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Assessing Socioeconomic Predictors of Nutritional Quality in Urban Households: A Case Study of Faisalabad, Punjab

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ABSTRACT

This study examines the socioeconomic determinants of healthy eating habits and their implications for household health outcomes in Faisalabad, Pakistan. The primary objective is to assess how household structure, employment status, education, income levels, and access to food shape dietary patterns across different socioeconomic groups. In Faisalabad, pronounced income disparities limit the ability of low-income households to access nutritious food, often resulting in poor dietary choices and a higher prevalence of diet-related diseases such as diabetes, obesity, and cardiovascular conditions.

Using primary data collected from households representing diverse socioeconomic backgrounds, the study explores dietary practices, levels of nutritional awareness, and food-related constraints faced by different demographic groups. Regression analysis reveals that socioeconomic factors play a significant role in shaping dietary diversity. In the first model, the Dietary Diversity Score (DDS) was used as the dependent variable ($R^2 = 0.208$; $p < 0.001$). Education, income, marital status, and home ownership were positively associated with DDS, while household size showed a negative relationship, indicating resource dilution in larger families. These findings suggest that households with greater economic stability and higher educational attainment tend to consume more diverse diets.

In the second model, Body Mass Index (BMI) served as the dependent variable ($R^2 = 0.029$; $p = 0.016$). DDS emerged as a positive but weak predictor of BMI, with a one-unit increase in dietary diversity associated with a 0.33-unit rise in BMI. Overall, the results indicate that while socioeconomic status strongly influences diet quality, dietary diversity alone has a limited effect on BMI, highlighting the importance of other factors such as lifestyle, physical activity, and genetic predispositions in determining household health outcomes.

1. Introduction

The foundation of human health and well-being is a nutritious diet, which affects productivity, growth, development, and survival at every stage of life. A healthy diet, according to the World Health Organization (WHO, 2023), guards against all types of malnutrition, including under nutrition, overweight, obesity, and food-related non-communicable diseases (NCDs) such type 2 diabetes, cardiovascular disease, and some types of cancer. Urbanization, globalized supply chains, and the rise in ultra-processed food availability have all contributed to changes in global food systems during the last three decades, which have had a substantial impact on dietary patterns and public health (GBD, 2024).

A number of Sustainable Development Goals (SDGs), such as those pertaining to hunger, health, and sustainable production, depend on eating a healthy diet (United Nations, 2024). The twin burden of malnutrition, where under nutrition and micronutrient deficiencies coexist with rising rates of obesity and NCDs, is a defining feature of nutrition issues in low- and middle-income countries (LMICs) like Pakistan (Global Nutrition Report, 2025). Therefore, identifying, assessing, and enhancing nutritious diets continues to be a top concern for economic development, public health, and policy.

A basic component of managing and preventing non-communicable diseases (NCDs), such as heart disease, obesity, type 2 diabetes, and some types of cancer, is diet. However, socioeconomic limitations frequently make it

difficult for underprivileged groups to obtain reasonably priced, nutrient-dense food, raising their risk of developing chronic illnesses (WHO, 2020). The key environment in which eating habits are established and sustained is the home. Children's academic performance, long-term health prospects, and physical and cognitive development can all be affected by poor household nutrition (Victora, 2008).

Not only can diet-related health problems impact individuals, but they also significantly overwhelm healthcare systems and lower worker productivity. In addition to lowering long-term healthcare expenses, preventive measures that target the underlying socioeconomic reasons of bad diets can enhance social well-being (Sassi, 2010). These changes have led to the extensive consumption of highly processed meals with a lot of sugar, salt, dangerous fats, and additives but poor in critical nutrients. Particularly in impoverished countries, the "nutrition transition," as this dietary change is known, has been linked to rising rates of obesity, metabolic syndrome, and other chronic health issues (Popkin, 2017).

Cultural, social, and financial factors greatly affect eating habits in Pakistan. Formerly grounded on home-cooked meals of whole grains, legumes, vegetables, and dairy, the traditional diet is gradually being substituted by processed meals high in salt, sugar, and bad fats. Particularly among urban populations and young people, fast food, soft drinks, and deep-fried snacks have become everyday consumption (Raza, 2019).

Dietary habits in Pakistan are shaped mostly by cultural norms and eating practices. Generally based on wheat or rice, meals usually feature meat, legumes, or vegetables. Particularly in traditional meals, however, overuse of salt, oil, ghee, and spices is usual. Across socioeconomic strata, deep-fried snacks like samosas and pakoras are popular; sugary desserts are sometimes ingested in great volumes during celebrations, family gatherings, and daily routines (Afzal, 2020). In order to preserve physical health and combat a variety of illnesses, a balanced diet is essential. The foods we eat sustain immune function, energy levels, and organ health while also providing the vital nutrients required for growth and development. Furthermore, dietary habits have a substantial correlation with preventing acute and chronic illnesses.

The direct effect of a good diet on physical well-being and the avoidance of chronic diseases is one of the fundamental reasons for its importance. Studies have consistently connected a low risk of heart disease, stroke, type 2 diabetes, and certain kinds of cancer to a diet high in fruits, vegetables, whole grains, lean meats, and healthy fats. The World Health Organization notes that poor diet is a significant risk factor for many of the top causes of death, including cardiovascular disease; therefore, a balanced diet is very important in avoiding these diseases.

Heart damage, stroke, and other cardiovascular illnesses are among the major causes of death globally. A good diet can help to significantly reduce the likelihood of these conditions by raising blood pressure, lowering cholesterol, and preserving healthy blood vessels. Diets strong in fruits, vegetables, and whole grains as well as a limited intake of heart-healthy fats like omega-3 fatty acids are associated with reduced probability of heart disease and stroke, according to the American Heart Association (2019). Two things for which these diets are well known are reducing inflammation, which is a necessary component in heart disease prevention, and promoting good weight reduction.

Eating a balanced diet rich in fiber fruits, vegetables, and whole grains helps to control blood sugar levels and delay insulin resistance. This, in combination with its role in preventing type 2 diabetes, makes eating a healthy diet absolutely critical. According to Hu (2001), a diet high in plant-based foods and low in processed foods could minimize the chances of type 2 diabetes by half. However, eating rich in refined carbohydrates and sugar-filled foods has been linked to a higher risk of developing the disease. Objectives of this research will be to explore the major socioeconomic factors that influence food consumption patterns, which include size of household, occupation, income, and level of education. This research will also seek to investigate food consumption patterns and their relationship to the general health outcomes of members of each household, which will be marked by how food consumption patterns affect overall general well-being. It will also seek to investigate general levels of various key health factors and food consumption patterns based on economic and level of education considerations.

2. Literature Review

Different theories have been put forth to explain these disparities. People with lower socioeconomic positions based on their work, income, or degree of education might not have the same material and psychological resources as those with higher socioeconomic positions. Healthy dietary behavior is recognized to be influenced by both financial resources, such as increased food budgets and access to health-promoting products and services, and psychosocial resources, such as cooking abilities, nutrition knowledge, and positive attitudes about healthy eating (Braveman, 2011).

(Ana, 2014) conducted a study based on 33 research reviews and 17 lower middle-income countries (LMICs) and showed significant variations in eating patterns according to socioeconomic status (SES) and urbanization. Most of the research, which used both cross-sectional and longitudinal approaches, originated in Brazil, China, and Iran. The results showed that higher intakes of calories, protein, fluids (including polyunsaturated saturating, and unsaturated fatty acids), cholesterol, iron, and vitamins A and C were linked to higher socioeconomic status and urban life. These groups also had lower fiber and carbohydrate intakes. Furthermore, higher socioeconomic status was associated with higher levels of diversity, higher quality diets, and higher fruit and vegetable consumption; although there were few studies in low-income countries, similar trends were noted, with one exception: fruit intake was lower in low-income countries' urban areas than in their rural ones.

According to the National Health and Nutrition Examination Survey (NHANES), individuals with more wealth ate nutrient-dense meals including whole grains, vegetables, and fruits more probably than those with poorer education and income levels, who were more likely to eat fast food, sugar-sugar-sweetened beverages, and processed snacks. Cultural standards, geographical location, and other environmental conditions all affect the way socioeconomic status influences eating patterns. Even though income was a strong predictor of food choices--according to a survey done in rural regions, for instance--local food policies and the presence of healthy food outlets greatly affected dietary patterns (Walker, 2010).

Black middle school students from low-income backgrounds were more probably to consume meat, fried meals, and empty-calorie food and less likely than their high-income White counterparts to eat grains, dairy items, fruits, and vegetables (Fahlman, 2010). Research on the motivational determinants of eating behavior, which have mostly focused on personal-level variables including taste preferences, nutrition knowledge, attitudes, and goals, have informed health education efforts to promote better eating habits including nutrition advice and counseling (Brug, 2005).

Conversely, people of little wealth are more liable to depend on inexpensive, high-energy, low-nutrient meals such processed snacks, sugary beverages, and fast food. Research never stops demonstrating that people with lower income have fewer access to healthy food choices. This is often due to financial restrictions as well as limited availability in food deserts (Walker, 2010). A National Health and Nutrition Examination Survey (NHANES) investigation found that lower-income and education groups consumed more sugary beverages, fast food, and processed meals while people with lower SES were more likely to consume nutrient-dense foods including fruits, vegetables, and whole.

The financial weight of food costs on lower-income families, especially in regions known as "food deserts" where supermarkets are scarce is worsened by other costs connected with food acquisition including transport to supermarkets. The increased financial pressure and limited access to nutrient-dense meals in these communities additionally reinforce their poor dietary selections (Walker, 2010).

Regardless of other socio demographic variables, the findings indicated that a low level of health literacy may negatively affect nutrition and physical activity, lending credence to the idea that health literacy is a key social determinant of health. Furthermore, the findings clearly revealed that people from lower socioeconomic classes have poorer health literacy. It is necessary to monitor the prevalence of socioeconomic factors, such as health literacy, among a nation's population in order to develop patient-centered healthcare policies and services, as well as to establish a society that is more knowledgeable about public health. In this respect, incorporating a health literacy evaluation instrument into risk factor or behavioral monitoring programs seems to be essential for developing more effective and comprehensive prevention and health promotion programs (Zanobini, 2021).

3. Materials and Methods

The study was carried out in Punjab province's major industrial and agricultural centre, Faisalabad, which is also Pakistan's third-largest city. Faisalabad is the perfect place to study the connection between socioeconomic determinants and nutritional outcomes because of its advantageous location and economic variety. The city offers a distinctive mix of job categories, economic groups, and access to food and healthcare resources because it includes both urban and peri-urban areas (Pakistan Bureau of Statistics, 2023).

Faisalabad's urban neighborhoods are distinguished by comparatively superior healthcare, education, and infrastructure. Peri-urban communities, on the other hand, frequently exhibit semi-rural characteristics, such as lower household incomes, greater rates of food insecurity, and restricted access to nutrition education, even though they are still a part of the urban environment (Imran, 2019). These differences offer a helpful foundation for investigating the ways in which dietary diversity and health are impacted by

differences in socioeconomic position. This study's target demographic consists of families in Faisalabad's urban and peri-urban areas. The study specifically targets households with an adult member (at least 18 years old) who can give accurate information about the socioeconomic status, food habits, and health of the household. Household heads and other adults who are knowledgeable with daily expenses, food buying habits, and family medical history are included in this.

It was a calculated decision to include a wide range of demographics in the household sample. Significant intra-urban disparities exist in Pakistan's urban terrain, spanning from affluent residential neighborhoods to impoverished villages. The study highlights the variation in food quality and nutrition access within a single city by enrolling respondents from both extremes. This diversity enhances the analysis and makes the results more broadly applicable. This study used a multi-stage stratified random sample procedure to guarantee representativeness and minimize sampling bias. Because of Faisalabad's socioeconomic diversity, stratified sampling was necessary to guarantee sufficient representation from both urban and peri-urban areas. Based on socio-spatial features and administrative boundaries, Faisalabad was first divided into these two major strata. Specific places were chosen at random from each stratum in the second stage. Households within the specified localities were picked at random for the third step.

A popular method in social science and public health research for examining heterogeneous groups is stratified random sampling (Kumar, 2019). It increases the validity of statistical inference by reducing the possibility of certain subgroups being over- or under-represented. Without stratification, for instance, a completely random sample may under sample from low-income or peri-urban areas and oversample from affluent metropolitan areas.

Cochran's formula for small populations was used to determine a sample size of 200 households:

$$n_0 = \frac{Z^2.p(1-P)}{e^2} \qquad \textbf{equ\#1}$$

Where:

- Z = 1.96 (for 95% confidence)
- p = the anticipated percentage of dietary diverse households (maximum variability assumed at 0.5).
- e = the error margin (0.05)

The final sample size was determined at 200 after accounting for the predicted response rate and the finite population. This is statistically sufficient for multiple regression analysis involving multiple independent variables.

The selected sample makes it possible to conduct in-depth analyses across subgroups and guarantees that the links and patterns found in the data are both contextually and statistically significant.

A structured questionnaire created especially to meet the goals of the study served as the main instrument for gathering data for this investigation. The questionnaire was broken up into five primary sections and included both closed-ended and open-ended questions:

1. Socioeconomic and demographic data, such as age, gender, income, education, and household size
2. Nutritional habits and food consumption frequency
3. Household members' health status, including height and weight for BMI calculations
4. Dietary costs and availability of nutritious dietary options
5. Ownership of assets and living circumstances

In this study, the main indicator of dietary quality and nutritional sufficiency is the Dietary Diversity Score (DDS). The number of distinct food groups consumed within a 24-hour recall period is used to compute the DDS. The following food groups are included in the DDS utilized in this study in accordance with the Food and Agriculture Organization's (FAO) guidelines:

1. Cereals
2. Roots and tubers
3. Vegetables
4. Fruits
5. Meat, poultry, and fish
6. Eggs
7. Legumes and nuts
8. Dairy products
9. Oils and fats
10. Sweets
11. Spices and condiments
12. Beverages (excluding water)

BMI serves as an objective indicator of the health consequences linked to food choices. It is computed using the following formula:

$$BMI = \frac{Weight\ (kg)}{Heitht\ (m)^2} \qquad \textbf{equ\#2}$$

Based on World Health Organization (WHO) standards, individuals are categorized as:

1. Underweight: BMI < 18.5
2. Normal weight: BMI 18.5–24.9
3. Overweight: BMI 25.0–29.9
4. Obese: BMI ≥ 30

The independent variables selected for this study are grounded in socioeconomic theory and previous empirical findings on nutrition and health determinants: Age, Marital Status, Household Size**,** Education Level, Income**,** Asset Ownership**,** House Ownership

Data Analysis Techniques

The study employed a two-pronged analytical approach: descriptive statistics to summarize sample characteristics and regression analysis to explore causal relationships between variables. These techniques were chosen for their ability to provide both an overview of the data and the statistical rigor needed to identify significant predictors of dietary diversity and health outcomes. Descriptive analysis was conducted using measures such as:

1. **Frequencies and percentages** for categorical variables (e.g., gender, marital status, house ownership)
2. **Means and standard deviations** for continuous variables (e.g., income, DDS, BMI, household size)

This provided a comprehensive overview of the demographic and socioeconomic composition of the 200 sampled households in Faisalabad. For example, household sizes ranged from 2 to 11 members, with a mean size of 6.1. Education levels varied widely, with respondents having 0 to 16 years of schooling. Such descriptive results help contextualize the population before conducting inferential analysis. To investigate the determinants of healthy dietary behavior and its impact on health, two multiple regression models were estimated:

Model 1: Determinants of Dietary Diversity Score (DDS)

$$\mathrm{HDS}_i = \beta_0 + \beta_1 lnincome_i + \beta_2(edu_i) + \beta_3 lnHS_i HS + \beta_4 \text{marital status} + \beta_5\, asset_i + \beta_6 lnage_i + e_i \quad \textbf{e} \qquad \textbf{qu\#3}$$

This model uses DDS as the dependent variable, with socioeconomic and demographic indicators as explanatory variables. The model assesses how changes in income, education, and household structure affect dietary diversity

Model 2: Impact of Dietary Diversity on BMI

$$\mathrm{BMI}_i = \alpha_0 + \alpha_1 \mathrm{HDS}_i + \mu_i \qquad \textbf{equ\#4}$$

The impact of dietary quality (DDS) on household health as determined by BMI is investigated in this second model. A positive DDS coefficient would imply that healthier weight outcomes are linked to a more varied diet. The study's overarching goal, which is to connect socioeconomic determinants to both food patterns and real health outcomes, is addressed by this regression. This study conceptualizes dietary diversity as both an outcome of socioeconomic conditions and a proximate determinant of health outcomes. While this sequential framework is commonly used in nutrition and development research, it is acknowledged that the relationship between Dietary Diversity Score (DDS) and Body Mass Index (BMI) may be subject to endogeneity and reverse causality. In particular, individuals' body weight or health status may influence dietary choices and food diversity, just as dietary diversity may affect body weight. Due to the cross-sectional nature of the data and the absence of instrumental variables or longitudinal observations, causal inference cannot be established. Therefore, the estimated relationship between DDS and BMI in Model 2 should be interpreted as an association rather than a causal effect.

4. Results and Discussion

Descriptive statistics provide the foundational understanding of the variables used in regression models and nutritional assessments. Table 1 summarizes the central tendencies and dispersions of the key study variables. Below is a detailed analysis of each:

Table 1: Descriptive Statistics

Variable	Mean	Std Dev	Min	Median	Max
DDS (Dietary Diversity Score)	7.64	2.3	2	8	12
BMI (Body Mass Index)	23.32	4.41	13.93	22.8	37.1
Age	28.31	7.6	19	26.5	61
Gender (1 = Male, 2 = Female)	1.48	0.5	1	1	2
Marital Status	1.48	0.54	1	1	4
Years of Schooling	15.37	1.51	12	16	18
Employment Status (1–4)	1.8	0.9	1	1	4
Income *(PKR)*	71265	39850	10,000	60,500	250,000
Household Size	6.03	2.44	2	5	17
Dependents (children/elderly)	2.49	1.53	1	2	8
Meals per Day	2.76	0.92	1	3	10
Water Intake (glasses/day)	8.24	2.75	2	8	20

The dataset consists of responses from 200 individuals**,** capturing various demographic, socioeconomic, and health-related variables. Here's a breakdown of the key findings:

Dietary Diversity Score (DDS): The average DDS was **7.64**, with a minimum of **2** and a maximum of **12**, indicating a wide range in dietary diversity among respondents. A higher DDS suggests greater consumption of a variety of food groups, reflecting better dietary quality.

Body Mass Index (BMI): The average BMI was **23.32**, with a standard deviation of **4.41**, ranging from **13.93** (underweight) to **37.10** (obese). Most respondents fell within the normal weight range, but there is significant variation, indicating the presence of both underweight and overweight individuals in the sample. The average age of respondents was 28.31 years (SD = 7.6), ranging from 19 to 61 years. The relatively young sample suggests a population group in the economically active phase of life. Younger adults tend to have different dietary preferences compared to older individuals, including higher consumption of fast food, sweetened beverages, and processed items (Afshin, 2019). However, the regression model showed that older age correlates positively with healthier diets, likely due to increased awareness and concern for long-term health.

Gender: The average gender value was 1.48**,** indicating a nearly equal distribution of males and females (where 1 = male and 2 = female). With a mean of 1.48 and a range from 1 to 4, most respondents were single or married. As discussed in section 4.2, marriage is associated with more stable household routines and collaborative food choices. Shared responsibilities in meal preparation and financial management may enhance food diversity and frequency. Respondents had a high average of 15.37 years of schooling, with a minimum of 12 and a maximum of 18 years. This reflects a generally well-educated sample, which is consistent with urban sampling in a city like Faisalabad. Education is strongly correlated with better nutritional choices, as educated individuals are more likely to interpret food labels, follow dietary guidelines, and avoid harmful eating habits (Muthini, 2020).

Employment Status: With an average of 1.80 and a range of 1 to 4**,** the employment data indicates a mix of full-time, part-time, and possibly unemployed individuals or students. The distribution leans slightly toward full-time employment. The average monthly household income was PKR 71,265, with wide variability (SD ≈ 39,850), ranging from PKR 10,000 to PKR 250,000. This dispersion reflects the socioeconomic diversity of the sample. The strong positive association between income and DDS, as shown in regression analysis, aligns with numerous studies indicating that higher-income households can afford a wider array of foods, including more costly items like dairy, fruits, and meat (Maharjan, 2019). The mean household size was 6.03, with a maximum of 17. The average number of dependents (children/elderly) was 2.49. Larger families with more dependents typically face higher food burdens, leading to prioritization of quantity over quality. This resource dilution may explain the negative correlation between household size and DDS.

Number of Dependents: Respondents reported an average of 2.49 dependents (children or elderly), with some having as many as 8 dependents**.** More dependents can influence household food security and nutritional planning. Respondents reported consuming 2.76 meals per day on average, with some households indicating up to 10 meals. This figure may reflect snacking behavior or multiple small meal portions rather than full meals. Households eating fewer than three meals per day may be more susceptible to under nutrition, while those with frequent meals must also

ensure nutritional balance. Water consumption averaged 8.24 glasses per day, with responses ranging from 2 to 20. Adequate hydration is essential for digestion, nutrient absorption, and overall metabolic function. While water intake is not directly included in DDS or BMI calculations, it serves as an important behavioral health indicator. To determine which socioeconomic and demographic factors significantly predict Dietary Diversity Score (DDS), a multiple regression model was applied using DDS as the dependent variable and six explanatory variables: education, log-transformed income, log-transformed household size, marital status, house ownership, and log-transformed age.

Table 2: Test Statistics Results

Predictor	Coefficient	T statistics	p-value	Significance
Constant	-12.134	-3.264	0.001	Significant at 5%
Education	0.223	2.132	0.034	Significant at 5%
Log Income	2.772	4.063	0.00	Significant at 5%
Log Household Size	-1.993	-2.177	0.031	Significant at 5%
Marital Status	0.363	-2.419	0.016	significant at 5%
House ownership	0.542	2.490	0.014	significant at 5%
Log age	3.624	1.914	0.057	significant at 5%

R-squared: 0.608 **Adjusted R-squared:** 0.580 F-statistic: 7.225 (p = 0.0000)

The R-squared value indicates that about 61% of the variation in dietary diversity is explained by the included variables. While moderate, this is acceptable in behavioral studies where multiple unobserved factors influence outcomes (Gujarati, 2009). Table 2 presents the results of the test statistics coefficient for education was 0.223 (p = 0.034), indicating that for every additional year of schooling, the DDS increases by approximately 0.22 units. This positive and statistically significant relationship confirms that education plays a fundamental role in shaping dietary behavior. Household income exhibits a positive and statistically significant association with dietary diversity. The estimated coefficient on log-transformed income is 2.772 ($p < 0.01$), indicating that income is an important socioeconomic determinant of food choice in urban Faisalabad. Given the logarithmic specification of income, the coefficient should be interpreted as a semi-elasticity. Specifically, a 1 percent increase in household income is associated with an approximate 0.028-unit increase in the Dietary Diversity Score, holding other factors constant. Although the marginal effect appears modest, its statistical significance highlights the role of economic capacity in enabling households to access a broader range of food groups. Higher-income households are better positioned to afford relatively expensive and perishable foods such as fruits, vegetables, dairy products, and animal-source proteins, which are essential components of a diverse and nutritionally adequate diet. This finding is consistent with prior empirical evidence from urban settings in developing countries, which shows that income growth improves diet quality primarily through enhanced food variety rather than increased caloric intake alone. The result underscores the importance of income-enhancing and social protection policies in improving dietary quality among urban households. DDS dramatically declines with increasing home size, according to the coefficient for household size, which was -1.993 (p = 0.031). The principle of resource dilution, which states that as few food resources are shared by more people, the diversity of food available per capita is decreased, is reflected in this inverse relationship.

DDS was positively correlated with marital status, with a value of 0.363 (p = 0.016). The nutritional diversity of married people was somewhat higher than that of single people. This might be because marriage frequently brings with it a more regimented lifestyle, joint meal planning responsibilities, and a combined income. Family health and balanced meals may receive more attention in married households, especially those with kids. Married couples may also have more consistent cooking practices, which encourages the inclusion of a variety of foods. A strong

correlation between improved dietary diversification and home ownership was found, with a value of 0.542 ($p = 0.014$). Having a home is frequently a sign of long-term financial security and reduced monthly costs, which can free up funds for buying a wider range of foods. With a marginal p-value of 0.057 and a coefficient of 3.624, the age variable appeared to have a positive but marginally significant link with DDS. Due to their higher concern for their health, collected knowledge, and cooking experience, older respondents were more likely to report having varied diets.

BMI as Dependent Variable

A straightforward linear regression was carried out using BMI as the dependent variable and DDS as the only predictor in order to investigate the connection between dietary behavior and health consequences in more detail.

Table 3: Impact of Dietary Diversity Score (DDS) on the Outcome Variable

Predictor	Coefficient	T statistics	p-value	Significance
Constant	20.818	19.412	0.000	Significant at 5%
DDS	0.328	2.436	0.016	Significant at 5%

R-squared: .029 **Adjusted R-squared:** .024 **F-statistic:** 5.936 (p-value < 0.016).

Table 3 presents the results of the regression analysis, indicating that the Dietary Diversity Score (DDS) has a statistically significant effect at the 5% level. It is clear from this beneficial link that dietary diversity has an impact on physical health outcomes, especially body weight. A wider variety of foods consumed by households increases the likelihood that they will achieve their nutritional and caloric needs, leading to more ideal BMI levels. A greater DDS does not, however, automatically translate into a healthy BMI if the variety contains items that are high in energy but low in nutrients. For example, diets high in processed meals, sugar-sweetened beverages, and fried snacks may raise DDS but also result in overweight and obesity.

Mekonnen (2021) highlights that in order to determine DDS's actual health impact, it should be read in conjunction with food quality indices. In a similar vein, Sibhatu (2015) discovered that in underdeveloped nations, higher DDS is closely associated with better hemoglobin levels, better child growth outcomes, and fewer instances of stunting and underweight. The study's findings support the claim that DDS is a helpful, albeit imperfect, stand-in for dietary sufficiency and overall health in adult populations.

Limitation of the study:

Despite its contributions, this study has several limitations that should be acknowledged when interpreting the findings. First, the analysis is based on cross-sectional data, which restricts the ability to establish causal relationships between socioeconomic factors, dietary diversity, and health outcomes. In particular, the use of the Dietary Diversity Score (DDS) as both an outcome variable and an explanatory variable for BMI raises the possibility of endogeneity and reverse causality, as individuals' health status may also influence dietary choices. Second, BMI was used as the sole indicator of health, which, although widely applied in nutrition research, is a relatively crude measure that does not capture micronutrient deficiencies, body composition, physical activity levels, or other dimensions of nutritional health. Third, while the sample size is statistically adequate, the sample is skewed toward relatively well-educated respondents, which may limit the generalizability of the results to less-educated and lower-income urban households in Pakistan. Finally, unobserved factors such as food prices, dietary quality within food groups, lifestyle behaviors, and genetic predispositions were not captured in the data and may also influence both dietary diversity and health outcomes. Future research using longitudinal data, additional health indicators, and more representative samples would help to address these limitations and provide stronger causal insights.

5. Conclusion

According to the study's findings, socioeconomic factors significantly influence the food habits and health outcomes of urban households in Faisalabad. The results support the theories that dietary diversity and health indicators are positively impacted by household stability, money, and education. On the other hand, a larger household tends to dilute food supplies, which results in a lower-quality diet. Education directly increases food choice, cooking skills, and nutrition awareness, all of which contribute to higher-quality diets. Families may buy a range of nutrient-dense foods thanks to income, which is a powerful enabler of dietary diversity. Dietary diversity was negatively correlated with household size, which may indicate food insecurity and resource limitations. Home ownership and marital status were positively associated with better eating habits, underscoring the importance of stability in encouraging better food choices. Better diets were positively connected with age, most likely as a result of growing health consciousness and experience. Better diets translate into

better physical health, as evidenced by the statistically significant positive effect of the Dietary Diversity Score (DDS) on BMI.

Recommendations

The study's conclusions lead to the following practical suggestions for development planners, public health professionals, and legislators:

- Integrate nutrition education into school curriculums and adult literacy programs. Education on balanced diets, food groups, and health effects should be tailored to different literacy levels and community contexts.
- Introduce or scale up social protection schemes like food subsidies, income support, and employment guarantees, particularly targeting low-income families. Financial empowerment directly increases a household's ability to afford and choose a diverse, healthy diet.
- Promote kitchen gardening programs in urban and peri-urban areas, especially for low-income homeowners. This can improve access to fresh vegetables and reduce dependency on market prices.
- Design nutrition programs targeting newly married couples and young families to instill lifelong dietary habits. Culturally sensitive counseling sessions during pre-marital or post-marital workshops can be effective.
- DDS can serve as a practical and quick screening tool in primary healthcare centers to assess household food quality. This allows early identification of at-risk populations for targeted nutrition interventions.

6. References

Afshin, A. (2019). Global patterns of diet quality and health outcomes: A systematic review. *The Lancet Global Health, 7*(5), 432–445.

Afzal, M. (2020). Socioeconomic determinants of household dietary diversity in South Asia. *Journal of Nutrition and Health Sciences, 8*(2), 55–64.

American Heart Association. (2019). *Healthy eating recommendations for cardiovascular disease prevention*. https://www.heart.org

Ana, V. (2014). Nutrition interventions in low- and middle-income countries: A meta-analysis of 33 systematic reviews. *Public Health Nutrition, 17*(11), 2475–2489.

Braveman, P. (2011). Social determinants of health: The role of equity and structural disparities. *Annual Review of Public Health, 32*, 381–398.

Brug, J. (2005). Determinants of healthy eating: Motivation, opportunity, and abilities. *Appetite, 45*(1), 5–9.

Fahlman, M. (2010). Dietary behaviors among urban Black adolescents: Barriers to healthy eating. *Journal of School Health, 80*(5), 235–242.

GBD 2024. (2024). *Global Burden of Disease Study 2024 results*. Institute for Health Metrics and Evaluation. https://www.healthdata.org

Global Nutrition Report. (2025). *Global nutrition report 2025: Progress toward ending malnutrition*. Development Initiatives.

Hu, F. B. (2001). Diet, lifestyle, and the risk of type 2 diabetes: A review. *The New England Journal of Medicine, 345*(5), 790–797.

Imran, M. (2019). Determinants of food insecurity in households of developing countries. *Asian Journal of Agriculture and Development, 16*(3), 99–111.

Maharjan, K. (2019). Socioeconomic factors influencing dietary practices in South Asia. *International Journal of Social Economics, 46*(7), 875–890.

Mekonnen, T. (2021). Household dietary diversity and nutritional outcomes in urban Ethiopia. *BMC Public Health, 21*(1), 1104.

Muthini, D. (2020). Income inequality and dietary diversity among rural households in Kenya. *Food Policy, 92*, 101–112.

Pakistan Bureau of Statistics. (2023). *Pakistan Social and Living Standards Measurement Survey 2023*. Government of Pakistan.

Popkin, B. M. (2017). Relationship between global nutrition transition and chronic disease. *Obesity Reviews, 18*(S1), 7–13.

Raza, A. (2019). Socioeconomic drivers of unhealthy dietary patterns in Pakistan. *Pakistan Journal of Nutrition, 18*(4), 350–359.

Ruel, M. (2013). Nutrition-sensitive interventions and programs: A systematic review. *The Lancet, 382*(9891), 536–551.

Sassi, F. (2010). *Obesity and the economics of prevention: Fit not fat*. OECD Publishing.

Sibhatu, K. (2015). Farm production diversity and dietary diversity in developing countries. *Food Policy, 50*, 1–20.

Sinha, M. (2017). ICT exports, innovation, and GDP growth among OECD countries. *Technological Forecasting and Social Change, 122*, 15–25.

United Nations. (2024). *Sustainable Development Goals report 2024*. United Nations Publications.

Victora, C. (2008). Maternal and child undernutrition: Consequences for adult health and human capital. *The Lancet, 371*(9609), 340–357.

Walker, R. (2010). Food deserts, access inequalities, and dietary patterns: An urban analysis. *Health & Place, 16*(5), 1020–1025.

World Health Organization. (2020). *Diet, nutrition, and the prevention of chronic diseases*. Author.

World Health Organization. (2023). *Healthy diet*. https://www.who.int/news-room/fact-sheets/detail/healthy-diet

Zanobini, P. (2021). Health literacy, socioeconomic status, and dietary behavior: A cross-country comparison. *International Journal of Public Health, 66*, 160–169.