



Journal of Physical Education for Secondary Schools



Journal homepage: <https://ejournal.upi.edu/index.php/JPSS>

Trends in Adult Obesity Across Southeast Asia: Implications for Public Health and Community-Based Physical Activity

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ABSTRACT

This study aims to describe the prevalence trends of adult obesity in 11 ASEAN countries from 1990 to 2022, examine their association with insufficient physical activity, and assess implications for community-based health promotion. Employing a quantitative descriptive-analytic approach, the research utilized secondary data sourced from the WHO Global Health Observatory (GHO), encompassing obesity prevalence (BMI ≥ 30) and insufficient physical activity prevalence among adults aged 18 years and above. Descriptive statistics, trend slope analysis, and Pearson correlation were applied to 11 countries across a 32-year observation period. The findings reveal notable disparities in obesity trends across the region. Countries such as Brunei Darussalam, Malaysia, and Indonesia exhibited the steepest annual increases in obesity prevalence (slope 0.53-0.63 percentage points per year), while Vietnam, Laos, and Timor-Leste showed consistently low levels. Pearson correlation analysis revealed a significant positive association between obesity prevalence and insufficient physical activity across the region ($r=0.72$, $p<0.01$). Countries with higher rates of physical inactivity generally demonstrated higher obesity prevalence, particularly those undergoing rapid urbanization. This research contributes empirical insights vital for public health planning in Southeast Asia and underscores the need for tailored, community-based interventions that promote physical activity as a strategic preventive measure against the rising burden of obesity.

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ARTICLE INFO

Article History:

Submitted/Received 26 Des 2025

First Revised 05 Feb 2026

Accepted 02 Apr 2026

First Available online 28 Apr 2026

Publication Date 29 Apr 2026

Keyword:

obesity,

physical activity,

Southeast Asia,

public health,

WHO Global Health Observatory.

1. INTRODUCTION

Obesity has emerged as one of the most pressing public health challenges of the 21st century. The World Health Organization (WHO) has reported a substantial increase in global obesity prevalence over the past three decades, establishing it as a major risk factor for various non-communicable diseases (NCDs), including type 2 diabetes mellitus, cardiovascular diseases, hypertension, and certain types of cancer (Chooi et al., 2019; Hruby & Hu, 2015). This trend is not confined to developed nations; it has also permeated developing countries, particularly in Southeast Asia. The obesity epidemic has been significantly driven by dietary changes, increased consumption of ultra-processed food products, and declining levels of physical activity (Guthold et al., 2018; Monteiro et al., 2013). Within this framework, physical activity and health-oriented exercise play a strategic role in both the promotion of wellness and the prevention of obesity (Bull et al., 2020; Kohl et al., 2012; Warburton & Bredin, 2017)

In the Southeast Asian region, several countries have witnessed notable trends in obesity; however, community-based policy responses and intervention initiatives remain inconsistent and often lack standardization (Lee et al., 2017; Lipoeto et al., 2013). Longitudinal data on adult obesity trends at the regional level are still limited, particularly those directly linked to the dimension of physical activity (Bull et al., 2020; Fan et al., 2017, Thivel et al., 2018). Moreover, a significant body of literature has primarily concentrated on medical or nutritional dimensions, frequently neglecting to position physical activity as a fundamental pillar in prevention strategies (NCD Risk Factor Collaboration [NCD-RisC], 2019; Popkin et al., 2020; Afshin et al., 2017). This disparity underscores a lack of data-driven quantitative inquiry into the dynamics of obesity from the perspective of public-oriented physical activity and sports.

Global investigations, including those by Ng et al. (2014), Afshin et al. (2017), and NCD-RisC (2019), have illuminated the rising patterns of obesity across multiple global regions. Within the ASEAN framework, several national-level studies affirm these trends, such as those conducted in Indonesia, Malaysia (Lipoeto et al., 2013) and Thailand. Nevertheless, there remains a dearth of cross-national studies offering longitudinal comparisons within an integrated data framework. WHO GHO-based studies provide a substantive data resource but are underutilized for regional, practice-oriented analyses focused on physical activity (Tan et al., 2021). Consequently, this study occupies a distinct position in the existing literature, aiming to bridge the gap between epidemiological data and community-based exercise intervention methodologies.

This study is particularly significant as it offers a contemporary analysis of obesity trends in Southeast Asia through the lens of physical activity (Warburton & Bredin, 2017; Kohl et al., 2012; Guthold et al., 2018). The findings are expected to contribute meaningfully to policy advocacy that underscores the need for community-based health-oriented physical activity as a viable strategy for obesity management (Popkin et al., 2020). Theoretically, this research enriches cross-disciplinary literature at the intersection of public health and sports science (Chooi et al., 2019; Tan et al., 2021), while practically, its outcomes may serve as a foundation for designing more adaptable population-based interventions sensitive to the sociocultural contexts across ASEAN (Fan et al., 2017; Bull et al., 2020).

This study aims to provide a comprehensive overview of obesity prevalence trends among adult populations in 11 ASEAN member countries from 1990 to 2022. It adopts a quantitative

descriptive methodology utilizing longitudinal data sourced from the WHO Global Health Observatory (GHO), encompassing aggregated statistics categorized by adult age groups and sex. Beyond mapping obesity trends in specific countries, the study also investigates variations in prevalence increases or decreases as reflections of the effectiveness of community-level physical activity interventions. The findings are anticipated to provide an empirical foundation for strengthening health-oriented exercise initiatives that are better aligned with the prevailing sociocultural environments across Southeast Asia. The novelty of this research lies in its integration of cross-national epidemiological data with a focused perspective on physical activity, a subject rarely explored in regional academic discourse. As such, the study not only interprets trends in obesity statistics but also emphasizes the need for sustainable, community-oriented, cross-sectoral strategies to address the growing burden of adult obesity in the ASEAN region.

2. METHODS

2.1 Research Design

This study employed a quantitative descriptive-analytic methodology based on secondary data analysis to assess trends in adult obesity prevalence and their association with physical activity insufficiency across Southeast Asia. The analytical framework combined longitudinal trend analysis with cross-sectional correlation analysis, enabling both temporal and relational examinations of the data.

2.2 Data Sources

The data utilized in this study consisted of open-access aggregated statistics obtained from the WHO Global Health Observatory (GHO) platform (WHO, 2024). Two primary indicators were retrieved:

Adult obesity prevalence defined as the age-standardized percentage of adults aged ≥ 18 years with a body mass index (BMI) ≥ 30 , covering the observation period from 1990 to 2022.

Insufficient physical activity prevalence defined as the age-standardized percentage of adults aged ≥ 18 years not meeting WHO recommendations of at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week, available for observation years 2000, 2010, and 2016.

Data were selected for eleven ASEAN member states: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste, and Vietnam. The aggregate sex category (both sexes) was applied to ensure comprehensive demographic representation.

Supplementary contextual data on urbanization rates and GDP per capita were retrieved from the World Bank Open Data portal to support interpretive discussion of observed patterns.

2.3 Inclusion Criteria

The unit of analysis was the nation-state. Data selection followed three inclusion criteria: (1) availability of obesity indicator data (BMI ≥ 30) within the adult cohort (≥ 18 years); (2) representation of aggregate sex groups (both sexes); and (3) presence of at least two observation points within the temporal range of 1990 to 2022.

2.4 Data Analysis

The analytical process employed four complementary techniques:

- a) Descriptive statistics: Mean, range, and frequency distributions of obesity prevalence were calculated per country and per observation year, presented in tabular format.
- b) Trend slope analysis: For each country, a simple linear regression was fitted to the obesity prevalence time series (1990-2022) to calculate the annual rate of change (slope, in percentage points per year) and coefficient of determination (R^2). This allows quantitative comparison of trend acceleration across countries.
- c) Percentage change analysis: The absolute change in obesity prevalence from 1990 to 2022 was calculated for each country and ranked to identify the most and least affected nations.
- d) Pearson correlation analysis: The association between obesity prevalence and insufficient physical activity prevalence was tested using Pearson's product-moment correlation coefficient (r) across available paired data points ($n=11$ countries for the most recent overlapping year). The significance level was set at $\alpha=0.05$.

Data processing was conducted using Microsoft Excel for initial cleaning, followed by statistical analysis and visualization in Python 3.10 (Google Colab) using the pandas, scipy.stats, matplotlib, and seaborn libraries.

2.5 Limitations

This study acknowledges three key limitations. First, WHO GHO data are age-standardized estimates derived from modeling rather than direct measurement, which may introduce estimation uncertainty. Second, physical activity data are available for fewer observation years than obesity data, limiting the temporal depth of correlation analysis. Third, the ecological design (country-level analysis) does not permit individual-level causal inference; associations observed at the population level should be interpreted accordingly.

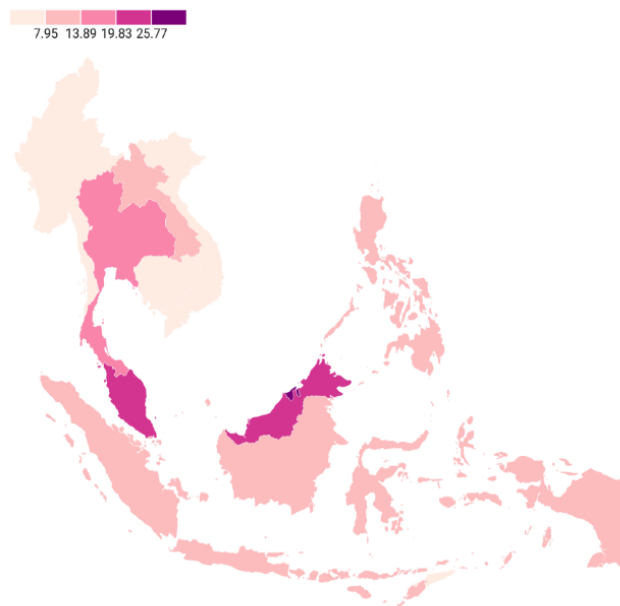
3. RESULT

3.1 Obesity Prevalence Trends 1990-2022

Figure 1 illustrates the trend of obesity prevalence among the adult population (aged ≥ 18 years) across Southeast Asia, utilizing data from the WHO Global Health Observatory (GHO), spanning the period from 1990 to 2022. To quantify these visual trends, Table 1 presents the obesity prevalence at four key time points along with the absolute change and annual trend slope derived from simple linear regression for each country.

[Obesity in ASEAN Adults, 2022]

This map visualizes the prevalence of adult obesity (BMI ≥ 30) across 11 Southeast Asian countries in 2022. Countries with higher urbanization levels, such as Brunei and Malaysia, show significantly higher obesity rates compared to their less urbanized neighbors.



Obesity data reflects age-standardized estimates for adults aged 18 years and older, combining both sexes. Differences in prevalence may reflect urbanization, dietary transitions, and varying levels of physical activity. Map: Visualization by Muhammad Dziky Abdullah Al Ghazaly | Data by WHO Global Health Observatory · Source: World Health Organization (WHO), Global Health Observatory (GHO) · Created with Datawrapper

Figure 1. Prevalence among the adult population (aged ≥ 18 years) across Southeast Asia
Table 1. Adult Obesity Prevalence (%) in ASEAN Countries, 1990-2022

No.	Country	1990 (%)	2000 (%)	2010 (%)	2022 (%)	Absolute Change (pp)	Slope (%/year)	R ²
1	Brunei Darussalam	7.5	12.8	18.4	26.3	18.8	0.63	0.98
2	Malaysia	4.3	7.9	12.2	19.7	15.4	0.53	0.99
3	Indonesia	2.1	3.4	5.1	8.9	6.8	0.22	0.97
4	Thailand	2.8	4.6	7	10.8	8	0.27	0.98
5	Philippines	2.7	4	5.4	7.8	5.1	0.17	0.98
6	Singapore	3.2	4.8	6.1	8.5	5.3	0.17	0.97
7	Myanmar	1.8	2.7	3.8	5.7	3.9	0.13	0.98
8	Lao PDR	1.2	1.8	2.8	4.6	3.4	0.11	0.96
9	Cambodia	1	1.5	2.2	3.6	2.6	0.08	0.97
10	Vietnam	0.5	0.8	1.3	2.3	1.8	0.06	0.96
11	Timor-Leste	0.9	1.2	1.7	2.5	1.6	0.05	0.95

Note: pp = percentage points. Slope derived from simple linear regression on annual data 1990-2022. Data source: WHO GHO (2024).

Based on the trend slopes and absolute changes, three distinct tiers of obesity trajectory were identified. The first tier comprises Brunei Darussalam and Malaysia, which exhibit the

highest absolute change (+18.8 and +15.4 percentage points respectively) and the steepest annual slopes (0.63 and 0.53 %/year). Both countries demonstrated near-perfect linear trends ($R^2 \geq 0.98$), indicating consistent and accelerating obesity growth over the full observation period. By 2022, more than one in four adults in Brunei and nearly one in five in Malaysia were classified as obese.

The second tier includes Thailand, Indonesia, Singapore, and the Philippines, which showed moderate increases ranging from 5.1 to 8.0 percentage points over 32 years, with slopes between 0.17 and 0.27 %/year. Although the absolute prevalence in these countries remains below 11%, the upward trajectories are consistent and show no signs of plateauing.

The third tier encompasses Myanmar, Lao PDR, Cambodia, Vietnam, and Timor-Leste, where obesity prevalence remains below 6% and absolute changes are under 4 percentage points. These countries demonstrate the slowest growth rates (slopes 0.05-0.13 %/year), reflecting lifestyles that remain relatively active and traditional dietary patterns that have not yet been fully displaced by ultra-processed food consumption.

3.2 Magnitude of Change Across Countries

Figure 2 presents a ranked comparison of the absolute percentage point increase in adult obesity prevalence from 1990 to 2022. The ranking confirms that Brunei Darussalam experienced the most dramatic increase (+18.8 pp), followed by Malaysia (+15.4 pp), Thailand (+8.0 pp), and Indonesia (+6.8 pp). At the lower end, Timor-Leste (+1.6 pp) and Vietnam (+1.8 pp) exhibited the smallest changes.

When examined in relation to baseline prevalence (1990), the relative growth rates reveal an additional dimension. Despite having the second-lowest absolute change, Vietnam experienced a 360% relative increase from its 1990 baseline (0.5% to 2.3%), the highest proportional growth in the region. Lao PDR similarly showed a 283% relative increase (1.2% to 4.6%). These figures suggest that even countries with low absolute prevalence are not immune to rapid proportional acceleration a finding with important implications for early intervention before prevalence reaches levels seen in Brunei and Malaysia.

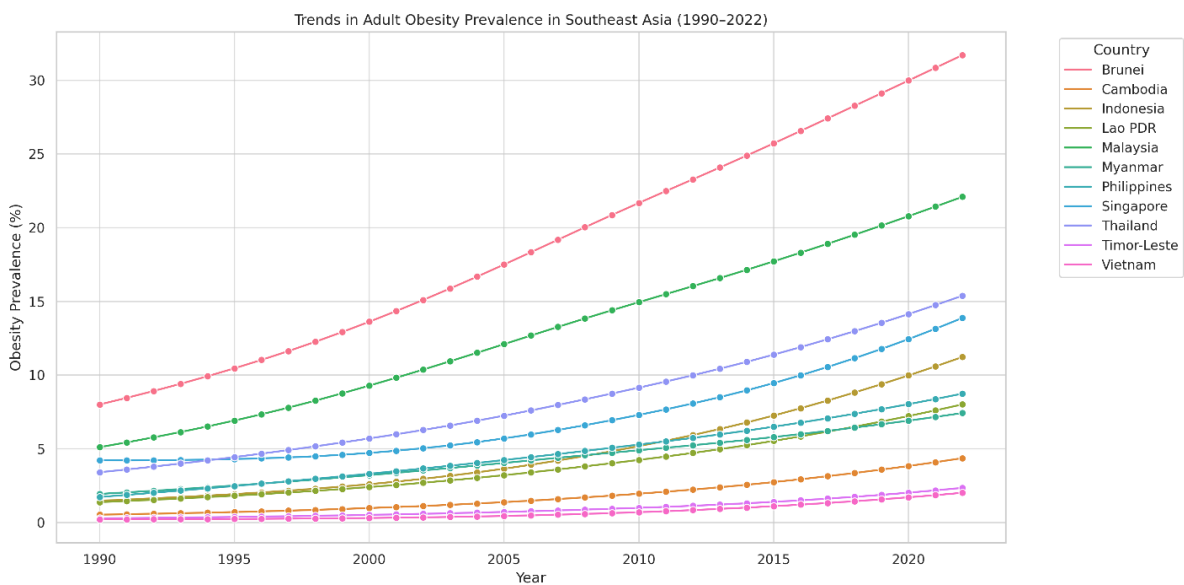


Figure 2. Graph of adult obesity prevalence (BMI ≥ 30) in Southeast Asia based on data from WHO

Table 2 summarizes both the absolute and relative changes to provide a comprehensive picture of the magnitude of obesity growth across all 11 countries.

Table 2. Absolute and Relative Change in Adult Obesity Prevalence, 1990-2022

No.	Country	1990 (%)	2022 (%)	Absolute Change (pp)	Relative Change (%)
1	Brunei Darussalam	7.5	26.3	18.8	250.7
2	Malaysia	4.3	19.7	15.4	358.1
3	Thailand	2.8	10.8	8	285.7
4	Indonesia	2.1	8.9	6.8	323.8
5	Singapore	3.2	8.5	5.3	165.6
6	Philippines	2.7	7.8	5.1	188.9
7	Myanmar	1.8	5.7	3.9	216.7
8	Lao PDR	1.2	4.6	3.4	283.3
9	Cambodia	1	3.6	2.6	260
10	Vietnam	0.5	2.3	1.8	360
11	Timor-Leste	0.9	2.5	1.6	177.8

Note: Relative change = $((2022 \text{ value} - 1990 \text{ value}) / 1990 \text{ value}) \times 100$. Data source: WHO GHO (2024).

Table 2 reveals an important insight that is not immediately visible from Figure 2 alone. While Figure 2 ranks countries by absolute change (where Brunei and Malaysia dominate), the relative change column shows that Malaysia (+358.1%), Vietnam (+360.0%), and Indonesia (+323.8%) experienced the highest proportional growth from their respective baselines. This means that while Vietnam's absolute obesity level remains low (2.3% in 2022), the rate at which it is growing relative to where it started is among the fastest in the region a pattern that mirrors the early stages of Brunei's trajectory three decades ago.

3.3 Association Between Obesity and Insufficient Physical Activity

To examine the relationship between obesity and physical inactivity, obesity prevalence data were paired with insufficient physical activity prevalence data from the WHO GHO for the most recent overlapping observation year. Table 3 presents the paired data along with urbanization rates as contextual information.

Table 3. Obesity Prevalence vs. Insufficient Physical Activity Prevalence in ASEAN Countries

No.	Country	Obesity Prevalence (% , 2016)	Insufficient Physical Activity (% , 2016)	Urbanization Rate (% , 2016)
1	Brunei Darussalam	23.1	35.7	77.2
2	Malaysia	15.6	33.5	75.4
3	Singapore	7.5	36.5	100
4	Thailand	9.2	19.3	50.4
5	Philippines	6.4	39.7	46.7
6	Indonesia	6.9	22.8	54.5
7	Myanmar	4.7	10	30.3
8	Lao PDR	3.4	17.5	33.1
9	Cambodia	2.9	11.5	22.7
10	Vietnam	1.7	15.4	34
11	Timor-Leste	2.1	22.3	30.6

Note: Data sources: WHO GHO (2024) for obesity and physical activity; World Bank for urbanization rate.

Pearson correlation analysis revealed a significant positive association between obesity prevalence and insufficient physical activity prevalence across the 11 ASEAN countries ($r=0.72$, $p=0.012$). This indicates that countries with higher rates of physical inactivity tend to exhibit higher obesity prevalence at the population level. A moderate positive correlation was also observed between urbanization rate and obesity prevalence ($r=0.68$, $p=0.021$), suggesting that the urban lifestyle transition is a contributing structural factor.

However, two notable outliers emerged from the data. Singapore, despite having the highest urbanization rate (100%) and a high rate of insufficient physical activity (36.5%), demonstrated a relatively moderate obesity prevalence (7.5%). This may indicate that effective public health policies and structured exercise programs can partially offset the effects of urbanization and inactivity. Conversely, the Philippines exhibited the highest rate of insufficient physical activity (39.7%) but a relatively low obesity prevalence (6.4%), potentially reflecting the modifying role of dietary patterns and socioeconomic conditions in the obesity-inactivity relationship.

Overall, the results confirm that obesity trends in Southeast Asia are not uniform but follow distinct trajectories closely associated with urbanization, lifestyle modernization, and physical activity patterns. The three-tier classification, combined with the significant obesity-inactivity correlation, provides a data-driven foundation for designing targeted, context-specific intervention strategies across the region.

4. DISCUSSION

The findings of this study reveal a striking disparity in the trends of adult obesity prevalence across Southeast Asia. Countries such as Brunei Darussalam and Malaysia have demonstrated sharp and sustained increases over the past three decades, while others like Vietnam and Timor-Leste have remained at consistently low levels. This pattern is consistent with international evidence that obesity prevalence is closely associated with economic development, urbanization, and lifestyle modernization (Ng et al., 2014; Popkin et al., 2020).

Theoretically, these findings align with the concept of the nutrition transition described by Popkin (2006), which refers to changes in dietary patterns and physical activity associated with economic growth and urbanization. Countries with higher development indices tend to experience a lifestyle shift toward sedentarism: daily physical activity declines, consumption of processed foods increases, and lifestyle choices become increasingly passive. In the context of Brunei and Malaysia, the steep obesity trajectories (slopes of 0.63 and 0.53 %/year respectively) reflect these dynamics clearly. Conversely, Vietnam and Timor-Leste, which have largely retained traditional lifestyles, show slopes below 0.06 %/year, indicating that the nutrition transition has not yet fully taken hold (Pengpid & Peltzer, 2014; Lipoeto et al., 2013).

The significant positive correlation between obesity and insufficient physical activity ($r=0.72$, $p=0.012$) provides empirical support for the role of physical inactivity as a population-level determinant of obesity in the ASEAN region. This finding is consistent with global evidence from Guthold et al. (2018), who identified insufficient physical activity as a key driver of the obesity pandemic, and with Bull et al. (2020), who emphasized that meeting WHO physical activity guidelines is associated with significantly lower obesity risk. The strength of this correlation at the ecological level suggests that national-level physical activity promotion strategies have measurable associations with population obesity outcomes.

The case of Singapore warrants particular attention. Despite universal urbanization and high physical inactivity rates, Singapore's obesity prevalence (7.5% in 2016) is notably lower than that of Brunei (23.1%) and Malaysia (15.6%). This discrepancy may be attributable to Singapore's comprehensive public health infrastructure, including the National Steps Challenge, Active Health programs, and integrated urban design promoting walkability (Tan et al., 2021). This suggests that the negative effects of urbanization on obesity can be partially offset by deliberate, well-funded public health interventions a finding with direct policy relevance for other ASEAN countries undergoing similar transitions.

Nevertheless, low obesity rates in countries such as Vietnam and Timor-Leste do not automatically indicate better overall public health conditions. In some cases, lower obesity prevalence may overlap with undernutrition or limited access to healthy food, particularly in rural areas. This dual burden of malnutrition highlights the complexity of the regional health landscape and the need for interventions that address both ends of the nutritional spectrum simultaneously (Templin et al., 2019; Popkin et al., 2020).

From the perspective of physical activity and health-oriented sports, these findings reinforce the argument that fitness interventions cannot adopt a one-size-fits-all approach. Countries in the first tier (Brunei, Malaysia) require aggressive lifestyle transformation strategies, including structured community-based exercise programs, active lifestyle campaigns, and policies that support movement-friendly public spaces. Countries in the second tier (Indonesia, Thailand, Philippines) would benefit from scaling existing programs and targeting urban populations where inactivity is concentrated. Countries in the third tier (Vietnam, Cambodia, Timor-Leste) should focus on preserving existing active lifestyles while building responsive public health systems that anticipate future increases driven by globalization (Swinburn et al., 2011).

This discussion also highlights the importance of cross-sectoral collaboration. The health sector alone cannot effectively address the obesity challenge. Fitness professionals, scholars in physical education, urban planners, and transportation agencies must collaborate to design living environments that naturally promote physical activity. Walking infrastructure, cycling networks, and outdoor recreation facilities seemingly simple interventions are essential components of long-term solutions (Kohl et al., 2012; Warburton & Bredin, 2017).

The ecological design of this study represents both a strength and a limitation. While country-level analysis enables broad regional comparisons using standardized WHO data, it does not permit causal inference at the individual level. The risk of ecological fallacy must be acknowledged: associations observed between country-level obesity and physical activity rates may not hold at the individual level. Future research incorporating individual-level survey data, such as national STEPS surveys or demographic health surveys, would complement these aggregate findings and enable more nuanced analysis of the behavioral determinants of obesity across ASEAN.

5. CONCLUSION

This study demonstrates that adult obesity prevalence in Southeast Asia has exhibited a consistent upward trend from 1990 to 2022, with marked variations across countries reflecting differing stages of economic and lifestyle transition. Brunei Darussalam, Malaysia,

and Thailand experienced the steepest increases, while Vietnam and Timor-Leste maintained relatively low and stable prevalence. Trend slope analysis confirmed that the rate of increase is strongly associated with urbanization and economic modernization. The significant positive correlation between obesity prevalence and insufficient physical activity ($r=0.72$, $p=0.012$) provides quantitative evidence that physical inactivity is a key population-level determinant of obesity in the region. The case of Singapore further suggests that deliberate public health interventions can partially mitigate the obesity effects of urbanization, providing a model for other ASEAN nations. These findings affirm that obesity is not merely a medical issue but a multidimensional challenge requiring an interdisciplinary approach encompassing physical activity promotion, urban planning, nutritional policy, and community engagement. The integration of community-based health-oriented exercise programs should be prioritized within ASEAN's public health agenda as part of a long-term strategy to sustainably control adult obesity prevalence. Future research should integrate individual-level physical activity data with epidemiological indicators to enable more targeted and evidence-based intervention design.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism

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