

The Association Between Social Interaction and Nutritional Status: A Cross-Sectional Study in a Health-Promoting Campus Setting

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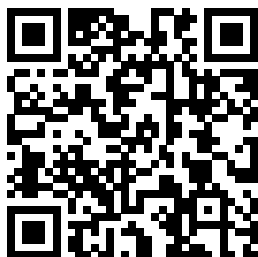
ABSTRACT

This study aimed to analyze the relationship between fruit and vegetable intake, physical activity, nutritional status, and social interaction among the academic community at Polkesbaya Corner, a health-promotion facility developed by Poltekkes Kemenkes Surabaya as part of the “Healthy Campus Initiative.” Polkesbaya Corner serves as a campus-based innovation designed to integrate nutrition education, physical activity, and social engagement, supporting the 3rd Sustainable Development Goal (Good Health and Well-being). A cross-sectional study was conducted among 363 respondents selected through proportionate stratified random sampling. Data were collected using a Food Frequency Questionnaire (FFQ), 24-hour dietary recall, the International Physical Activity Questionnaire (IPAQ), anthropometric measurements, and sociometric observation. A statistical association was observed between social interaction and nutritional status ($p = 0.024$), whereas fruit and vegetable intake and physical activity were not significantly associated with this outcome. Overall, 52.3% of respondents had normal nutritional status, while 31.7% were overweight. Most participants performed light physical activity (79.3%) and consumed sautéed vegetables (74.1%) and sliced fruits (68.9%). These findings highlight the crucial role of social engagement in promoting healthy behaviors within the campus environment. Therefore, Polkesbaya Corner can serve as a “living laboratory” to foster a culture of health by integrating nutrition education, physical activity, and social participation—supporting the national health promotion agenda and the achievement of SDG 3.

Key Messages:

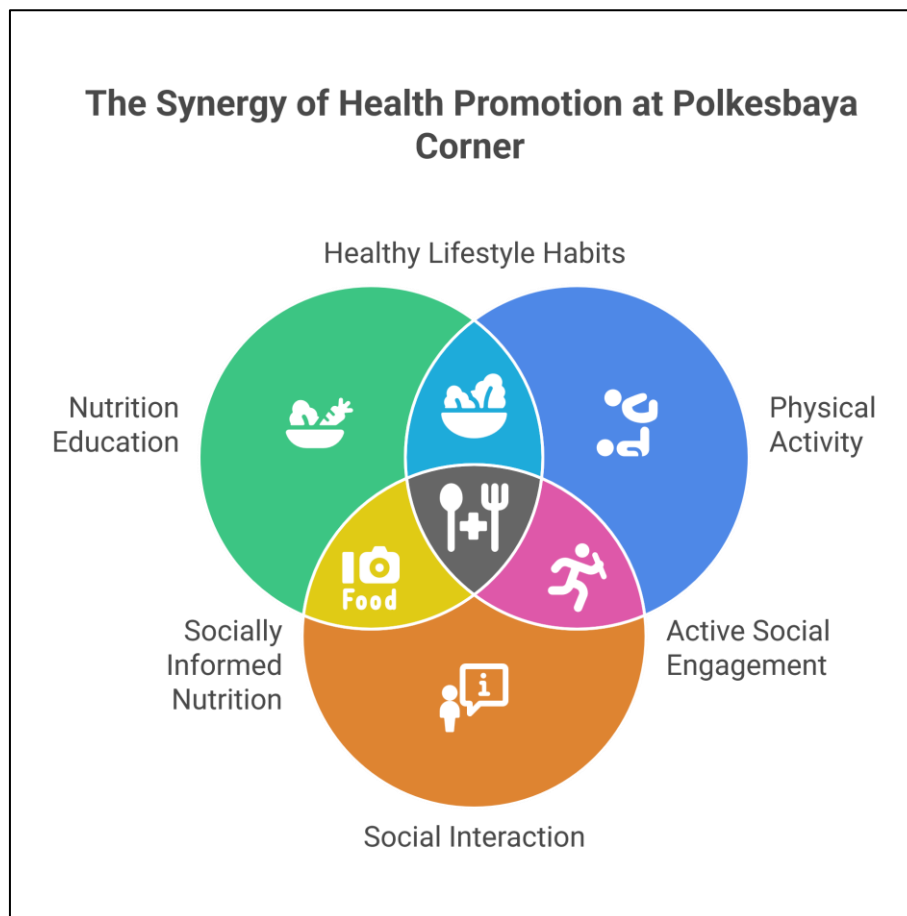
- Social interaction plays an important role in nutritional status, as social engagement promotes healthier diet and physical activity.
- Polkesbaya Corner is a model of a healthy campus, which combines nutrition education, physical activity, and social interaction to support the 3rd SDG Good Health and Well-being.

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GRAPHICAL ABSTRACT



INTRODUCTION

Health is a balanced state that includes physical, mental, and social aspects, not just the absence of disease (1,2). In the modern public health paradigm, efforts to maintain and improve health status no longer depend only on medical services, but also on a healthy lifestyle, including a nutritious diet, regular physical activity, and quality social interactions. All three form important determinants of individual and community well-being (3). However, the reality of urbanization, changes in consumption behavior, and increasing sedentary lifestyles have caused inequality between the needs and healthy behaviors of the community, especially among students and educators (4,5).

Globally, the commitment to comprehensive health aligns with the 3rd Sustainable Development Goal (SDG): "Ensure healthy lives and promote well-being for all at all ages." This goal highlights the importance of preventing non-communicable diseases through improved nutrition literacy and promotion of active lifestyles (6–8). Therefore, integrating healthy diet, physical activity, and social interaction is essential to achieving SDG 3, particularly among productive populations in higher education institutions. As agents of change, universities play a strategic role in fostering sustainable health values through environmental and behavioral innovation.

A healthy diet, especially the consumption of vegetables and fruits, plays a major role in maintaining nutritional status and preventing chronic diseases (9,10). Various studies show that increased consumption of fruits and vegetables can reduce the risk of obesity, diabetes mellitus, and cardiovascular disease (11–13). However, national surveys in Indonesia reveal that fruit and vegetable consumption remains below the WHO recommendation of at least five servings per day. Factors such as low nutrition literacy, limited access to healthy food, and the fast-paced campus lifestyle contribute to poor dietary habits (14,15).

Physical activity is another important element for maintaining fitness, metabolic balance, and

mental health (16,17). Unfortunately, technological advances and prolonged online learning have increased sedentary behavior, leading to reduced physical fitness and lower levels of social interaction within campuses (18,19). Evidence suggests that group-based physical activity enhances motivation, builds social networks, and reduces stress levels, underscoring the social dimension of active living.

Social interaction also has a powerful influence on health. High social support improves adherence to healthy behaviors, enhances psychological resilience, and lowers the risk of metabolic disorders (20). Conversely, social isolation increases stress and decreases quality of life. Therefore, an integrated approach that combines physical, nutritional, and social dimensions is crucial for achieving holistic health (21–23).

To respond to this need, Poltekkes Kemenkes Surabaya established Polkesbaya Corner, a health-promoting campus facility that integrates nutritious dining areas, sports zones, and social spaces. This concept serves as a “living laboratory” that supports the practice of healthy behaviors and allows observation of the interplay between diet, physical activity, and social interaction in influencing nutritional status.

While numerous studies have examined diet and physical activity as separate individual behaviors, the influence of an intentionally designed social and physical campus environment on nutritional status has received limited attention. Therefore, this study seeks to address that gap by examining how social interaction, dietary patterns, and physical activity within the Polkesbaya Corner environment relate to students’ nutritional status. This research supports Indonesia’s Ministry of Health’s promotive and preventive policy direction and contributes to the realization of SDG 3 (*Good Health and Well-being*) within higher education institutions.

METHODS

This research employed a cross-sectional quantitative design to analyze the relationship between fruit and vegetable intake, physical activity, nutritional status, and social interaction within the Polkesbaya Corner environment. Polkesbaya Corner was developed as a health-promotion model in Poltekkes Kemenkes Surabaya, functioning as a “living laboratory” that integrates nutrition education, physical activity, and social engagement spaces. The study was conducted over a ten-month period from January to October 2025, coinciding with the implementation of the “Healthy Campus Initiative.”

The study population included all members of the Poltekkes Kemenkes Surabaya academic community—students, lecturers, administrative staff, supporting personnel, and nearby residents who accessed the Polkesbaya Corner facilities. The sample size was calculated using the Lemeshow formula with a 5% margin of error, resulting in 363 respondents. Participants were selected using proportionate stratified random sampling to ensure representation across departments and job categories. The inclusion criteria were: (1) aged 16–65 years, (2) willing to participate and provide informed consent, (3) active members of the campus or community visitors, and (4) physically and mentally capable of participating in interviews and measurements. Exclusion criteria included known chronic diseases affecting nutritional status, such as diabetes mellitus or thyroid disorders.

Data collection combined structured interviews, anthropometric measurements, and sociometric observations conducted by trained enumerators. Quantitative data were obtained using validated instruments including the Food Frequency Questionnaire (FFQ), the 24-hour dietary recall, and the International Physical Activity Questionnaire (IPAQ) short form. Nutritional intake was assessed through a semi-quantitative FFQ adapted from the Indonesian Ministry of Health and validated through pilot testing on 30 participants. Respondents reported their weekly frequency and types of fruit and vegetable consumption, which were converted into weekly servings and compared with WHO recommendations of at least five servings per day. Intake was then categorized as adequate or inadequate. Physical activity was measured using the IPAQ short form, which recorded the duration and frequency of light, moderate, and vigorous activities during the previous week. The activities were converted into MET-minutes per week and categorized as light (<600 MET-min/week), moderate (600–1,500 MET-min/week), or vigorous (>1,500 MET-min/week) according to WHO standards.

Nutritional status was determined using anthropometric measurements of height and weight obtained with calibrated digital scales and stadiometers. Body Mass Index (BMI) was calculated by dividing

weight in kilograms by the square of height in meters (kg/m^2), and the results were classified based on WHO (2023) criteria: underweight (<18.5), normal ($18.5\text{--}24.9$), and overweight/obese (≥ 25.0). Each measurement was taken twice, and the average was used in data analysis to ensure accuracy and consistency.

Social interaction was measured using a sociometric observation method complemented by a structured observation checklist. Observations were conducted during routine campus activities at Polkesbaya Corner over three non-consecutive days. The sociometric score was derived from three parameters: frequency of engagement (number of times individuals initiated or joined group discussions or activities), duration of interaction (average minutes spent interacting with peers or staff), and reciprocity or cooperation (observed mutual participation, assistance, or information exchange between individuals). Each parameter was scored on a five-point Likert scale, and total scores ranging from 3 to 15 were obtained. The results were then categorized into low (3–7), moderate (8–11), and high (12–15) social interaction levels. To ensure reliability, all enumerators underwent observer calibration sessions, and inter-observer agreement was confirmed with a Cohen's kappa coefficient of 0.82, indicating substantial reliability.

Data were analyzed using IBM SPSS version 26.0. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize respondent characteristics. The Chi-Square test was performed to determine associations between independent variables (fruit and vegetable intake, physical activity, social interaction) and the dependent variable (nutritional status), with a significance level set at $p < 0.05$. Cross-tabulations were also conducted to explore subgroup differences across age, department, and interactivity level.

CODE OF HEALTH ETHICS

Ethical feasibility of the Research Ethics Committee of the Faculty of Medicine, Sebelas Maret University Number 99/UN27.06.11/KEP/EC/2025.

RESULTS

Based on Table 1, the average age of the respondents was 23.8 years (SD 9.5) with an age range of 16–62 years, showing the dominance of the young age group. The average weight is 59.8 kg and the height is 159.9 cm, resulting in an average body mass index (BMI) of 23.2 (SD 4.8) which is in the normal category according to the WHO classification. These results reflect that most of the respondents have relatively good nutritional status and are proportional to their physical characteristics.

Table 1. Respondent Characteristics of Research Social Interaction and Nutritional Status in the Health-Promoting Campus of Polkesbaya Corner

Variable	N =363			
	Min	Max	Mean	SD
Age (years)	16	62	23.8	9.5
Weight (kg)	30.0	124.0	59.8	14.7
Height (cm)	143.0	189.0	159.9	8.4
BMI	13.3	39.5	23.2	4.8

The results of the study on 363 respondents at Polkesbaya Corner showed that the majority were aged 16–25 years old (80.7%) and came from the Department of Health Analysts (32.2%). Most of them consumed sautéed vegetables (74.1%) and cut fruits (68.9%), with predominantly light physical activity (79.3%) and sitting time of 4–6 hours per day (57%). The nutritional status of the respondents was generally normal (52.3%), but there were still 31.7% overweight. As many as 68% of respondents have not taken advantage of Polkesbaya Corner facilities, even though 45.7% show high social interaction. These findings indicate the need to increase physical activity and participation of campus facilities to support a healthy lifestyle.

Table 2. Distribution of Respondent Social Interaction and Nutritional Status in the Health-Promoting Campus of Polkesbaya Corner

	Variable	n =363	%
Age	16-25 Late youth	293	80.7
	26-35 Early adulthood	26	7.2
	36-45 Intermediate adults	22	6.1
	46-55 Advanced Adults	15	4.1
	56-65 Pre-elderly	7	1.9
Department	Nutrition	16	4.4
	Electromedical Engineering	51	14.0
	Health Analyst	117	32.2
	Dental Nursing	52	14.3
	Environmental Health	49	13.5
	Rectorate	26	7.2
	General Public	21	5.8
	Midwifery	5	1.4
	Nursing	2	0.6
	Security, Driver, Cleaning Service	24	6.6
Frequency of Vegetable Intake	Sauté	269	74.1
	Boiled	79	21.8
	Steam	15	4.1
Frequency of Fruit Intake	Sliced Fruit	250	68.9
	Fruit Juice	108	29.8
	Pudding	5	1.4
Frequency of Physical Activity	Light Activity	288	79.3
	Moderate Activity	75	20.7
Nutrition Status	Underweight	58	16.0
	Normal	190	52.3
	Overweight	115	31.7
Breakfast Frequency	Yes	185	51.0
	No	178	49.0
Frequency of Facility Use	Never	247	68.0
	Sometimes	96	26.4
	Often	16	4.4
	Very Often	4	1.1
Frequency of Long Sitting a Day	<4 hours	69	19.0
	4-6 hours	207	57.0
	7-9 hours	69	19.0
	>9 hours	18	5.0
Social Interaction	Less Interactive	58	16.0
	Moderately Interactive	139	38.3
	Interactive	166	45.7

The results of the analysis showed a significant relationship between age, share, and social interaction with the nutritional status of the respondents ($p < 0.05$). The majority of late adolescents (53.6%) have normal nutritional status, while the proportion of overweight increases in the adult age group. By section, respondents from the Department of Health Analysts (60.7%) had the most normal nutritional status, while the general public showed the highest tendency to be overweight (71.4%). Physical activity, fruit and vegetable intake were not significantly related to nutritional status. Interestingly, respondents with high social interaction tended to have better nutritional status than those who were less interactive, confirming the importance of social support for nutritional balance.

Table 3. Cross-tabulation of Respondent Research Social Interaction and Nutritional Status in the Health-Promoting Campus of Polkesbaya Corner

	Variable	Underweight		Normal		Overweight		n	p-value
		n	%	n	%	n	%		
Age	16–25 Late youth	57	19.5	157	53.6	79	27.0	293	0.000
	26–35 Early adulthood	0	0	17	65.4	9	34.6	26	
	36–45 Intermediate adults	0	0	9	40.9	13	59.1	22	
	46–55 Advanced Adults	0	0	5	33.3	10	66.7	15	
	56–65 Pre-elderly	1	14.3	2	28.6	4	57.1	7	
Department	Nutrition	0	0	11	68.8	5	32.1	16	0.001
	Electromedical Engineering	12	23.5	25	49.0	14	27.5	51	
	Health Analyst	22	18.8	71	60.7	24	20.5	117	
	Dental Nursing	11	21.2	26	50.0	15	28.8	52	
	Environmental Health	10	20.4	19	38.8	20	40.8	49	
	Rectorate	0	0	14	53.8	12	46.2	26	
	General Public	0	0	6	28.6	15	71.4	21	
	Midwifery	1	20.0	2	40.0	2	40.0	5	
	Nursing	0	0	1	50.0	1	50.0	2	
	Satpam, Driver, Cleaning Service	2	8.3	15	62.5	7	29.2	24	
Breakfast	Yes	24	13.0	100	54.1	61	33.0	185	0.280
	No	34	19.1	90	50.6	54	30.3	178	
Vegetable Intake	Sauté	40	14.9	142	52.8	87	32.3	269	0.292
	Boiled	17	21.5	37	46.8	25	31.6	79	
	Steam	1	6.7	11	73.3	3	20.0	15	
Fruit Intake	Sliced Fruit	42	16.8	131	52.4	77	30.8	250	0.858
	Fruit Juice	16	14.8	56	51.9	36	33.3	108	
	Pudding	0	0	3	60.0	2	40.0	5	
Physical Activity	Light Activity	51	17.7	147	51.0	90	31.2	288	0.208
	Moderate Activity	7	9.3	43	57.3	25	33.3	75	
Social Interaction	Less Interactive	7	12.1	22	37.9	29	50.0	58	0.024
	Moderately Interactive	21	15.1	78	56.1	40	28.8	139	
	Interactive	30	18.1	90	54.2	46	27.7	166	

DISCUSSION

This study aimed to analyze the relationship between fruit and vegetable intake, physical activity, social interaction, and nutritional status within the academic community of Poltekkes Kemenkes Surabaya, using the Polkesbaya Corner as a contextual setting for a health-promoting campus. The findings revealed that most respondents were in the late adolescent age group (16–25 years) and had normal nutritional status (52.3%), while 31.7% were overweight and 16% underweight. These proportions indicate that, despite the generally good nutritional status among respondents, there remains a dual burden of malnutrition that requires targeted health promotion interventions.

The study found a significant association between social interaction and nutritional status ($p = 0.024$), whereas fruit and vegetable intake and physical activity showed no meaningful relationships. The study by Johannes et.al (2025) strengthens the use of the Social Ecological Model in understanding the involvement of physical activity, with an emphasis on multidimensional determinants such as personal, social, and environmental characteristics that interact with each other influencing health behaviors (24). Social networks and supportive peer relationships may foster healthier eating patterns and lifestyle behaviors, as individuals tend to model the actions of their social groups (25). Thus, social interaction

serves as a critical determinant of health behavior consistency within the campus setting.

Interestingly, 68% of respondents reported never using the Polkesbaya Corner facilities, although nearly half (45.7%) demonstrated high levels of social interaction. This finding suggests that the observed associations between social interaction and nutritional status may reflect broader social behaviors within the campus environment, not necessarily the direct effect of the Corner facility itself. The low utilization rate highlights an important contextual factor: Polkesbaya Corner served as the setting for this study but not as an intervention being evaluated. Therefore, while the concept of a “living laboratory” is innovative and aligns with global Health Promoting Campus initiatives, this cross-sectional design captures associations at a single point in time and does not measure the efficacy or causal impact of the facility on behavioral outcomes.

The implication of this finding is twofold. First, the low participation rate may limit the generalizability of the results to actual users of the Polkesbaya Corner. Second, it raises the possibility of selection bias, in which individuals with higher social engagement and health awareness are more likely to visit or utilize such health-promoting spaces. A follow-up comparative analysis between users and non-users could provide valuable insights into whether the positive relationship between social interaction and nutritional status differs across these groups. Such analysis would also help clarify whether Polkesbaya Corner attracts already health-conscious individuals or effectively promotes behavior change among less active or nutritionally at-risk populations.

From a behavioral perspective, the low utilization of the facility (68%) despite its accessibility may stem from several factors, such as lack of awareness, limited time availability, or low perceived benefit. Studies in similar campus-based health interventions indicate that behavioral change requires not only the availability of facilities but also social and motivational reinforcement (26). Therefore, Polkesbaya Corner could be more effectively positioned as a participatory platform for collective engagement, integrating health literacy programs, peer-led activities, and environmental nudges to foster habitual use.

Regarding fruit and vegetable consumption, the results indicate that while the majority of respondents consumed vegetables and fruits regularly, their intake likely fell below the WHO recommendation of five servings per day. These findings are consistent with national data showing that Indonesian adolescents and young adults have suboptimal fruit and vegetable consumption (27). Similarly, 79.3% of respondents engaged in light physical activity, which reflects a sedentary lifestyle pattern common in higher education populations. Both behaviors may contribute to the observed proportion of overweight individuals and underscore the need for multifaceted interventions that combine education, environmental support, and social influence.

The age factor also showed a meaningful relationship with nutritional status ($p=0.000$). Younger respondents (16–25 years) tended to have normal BMI, while overweight prevalence increased among adults. Research by Dekanalis et al. (2024) found that in the young adult age group, the risk of overweight increases due to work stress and less sleep time (28). In this study, the general non-campus community group showed the highest proportion of overweight (71.4%), while health students had the highest proportion of normal nutritional status (60.7%). This suggests that the level of nutrition knowledge and health literacy contributes to a person's nutritional status, where groups with a health education background tend to have better eating behaviors (29–32).

The findings reaffirm that social determinants of health particularly peer relationships and environmental context are crucial for understanding dietary and physical behavior patterns. In this regard, Polkesbaya Corner provides a valuable context for observing these dynamics. However, the study does not evaluate the facility's impact as a health intervention. Clarifying this distinction is essential for managing reader expectations and accurately positioning this research as an observational study conducted within a unique health-promotion setting.

Despite the cross-sectional nature of the study, the results underscore the potential of integrating social interaction within health promotion strategies. Future research should employ longitudinal or quasi-experimental designs to examine behavioral changes resulting from active participation in Polkesbaya Corner programs. Additionally, stratified analyses comparing users and non-users would help control for selection bias and more accurately assess whether social engagement within the facility contributes

directly to improved nutritional outcomes.

Overall, the study confirms that good nutritional status is not only influenced by the consumption of nutritious food and physical activity, but also by positive social interactions. Social support is proving to be an important catalyst in shaping healthy behaviors, while low physical activity and utilization of campus facilities are still a challenge. Therefore, the health promotion strategy within the Polytechnic of the Ministry of Health Surabaya needs to be focused on increasing the active participation of the academic community through a collaborative approach across study programs, contextual nutrition education, and strengthening the Polkesbaya Corner-based healthy campus community. The sustainable implementation of this program is expected to support the creation of a healthy, productive, and competitive young generation, as well as a real contribution of higher education institutions to the achievement of the 3rd SDGs.

CONCLUSION

This study found a significant association between social interaction and nutritional status among the Poltekkes Kemenkes Surabaya academic community, while fruit and vegetable intake and physical activity were not related. Individuals with higher levels of social engagement tended to have normal BMI, highlighting the importance of social environments in promoting healthy lifestyles. Although Polkesbaya Corner has the potential to serve as a “living laboratory” for health promotion, its low utilization rate indicates the need for stronger participation strategies. Future research should employ longitudinal or intervention-based designs to measure behavioral changes over time and compare users and non-users of Polkesbaya Corner to better understand its impact and strengthen campus-based health promotion aligned with Sustainable Development Goal 3 (Good Health and Well-being).

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest related to this study.

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