less so in Segment 2 (0.250). These findings highlight the varying impacts of socio-economic status, the social environment, and body knowledge on health and eating behaviors across different segments.

Conclusion

This study emphasizes the importance of understanding the human body, chemical reactions, energy, and socio-economic factors in shaping health decisions and eating patterns. It reveals that while understanding the human body and chemical reactions significantly influences eating patterns, socio-economic factors and the social environment have a more profound effect on health decisions. The findings suggest that achieving positive changes in eating habits and public health requires a comprehensive approach that includes empowering scientific knowledge, improving socio-economic conditions, and fostering social norms that promote healthy lifestyles. The study also identifies that socio-economic factors, understanding the human body, and chemical reactions have a substantial impact on eating patterns and health decisions, while the social environment and understanding of energy have lesser effects. The use of prediction-oriented segmentation reveals that the influence of these factors varies significantly across segments, highlighting the need for tailored health interventions and policies. However, one potential limitation is that the study's focus on segmented groups may overlook broader societal factors, and more research could explore additional variables that affect public health more universally.

Acknowledgement

We extend our gratitude to KOPI ALINEA for facilitating this research. The support provided, including access to discussions, references, and feedback, has been instrumental in developing ideas and completing this study.

References

- Aldhalemi, A. A., & Lahhob, Q. R. (2024). The study of chemical reactions in the human body through the use of hormones. *International Journal of Advanced Biochemistry Research*, 8(5), 01-09. <http://dx.doi.org/10.33545/26646781.2024.v6.i1a.167>
- Ball, K., Timperio, A. F., & Crawford, D. A. (2006). Understanding environmental influences on nutrition and physical activity behaviors: where should we look and what should we count?. *International Journal of Behavioral Nutrition and Physical Activity*, 3, 1-8. <https://doi.org/10.1186/1479-5868-3-33>
- Bandura, A. (2004). Health promotion by social cognitive means. *Health education & behavior*, 31(2), 143-164. <https://doi.org/10.1177/1090198104263660>
- Braveman, P., & Gottlieb, L. (2014). The social determinants of health: it's time to consider the causes of the causes. *Public health reports*, 129(1_suppl2), 19-31. <https://doi.org/10.1177/00333549141291S206>
- Contento, I. R. (2007). Nutrition education: linking research, theory, and practice. *Jones and Barlett Publishers*.
- Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- Darmon, N., & Drewnowski, A. (2008). Does social class predict diet quality?. *The American journal of clinical nutrition*, 87(5), 1107-1117. <https://doi.org/10.1093/ajcn/87.5.1107>
- Eng, C. W., Lim, S. C., Ngongo, C., Sham, Z. H., Kataria, I., Chandran, A., & Mustapha, F. I. (2022). Dietary practices, food purchasing, and perceptions about healthy food availability and affordability: a cross-sectional study of low-income Malaysian adults. *BMC Public Health*, 22(1), 192. <https://doi.org/10.1186/s12889-022-12598-y>
- Figueroa, G. (2022). *Informing Clinical Interventions by Evaluating Perceived Barriers to Healthy Diet in Diverse Patients with Non-Alcoholic Fatty Liver Disease* (Doctoral dissertation, University of Miami).
- Firdaus, T., Nisak, K., Putri, M. O., & Shodiq, M. A. F. (2022). Covid-19 Epidemiology in Madura: Public Behaviors' Compliance to Government Policy. *Journal of Public Health for Tropical and Coastal Region*, 5(2), 51-61. <https://doi.org/10.14710/jphtcr.v5i2.13749>
- Frayn, K. N. (2022). *Understanding human metabolism*. Cambridge University Press.
- Godswill, A. G., Somtochukwu, I. V., Ikechukwu, A. O., & Kate, E. C. (2020). Health benefits of micronutrients (vitamins and minerals) and their associated deficiency diseases: A systematic review. *International Journal of Food Sciences*, 3(1), 1-32.
- Kohler, S. M. (2024). *With ALL, FOR ALL: From Context-Sensitive Physical Activity Assessment to Population-Based Physical Activity Promotion with a Focus on Health Equity*. Friedrich-Alexander-Universitaet Erlangen-Nuernberg (Germany).
- Kolodinsky, J., Harvey-Berino, J. R., Berlin, L., Johnson, R. K., & Reynolds, T. W. (2007). Knowledge of current dietary guidelines and food choice by college students: better eaters have higher knowledge of dietary guidance. *Journal of the American Dietetic Association*, 107(8), 1409-1413.
- Labrague, L. J. (2021). Psychological resilience, coping behaviours and social support among health care workers during the COVID-19 pandemic: A systematic review of quantitative studies. *Journal of nursing management*, 29(7), 1893-1905. <https://doi.org/10.1111/jonm.13336>

- Lantz, P. M., Lynch, J. W., House, J. S., Lepkowski, J. M., Mero, R. P., Musick, M. A., & Williams, D. R. (2001). Socioeconomic disparities in health change in a longitudinal study of US adults: the role of health-risk behaviors. *Social science & medicine*, 53(1), 29-40. [https://doi.org/10.1016/S0277-9536\(00\)00319-1](https://doi.org/10.1016/S0277-9536(00)00319-1)
- Lleras, C. (2005). Path analysis. *Encyclopedia of social measurement*, 3(1), 25-30.
- Marchese, L., Livingstone, K. M., Woods, J. L., Wingrove, K., & Machado, P. (2022). Ultra-processed food consumption, socio-demographics and diet quality in Australian adults. *Public Health Nutrition*, 25(1), 94-104. <https://doi.org/10.1017/S1368980021003967>
- Marmot, M. (2015). The health gap: the challenge of an unequal world. *The Lancet*, 386(10011), 2442-2444.
- Mert-Biberoğlu, F., Erdem, N. Z., Özdenkaya, Y., Özdemir, E. M., & Saka, B. (2023). Effects of Whey Protein, Omega-3 Fatty Acid and Roux-En-Y Gastric Bypass on Body Weight, Biochemical Parameters and Organ Functions in an Obese Rat Model: Experimental Research. *Obesity Surgery*, 33(5), 1553-1563. <https://doi.org/10.1007/s11695-023-06560-z>
- Mitra, M., Mitra, S., & Nandi, D. K. (2024). Human Physiology and Metabolism: An Overview. *Body Recomposition*, 43-58.
- Pocock, G., Richards, C. D., & Richards, D. A. (2018). *Human physiology*. Oxford university press.
- Runo, W. S., Kiara, K., & Mandela, R. (2020). Influence of Nutrition Knowledge on Healthy Food Choices among Pupils in Nyeri County, Kenya. *International Journal of Research and Scientific Innovation*, 7(9), 01-09.
- Sagastume, D., Siero, I., Mertens, E., Cottam, J., Colizzi, C., & Peñalvo, J. L. (2022). The effectiveness of lifestyle interventions on type 2 diabetes and gestational diabetes incidence and cardiometabolic outcomes: a systematic review and meta-analysis of evidence from low- and middle-income countries. *EclinicalMedicine*, 53. <https://doi.org/10.1016/j.eclinm.2022.101650>
- Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In *Handbook of market research* (pp. 587-632). Cham: Springer International Publishing.
- Setia, M. S. (2016). Methodology series module 3: Cross-sectional studies. *Indian journal of dermatology*, 61(3), 261-264.
- Sherwood, L., Kell, R. T., & Ward, C. (2004). *Human physiology: from cells to systems*.
- Snapiro, Z., Eberbach, C., Ben-Zvi-Assaraf, O., Hmelo-Silver, C., & Tripto, J. (2017). Characterising the development of the understanding of human body systems in high-school biology students—a longitudinal study. *International Journal of Science Education*, 39(15), 2092-2127. <http://dx.doi.org/10.1080/09500693.2017.1364445>
- Stipanuk, M. H., & Caudill, M. A. (2018). *Biochemical, Physiological, and Molecular Aspects of Human Nutrition-E-Book: Biochemical, Physiological, and Molecular Aspects of Human Nutrition-E-Book*. Elsevier health sciences.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International journal of medical education*, 2, 53. <https://doi.org/10.5116/ijme.4dfb.8dfd>
- Thompson, A. L. (2020). Evaluating the pathways linking complementary feeding practices to obesity in early life. *Nutrition Reviews*, 78(Supplement_2), 13-24. <https://doi.org/10.1093/nutrit/nuz057>
- Wardle, J., Parmenter, K., & Waller, J. (2000). Nutrition knowledge and food intake. *Appetite*, 34(3), 269-275.
- WHO. (2024). Noncommunicable diseases. *World Health Organization*
- Worsley, A. (2002). Nutrition knowledge and food consumption: can nutrition knowledge change food behaviour?. *Asia Pacific journal of clinical nutrition*, 11, S579-S585.
- Wilkinson, R. (2010). *The Spirit Level: Why equality is better for everyone*. Penguin.

