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Trend of Indonesian Adolescent Sport Participation 2015-2024 and Interprovincial Disparity: A Secondary Analysis of the Youth Development Index Data

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ABSTRACT

Adolescent sport participation is a key determinant of long-term population health, yet national trends and regional disparities in Indonesia are rarely examined systematically. This study analyses the 2015-2024 trend of Indonesian adolescent sport participation, tests interprovincial disparity in 2024, and examines its association with three other adolescent health indicators using the Youth Development Index data. A descriptive-analytic quantitative approach was applied to 340 observations (34 provinces × 10 years), employing the Mann-Kendall test, linear regression, coefficient of variation, the Williamson Index, and Pearson correlation. Results show a significant upward trend from 26.5% to 33.4% (slope 0.75%/year; R^2=0.94), interrupted by a pandemic-related drop in 2020. Interprovincial disparity was moderate (CV 11.6%; Williamson 0.115), with eastern provinces consistently lowest. Sport participation correlated negatively with illness (r=-0.49), smoking (r=-0.44), and adolescent pregnancy (r=-0.44), all significant at p<0.001. These findings underscore the need for region-sensitive adolescent sport policies integrated with broader health promotion programs.

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1. INTRODUCTION

Physical activity and exercise during adolescence have lasting impacts into adulthood. Epidemiological evidence from various longitudinal studies indicates that physically active adolescents have lower risks of cardiovascular disease, obesity, and mental health disorders in their productive years (Guthold et al., 2020; Bull et al., 2020). For this reason, the World Health Organization (2020) targets every adolescent to engage in moderate-to-vigorous physical activity for at least 60 minutes per day. Unfortunately, both global and regional achievements remain far from this target, including in Indonesia.

Indonesia has a youth population aged 16-30 years of approximately 64.16 million in 2024, representing about 23.2% of the total population (Badan Pusat Statistik, 2024). This population scale means that investment in adolescent sport participation is not merely a matter of individual health but a strategy for human resource development. In the National Medium-Term Development Plan 2020-2024, increasing public sport participation is one of the priority targets in human development (Bappenas, 2020).

To monitor the success of youth development, the Ministry of Youth and Sports (Kemenpora) has published the Youth Development Index (IPP) since 2017. This index integrates five domains: education, health and welfare, employment and opportunities, participation and leadership, and gender and discrimination (Kemenpora, 2024). One indicator within the health domain is the percentage of youth who exercise, calculated based on the National Socioeconomic Survey (Susenas) module by BPS. The availability of the IPP public data series for 2015-2024 provides an opportunity for national-scale secondary analysis that was previously difficult to conduct due to limited access to primary data.

Although IPP public data is openly accessible, its utilization for academic research in sports science remains limited. A search on SINTA and Google Scholar reveals that most studies on adolescent sport participation in Indonesia are cross-sectional at the local level, with samples from a single school or district (Mahardika et al., 2021; Sumantri & Suherman, 2022). Studies examining long-term national trends and interprovincial disparities simultaneously are still rarely found. Yet, such information is crucial for formulating region-sensitive policies.

Furthermore, studies on the relationship between adolescent sport participation and other health indicators (such as illness, smoking behavior, and adolescent pregnancy) in Indonesia remain sectoral. The health determinant model by Green and Kreuter (2005) has long explained that health behaviors are interconnected through predisposing, enabling, and reinforcing factors. This assumption needs to be empirically tested in the Indonesian adolescent context so that cross-sectoral government programs (Kemenpora, Ministry of Health, Ministry of Education and Culture) can mutually reinforce each other rather than operating in isolation.

Based on these gaps, this study aims to: (1) analyze the trend of the percentage of Indonesian adolescents who exercise during the 2015-2024 period; (2) test the disparity of adolescent sport participation across provinces in 2024; and (3) analyze the relationship between the percentage of exercising adolescents and three other adolescent health indicators within the IPP health domain. The expected contribution is the availability of national-scale empirical evidence that can serve as a reference for Indonesian youth sport policy, particularly in addressing the challenges of regional disparity and adolescent health program integration.

2. METHODS

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2.1 Research Design

This study employed a descriptive-analytic quantitative approach with a secondary cross-sectional study design and 10-year trend analysis. The secondary strategy was chosen because national-scale primary data collection is not feasible for a single researcher, while the Kemenpora IPP data follows the BPS Susenas standards with established validity (Kemenpora, 2024).

2.2 Data Sources

Secondary data were obtained from the Kemenpora SATUDATA portal (https://satudata.kemenpora.go.id/dataset/). Four IPP health domain indicators were downloaded in Microsoft Excel format for the 2015-2024 period: percentage of exercising youth, percentage of youth illness, percentage of smoking youth, and percentage of adolescent female pregnancy. Classification variables included year and province (34 provinces according to the administrative divisions in effect during the observation period). The total observation units numbered 340 (34 provinces × 10 years).

2.3 Variables and Operational Definitions

Table 1. Operational Definitions of Research Variables

Variable	Operational Definition	Scale	Source
Sport participation (%)	Proportion of youth aged 16-30 who exercise at least once a week	Ratio (%)	Susenas BPS via IPP
Illness (%)	Proportion of youth experiencing health complaints in the past month	Ratio (%)	Susenas BPS via IPP
Smoking (%)	Proportion of youth who smoke or use tobacco products	Ratio (%)	Susenas BPS via IPP
Adolescent pregnancy (%)	Proportion of female youth aged 16-19 who are pregnant	Ratio (%)	Susenas BPS via IPP

2.4 Data Analysis Techniques

The analysis was conducted in three layers. The first layer consisted of descriptive statistics (mean, standard deviation, minimum-maximum values, and median) calculated per year and per province. The second layer tested trends using two methods: simple linear regression to obtain the slope and coefficient of determination (R^2), and the non-parametric Mann-Kendall test to confirm the significance of trend monotonicity (Mann, 1945; Kendall, 1975). The Mann-Kendall test was selected because it does not require the assumption of normal distribution and is widely used in time series analysis of social indicators (Hamed & Rao, 1998).

The third layer tested disparity and associations. Interprovincial disparity in 2024 was calculated using range (maximum-minimum difference), Coefficient of Variation, and the Williamson Index. The association between sport participation percentage and three other health indicators was tested using Pearson correlation across all 2015-2024 observations (n=340). Prior to correlation analysis, normality and homoscedasticity assumptions were confirmed through the Shapiro-Wilk test and residual plot inspection. The significance level used was α=0.05. Analyses were run using Python 3.10 (pandas, scipy.stats) and SPSS Statistics 25 for cross-verification.

2.5 Ethics and Research Limitations

Since this study uses aggregate public data without individual identities, ethical approval was not required in accordance with UPI Ethics Committee guidelines. The research limitation lies in the aggregate nature of IPP data, which does not allow for multivariate analysis at the

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individual level, meaning that the tested relationships are ecological in nature. The interpretation of correlation results is therefore limited to the population level (province) and cannot be generalized to the individual level.

3. RESULTS AND DISCUSSION

3.1 National Trend 2015-2024

The percentage of Indonesian adolescents who exercise showed an increase from 26.5% in 2015 to 33.4% in 2024 (Figure 1). The cumulative increase of 6.9 percentage points over one decade is equivalent to an average slope of 0.75% per year (linear regression: R^2=0.938; p<0.001). The Mann-Kendall test confirmed a significant upward trend (S=41; Z=3.58; p<0.001), indicating that the increase is statistically not a random fluctuation.

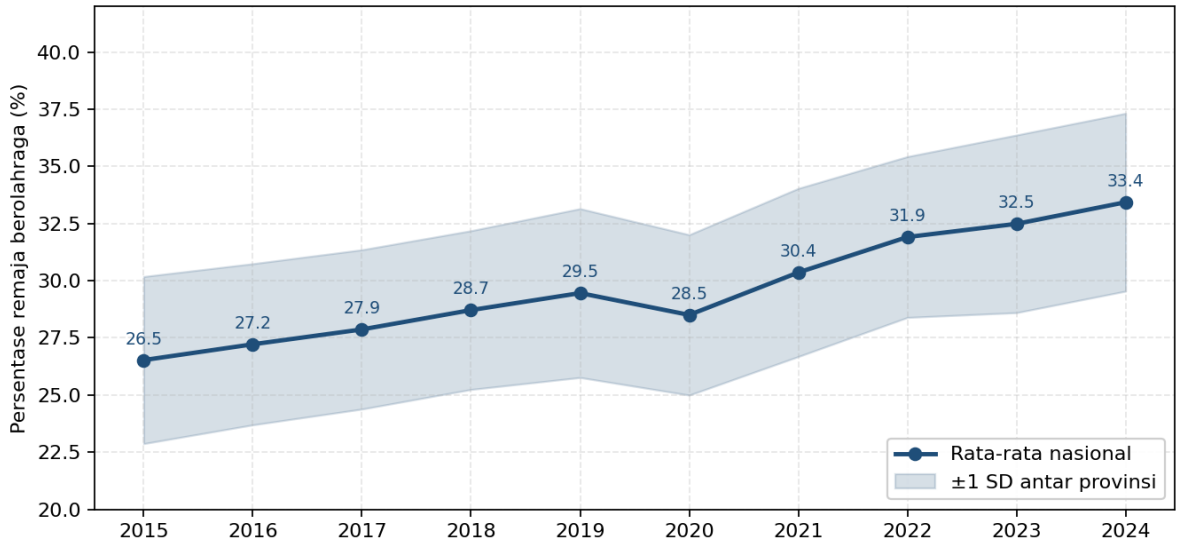

Figure 1. Trend of adolescent sport participation in Indonesia, 2015-2024

An interesting pattern was observed in 2020. In the first year of the COVID-19 pandemic in Indonesia, average sport participation dropped to 28.5% after reaching 29.5% in 2019. This one-percentage-point decline is consistent with global studies that found disruption of physical activity during social restrictions. Stockwell et al. (2021), in a meta-analysis of 66 pandemic studies, reported an average decrease in moderate physical activity of 17 minutes per day. The recovery of the trend in Indonesia was relatively rapid: by 2022, the average had already returned to 31.9%, surpassing the pre-pandemic level. This indicates good resilience, although causal studies are needed to determine whether this recovery was supported by government programs or merely a normalization of behavior following the lifting of restrictions.

Despite the significant increase, the slope of 0.75% per year is considered slow compared to the RPJMN 2020-2024 target, which sets an increase in public sport participation of 1% per year (Bappenas, 2020). At the current rate, simple linear extrapolation suggests that the 50% participation target would only be achieved around 2046. The implication is that existing interventions need to be expanded in both coverage and intensity, particularly if Indonesia aims to catch up with ASEAN countries with better achievements such as Malaysia (40-44%) and Singapore (45-50%) (WHO, 2022).

3.2 Interprovincial Disparity in 2024

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The distribution of adolescent sport participation across provinces in 2024 was fairly wide. The highest percentage was recorded in DI Yogyakarta (43.0%), DKI Jakarta (40.7%), and Bali (39.5%), while the lowest percentages were in Papua (25.8%), East Nusa Tenggara (26.3%), and West Papua (27.1%) as presented in Figure 2.

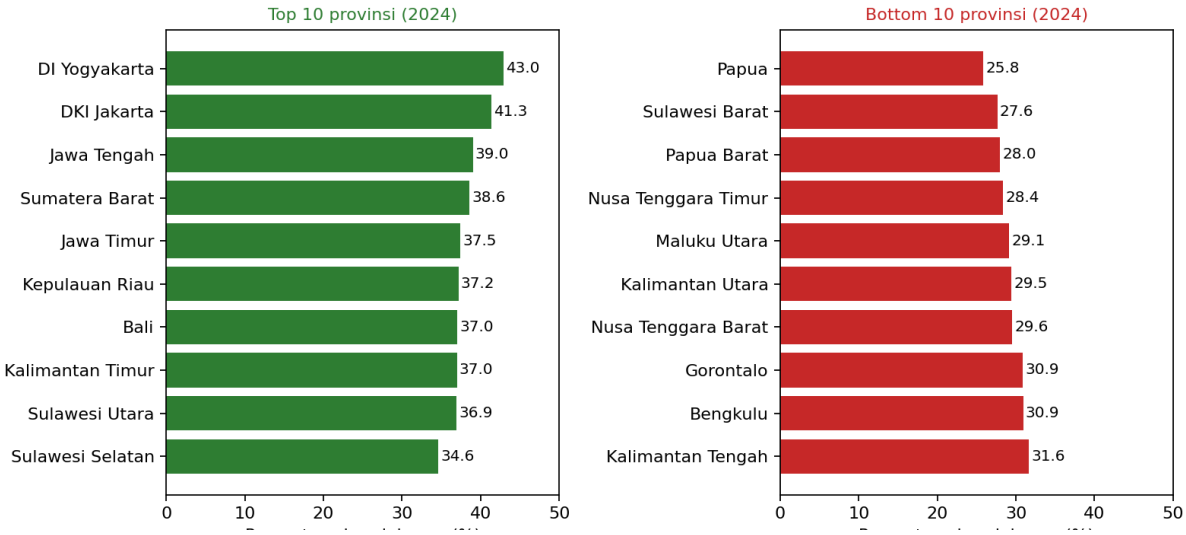

Figure 2. Interprovincial disparity of adolescent sport participation, Indonesia 2024

The disparity range reached 17.1 percentage points with a Coefficient of Variation of 11.6% and a Williamson Index of 0.115. According to the classification by Akita and Miyata (2018), this CV value falls into the low-moderate category. However, the seemingly moderate level of disparity on the surface conceals structural gaps when viewed by regional zone (Figure 3): the Maluku-Papua region ranked lowest with an average of 28.6%, while Java was at the top with an average of 36.7%. This gap of nearly 8 percentage points means that one in three young people in Java exercises regularly, while in Maluku-Papua it is only approximately one in four.

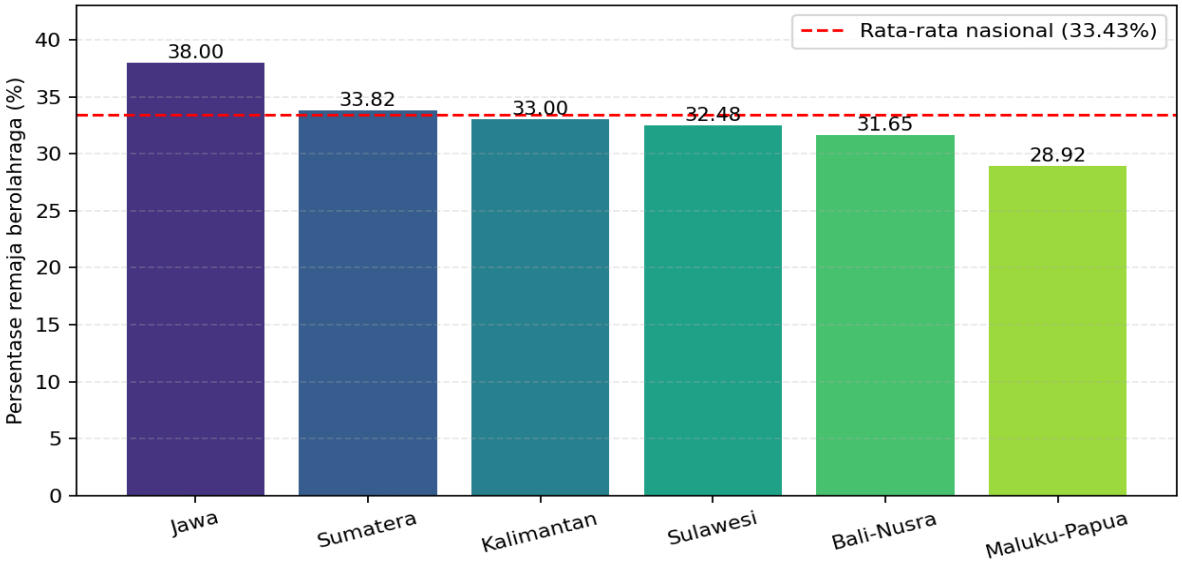

Figure 3. Average adolescent sport participation by regional zone, Indonesia 2024

This disparity pattern supports the PRECEDE framework by Green and Kreuter (2005). Provinces with high participation tend to share three characteristics: higher density of public sports facilities (enabling factor), an institutionalized sports culture through school physical

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education (predisposing factor), and more consistent regional policy support such as sports regulations in DIY and regular sports events in Bali (reinforcing factor). Conversely, provinces in the Maluku-Papua region face limitations across all three factors, as documented by Hidayat et al. (2023) regarding the distribution of school sports facilities and by Susilowati and Wibowo (2021) for IPP health domain scores.

The policy implications are quite clear. A one-size-fits-all approach will not narrow this gap. Provinces with low participation require interventions focused on building basic sports infrastructure, increasing the capacity of physical education teachers, and integrating indigenous sports into local curricula as a form of contextual modification. New Zealand's experience with the Active Communities program engaging Maori communities (Sport NZ, 2020) can serve as a reference for local governments in Papua, NTT, and Maluku.

3.3 Association Between Sport Participation and Other Health Indicators

Pearson correlation between the percentage of exercising adolescents and three negative health indicators showed statistically significant negative relationships (Figure 4). The correlation coefficient for illness was r=-0.485 (p<0.001), smoking r=-0.442 (p<0.001), and adolescent pregnancy r=-0.444 (p<0.001). All three coefficients fall within the moderate range according to Cohen's (1988) classification, with coefficients of determination (R^2) of 19-24%.

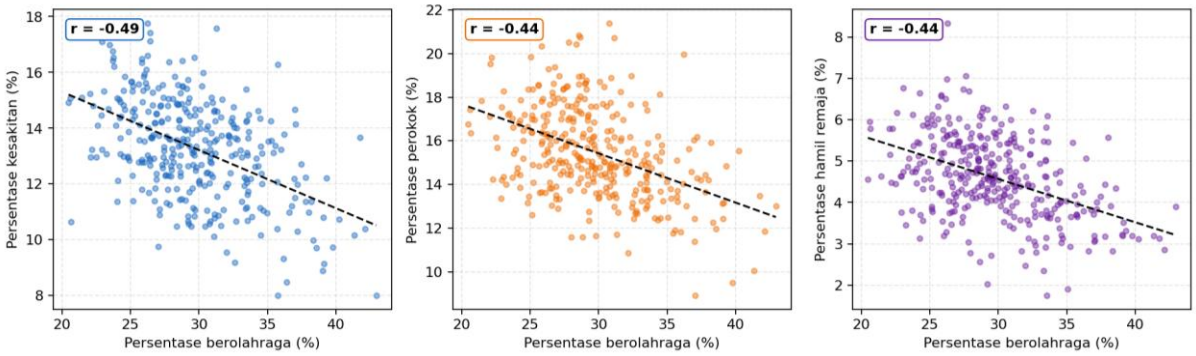

Figure 4. Association between sport participation and other adolescent health indicators (n=340)

Table 2. Summary of Pearson Correlation Coefficients Between Sport Participation and Adolescent Health Indicators (n=340)

Variable	r	p-value	R^2 (%)	Interpretation
Illness	-0.485	<0.001	23.5	Moderate negative
Smoking	-0.442	<0.001	19.5	Moderate negative
Adolescent pregnancy	-0.444	<0.001	19.7	Moderate negative

The direction of these relationships is consistent with the literature. Regarding illness, research by Janssen and LeBlanc (2010) and Poitras et al. (2016) has demonstrated that regular exercise enhances immunocompetence, reduces systemic inflammation, and lowers the risk of infectious diseases in adolescents. Regarding smoking behavior, a longitudinal study in Europe by Audrain-McGovern et al. (2003) found that physically active adolescents were 30-50% less likely to initiate smoking, through sport-based peer-group mechanisms and perceived physical fitness. Regarding adolescent pregnancy, the relationship likely occurs indirectly through mediating factors such as education level and social engagement; this is consistent with the WHO social determinants of health model (2020).

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It is important to emphasize that the reported correlations are ecological in nature (province-year level) and do not automatically indicate causality at the individual level. The risk of ecological fallacy should be considered if these results are interpreted causally (Robinson, 1950). Nevertheless, for aggregate policy purposes, the consistently negative associations provide strong justification for an integrated program approach: increasing adolescent sport participation has the potential to serve as a multi-target policy instrument that simultaneously improves other health indicators within the same domain.

3.4 Synthesis and Contribution

The three main findings of this study are mutually reinforcing. The significant national upward trend indicates a positive direction for adolescent sport development, yet the rate of increase is still far from ideal. The persistent large interprovincial disparity signals that national growth does not automatically mean equitable growth. The consistent negative correlation with other negative health indicators underscores the position of sport as a leverage point in the adolescent health system: intervention at one point has the potential to impact several variables simultaneously.

The contributions of this study are multi-layered. First, methodologically, the integration of Mann-Kendall, Coefficient of Variation, and the Williamson Index provides a more robust analytical approach compared to the majority of previous studies that only reported crude averages. Second, substantively, the ecological correlation analysis on n=340 provides quantitative evidence previously unavailable in Indonesia regarding the association between sport participation and other adolescent health indicators. Third, practically, these results can be used by Kemenpora and local governments in designing evidence-based programs targeting specific regions.

This study has three limitations that should be openly acknowledged. First, IPP data measures exercise frequency (at least once a week) without distinguishing intensity and duration, thus not fully aligned with WHO recommendations based on minutes per day. Second, the aggregate nature of the data limits the ability to control for confounding variables at the individual level such as household socioeconomic status. Third, IPP data does not differentiate types of sport (recreational vs. competitive), so specific implications for athlete development cannot be directly derived from this study. Future studies using individual-level primary data, including objective measurements using accelerometers, would enrich these aggregate findings.

4. CONCLUSION

This study addressed its three initial objectives. First, Indonesian adolescent sport participation increased significantly from 26.5% (2015) to 33.4% (2024) with a slope of 0.75 points per year, despite a temporary decline in 2020 due to the COVID-19 pandemic. Second, interprovincial disparity in 2024 was in the low-moderate category (CV 11.6%; Williamson Index 0.115), although regional zone gaps were quite apparent, with Java at the top and the Maluku-Papua region at the bottom. Third, sport participation was significantly negatively correlated with the percentages of illness, smoking, and adolescent pregnancy (all $p<0.001$) at the province-year population level. The policy implications emphasize three points. The central government needs to accelerate the rate of participation increase through strengthening physical education and the school sports ecosystem. Local governments in eastern regions require asymmetric support in the form of basic sports infrastructure development and sports workforce capacity building. Cross-ministerial integration (Kemenpora, Ministry of Health, Ministry of Education and Culture) is key because sport

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participation has been shown to be associated with other adolescent health indicators within the same domain. Future research is recommended to examine the causal factors of regional disparity using a multilevel approach and primary data.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this manuscript. The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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