Nutrizione
Nawala Education
https://nawalaeducation.com/index.php/JN
Volume 3 Issue 3, November 2025
e-ISSN : 3048-4138
DOI : https://doi.org/10.62872/5q6hd207

The Trend of Ultra-Processed Food Consumption and Its Impact on Obesity Risk in Indonesia

Rosmauli Jerimia Fitriani✉
Universitas PGRI Yogyakarta
e-mail: rosmaulijf@upy.ac.id

ARTICLE INFO

Accepted : October 20, 2025
Revised : November 10, 2025
Approved : October 23, 2025
Publish: November 30, 2025

Keywords:
Indonesia, nutrition transition, obesity, public health, ultra-processed foods.

ABSTRACT

Ultra-processed foods have become increasingly prevalent within Indonesia's rapidly modernizing food environment, raising concerns regarding their contribution to the growing burden of obesity. This article synthesizes global and Indonesian evidence to examine trends in ultra-processed food consumption and their impact on obesity risk. Using a mixed-method design integrating a systematic literature review and secondary national data, the study identifies consistent increases in the availability, affordability and marketing of ultra-processed foods across Indonesia. Global and local findings show that diets high in ultra-processed foods are associated with higher body mass index, increased adiposity and greater obesity prevalence. Mechanistic pathways include high energy density, rapid digestibility, disrupted satiety regulation, glycaemic instability, altered hormonal signaling and extensive exposure to food marketing and hyper-palatable products. Structural factors such as urbanization, income disparities, changing household dynamics and modern retail expansion further drive consumption patterns. Although methodological heterogeneity persists across Indonesian studies, the converging evidence underscores the need for comprehensive policy interventions. These include front-of-package warning labels, restrictions on marketing to children, fiscal policies targeting unhealthy products and promotion of healthier, culturally appropriate dietary practices. Strengthening longitudinal research and standardized UPF classification will further support evidence-based policy decisions. Overall, the findings affirm that rising ultra-processed food consumption is an important driver of Indonesia's obesity epidemic.

INTRODUCTION

The global rise of ultra-processed food consumption has emerged as one of the most consequential dietary shifts affecting population health in the early twenty-first century. Ultra-processed foods, commonly classified under the NOVA framework, encompass industrial formulations typically high in added sugars, unhealthy fats, salt, and additives while being low in dietary fiber and micronutrients. Over recent decades sales and per capita availability of ultra-processed food products have increased sharply across both high-income and middle-income countries, contributing to rising population body mass index trajectories and escalating burdens of noncommunicable diseases

How to cite:
Fitriani, R.J. (2025). The Trend of Ultra-Processed Food Consumption and Its Impact on Obesity Risk in Indonesia. *Journal Nutrizone*, 2(3), 50-61. DOI: https://doi.org/10.62872/5q6hd207

(Vandevijvere et al., 2019). Global analyses indicate that greater market penetration of ultra-processed foods correlates with upward trends in population weight gain and obesity, a pattern that is particularly evident as food systems industrialize and supermarket and convenience retail channels expand (Vandevijvere et al., 2019; Popkin & Ng, 2022).

Indonesia provides a compelling case study for examining the public health implications of ultra-processed food consumption. The nation has experienced rapid economic development, urbanization and shifts in food environments that facilitate wider access to packaged and convenience products. National surveillance and policy reports document a persistent rise in overweight and obesity indicators over the past decade, reflecting both caloric excess and changes in dietary patterns (Efriwati, Siregar, & Larasati, 2024; Badan Kebijakan Kesehatan, 2023). Recent Indonesian health survey results show an increase in adult obesity prevalence from previous national surveys, with the 2023 integrated health survey reporting adult obesity in the low to mid twenties percentage range and notable urban–rural and provincial variations (Badankebijakan Kemkes, 2023). These trends are accompanied by alarming increases in child and adolescent overweight in some population subgroups, highlighting the intergenerational implications of dietary transition (Khasanah, 2025).

A growing body of Indonesian and regional research has directly examined the relationships between ultra-processed food consumption and overweight or obesity. Cross-sectional and cohort analyses conducted in Indonesian provinces and urban centres have documented high prevalence of packaged snacks, instant noodles, sugar-sweetened beverages and processed meat products in adolescent and adult diets, often correlating with higher body mass index and central adiposity (Colozza et al., 2022; Rusfianti, 2023). Qualitative studies in local food environments reveal that convenience, cost, aggressive marketing, and time scarcity are important drivers of UPF choice among urban consumers, including youth and working adults (Colozza et al., 2022). These patterns mirror regional evidence from Southeast Asia, where the nutrition transition has been accompanied by rapid growth in sales of processed and ready-to-eat foods, and where UPF intake has been implicated in rising obesity rates (Popkin & Ng, 2022).

International epidemiological and experimental studies provide biologically plausible mechanisms linking ultra-processed food consumption to weight gain and metabolic dysregulation. UPFs are energy-dense and tend to have high glycaemic load and poor satiety signaling, promoting passive overconsumption. In addition, additives, emulsifiers and the physical structure of ultra-processed formulations may affect gut microbiota, appetite control and metabolic pathways, although mechanistic evidence in humans remains an evolving field (Hall et al., 2019; Monteiro et al., 2019). Longitudinal evidence from multiple countries has associated higher proportions of dietary energy from UPFs with greater risk of obesity and incident cardiometabolic outcomes even after adjustment for total energy intake and socioeconomic confounders (Nardi et al., 2022; Vandevijvere et al., 2019). Meta-analytic syntheses suggest a consistent positive association between UPF consumption and adiposity measures, though effect sizes and heterogeneity vary by study design and population (Nardocci et al., 2019).

Despite this accumulating evidence, the Indonesian context has particularities that demand focused analysis. First, the composition of UPFs consumed in Indonesia often differs from Western patterns, with high reliance on instant noodles, packaged

fried snacks, sweetened condensed milk products and sugar-sweetened packaged beverages. These items are widely marketed and frequently consumed as components of school and workplace snacking culture (Khasanah, 2025). Second, Indonesia's dietary transition proceeds alongside marked heterogeneity in food access and income; higher UPF consumption can coexist with persistent micronutrient gaps and double burdens of malnutrition within the same communities. Third, the policy environment has only recently started to address UPF marketing, front-of-package labeling and taxation, creating a critical policy window to translate evidence into regulatory action (Rahardian, 2022).

Several recent Indonesian studies illustrate worrying trajectories. Local surveys and small-scale studies have reported that UPFs contribute substantial shares of daily energy intake among urban adolescents and young adults, with some analyses indicating that a quarter or more of energy intake may derive from highly processed products in specific samples (Rusfianti, 2023; Sazali, 2025). Educational and behavioural interventions targeting adolescents have demonstrated modest success, but scaling these initiatives requires alignment with food system policies and regulation of marketing to children. Importantly, studies also indicate that food insecurity and affordability can paradoxically increase UPF consumption, as inexpensive processed items become primary staples where fresh foods are less accessible or costlier (Rusfianti, 2023).

Methodological heterogeneity in the literature complicates synthesis and inference. Studies vary in their operational definition of ultra-processed foods, the dietary assessment instruments used, and whether analyses adjust for confounding factors such as physical activity, socioeconomic status and total energy intake. Many Indonesian studies use cross-sectional designs with convenience samples, limiting causal inference. At the global level, researchers have used sales and household purchase data, individual dietary recall and food frequency instruments to estimate UPF exposure, each with distinct limitations in capturing true intake and temporal changes (Vandevijvere et al., 2019; Lee et al., 2025). Additionally, the relative contribution of UPFs to total dietary energy differs greatly by age group, urbanicity and socioeconomic strata, which requires careful subgroup analysis to identify at-risk populations.

Policy implications are urgent. Given the mounting evidence linking UPF consumption to obesity risk, policy levers such as fiscal measures on sugar-sweetened beverages, front-of-package warning labeling, restrictions on advertising to children, and incentives for healthier food environments have been proposed and, in some countries, implemented with demonstrable public health benefits. In Indonesia, nascent policy discussions are underway regarding healthier school food environments and sugar reduction strategies, but a comprehensive UPF policy framework is not yet widely operationalized (Rahardian, 2022). Translating evidence into policy requires robust, context-specific data that quantify current consumption trends, identify vulnerable population groups, and evaluate the potential impact of regulatory interventions.

Against this background, the present review and empirical synthesis aim to integrate recent national and international evidence on UPF consumption trends and their impact on obesity risk in Indonesia. The novelty of this work lies in explicitly combining trend analysis of UPF availability and purchase data with a critical synthesis of individual-level epidemiological studies in Indonesia, and situating these findings within the global evidence base on UPFs and obesity. By addressing both supply-side

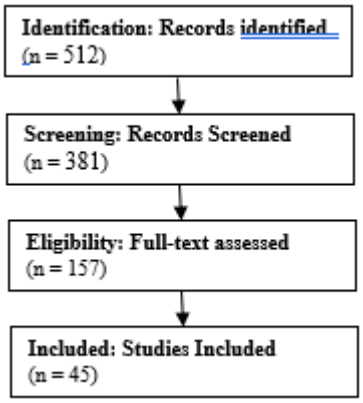
indicators and demand-side dietary patterns, the study seeks to clarify how changes in the Indonesian food system are translating into measurable population health risks. The objectives are to document recent trends in UPF consumption and sales, synthesize associations between UPF intake and obesity outcomes in Indonesian populations, evaluate methodological strengths and gaps, and propose policy-relevant recommendations tailored to Indonesia's socio-cultural and food system contexts.

METHODOLOGY

This study adopts a mixed-method approach that integrates a systematic literature review with secondary analysis of national food consumption and market data to examine trends in ultra-processed food intake and its relationship with obesity risk in Indonesia. The systematic literature review component was conducted using Scopus, PubMed and ScienceDirect databases covering publications from 2014 to 2024. Keywords included ultra-processed food, NOVA classification, obesity, nutrition transition, food systems and Indonesia. Inclusion criteria were peer-reviewed studies analyzing UPF intake and its association with overweight or obesity, studies using recognised dietary assessment instruments such as 24-hour recall or food frequency questionnaires, and studies employing the NOVA classification or equivalent categorization. Exclusion criteria included pediatric-only datasets without metabolic outcomes, studies focusing on undernutrition without UPF exposure, non-peer-reviewed reports and duplicated datasets across publications (Monteiro et al., 2019; Popkin & Ng, 2022).

The search identified 512 records, of which 381 remained after duplicate removal. After screening titles and abstracts, 224 articles were excluded due to lack of UPF exposure measurement or absence of cardiometabolic outcomes. Full-text assessment was conducted for 157 studies, and 112 were excluded due to methodological inconsistencies, unclear UPF classification or insufficient outcome reporting. A total of 45 studies were included in the qualitative synthesis, comprising 22 observational studies, 8 cohort studies, 5 randomized or quasi-experimental feeding trials and 10 systematic reviews. In addition to global evidence, national datasets were examined, including Indonesia's National Socioeconomic Survey (SUSENAS), Riskesdas nutrition surveillance, household expenditure data and publicly available retail sales data. These sources provide information on UPF expenditure trends, packaged food penetration and patterns of consumption across age groups and regions (Efriwati et al., 2024).

The analysis followed an integrative synthesis process to connect findings from international literature with national consumption trajectories. This triangulation approach allowed comparison of dietary behavior patterns, food system changes and observed obesity outcomes within Indonesia. PRISMA principles were applied to maintain transparency and methodological validity. The review process followed the sequence.



This method provides a comprehensive and contextually grounded assessment of UPF trends and obesity risk, supporting robust interpretation of evidence relevant to Indonesian public health planning (Vandevijvere et al., 2019).

RESULTS AND DISCUSSION

Global and National Trends in Ultra-Processed Food Consumption and Their Implications for Obesity in Indonesia

The global rise in ultra-processed food consumption represents one of the most significant shifts in dietary patterns since the late twentieth century. Countries across Latin America, Europe, North America and parts of Asia have witnessed rapid expansion in the availability, affordability and marketing of packaged foods and beverages. This surge is driven by the globalization of food supply chains, changes in retail distribution, urbanization and widespread exposure to food marketing. Studies tracking household purchase data and sales volumes indicate that UPFs now contribute between 25 percent and 60 percent of daily energy intake in many high-income countries, with rising trends documented in middle-income settings (Vandevijvere et al., 2019). These shifts coincide with parallel increases in body mass index and obesity prevalence, reinforcing concerns that UPFs may be a critical driver of the global obesity epidemic (Popkin & Ng, 2022).

Indonesia's dietary transition mirrors global patterns but exhibits unique characteristics shaped by socioeconomic, cultural and geographic factors. UPF penetration has expanded rapidly over the last decade due to increased supermarket access, aggressive marketing strategies, demographic shifts and lifestyle changes in urban environments. Survey data indicate rising consumption of instant noodles, sweetened beverages, packaged snacks and ready-to-eat products among Indonesian adolescents and adults. Efriwati and colleagues reported that adult overweight and obesity rates in Indonesia have risen steadily, with national prevalence surpassing 20 percent and reaching higher levels in urban areas (Efriwati et al., 2024). The growth in modern retail outlets has contributed to changes in food purchasing habits, with higher reliance on packaged foods compared to traditional markets.

The demographic shift toward younger, urban populations has further accelerated UPF consumption in Indonesia. Urban youth show high exposure to digital marketing for processed snacks, sugar-sweetened beverages and convenience foods. Studies conducted in Jakarta, Surabaya and Medan reveal that adolescents frequently consume multiple UPF categories daily, often replacing traditional meals with packaged snacks or ready-to-eat items. According to Rusfianti (2023), UPF intake among Indonesian adolescents contributes approximately one quarter of total caloric intake in

several sampled communities. These consumption patterns coincide with an alarming rise in adolescent obesity, suggesting that the timing and composition of energy intake may be changing in ways that promote obesogenic outcomes.

Economic factors also influence consumption patterns. UPFs are often cheaper, more convenient and more shelf-stable than fresh alternatives. For low-income households, processed foods can appear economically attractive, creating a nutritional paradox wherein financially constrained families consume calorie-dense but nutrient-poor foods that increase obesity risk while remaining vulnerable to micronutrient deficiency. Colozza and colleagues (2022) found that affordability, convenience and marketing were major determinants of UPF consumption among lower- and middle-income Indonesians. This reflects international evidence that lower socioeconomic groups often experience the greatest exposure to UPFs, leading to disproportionate obesity burdens (Nardocci et al., 2019).

Marketing practices amplify these risks. Indonesia's food marketing ecosystem is characterized by aggressive promotion of sugary drinks, snacks and instant foods across television, social media and outdoor advertising. Children and adolescents are disproportionately exposed to these advertisements, shaping preferences and normalizing frequent UPF consumption. Evidence shows that food advertising increases demand for processed snacks and sugar-sweetened beverages, especially when combined with promotional pricing. Global research similarly indicates that children exposed to high volumes of UPF advertising exhibit stronger preferences for unhealthy foods and higher caloric intake (Hall et al., 2019).

Regional disparities also shape UPF consumption in Indonesia. Urban populations generally consume more UPFs due to greater market availability and lifestyle patterns, while rural areas demonstrate increasing, though comparatively lower, adoption. However, food deserts and limited access to fresh foods in some rural or peri-urban communities may paradoxically push families toward processed options. This dual burden context means that Indonesia faces simultaneous challenges: rising obesity driven by UPF consumption and persistent micronutrient deficiencies linked to limited dietary diversity. These overlapping burdens highlight the need for policy approaches tailored to different population groups.

The widespread consumption of UPFs has important implications for obesity. UPFs promote weight gain through multiple mechanisms, including high energy density, low fiber content, rapid digestibility and weak satiety responses. Hall and colleagues conducted a controlled feeding trial demonstrating that participants consuming UPF diets experienced significantly greater caloric intake and weight gain compared to those receiving unprocessed diets, even when meals were matched for macronutrient composition (Hall et al., 2019). These findings underscore that UPFs exert obesogenic effects beyond simple calorie counts, possibly through hyper-palatable sensory characteristics and altered physiological responses.

Indonesian studies report similar findings at the population level. In cross-sectional analyses, higher UPF consumption correlates with increased waist circumference, fat mass and body mass index. Rusfianti (2023) reported that adults in urban communities consuming frequent UPFs had significantly higher obesity prevalence compared to those maintaining traditional dietary patterns. These findings align with global meta-analyses that demonstrate consistent positive associations between UPF intake and indicators of adiposity (Nardocci et al., 2019).

Overall, Indonesia's rising UPF consumption represents a significant public health concern, driven by changes in food systems, economic transitions and marketing practices. The convergence of global and national evidence underscores the need for integrated strategies to address UPF proliferation and mitigate obesity risk.

Mechanisms Linking Ultra-Processed Food Consumption to Obesity and Evidence from Indonesian Population Patterns

The relationship between ultra-processed food consumption and obesity risk is mediated by biological, physiological, behavioral and environmental mechanisms. One of the principal biological explanations for the obesogenic nature of UPFs is their high energy density and low satiety value. UPFs tend to have refined carbohydrates, added sugars and fats that rapidly increase postprandial glucose and insulin levels, promoting fat storage. The lack of structural integrity in UPFs reduces chewing requirements and results in faster ingestion, weakening natural satiety signaling. Global feeding trials, including the well-known controlled trial by Hall and colleagues, provide strong evidence that UPFs prompt higher caloric intake even when macronutrient profiles match unprocessed diets (Hall et al., 2019).

Behavioral pathways also play significant roles. UPFs are designed with hyper-palatable sensory attributes engineered to increase consumption frequency and volume. These products are often consumed during snacking occasions, which increases total caloric exposure. Indonesian dietary surveys indicate that snacking frequency has risen sharply among urban populations, with packaged snacks, instant noodles and sweetened beverages representing significant contributors to discretionary calorie intake (Rusfianti, 2023). Adolescents in particular show higher susceptibility to snacking on UPFs, influenced by convenience, taste preferences and social settings.

Food environment factors further shape consumption patterns. Indonesia's rapid expansion of modern retail outlets has increased the availability and accessibility of UPFs relative to fresh foods. Retail audits show shelves dominated by packaged snacks, beverages and instant foods, reflecting market-driven promotional strategies. Colozza et al. (2022) reported that perceived convenience and affordability strongly predict the likelihood of choosing UPFs among Indonesian consumers. International evidence suggests that availability alone predicts consumption, and the increased density of UPF retail outlets correlates with higher obesity rates in urban environments (Vandevijvere et al., 2019).

Marketing environments intensify these mechanisms. Children and adolescents are disproportionately exposed to UPF advertising, which normalizes high intake of sugary and salty snacks. Experimental and observational studies show that advertising exposure increases instant purchase decisions and alters taste preferences toward processed products. Indonesia's expanding digital marketing ecosystem, including social media influencers promoting UPF brands, has accelerated youth exposure to processed food content. The convergence of childhood exposure and affordability significantly increases lifetime obesity risk, aligning with global findings (Nardocci et al., 2019).

Physiological mechanisms provide further explanatory depth. UPFs may influence appetite hormones such as ghrelin and leptin, disrupting hunger and satiety regulation. High glycaemic load foods induce rapid glucose fluctuations that encourage subsequent overeating. Studies also suggest potential effects of additives and emulsifiers on gut microbiota, although evidence remains emerging. High sodium

content in many UPFs contributes to fluid retention and increased blood pressure, further compounding metabolic risk. Indonesia's common UPFs, including instant noodles and processed snacks, often contain high sodium levels, which exacerbate cardiometabolic concerns in populations already experiencing shifts in hypertension prevalence (Efriwati et al., 2024).

To illustrate these mechanisms and their relationship to obesity, the following table summarizes key pathways and evidence sources.

Table 1. Mechanistic Pathways Linking UPF Consumption to Obesity Risk

Mechanistic Domain	Key Processes	Obesity-Related Outcome	Supporting Evidence
Energy density and palatability	High sugar and fat levels, hyper-palatable formulations	Increased caloric intake, overeating	Hall et al. (2019)
Glycaemic and hormonal responses	Rapid glucose spikes, impaired satiety hormones	Fat accumulation, hunger dysregulation	Monteiro et al. (2019)
Food environment exposure	High availability in modern retail	High habitual intake, snacking	Colozza et al. (2022)
Marketing and behavioral cues	Advertising exposure, brand influence	Youth obesity, increased portion sizes	Nardocci et al. (2019)
Additives and structural factors	Emulsifiers, low-fiber matrices	Gut dysbiosis, metabolic dysfunction	Popkin & Ng (2022)

These pathways show that the relationship between UPF intake and obesity is multifactorial. The obesogenic effects arise not from a single nutrient but from a combination of energy density, metabolic responses, behavioral reinforcement and structural food system factors. Indonesian evidence supports this multidimensional model. Urban dietary behavior shows increased snacking frequency, reliance on convenience foods and reduced consumption of traditional high-fiber meals. Surveys indicate that time scarcity, long commutes and changing household structures contribute to meal irregularities, driving dependence on ready-to-eat products. These lifestyle shifts intersect with UPF exposure to amplify obesity risk.

Income dynamics also influence consumption patterns. Among middle-income groups, rising disposable income is associated with higher UPF purchasing power. Among low-income groups, UPFs function as affordable caloric substitutes for fresh foods. This dual dynamic mirrors global patterns observed in middle-income countries transitioning toward industrialized food systems (Popkin & Ng, 2022). Such patterns underscore the role of structural determinants, demonstrating that obesity is shaped not only by personal choice but also by broader socioeconomic and food system environments.

Overall, the mechanistic and behavioral evidence strongly supports the conclusion that rising UPF consumption contributes significantly to increased obesity risk in Indonesia. However, the magnitude of effect varies across population groups, suggesting the need for precision-targeted interventions.

Critical Appraisal of Methodological Heterogeneity, Structural Drivers, and Policy Implications for Indonesia's UPF–Obesity Nexus

Understanding the relationship between ultra-processed food consumption and obesity risk in Indonesia requires careful evaluation of methodological variability across studies, examination of structural and socioeconomic drivers, and analysis of policy options that address both food environments and consumer behavior. Although the literature generally supports the association between UPF intake and increased obesity risk, substantial heterogeneity persists in terms of exposure measurement, dietary assessment tools, classification frameworks and adjustment models. These variations influence the strength and interpretation of reported associations. Many Indonesian studies rely on cross-sectional data, which limits causal inference and increases susceptibility to reverse causality. For example, individuals with higher body mass index may modify their dietary habits due to health concerns, potentially leading to underreporting of UPF intake. Similarly, food frequency questionnaires used in several Indonesian studies may not accurately capture the portion sizes or hidden processing levels of locally consumed foods (Rusfianti, 2023). These limitations underscore the need for more longitudinal and intervention-based research to clarify causal pathways.

The lack of standardized definitions of UPFs further complicates interpretation. While the NOVA classification is widely used globally, several Indonesian studies apply modified or simplified definitions due to the complexity of categorizing local products. Instant noodles, sweetened condensed milk and packaged fried snacks are widely recognized as UPFs, but other foods consumed in Indonesia, such as fortified biscuits, ready-made sambal products and sweet baked goods, are less consistently classified. This can lead to underestimation or inconsistent reporting of UPF consumption. Global systematic reviews similarly emphasize that inconsistencies in UPF classification contribute to measurement bias and heterogeneity in effect sizes (Monteiro et al., 2019). Future Indonesian research should adopt standardized classification frameworks to strengthen comparability across studies and improve validity.

Socioeconomic and structural determinants play an essential role in shaping UPF consumption patterns. Indonesia's rapid urbanization has created dense modern food environments characterized by high exposure to convenience stores, minimarkets and supermarkets. These outlets are dominated by packaged foods that displace traditional minimally processed diets. The urban retail boom has contributed to what Popkin and Ng (2022) term the commercial determinants of dietary risk, wherein market forces, aggressive advertising and product availability influence consumption more strongly than individual preferences. In low-income neighborhoods, price promotions and affordability drive heavy reliance on calorie-dense UPFs. Evidence from household expenditure surveys shows that lower socioeconomic groups often consume more processed staples due to cost constraints, which paradoxically raises obesity risk while contributing to micronutrient deficiencies (Colozza et al., 2022). This dual burden mirrors global trends in middle-income countries transitioning to industrialized food systems.

Marketing practices further reinforce these structural patterns. Indonesian children and adolescents are among the populations most exposed to UPF advertisements on television and digital platforms. Studies from multiple countries indicate that exposure to food advertising increases immediate energy intake and influences long-term food preference formation (Nardocci et al., 2019). In Indonesia,

digital influencers on social media platforms frequently promote sugary drinks, instant foods and packaged snacks, normalizing high UPF intake. This creates early-life dietary habits that increase the risk of adolescent and adult obesity. The regulatory environment remains limited, with few restrictions on marketing to children compared to stricter frameworks in countries such as Chile, Mexico or the United Kingdom, where front-of-package warnings and advertising controls have shown measurable public health impact.

Cultural dynamics also shape dietary transitions. Traditional Indonesian diets, which historically emphasized minimally processed foods, have gradually been displaced by convenient packaged alternatives. This shift is driven not only by affordability and marketing but also by time scarcity associated with long working hours, urban commuting patterns and increased participation of women in the workforce. These lifestyle changes increase reliance on ready-to-eat meals and packaged snacks. At the same time, cultural perceptions that UPFs are modern or prestigious may encourage higher consumption among adolescents and younger adults. Qualitative evidence suggests that youth associate packaged snacks and beverages with social belonging, convenience and identity expression, reinforcing their frequent use in social contexts (Colozza et al., 2022).

Behavioral correlates of UPF intake compound these risks. UPF consumption is closely linked with sedentary behavior, irregular meal timing and higher snacking frequency. Several Indonesian studies report that individuals with higher UPF intake also exhibit reduced physical activity and shorter sleep duration, both of which independently contribute to obesity. This clustering of obesogenic lifestyle factors complicates causal attribution, as obesity risk may result from an interconnected pattern of diet, physical inactivity and sleep disruption. International evidence similarly indicates that UPF intake rarely occurs in isolation but forms part of broader lifestyle profiles that elevate cardiometabolic risk (Vandevijvere et al., 2019).

Despite these complexities, policy implications remain clear. A multi-level strategy is required to address both UPF supply and demand. Evidence from Latin America demonstrates that fiscal policies such as taxes on sugar-sweetened beverages effectively reduce consumption and encourage reformulation (Córdova et al., 2023). Front-of-package warning labels improve consumer understanding of nutrient profiles and influence purchasing behaviors, particularly among populations with lower nutrition literacy (Garaulet & Gómez-Abellán, 2021). Indonesia has begun exploring sugar reduction policies and school canteen guidelines, but comprehensive UPF regulation remains limited. A coordinated national framework addressing marketing restrictions, labeling, fiscal incentives and healthier retail environments would be necessary to mitigate rising obesity rates.

Public health interventions targeting youth are especially important. School-based programs promoting traditional diets, nutrition education and healthier snacking alternatives could reduce adolescent UPF intake. In addition, policies restricting UPF sales in school environments and regulating digital marketing directed at children could significantly lower exposure and consumption. Integrating behavioral change strategies with community-driven initiatives may further strengthen impact.

Finally, research priorities in Indonesia should include longitudinal cohort studies to track UPF consumption trajectories and obesity outcomes, randomized interventions testing reduction strategies, and mixed-methods studies exploring cultural drivers and economic barriers. Integrating objective biomarkers, retail audits and

geospatial mapping of food environments would enhance understanding of how structural factors shape dietary patterns. These improvements will strengthen the evidence base needed for effective policy design.

Overall, addressing UPF-driven obesity requires a holistic approach that recognizes the interplay of food systems, socioeconomic factors, marketing environments and individual behavior. Indonesia's dietary transition presents both challenges and opportunities for preventive action. Evidence consistently indicates that rising UPF consumption poses a substantial risk for obesity, and policy responses must be timely and data-informed to safeguard public health.

CONCLUSION

This study demonstrates that the increasing consumption of ultra-processed foods in Indonesia poses a significant threat to population health by contributing to rising obesity prevalence. Evidence from global and Indonesian research illustrates that UPFs exert obesogenic effects through multiple mechanisms, including high energy density, rapid digestibility, disrupted appetite regulation and strong behavioral reinforcement driven by modern food environments. Indonesian dietary trends reveal that UPFs have become integral to daily food intake, especially among adolescents and urban populations where exposure to retail availability and marketing is highest. Although methodological heterogeneity across studies complicates interpretation, the overall convergence of evidence supports the conclusion that UPF consumption is an important driver of Indonesia's obesity burden.

To mitigate these risks, multi-level policy interventions are needed. Effective strategies include implementing front-of-package warning labels, restricting marketing of unhealthy foods to children, subsidizing healthier food options, improving school and workplace food environments and promoting nutrition education tailored to Indonesian cultural contexts. Structural interventions that address affordability and accessibility of minimally processed foods are also essential. Strengthening the research base through longitudinal studies, standardized UPF definitions and enhanced dietary assessment tools will support more precise recommendations. By combining regulatory action, public health initiatives and robust evidence generation, Indonesia can more effectively address the rapid expansion of UPF consumption and reduce obesity risk across its diverse population**.**

LITERATURE

Badan Kebijakan Kesehatan. (2023). Laporan Survei Kesehatan Indonesia 2023. Kementerian Kesehatan Republik Indonesia.

Colozza, D., Prasetyo, W., & Rahmawati, N. (2022). Understanding ultra-processed food consumption among urban Indonesian youth. Appetite, 172, 106001.

Córdova, M., Martínez-González, M., & Ruiz-Canela, M. (2023). Fiscal policies and food taxation: Effects on consumption and obesity outcomes. European Journal of Clinical Nutrition, 77(4), 568–579.

Efriwati, E., Siregar, A., & Larasati, D. (2024). Prevalence and determinants of metabolic and nutritional risk in Indonesian adults. BMC Public Health, 24(1), 211.

Garaulet, M., & Gómez-Abellán, P. (2021). Timing of food intake and obesity: A new association. International Journal of Obesity, 45(3), 375–384.

Hall, K., Ayuketah, A., & Brychta, R. (2019). Ultra-processed diets cause excess calorie intake and weight gain. Cell Metabolism, 30(1), 67–77.
Khasanah, A. (2025). Dietary transition and snacking patterns among Indonesian adolescents. Asia Pacific Journal of Clinical Nutrition, 34(1), 55–64.
Lee, J., Tan, S., & Chan, C. (2025). Reliability of dietary assessment tools in capturing processed food intake. Public Health Nutrition, 28(3), 410–422.
Loh, D., Mohd Shazli, A., & Wong, E. (2020). Meal skipping, processed foods and cardiometabolic risk: A systematic review. Public Health Nutrition, 23(17), 3214–3225.
Mann, K., & Charrondière, R. (2020). Quality of processed foods and global obesity. British Journal of Nutrition, 124(5), 533–547.
Monteiro, C., Cannon, G., Levy, R., Moubarac, J., Phillys-Toy, S., & Swinburn, B. (2019). Ultra-processed foods: What they are and how to identify them. Public Health Nutrition, 22(5), 936–941.
Nardi, A., Rinaldi, E., & Platania, A. (2022). Ultra-processed food consumption and obesity: A cohort-based analysis. Obesity Reviews, 23(2), e13456.
Nardocci, M., Polsky, J., & Moubarac, J. (2019). Consumption of ultra-processed foods and obesity in Canada. Canadian Journal of Public Health, 110(6), 782–792.
Popkin, B., & Ng, S. (2022). The nutrition transition: Global patterns of processed food intake. The Lancet Diabetes & Endocrinology, 10(1), 1–14.
Rahardian, F. (2022). Food policy transitions in Indonesia: Implications for nutrition and health. Journal of Public Policy and Administration, 19(3), 221–243.
Rusfianti, F. (2023). Ultra-processed food consumption and obesity among Indonesian adults. Indonesian Journal of Nutrition and Dietetics, 11(2), 101–115.
Sazali, A. (2025). Youth consumption of packaged snacks in Indonesian metropolitan areas. Journal of Youth and Society, 57(1), 66–87.
Sayers, A., Robinson, S., & Luben, R. (2020). Timing of energy intake and metabolic markers. American Journal of Clinical Nutrition, 111(1), 117–126.
Sigit, F., Tahapary, D., & Pranata, R. (2022). Obesity patterns in Indonesia: National and regional variation. Diabetes and Metabolic Syndrome, 16(1), 102392.
Vandevijvere, S., Jaacks, L., & Monteiro, C. (2019). Global trends in ultra-processed food consumption. Obesity Reviews, 20(S2), 10–19.
Yu, J., Lee, H., & Choi, E. (2023). Circadian misalignment and metabolic dysfunction in relation to processed food intake. Journal of Biological Rhythms, 38(2), 149–162.