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Evaluating Nutritional Standards and Fiscal Sustainability in Free School Meal Programs

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ABSTRACT

Introduction: Childhood obesity is a global health emergency that threatens the quality of Indonesia's human resources. Indonesian Health Survey (IHS) recorded an increase in adult obesity prevalence from 23.4% to 21.8% in 2018. National indicators estimate that approximately 18.8% of children aged 5-12 years are overweight and 10.8% are obese.
Objective: This study aims to evaluate the impact of Ultra-Processed Foods (UPF) on the Makan Bergizi Gratis (MBG) program through an integration of public health, nursing, Islamic psychology, and accounting perspectives.
Method: The method used was a narrative literature review with an electronic literature search in Google Scholar, PubMed, SINTA, and ScienceDirect databases for the 2019–2026 period.
Result: The results show that UPF triggers biological sabotage through insulin resistance and disruption of the leptin-ghrelin hormone. Psychoneurobiologically, the hyperpalatable nature of UPF hijacks the brain's reward system, triggering food addiction. Implementation analysis revealed a fatal food safety gap that resulted in 5,620 student food poisoning and a crisis of public trust due to low dietetic standards in the field. From an accounting perspective, the use of UPF constitutes a "pseudo-efficiency" that creates contingent liabilities in the form of inflated future health costs.
Conclusion: The study's conclusion emphasizes that the success of MBG should be measured by the integration of nutritional audits and the use of fresh local ingredients to break dependence on industrial food and ensure sustainable investment in human resources.

Keywords: childhood obesity, health accounting, makan bergizi gratis, nutrition policy, ultra-processed

Introduction

Childhood obesity is now recognized as a global public health emergency. The WHO reports that more than 124 million children worldwide are obese and 213 million are overweight, with a trend that continues to increase year after year (Pangestu et al., 2022). In Indonesia, this prevalence is alarming; the 2023 Indonesian Health Survey (SKI) recorded an increase in adult obesity prevalence to 23.4% from 21.8% in 2018 (Ministry of Health of the Republic of Indonesia, 2025), while national indicators estimate that approximately 18.8% of children aged 5–12 years are overweight and 10.8% are obese (Ferdianti, 2021). This condition has shifted from being merely an aesthetic issue to a life-threatening clinical condition (WHO, 2025). Community health centers and hospitals are no longer just treating "obese children," but also children with the complete metabolic syndrome, which includes insulin resistance, dyslipidemia, hypertension, and chronic systemic inflammation (Weihe & Weihrauch-Blüher, 2022). A more alarming phenomenon is the increasing incidence of type 2 diabetes mellitus in children, with obese children having a fourfold increased risk of developing type 2 diabetes before the age of 25 (Bjornstad et al., 2022; Lawrence et al., 2021). Furthermore, approximately 15–25% of obese children now experience juvenile hypertension (Song et al., 2022), and the risk of non-alcoholic fatty liver disease (NAFLD) reaches 34% in this population (Anderson et al., 2021).

The primary trigger for this health crisis is a shift in modern dietary patterns, marked by a surge in the consumption of fast food and packaged foods that are practical, affordable, and easily accessible by schoolchildren (Ferdianti, 2021; Zahra et al., 2025). These products are known as Ultra-Processed Foods (UPF), industrially processed foods high in energy, saturated fat, sugar, and salt, but low in fiber and micronutrients (Ferdianti, 2021; Khasanah et al., 2025). Chronic consumption of UPF not only impacts physical health but also triggers addictive eating behaviors through activation of the brain's dopaminergic reward system (Gearhardt et al., 2023; Unwin et al., 2025). Exposure to these hyperpalatable foods reinforces the hedonic eating response, shifting consumption patterns from physiological needs to sensory pleasure-based consumption (Witek et al., 2022). In the child population, this leads to food addiction, characterized by impulsive behavior and loss of control over consumption (Santos et al., 2024), given their suboptimal cognitive development in regulating long-term impulses (Lin et al., 2020; Mescoloto et al., 2023).

Amid this threat, the Indonesian government launched the Makan Bergizi Gratis Program (MBG) as a national strategy to improve human resource quality, with an estimated annual budget of IDR 400 trillion to IDR 450 trillion (Pangaribuan et al., 2024). This program promises equitable access to nutrition and increased learning productivity (Azzahra et al., 2025; Kiftiyah et al., 2025). However, significant challenges arise in logistics and governance (Eliza et al., 2024; Tambunan et al., 2025). There is a significant risk if this massive budget is compromised by the pragmatic efficiency option of providing affordable and long-lasting UPF as the main menu. From an accounting perspective, the use of UPF may appear nominally "economical" in annual realization reports, but holistically, it represents a misdirected investment that actually creates long-term health liabilities for the country (Pangaribuan et al., 2025).

Although studies on child obesity and the Makan Bergizi Gratis (MBG) program are emerging, the current literature remains trapped in a fragmented academic space. Previous

research tends to focus only on biomedical aspects (Ferdianti, 2021; Zahra et al., 2025) without considering the fiscal realities of food procurement, or conversely, only examines the sociopolitical side of budgeting (Azzahra et al., 2025; Kiftiyah et al., 2025) without understanding the long-term clinical risks of purchased food commodities. A critical gap identified is the lack of analysis that integrates the biological risks of Ultra-Processed Foods (UPF), the mechanisms of psychological addiction in children, and accounting dilemmas in the school meal program supply chain.

Unlike other studies, this article employs an unprecedented multidisciplinary synthesis approach within the context of MBG policy in Indonesia. While similar studies often provide only nutritional recommendations that are often unrealistic in terms of cost, or economic recommendations that ignore health standards, this article aims to break this dichotomy. This study offers a holistic evaluation that integrates clinical evidence, behavioral dynamics, and fiscal efficiency within a single, integrated policy framework. This is crucial because without comprehensive intervention, this massively budgeted program risks backfiring on the country's health, where short-term cost savings through the use of UPF will lead to an uncontrolled explosion of chronic health costs in the future.

Objective

This research is crucial to ensuring that Indonesia's human resource investments truly produce a biologically healthy and economically empowered generation.

Method

Design and setting

This article was compiled using a literature review method with a comprehensive narrative approach. This study aims to critically evaluate the impact of Ultra-Processed Foods (UPF) on school meal programs through a multidisciplinary synthesis integrating perspectives from public health, nursing, Islamic psychology, and public sector accounting.

Literature Search Strategy

The literature search was conducted electronically between 2019 and 2026 to ensure data validity amidst the dynamics of food policy and the latest developments in metabolic research. The primary databases used included Google Scholar, PubMed/MEDLINE, SINTA (Science and Technology Index), and ScienceDirect. In addition to academic literature, this study also searched credible journalistic reports and recent policy documents to capture the reality of operational implementation and food safety incidents in the field. To increase accuracy, the researchers also utilized the Consensus AI tool to ensure the selected literature was based on verified scientific consensus.

Keywords

The search was conducted using Boolean operators (AND, OR) with specific terminology. In Indonesian, the keywords used were: "Ultra-processed foods" OR "Processed food" AND "Childhood obesity" AND "School meal programs" AND "Nutrition policy". Meanwhile, in English, the search used the terms: "Ultra-processed foods" OR "NOVA classification" AND "Childhood obesity" AND "School meal programs" AND "Nutrition policy".

Selection Criteria

Selection criteria were strictly applied to maintain the quality of the analysis. Inclusion criteria included: (1) original journal articles, systematic reviews, or policy papers published between 2019 and 2026; (2) studies focusing on child and adolescent populations (5–19 years old); and (3) articles specifically examining the relationship between UPF consumption and adiposity parameters or economic analysis of food policy. Researchers also included verified news reports from national media outlets related to poisoning incidents and the implementation of MBG as supporting data for the field analysis. Exclusion criteria included articles published before 2019, studies without complete manuscripts, and non-scientific publications irrelevant to the policy context.

Data Analysis

The collected data was analyzed using the Multidisciplinary Synthesis technique through three systematic stages. The first stage was data reduction, where findings were classified into theme clusters (biological-metabolic mechanisms, psychological addiction behaviors, and economic liabilities). The second stage was a literature comparison, comparing the consistency of global epidemiological data with the reality of food safety incidents and management constraints in MBG implementation in Indonesia. The final stage was a holistic synthesis, linking clinical and psychological risks and field operational failures with fiscal consequences to formulate applicable policy recommendations.

Result

The Urgency of Nutrition Control: National Obesity Trends in the MBG Policy

The implementation of the Free Nutritional Meals (MBG) Program faces significant challenges amidst a national nutritional emergency. The latest data from the 2023 Indonesian Health Survey (SKI), presented in Figure 1, shows that the prevalence of obesity in Indonesia has spread across all age groups with an increasing trend. The high obesity rates among the productive-age population and adolescents (aged 15 years and older) serve as a reminder that nutrition interventions must begin as early as possible, at the school level. If the Free Nutritional Meals (MBG) Program continues to include addictive UPF products, it risks exacerbating the national obesity curve, which is already at an alarming level, as evidenced by the increasing prevalence trend presented in the 2023 SKI (Isnur, 2024).

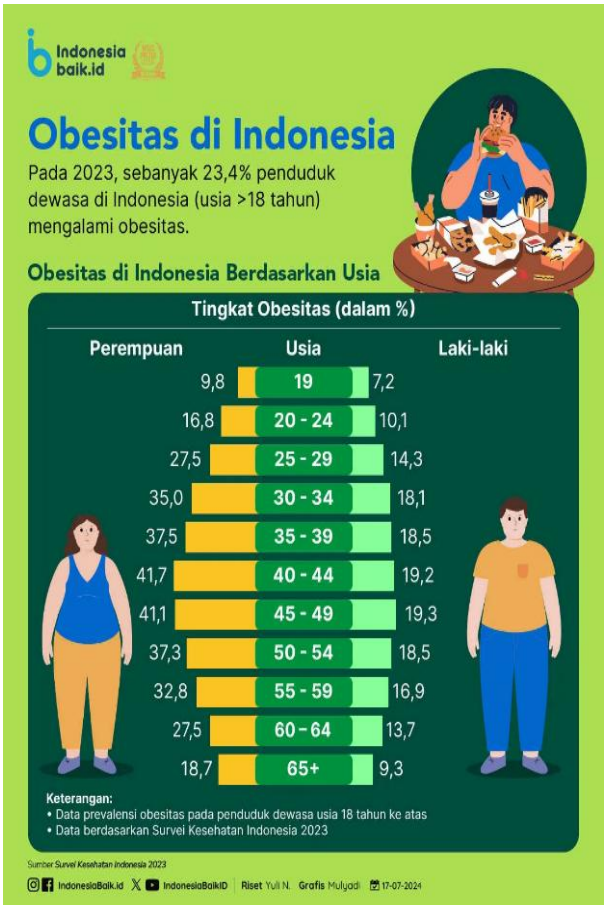

Figure 1. Obesity Prevalence Profile in Indonesia by Age Group.
(Source: SKI 2023, processed by P. Isnur, Y. N., & Mulyadi via Indonesiabaik.id, 2024)

Global Epidemiology: Ultra-Processed Foods (UPF) as a Commercial Determinant of Health

The escalation of childhood obesity is not merely a standalone medical phenomenon, but rather a manifestation of the penetration of Ultra-Processed Foods (UPF) as an aggressive commercial determinant of health within the modern food system. Global data shows a dramatic increase in the prevalence of overweight among children aged 5–19, from just 8% in 1990 to 20% in 2022, encompassing over 390 million people (World Health Organization: WHO, 2025). In Indonesia, this nutritional transition is reflected in the 2023 Indonesian Health Survey (SKI), which recorded an increase in adult obesity to 23.4% (Ministry of Health of the Republic of Indonesia, 2025). This trend is linearly followed by an 18.8% overweight burden among schoolchildren, indicating a systemic failure in controlling the food environment around educational institutions (Ferdianti, 2021). Food classification based on its level of processing can be seen in Table 1.

Table 1. Food Classification Based on NOVA and Its Relevance to the MBG Program

NOVA Category	Description	Example Material	Recommendation Program
Group 1	Unprocessed or minimally processed food	Rice, eggs, fresh meat, vegetables, fruit, nuts	Top Priority (Min. 80%)
Group 2	Processed kitchen ingredients (for cooking)	Coconut oil, salt, sugar, butter	Limit Use
Group 3	Simple processed food (2-3 ingredients)	Canned fish in salt, traditional cheese, fruit in syrup	Limited Use
Group 4	Industrially engineered, high in additives, hyperpalatable	Industrial nuggets, sausages, instant noodles, sweetened drinks, instant seasonings	Prohibited/Avoided

Source: Adapted from Monteiro et al. (2019) and World Health Organization (2025).

Based on Table 1, it is clear that the most at-risk food group is Group 4, or UPF. The dominance of UPF in the MBG supply chain is often driven by pragmatic reasons such as ease of distribution, robust logistics without a cold chain, and low nominal unit price. However, the selection of Group 4 for the sake of 'operational efficiency' ignores its non-nutritive nature, technically designed for mass consumption and addictiveness, which systemically undermines the primary goal of providing quality nutrition. Fundamental criticism of UPF in recent nutrition studies focuses not only on its poor nutritional composition, such as high sugar, saturated fat, and sodium, but also on its non-nutritive nature, technically designed for mass consumption (Dicken & Batterham, 2021). Longitudinal studies confirm that persistent exposure to UPF significantly increases Body Mass Index (BMI), waist circumference, and visceral fat accumulation through the mechanism of very high energy density but low satiety (Barata et al., 2025; Chang et al., 2021; Vallianou et al., 2025). Macroeconomically, the regulatory failure of these products creates massive negative externalities; for example, in Brazil, direct healthcare costs due to the impacts of UPF reached $107.5 million over the past decade (Nilson et al., 2025). This fact confirms that UPF poses a threat to the stability of the national health system, necessitating much more stringent nutritional policy interventions (De Oliveira et al., 2022; Koetsier et al., 2025; Vineis et al., 2023).

Biological Sabotage: Hormonal Maladaptation and Systemic Inflammation

A more in-depth clinical analysis suggests that UPF "sabotages" the metabolic regulatory systems of growing children. According to the NOVA classification, UPF is characterized by the use of industrial ingredients such as hydrogenated fats and refined sugars, which trigger an abnormal glycemic response (Monteiro et al., 2019; Lane et al., 2021). Extreme blood glucose spikes force the pancreas to secrete massive amounts of insulin,

which, if chronic, leads to insulin resistance, a condition in which the body's cells lose their sensitivity (Hall et al., 2021; Lustig, 2022). This pathophysiological pathway is a major precursor to type 2 diabetes mellitus and metabolic syndrome, which are now rapidly increasing in frequency in the adolescent population (Weihe & Weihrauch-Blüher, 2022).

Furthermore, UPF actively disrupts the gut-brain axis by manipulating appetite hormones. Consuming high-energy, low-fiber UPF results in the ineffectiveness of the hormone leptin (a satiety signal) in the hypothalamus, while the hormone ghrelin (a hunger signal) remains abnormally active (Hall et al., 2021; Izquierdo et al., 2023; Monda et al., 2024). This hormonal imbalance explains why children tend to overeat, or consume more processed foods than whole foods (Made et al., 2026). This systemic impact is exacerbated by chronic, low-grade inflammation triggered by food additives such as emulsifiers, which can alter the composition of the gut microbiota and increase intestinal permeability (leaky gut) (Panyod et al., 2024). This dysbiosis condition accelerates fat accumulation in the liver, which contributes to the risk of non-alcoholic fatty liver disease (NAFLD) and dyslipidemia from an early age (Anderson et al., 2021; Silveira et al., 2023; Vallianou et al., 2025).

Psychoneurobiology of Addiction: Manipulating the Reward System and Self-Control

A thorough analysis of eating behavior must address psychoneurobiological mechanisms, where UPF is technically designed to be a hyperpalatable product. The precise combination of refined sugar, trans fat, and high sodium creates sensory stimuli that can powerfully stimulate the dopaminergic reward pathway in the brain's mesolimbic system, in a pattern very similar to the mechanisms of substance addiction (Gearhardt & DiFeliceantonio, 2022; Qin et al., 2025).

Mechanistically, persistent UPF exposure triggers a neurobiological cascade that begins with stimulation of the Ventral Tegmental Area (VTA) to produce massive dopamine. This neurotransmitter is channeled through the mesolimbic pathway to the Nucleus Accumbens, creating a flood of dopamine that disrupts the Prefrontal Cortex. As a result, children's inhibitory control function, or cognitive "brakes," weakens (Gearhardt & DiFeliceantonio, 2022). This triggers a fundamental shift in children from homeostatic eating (eating based on energy needs) to hedonic eating (eating based on pleasure) (Thompson et al., 2025; Witek et al., 2022). This phenomenon explains why conventional nutrition education interventions often fail to address the addictive appeal of UPF products (Santos et al., 2024; Unwin et al., 2025). The neurobiological mechanisms by which UPF hijack the dopamine pathway and create this cycle of impulsive consumption can be visualized in Figure 2.

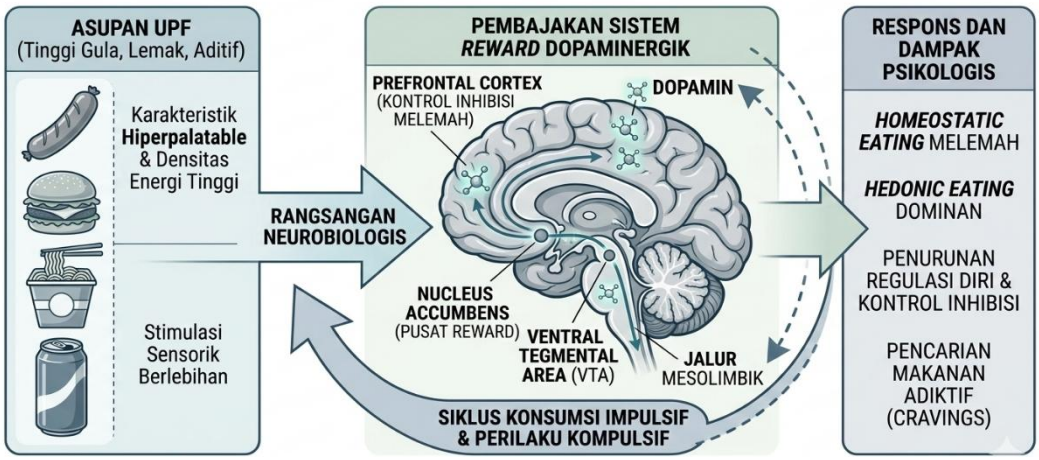

Figure 2. Diagram of the Neurobiological Mechanism of Ultra-Processed Food Addiction in the Brain's Reward System.

This diagram illustrates the hijacking of dopaminergic pathways by hyperpalatable foods, resulting in a weakening of children's cognitive inhibitory control over food intake. (Source: Processed by Researchers, 2026).

Based on the visualization in Figure 2, it is clear that this addiction undermines self-control. From an Islamic psychological perspective, the concept of halal consumption is not only related to the halalness of food ingredients, but also emphasizes the dimensions of quality, usefulness, and moderation of consumption that function as mechanisms for forming self-regulation in eating behavior. This food addiction crisis reflects the loss of self-regulation due to school environments that are full of exposure to non-thayyib (essentially poor quality) food. The integration of the halal concept into school meal program policies is an urgent psychological instrument to strengthen children's self-control capacity, where the value of thayyib emphasizes purity and long-term benefits for the body and soul, which serves as a moral anchor in facing environmental stressors that trigger obesity (Açik & Ülger, 2025). Without restructuring the availability of school meals, children with immature inhibitory control will continue to be trapped in destructive patterns of impulsive consumption and compulsive eating behaviors (Lin et al., 2020; Santos et al., 2024; de Almeida et al., 2021).

The Fiscal Paradox of the Makan Bergizi Gratis Program (MBG): Apparent Efficiency vs. Accumulated State Liabilities

The final analysis highlights the strategic dilemma in implementing the Makan Bergizi Gratis Program (MBG). With an extraordinarily large fiscal budget allocation, reaching IDR 400–450 trillion, the government is at a crossroads between short-term nominal efficiency and long-term human resource investment (Pangaribuan et al., 2024). Often, the selection of UPF in the school food supply chain is considered "efficient" due to its low unit price, long logistical shelf life, and low spoilage costs (Ayuni et al., 2025). However, from a health accounting perspective, this approach is a strategic failure that creates massive contingent liabilities in the state's future financial statements (Lane et al., 2024).

Systematically, any current procurement cost savings through the use of cheap processed ingredients will be paid for dearly by the state through chronic healthcare cost

inflation due to Non-Communicable Diseases (NCDs) and decreased national productivity (Pangaribuan et al., 2025). Furthermore, reliance on catering vendors without strict oversight creates a moral hazard risk, where providers tend to prioritize profit margins by serving UPF ingredients over more nutritious fresh local food (Aji, 2025). Therefore, MBG policies must be transformed using holistic Value for Money principles. Investing in fresh local food is not simply about meeting caloric needs but also the most prudent fiscal risk mitigation measure to ensure that the state budget is not exhausted solely to address the burden on BPJS (Social Security Agency) due to obesity, which could actually be prevented through school lunch plates (Ayuni et al., 2025; Lane et al., 2024). A comparison of the economic implications between the use of UPF and local food as a basis for nutritional policy making can be seen in Table 2.

Table 2. UPF-Based Procurement Analysis Dimensions
(Pseudo-Efficiency) Fresh Local Food Procurement (Human Resources Investment)

Dimensional Analysis	**UPF-Based Procurement (Pseudo-Efficiency)**	**Fresh Local Food Procurement (Human Resources Investment)**
Cost Per Unit	Low (Cheap in nominal terms upfront)	Moderate (In line with commodity market prices)
Logistics & Distribution	Easy (Long-lasting, no cold chain required)	Requires a cold chain
Health Impact	Triggers NCDs (Diabetes, Early Obesity)	Prevents stunting and obesity
Accounting Status	Contingent Liabilities	Strategic Assets (National Productivity)
Fiscal Impact	(Healthcare debt burden)	Fiscal efficiency through disease prevention

Source: Adapted from Aji (2025) and Nilson et al. (2025).

Based on Table 2, it can be seen that short-term budget savings through the use of the UPF actually create significantly greater fiscal risks in the future. This confirms that accounting transparency and nutritional quality must be key performance indicators (KPIs) for the successful implementation of the Makan Bergizi Gratis Program (MBG) in Indonesia.

Anatomy of Implementation Failure: From Dietetic Malpractice to a Crisis of Trust

The operational implementation of the Makan Bergizi Gratis Program (MBG) from 2025 to early 2026 revealed significant food safety gaps. Data shows that at least 5,620 students became victims of food poisoning due to weak supervision at the Nutrition Program Service Unit (SPPG) (Faisal, 2025). This crisis was exacerbated by the presentation of unusual and non-standard menus, such as the use of shark meat, which sparked a strong reaction from the National Nutrition Agency (BGN) and public doubts about the competence of nutritionists in the field (Nadira, 2025). Weak curation of fresh food ingredients often leads SPPGs to take shortcuts by using Ultra-Processed Foods (UPFs), which are instant but low in nutritional

integrity. The widespread use of UPFs is not simply a technical kitchen issue, but a form of state-sponsored dietetic malpractice.

Blundering statements by public officials who downplayed the importance of the role of nutritionists in MBG's operational structure created a widespread "Public Trust Crisis" (Prabowati, 2025; Simanjuntak, 2025). From a public sector risk management perspective, the lack of nutritionist supervision is not merely a technical issue, but a clear form of fiscal inefficiency. The trillions of rupiah allocated by the state budget are at risk of becoming health liabilities (post-poisoning medication recovery costs) and negative externalities that distort the effectiveness of the state budget. Rather than acting as a human capital investment, inaccurate menu curation without professional oversight actually creates budget waste that deviates the program from its Golden Indonesia 2045 vision.

The culmination of this failure is reflected in a sociocultural phenomenon where people have begun to compare the integrity of local food ingredients in traditional rituals (such as offerings), which are considered safer, fresher, and of better quality, to MBG menus that are susceptible to contamination and dominated by industrial products. This social irony is not merely satire, but rather a public demand for food standardization that prioritizes Whole Foods over high-risk instant processing. The massive mass poisoning cases are empirical evidence that without a commitment to food safety and the involvement of professionals, this national strategic program is at risk of losing its moral legitimacy in the public eye.

Conclusion

This study concludes that the integration of Ultra-Processed Foods (UPF) into the Free Nutritious Meals (MBG) program poses a multidimensional, systemic threat to the nation's future. Clinically, UPF triggers "biological sabotage" through insulin resistance and disruption of the hormones leptin and ghrelin, which disrupt satiety and hunger signals, directly increasing the risk of obesity and non-communicable diseases (NCDs) from an early age.

From a psychoneurobiological perspective, the hyperpalatable nature of UPF hijacks the dopaminergic reward system in children's brains, leading to food addiction, weakened self-control, and a shift in eating patterns from physiological needs to pleasure-based consumption (hedonic eating). Operationally, the implementation analysis uncovered fatal food safety gaps that have resulted in at least 5,620 student food poisonings. These incidents, coupled with low dietary standards in the field, have triggered a crisis of public confidence in the program's legitimacy.

From an accounting and economic perspective, the use of UPF in MBG represents a "false efficiency." Nominal initial cost savings actually create contingent liabilities in the form of a ballooning national healthcare debt burden (BPJS fees) and a decline in national productivity in the future. As a strategic solution, the success of the MBG should not be measured solely by nominal calorie sufficiency, but rather by transforming it through the integration of rigorous nutritional audits and the use of fresh, local ingredients to ensure sustainable investment in Indonesia's human resources toward the vision of a Golden Indonesia 2045.

Policy Recommendations and Implications

Implementing these findings requires tactical and operational steps from various stakeholders to ensure the MBG program achieves its objectives effectively. MBG

Management Institutions, such as the Nutrition Program Service Unit (SPPG), are advised to mandate the use of at least 80% fresh local ingredients in every cooperation contract and strictly prohibit the use of industrially processed meat and high-sodium instant seasonings. SPPGs should also prioritize budget allocation for the procurement of a cold chain logistics system to ensure food freshness without the need for added chemical preservatives.

Relevant ministries and agencies need to issue a "School Green Zone" regulation through a Regional Regulation that prohibits the distribution of UPF and sweetened beverages in canteens and within a certain radius around school gates. Furthermore, the program's audit mechanism must be transformed; the Ministry of Finance and the Ministry of Health need to develop Key Performance Indicators (KPIs) based on nutritional quality (Nutritional Audit) rather than simply the quantity of distribution. Determining this long-term economic risk matrix is crucial for monitoring the extent to which the MBG meal plan can reduce the country's fiscal burden due to chronic diseases in the future.

At the operational level in schools, a food literacy curriculum needs to be integrated so students can independently identify the content of food additives, while school canteens are directed to provide home-cooked meals strictly supervised by nutritionists. Finally, parents are advised to restructure their home environment by eliminating industrial food stocks and instilling the value of pure consumption as a form of self-regulation.

The implications of this research are clear: if these strategic recommendations are ignored, every rupiah spent in the state budget will not become a strategic asset, but instead will create a "Health Burden Generation" or "Anxious Generation 2045," which will permanently burden Indonesia's fiscal and social resilience in the future.

Conflict of Interest

No declare.

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Ethical consideration

No declare.

Authors' contribution

Each author contributed equally in all the parts of the research. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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