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Parental Employment Arrangements and Children's Exposure to Ultra-Processed Foods: Evidence from Indonesia

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Abstract

The nutrition transition in emerging economies has increased children's exposure to Ultra-Processed Foods (UPFs), raising concerns about how changing household work arrangements shape food environments. This study examines the association between parental employment arrangements and children's household-level UPF exposure in Indonesia. Using cross-sectional data from the 2025 National Socioeconomic Survey (SUSENAS), the analysis focuses on children aged 1–13 years who residing with their mothers. UPF exposure is measured as the household share of UPF expenditure in total prepared food and beverage expenditure and classified into four ordered categories: no, low, medium, and high exposure. Ordered logit models and average marginal effects are estimated.

The findings show that children in dual-earner households are more likely to experience high exposure to ultra-processed foods than those in father-only-employed households. This association is more pronounced among poor, vulnerable, and aspiring middle-class, but becomes small and statistically insignificant among middle-class-and-above. Age-specific results further indicate that younger children, those aged 1–4 years, are more exposed to UPF-intensive household food environments. Addressing this pattern requires a shift from individual-level nutrition education toward policies that reshape the food environment. Effective policy responses must expand affordable access to healthy and convenient foods, strengthen restrictions on unhealthy food marketing targeted at children, and provide targeted support for working families, particularly economically vulnerable households with young children. These measures are essential to ensure that nutritious food becomes not only healthier, but also accessible, practical, and feasible within the time constraints faced by working parents.

Keywords: Ultra-Processed Foods; Child nutrition; Parental employment; Socio-economic status; Household consumption.

Introduction

The rapid expansion of ultra-processed foods (UPFs) has become an increasingly important public health concern in emerging economies. This study refers to the NOVA food classification system, which groups foods according to the extent and purpose of industrial processing rather than solely by nutrient composition (Monteiro et al., 2019). In this framework, foods are commonly classified into four broad groups: unprocessed or minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed foods. UPFs refer to industrial formulations that are typically made from refined food substances, additives, and ingredients rarely used in home cooking, and are designed to be convenient, durable, highly palatable, and ready-to-consume (Gibney, 2018; Medin et al., 2025). Although the NOVA framework has been widely used in nutrition and public health research, recent debates emphasize that UPFs are a heterogeneous category and particularly when applied across diverse food systems and survey data (Trumbo et al., 2024). Nevertheless, evidence from

nationally representative samples indicates that higher UPF consumption is generally associated with poorer dietary profiles, including higher intake of free sugars, saturated fats, and total fats, and lower intake of fiber and several micronutrients (Martini et al., 2021). These concerns make UPF exposure an important entry point for understanding how changing food systems may affect household diets and child nutrition in emerging economies.

Children are a particularly important group in this transformation. Early dietary exposure can shape food preferences, taste formation, and consumption habits that may persist later in life. Unlike adults, children's diets are not determined solely by individual preferences, but are strongly shaped by household food availability, parental purchasing decisions, caregiving arrangements, and local food environments (Mahmood et al., 2021; Mauch et al., 2022). This is especially relevant for younger children, who depend more heavily on food provided within the household and have limited autonomy over what they consume. Therefore, understanding children's UPF exposure requires attention not only to individual consumption, but also to the household food environment in which children live.

At the same time, household food environments are changing alongside labor-market and family transitions. In many emerging economies, including Indonesia, more households are increasingly shaped by dual-earner arrangements, where both parents participate in paid work. Parental employment can improve household income and economic security, but it may also reduce the time available for meal planning, cooking, and supervision of children's diets. This creates a potential "time–nutrition trade-off," where working families may rely more heavily on ready-to-eat, packaged, or convenience foods to manage the competing demands of paid work and caregiving (Djupegot et al., 2017; McDonnell & Doyle, 2019; Mauch et al., 2022). Importantly, this does not imply that parental employment is harmful; rather, it suggests that the conditions under which parents work may influence how households organize food provisioning.

The relationship between parental employment and children's UPF exposure is also likely to vary by household economic status. Economically advantaged households may be better able to manage time constraints through healthier convenience foods, paid caregiving support, better storage facilities, or more diverse food choices. In contrast, poor and vulnerable households may face simultaneous constraints in time, income, and access to healthier alternatives, making low-cost and shelf-stable UPF products more attractive or practical. Recent evidence suggests that UPF consumption is socially patterned and that socioeconomic gradients vary across countries and stages of food-system development (Dicken et al., 2024). This means that UPF exposure should not be assumed to be concentrated only among wealthy or urban households, especially in countries undergoing rapid dietary transition.

Indonesia provides an important setting to examine these issues. The country is experiencing a continuing nutrition transition, with rising consumption of sugar-sweetened beverages, processed foods, ultra-processed foods, and ready-to-eat foods across urban, rural, and forested areas (Nurhasan et al., 2024). Evidence from Indonesian food environments also shows that convenience, affordability, taste, product availability, and social norms shape the consumption of unhealthy and ultra-processed foods (Colozza, 2024). At the same time, rural and disadvantaged food environments in low- and middle-income countries are increasingly recognized as important spaces where food availability, accessibility, affordability, desirability, and convenience shape dietary outcomes (Choudhury et al., 2025). These changes suggest that

children's exposure to UPF-intensive food environments in Indonesia may reflect not only urbanization or income growth, but also broader transformations in household livelihoods and food access.

This study aims to examine the association between parental employment arrangements and children's household-level exposure to ultra-processed foods (UPF) in Indonesia. It further investigates whether this association varies across household economic status and child age groups. Despite growing evidence on UPF consumption and its health implications, important research gaps remain. First, much of the literature focuses on individual dietary intake or health outcomes, while less attention has been given to household-level UPF exposure as a food-environment condition faced by children. Second, studies on parental employment and child nutrition often focus on maternal employment or anthropometric outcomes, rather than parental employment arrangements and exposure to UPF-intensive food environments. Third, relatively little is known about whether the association between parental employment and children's UPF exposure differs across household economic status and child age group. This gap is important because the same parental employment arrangement may produce different food-environment consequences depending on household resources and children's developmental stage.

Research Method

Data and Study Sample

This study uses the 2025 National Socio-Economic Survey (SUSENAS), with the main outcome constructed from the Consumption and Expenditure Module. This module records detailed information on household food and beverage consumption, including food items, standard units, quantities, purchase values, non-purchase consumption, and total consumption values. The food expenditure section covers a wide range of items, including staple foods, animal-source foods, fruits and vegetables, beverages, and prepared foods and drinks. For this study, the prepared food and beverage information is particularly important because it allows the construction of an expenditure-based measure of children's exposure to ultra-processed food (UPF)-intensive food environments.

Children are grouped into three age categories—1–4, 5–7, and 8–13 years to capture differences in food dependence and autonomy across childhood stages. Children aged 1–4 rely heavily on caregivers, making their food exposure closely tied to household purchasing and meal preparation practices, particularly when time-constrained parents rely on ready-to-eat or ultra-processed foods as practical feeding options (Scaglioni et al., 2018; Tartaglia et al., 2021; Costa & Oliveira, 2023). Children aged 5–7 represent an early school transition stage, when diets begin to extend beyond the home through school canteens, snacks, and vendors, although parental control remains important (Rachmadewi et al., 2021; Varela et al., 2024). By ages 8–13, children have greater autonomy and are increasingly influenced by peers and personal preferences; thus, parental employment may shape food exposure more indirectly through household resources, supervision, and pocket money rather than direct meal preparation alone (van Nee et al., 2021; Neufeld et al., 2022; Daly et al., 2022).

Classification of UPF Items in SUSENAS 2025

Given the absence of ingredient lists and detailed processing information in SUSENAS, this study applies a conservative UPF classification. The main specification includes only clearly

identifiable industrially formulated, packaged, or highly processed items, such as packaged cakes and biscuits, instant noodles, packaged snacks, processed meats, sugar-sweetened and packaged beverages, energy drinks, and ice cream. Ambiguous items, including bread products and ready-to-drink coffee, milk tea, chocolate milk, and similar beverages, are excluded from the main definition and used only in robustness checks, as the survey cannot distinguish factory-packaged products from freshly prepared items. Ready-to-eat meals such as rice meals, soup, cooked vegetables, cooked fish, and cooked chicken are also excluded because they may be freshly prepared rather than industrial formulations. This conservative approach ensures a strict and transparent UPF measure, consistent with NOVA's emphasis on the extent and purpose of processing rather than the place of purchase (Monteiro et al., 2019).

Measurement of Ultra-Processed Food Exposure

The dependent variable is children's exposure to ultra-processed foods (UPF). Ultra-processed foods are defined using the NOVA framework, which classifies foods based on the extent and purpose of industrial processing. Under NOVA, ultra-processed foods are generally industrial formulations made mostly or entirely from substances extracted from foods, food derivatives, and additives, and are typically designed to be convenient, highly palatable, durable, and ready to consume (Monteiro et al., 2019).

Because SUSENAS records food expenditure rather than dietary energy or nutrient intake, this study measures UPF exposure using an expenditure-based approach. This approach does not claim to measure actual calorie intake from UPF, but captures the extent to which children's ready-to-eat food expenditure is allocated to items that can be classified as ultra-processed. The use of dietary share or expenditure share is consistent with population-based UPF studies that compare relative UPF exposure across individuals or groups when detailed dietary composition is not fully available (Martínez Steele et al., 2017).

The main UPF exposure variable is calculated as follows.

$$UPFExp_i = \sum_{j \in UPF} Expenditure_{ij}$$

where $UPFExp_i$ denotes the total weekly expenditure of child i on food and beverage items classified as ultra-processed. The primary share measure is then defined as:

$$UPFShare_i = \frac{UPFExp_i}{ReadyToEatExp_i} \times 100$$

where $ReadyToEatExp_i$ denotes the child's total weekly expenditure on prepared foods and drinks, excluding ordinary drinking water. The denominator is restricted to prepared food and beverage expenditure because this category most directly captures ready-to-eat and convenience-oriented food purchases, while raw food ingredients are generally purchased and consumed at the household level and cannot be reliably attributed to individual children. Accordingly, the resulting UPF share should be interpreted as a household-level measure of exposure to UPF-intensive food environments. Since the empirical analysis is conducted at the child level, this household measure is assigned to each child living in the household and reflects the food environment to which the child is exposed, rather than the child's actual individual consumption.

Empirical Strategy

The baseline empirical model estimates the association between parental employment arrangements and children's exposure to ultra-processed foods (UPF). Since the dependent variable is defined as an ordered categorical outcome with four levels, no UPF exposure, low exposure, medium exposure, and high exposure this study employs an ordered logit model. This approach is appropriate because the outcome categories have a natural ranking, while the distance between adjacent categories cannot be assumed to be equal.

The ordered logit model is specified through a latent-response framework. Let $UPF\ Exposure_{ihd}$ denote the unobserved propensity of child i in household h and area d to be exposed to UPF. The baseline specification is written as follows:

$$UPF\ Exposure_{ihd} = \alpha + \sum_{r=1}^{R-1} \beta_r Parental\ Employment\ Arrangement_{hrd} + Child'_{ihd}\gamma + Mother'_{hd}\delta + Father'_{hd}\phi + Household'_{hd}\theta + \mu_d + \varepsilon_{ihd} \quad (1)$$

where $UPF\ Exposure_{ihd}$ is the latent propensity of child i in household h and area d to have a higher level of UPF exposure. $Parental\ Employment\ Arrangement_{hrd}$ denotes mutually exclusive parental employment categories, with father-only employed households as the reference group. $Child_{ihd}$, $Mother_{hd}$, $Father_{hd}$, and $Household_{hd}$ are vectors of child, maternal, paternal, and household characteristics, respectively. μ_d denotes area fixed effects, and ε_{ihd} is assumed to follow a logistic distribution.

The observed outcome Y_{ihd} is generated by dividing the latent variable into four ordered categories using three estimated thresholds, κ_1 , κ_2 , and κ_3 :

$$Y_{ihd} = \begin{cases} 0, & \text{if } UPF\ Exposure_{ihd} = 0 \\ 1, & \text{if } \kappa_1 < UPF\ Exposure_{ihd} \leq \kappa_2 \\ 2, & \text{if } \kappa_2 < UPF\ Exposure_{ihd} \leq \kappa_3 \\ 3, & \text{if } UPF\ Exposure_{ihd} > \kappa_3 \end{cases} \quad (2)$$

where categories 0, 1, 2, and 3 refer to no, low, medium, and high UPF exposure, respectively. The probability that child i belongs to category j is given by:

$$P(Y_{ihd} = j | X_{ihd}) = \Lambda(\kappa_{j+1} - \eta_{ihd}) - \Lambda(\kappa_j - \eta_{ihd}) \quad (3)$$

where $j = 0, 1, 2, 3$; $\Lambda(\cdot)$ is the logistic cumulative distribution function; $\kappa_0 = -\infty$ and $\kappa_4 = +\infty$; and η_{ihd} is the linear predictor from Equation (1), excluding the error term.

Since ordered logit coefficients indicate changes in the latent propensity rather than direct probability changes, the study reports average marginal effects for each UPF exposure category. All estimates use SUSENAS sampling weights, and standard errors are clustered at the primary sampling unit level.

Main Independent Variable

The main independent variable is parental employment arrangement, constructed from the employment status of the child's mother and father during the survey reference period. This variable captures the household breadwinner structure and distinguishes four categories: neither parent employed, only father employed, only mother employed, and both parents employed. In the regression model, only father employed is used as the reference category.

because it represents the conventional single-breadwinner arrangement and provides a meaningful comparison for assessing whether other parental employment configurations are associated with different levels of household UPF exposure. Table 1 provides the operational definitions, coding schemes, and measurement of the main variables used throughout the analysis

Table 1. Operational Definitions of Variables

Variable group	Variable	Operational definition	Suggested coding
Dependent variable	Household UPF exposure category	Ordered measure of household-level UPF exposure assigned to children aged 1–13 years. The category is constructed from household UPF share, distinguishing households with no UPF expenditure from positive-UPF households with low, medium, and high exposure.	0 = No UPF, 1 = Low UPF, 2 = Medium UPF, 3 = High UPF
Main independent variable	Parental employment arrangement	Employment arrangement of the child's parents during the reference period, constructed from maternal and paternal employment status. The reference category in the regression model is only father employed.	0 = Neither parent employed, 1 = Only father employed, 2 = Only mother employed, 3 = Both parents employed
Parental characteristic	Mother's age	Age of the mother in completed years.	Continuous
Parental characteristic	Father's age	Age of the father in completed years.	Continuous
Parental characteristic	Mother's education	Highest educational attainment of the mother. The reference category in the regression model is primary school or equivalent.	0 = No primary school certificate, 1 = Primary school or equivalent, 2 = Junior secondary, 3 = Senior secondary or vocational, 4 = Tertiary education
Parental characteristic	Father's education	Highest educational attainment of the father. The reference category in the regression model is primary school or equivalent.	0 = No primary school certificate, 1 = Primary school or equivalent, 2 = Junior secondary, 3 = Senior secondary or vocational, 4 = Tertiary education
Parental characteristic	Mother's working hours	Total working hours of the mother during the reference period. For non-employed mothers, working hours are coded as zero in the regression model.	Continuous
Parental characteristic	Father's working hours	Total working hours of the father during the reference period. For non-employed fathers, working hours are coded as zero in the regression model.	Continuous
Child characteristic	Child age	Age of the child in completed years. The analytical sample includes children aged 1–13 years.	1–13 years

Child characteristic	Child age group	Age group of the child, constructed to capture differences across early childhood and older children. The reference category in the regression model is age 1–4 years.	1 = 1–4 years, 2 = 5–7 years, 3 = 8–13 years
Child characteristic	Child sex	Biological sex of the child. The reference category in the regression model is male.	1 = Female, 0 = Male
Household characteristic	Household size	Total number of household members.	Continuous
Household characteristic	Number of children aged 1–13	Total number of children aged 1–13 years living in the household.	Continuous
Household characteristic	Household expenditure per capita	Monthly household expenditure divided by household size. This variable is used to construct household economic status.	Monthly per capita expenditure (in IDR)
Household characteristic	Household economic status	Household economic status constructed from per capita expenditure using poverty-line multiples. The reference category in the regression model is poor.	1 = Poor, 2 = Vulnerable, 3 = Aspiring middle class, 4 = Middle class and above
Area characteristic	Urban residence	Urban or rural classification of the household's place of residence. The reference category in the regression model is rural.	1 = Urban, 0 = Rural

The household expenditure module also provides summary information on food expenditure, non-food expenditure, and average monthly household expenditure. These variables can be used to construct per capita expenditure and household welfare quintiles. The SUSENAS questionnaire records the monthly household expenditure summary by combining monthly food expenditure and monthly non-food expenditure.

Robustness Checks and Heterogeneity Analysis

Robustness checks are conducted by varying the UPF definition, outcome specification, and denominator used to construct UPF share. The strict UPF definition is compared with a broader classification that includes potentially ultra-processed items, while alternative outcomes include any UPF exposure, high UPF exposure, continuous UPF share, and the four-category ordered UPF exposure variable. UPF share is also recalculated using alternative denominators, including total prepared food and beverage expenditure and total household food expenditure; because the analysis is conducted at the child level while UPF exposure is measured at the household level, standard errors are clustered at the household level and household-level models are estimated as an additional check. Heterogeneity analyses further examine whether the association between parental employment arrangement and high UPF exposure varies by household economic status, and by child age group, to assess how parental employment interacts with household resources and children's developmental stages in shaping UPF-intensive household food environments.

Result

Descriptive statistics

Before presenting the regression results, Table 2 provides an overview of children's characteristics across household UPF exposure categories. Since UPF exposure is measured at the household level and assigned to each child, the figures should be interpreted as the share of children living in households with the corresponding characteristics. The table shows that nearly half of the children in the sample live in households classified as having high UPF exposure, while only 2.4 percent live in households with no UPF exposure.

Several descriptive patterns are noteworthy. Children in high-UPF households are slightly more likely to live in dual-earner households. They are also more likely to come from poor and vulnerable households, have parents with lower educational attainment, and live in households with a larger number of children aged 1–13 years. In contrast, the share of children from middle-class-and-above households and urban areas is lower in the high-UPF category. Overall, these patterns indicate that household UPF exposure varies across parental employment arrangements, socioeconomic status, parental education, household composition, and place of residence. These descriptive differences provide the basis for the multivariate analysis presented in the next section.

Table 2. Descriptive Statistics by Household UPF Exposure Category (percent)

Variables	All sample	No UPF	Low UPF	Medium UPF	High UPF
UPF exposure category					
No UPF	2.4	100.0	0.0	0.0	0.0
Low UPF	18.0	0.0	100.0	0.0	0.0
Medium UPF	31.0	0.0	0.0	100.0	0.0
High UPF	48.6	0.0	0.0	0.0	100.0
Parental employment arrangement					
Neither parent employed	1.4	1.2	1.4	1.5	1.4
Only father employed	43.1	42.3	44.1	44.1	42.0
Only mother employed	1.6	1.7	1.9	1.5	1.5
Both parents employed	53.9	54.8	52.6	52.9	55.1
Household economic status					
Poor	13.7	20.8	9.1	9.3	17.8
Vulnerable	26.2	27.7	20.7	23.1	30.1
Aspiring middle class	49.1	44.3	53.2	53.8	44.9
Middle class and above	11.0	7.3	17.0	13.8	7.2
Child characteristics					
Age 1–4 years	24.5	20.1	21.5	23.9	26.3
Age 5–7 years	23.9	20.8	22.0	23.7	24.7
Age 8–13 years	51.6	59.1	56.5	52.3	49.0
Female child	48.3	47.0	48.2	48.4	48.3
Mother's education					
No primary school certificate	7.4	10.1	6.0	5.9	8.7
Primary school or equivalent	24.6	27.6	21.4	22.4	27.1
Junior secondary	22.3	20.9	21.0	22.0	23.1

Senior secondary or vocational	31.0	28.5	33.2	33.2	28.8
Tertiary education	14.8	12.9	18.5	16.6	12.3
Father's education					
No primary school certificate	7.9	9.2	6.2	6.3	9.4
Primary school or equivalent	25.2	27.4	21.6	23.3	27.7
Junior secondary	19.8	17.7	18.5	19.5	20.5
Senior secondary or vocational	34.9	33.1	38.0	37.2	32.4
Tertiary education	12.2	12.6	15.7	13.7	10.0
Parental age and working hours					
Mother's age	38.85	39.17	39.57	38.98	38.48
Father's age	42.41	42.67	42.93	42.50	42.15
Mother's working hours	22.71	22.37	23.36	22.95	22.33
Father's working hours	45.26	42.40	46.26	46.31	44.35
Household characteristics					
Household size	4.70	4.62	4.54	4.65	4.80
Number of children aged 1–13	1.97	1.91	1.74	1.88	2.11
Urban residence	45.6	29.0	56.6	54.1	36.9
Observations	269,868	6,446	48,589	83,765	131,068

For examining heterogeneity across economic groups, the main ordered logit estimates provide an overall picture of how parental employment arrangement and household characteristics are associated with children's exposure to different levels of household UPF. Table 3 reports average marginal effects rather than ordered logit coefficients, allowing each estimate to be interpreted as a change in the predicted probability of belonging to a specific UPF exposure category.

Table 3. Average Marginal Effects from Ordered Logit Model of Household UPF Exposure

Variables	No UPF	Low UPF	Medium UPF	High UPF
Dependent variable: Household UPF exposure category				
Parental employment arrangement				
Neither parent employed	-0.0018** (0.0007)	-0.0250** (0.0105)	-0.0124** (0.0060)	0.0392** (0.0172)
Only mother employed	-0.0010 (0.0008)	-0.0136 (0.0112)	-0.0062 (0.0055)	0.0209 (0.0175)
Both parents employed	-0.0022*** (0.0003)	- 0.0298*** (0.0045)	-0.0152*** (0.0023)	0.0472*** (0.0071)
Child characteristics				
Age 5–7 years	0.0001 (0.0002)	0.0009 (0.0023)	0.0005 (0.0014)	-0.0014 (0.0038)
Age 8–13 years	0.0017*** (0.0002)	0.0237*** (0.0020)	0.0121*** (0.0011)	-0.0376*** (0.0032)
Female child	-0.0001	-0.0018	-0.0009	0.0029

	(0.0001)	(0.0019)	(0.0010)	(0.0030)
Mother's education				
No primary school certificate	-0.0007*	-0.0101*	-0.0066	0.0174*
	(0.0004)	(0.0060)	(0.0041)	(0.0105)
Junior secondary	0.0006**	0.0085**	0.0049**	-0.0140**
	(0.0003)	(0.0038)	(0.0022)	(0.0062)
Senior secondary or vocational	0.0015***	0.0204***	0.0109***	-0.0327***
	(0.0003)	(0.0039)	(0.0022)	(0.0064)
Tertiary education	0.0017***	0.0233***	0.0121***	-0.0371***
	(0.0004)	(0.0054)	(0.0027)	(0.0085)
Father's education				
No primary school certificate	-0.0008**	-0.0122**	-0.0080**	0.0210**
	(0.0004)	(0.0056)	(0.0039)	(0.0098)
Junior secondary	0.0005**	0.0078**	0.0045**	-0.0129**
	(0.0003)	(0.0038)	(0.0022)	(0.0062)
Senior secondary or vocational	0.0015***	0.0208***	0.0111***	-0.0333***
	(0.0003)	(0.0037)	(0.0021)	(0.0061)
Tertiary education	0.0018***	0.0251***	0.0130***	-0.0399***
	(0.0004)	(0.0057)	(0.0028)	(0.0088)
Parental age and working hours				
Mother's age	0.0001***	0.0009***	0.0004***	-0.0014***
	(0.0000)	(0.0003)	(0.0002)	(0.0005)
Father's age	-0.0000	-0.0003	-0.0001	0.0005
	(0.0000)	(0.0003)	(0.0001)	(0.0004)
Mother's working hours	0.0000***	0.0004***	0.0002***	-0.0006***
	(0.0000)	(0.0001)	(0.0000)	(0.0001)
Father's working hours	0.0000***	0.0003***	0.0001***	-0.0004***
	(0.0000)	(0.0001)	(0.0000)	(0.0001)
Household characteristics				
Household size	0.0012***	0.0170***	0.0088***	-0.0270***
	(0.0001)	(0.0014)	(0.0007)	(0.0023)
Number of children aged 1–13	-0.0044***	-	-0.0315***	0.0970***
		0.0611***		
	(0.0002)	(0.0021)	(0.0012)	(0.0033)
Household economic status				
Vulnerable	0.0011***	0.0175***	0.0157***	-0.0342***
	(0.0003)	(0.0043)	(0.0040)	(0.0085)
Aspiring middle class	0.0042***	0.0639***	0.0442***	-0.1124***
	(0.0003)	(0.0041)	(0.0038)	(0.0081)
Middle class and above	0.0079***	0.1111***	0.0582***	-0.1771***
	(0.0005)	(0.0060)	(0.0039)	(0.0098)
Urban residence	0.0054***	0.0787***	0.0476***	-0.1316***
	(0.0002)	(0.0026)	(0.0017)	(0.0042)
Observations	236,254	236,254	236,254	236,254

The results show a clear association between parental employment arrangement and household UPF exposure. Relative to children living in households where only the father is employed, children in households where both parents are employed are significantly less likely to be in the no-UPF, low-UPF, and medium-UPF categories, while being significantly more likely to be in the high-UPF category. Specifically, having both parents employed increases the probability of high UPF exposure by 4.72 percentage points. Children in households where

neither parent is employed also have a higher probability of high UPF exposure, by 3.92 percentage points, compared with those in father-only-employed households. At the same time, they are less likely to be in the no-UPF, low-UPF, and medium-UPF categories.

Child characteristics show that children aged 8–13 years are less likely to be in the high-UPF category compared with children aged 1–4 years. The marginal effect indicates a 3.76 percentage-point lower probability of high UPF exposure for this older age group. In contrast, children aged 5–7 years do not differ significantly from the youngest group. Child sex is also not statistically significant across all categories, suggesting no meaningful difference in household UPF exposure between boys and girls. This is plausible because the outcome is measured at the household level, so it captures the household food environment rather than sex-specific individual dietary intake.

Parental education shows a consistent protective association with high UPF exposure. Higher maternal and paternal education are linked to a lower probability of high UPF exposure and a greater likelihood of being in lower UPF categories, with tertiary education reducing high exposure by 3.71 percentage points for mothers and 3.99 percentage points for fathers relative to primary education. Parental age and working hours show weaker associations: mother's age is negatively associated with high UPF exposure, while father's age is not statistically significant, and both maternal and paternal working hours are linked to only very small reductions in the probability of high UPF exposure.

Household composition, economic status, and residence are strongly associated with children's UPF exposure. Larger household size is linked to a lower probability of high UPF exposure, while each additional child aged 1–13 increases the probability of high exposure by 9.70 percentage points, suggesting greater reliance on convenient packaged foods in households with more children. A clear socioeconomic factor is also observed: compared with poor households, vulnerable, aspiring middle-class, and middle-class-and-above households are less likely to fall into the high-UPF category, with reductions of 3.42, 11.24, and 17.71 percentage points, respectively. Urban residence is also associated with a 13.16 percentage-point lower probability of high UPF exposure, although it increases the likelihood of low and medium exposure. These results indicate that children's household UPF exposure is shaped by household structure, economic resources, and place of residence.

To examine whether the association between parental employment arrangement and household UPF exposure differs across childhood stages, Table 4 reports age-stratified average marginal effects for the probability of high household UPF exposure. Because UPF exposure is measured at the household level and assigned to children, the estimates should be interpreted as the probability that children live in households with high UPF exposure, rather than as direct measures of individual child consumption.

The results show that dual parental employment is consistently associated with a higher probability of high household UPF exposure across all age groups. Compared with children in father-only-employed households, children in households where both parents are employed have a 6.52 percentage-point higher probability of high UPF exposure among those aged 1–4 years, 3.75 percentage points among those aged 5–7 years, and 4.13 percentage points among those aged 8–13 years. This pattern suggests that the association between dual parental employment and UPF-intensive household food environments is not limited to a particular stage of childhood.

The largest marginal effect appears among children aged 1–4 years, which may reflect the stronger dependence of young children on food purchased, prepared, and provided within the household. However, differences in magnitude across age groups should be interpreted cautiously because the models are estimated separately by age group. In contrast, the “only mother employed” category is not consistently significant, except for a weakly significant association among children aged 1–4 years. This reinforces the interpretation that the main pattern is not driven by maternal employment alone, but by the broader condition of dual parental employment.

Other household work arrangements show more limited and age-specific patterns. Households where neither parent is employed are significantly associated with higher UPF exposure only among children aged 8–13 years. This finding may reflect heterogeneity within the no-employed-parent group, including households facing economic vulnerability, non-standard work arrangements, or reliance on non-labor income. It suggests that high UPF exposure may emerge not only from parental time constraints, but also from broader household vulnerability.

Parental education, household composition, economic status, and residence further shape children’s likelihood of high UPF exposure. Higher parental education generally appears protective, with maternal senior secondary or tertiary education associated with lower high UPF exposure among children aged 1–4 and 8–13 years, while paternal education shows a more consistent protective pattern across age groups. Larger household size is associated with lower high exposure, whereas a greater number of children aged 1–13 increases the probability of high exposure. Children from aspiring middle-class and middle-class-and-above households, as well as those living in urban areas, are less likely to experience high household UPF exposure than children from poor households.

Table 4. Average Marginal Effects on High Household UPF Exposure by Child Age Group

Variables	Age 1–4 years	Age 5–7 years	Age 8–13 years
Parental employment arrangement			
Neither parent employed	0.0152 (0.0243)	0.0215 (0.0322)	0.0658*** (0.0223)
Only mother employed	0.0561* (0.0314)	0.0017 (0.0280)	0.0091 (0.0195)
Both parents employed	0.0652*** (0.0115)	0.0375*** (0.0113)	0.0413*** (0.0081)
Child characteristics			
Female child	0.0046 (0.0058)	-0.0019 (0.0062)	0.0038 (0.0041)
Mother’s education			
No primary school certificate	0.0151 (0.0166)	0.0112 (0.0179)	0.0201 (0.0125)
Junior secondary	-0.0295*** (0.0099)	-0.0085 (0.0101)	-0.0085 (0.0070)
Senior secondary or vocational	-0.0468*** (0.0101)	-0.0202* (0.0104)	-0.0317*** (0.0072)
Tertiary education	-0.0642*** (0.0133)	-0.0069 (0.0135)	-0.0356*** (0.0096)
Father’s education			

No primary school certificate	0.0201 (0.0154)	0.0532*** (0.0169)	0.0092 (0.0117)
Junior secondary	-0.0127 (0.0098)	-0.0079 (0.0099)	-0.0155** (0.0072)
Senior secondary or vocational	-0.0321*** (0.0095)	-0.0430*** (0.0097)	-0.0288*** (0.0070)
Tertiary education	-0.0386*** (0.0141)	-0.0463*** (0.0135)	-0.0365*** (0.0101)
Parental age and working hours			
Mother's age	-0.0011 (0.0007)	-0.0021*** (0.0008)	-0.0011* (0.0006)
Father's age	0.0009 (0.0007)	0.0017** (0.0007)	-0.0004 (0.0005)
Mother's working hours	-0.0009*** (0.0002)	-0.0005** (0.0002)	-0.0005*** (0.0002)
Father's working hours	-0.0003 (0.0002)	-0.0004* (0.0002)	-0.0006*** (0.0002)
Household characteristics			
Household size	-0.0367*** (0.0035)	-0.0286*** (0.0036)	-0.0211*** (0.0026)
Number of children aged 1–13	0.0997*** (0.0049)	0.0850*** (0.0050)	0.1003*** (0.0038)
Household economic status			
Vulnerable	-0.0442*** (0.0119)	-0.0155 (0.0123)	-0.0364*** (0.0103)
Aspiring middle class	-0.1249*** (0.0113)	-0.0984*** (0.0117)	-0.1101*** (0.0099)
Middle class and above	-0.1871*** (0.0151)	-0.1849*** (0.0144)	-0.1664*** (0.0116)
Urban residence	-0.1423*** (0.0064)	-0.1166*** (0.0067)	-0.1317*** (0.0050)
Observations	59,746	57,109	119,399

Beyond age-specific differences, household economic status may shape the extent to which parental employment arrangements are associated with children's exposure to UPF-intensive household food environments. Economic resources can determine whether working families are able to manage time constraints through healthier convenient foods, paid support, or more diverse food choices. For this reason, the analysis further estimates separate models by household economic status, focusing on the probability that children live in households with high UPF exposure.

The association between dual parental employment and high UPF exposure appears to be more pronounced among economically constrained households. Relative to father-only-employed households, dual parental employment is associated with a higher probability of high UPF exposure by 7.43 percentage points among poor households, 5.99 percentage points among vulnerable households, and 4.86 percentage points among aspiring middle-class households, while the association is small and statistically insignificant among middle-class-and-above households. Other covariates support this pattern: older children are less likely to live in

households with high UPF exposure, child sex is not significant, higher parental education is generally protective, the number of children aged 1–13 increases high exposure, and urban residence is associated with lower high exposure

Table 5. Average Marginal Effects of Parental Employment Arrangement on High UPF Exposure by Household Economic Status

Variables	Poor	Vulnerable	Aspiring middle class	Middle class and above
Parental employment arrangement				
Neither parent employed	0.0263 (0.0507)	0.0428 (0.0344)	0.0577** (0.0244)	-0.0242 (0.0366)
Only mother employed	0.0129 (0.0549)	0.0195 (0.0354)	0.0415 (0.0254)	-0.0281 (0.0385)
Both parents employed	0.0743*** (0.0240)	0.0599*** (0.0147)	0.0486*** (0.0096)	-0.0040 (0.0181)
Child characteristics				
Age 5–7 years	-0.0305*** (0.0105)	-0.0005 (0.0076)	0.0060 (0.0055)	-0.0085 (0.0101)
Age 8–13 years	-0.0435*** (0.0091)	-0.0429*** (0.0062)	-0.0362*** (0.0044)	-0.0336*** (0.0088)
Female child	-0.0021 (0.0095)	0.0063 (0.0060)	0.0033 (0.0041)	-0.0002 (0.0072)
Mother's education				
No primary school certificate	0.0230 (0.0230)	0.0242 (0.0185)	0.0167 (0.0148)	-0.0266 (0.0406)
Junior secondary	-0.0016 (0.0176)	-0.0094 (0.0116)	-0.0222*** (0.0085)	-0.0341 (0.0222)
Senior secondary or vocational	0.0047 (0.0200)	-0.0265** (0.0122)	-0.0452*** (0.0087)	-0.0451** (0.0218)
Tertiary education	0.0337 (0.0409)	-0.0287 (0.0209)	-0.0511*** (0.0113)	-0.0432* (0.0235)
Father's education				
No primary school certificate	0.0102 (0.0226)	0.0266 (0.0170)	0.0270** (0.0135)	0.0147 (0.0408)
Junior secondary	-0.0225 (0.0176)	0.0173 (0.0116)	-0.0260*** (0.0084)	-0.0480** (0.0226)
Senior secondary or vocational	-0.0285 (0.0190)	-0.0219* (0.0118)	-0.0396*** (0.0081)	-0.0464** (0.0211)
Tertiary education	-0.1134*** (0.0423)	-0.0278 (0.0234)	-0.0497*** (0.0120)	-0.0496** (0.0229)
Parental age and working hours				
Mother's age	0.0005 (0.0014)	-0.0008 (0.0009)	-0.0022*** (0.0006)	-0.0015 (0.0012)
Father's age	-0.0018 (0.0013)	0.0001 (0.0009)	0.0008 (0.0006)	0.0015 (0.0011)
Mother's working hours	-0.0009	-0.0007**	-0.0006***	-0.0001

	(0.0006)	(0.0003)	(0.0002)	(0.0004)
Father's working hours	-0.0006	-0.0006**	-0.0003	-0.0004
	(0.0005)	(0.0003)	(0.0002)	(0.0003)
Household characteristics				
Household size	-0.0353***	-0.0361***	-0.0220***	-0.0084
	(0.0058)	(0.0043)	(0.0032)	(0.0063)
Number of children aged 1–13	0.0688***	0.0982***	0.1017***	0.1030***
	(0.0083)	(0.0065)	(0.0048)	(0.0094)
Urban residence	-0.1171***	-0.1340***	-0.1363***	-0.1147***
	(0.0136)	(0.0084)	(0.0056)	(0.0119)
Observations	30,739	61,503	117,369	26,643

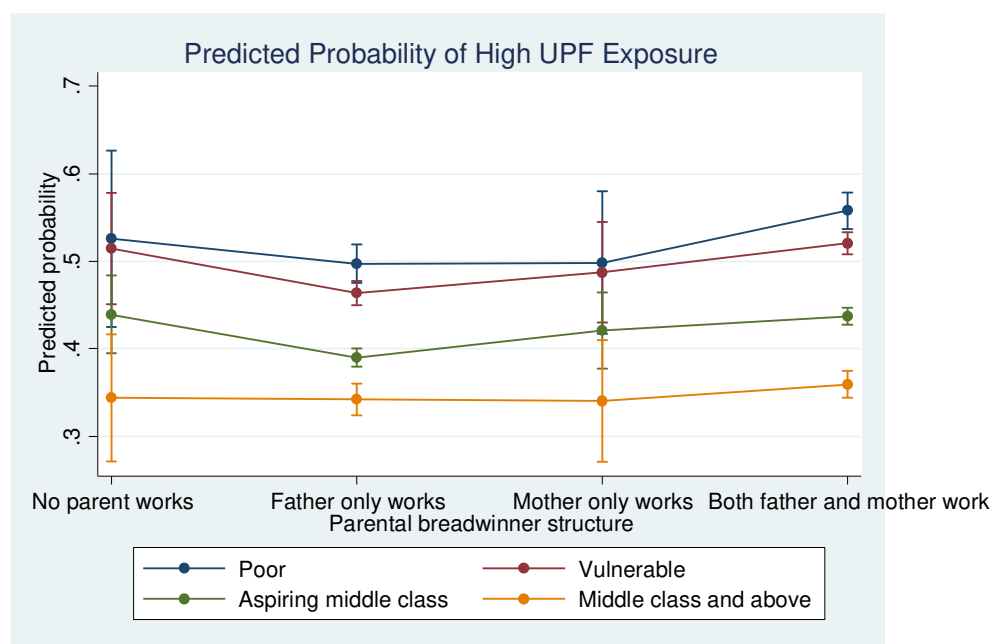


Figure 1. Predicted Probability of High Household UPF Exposure by Parental Employment Arrangement and Household Economic Status

To complement the subgroup analysis, Figure 1 presents the adjusted predicted probability of high household UPF exposure across parental employment arrangements and household economic groups. The figure shows that children in poor and vulnerable households have consistently higher predicted probabilities than those in middle-class-and-above households, particularly when both parents are employed, in line with the marginal effects reported in Table 5. This pattern suggests that dual parental employment is more closely associated with high UPF exposure under economic constraints, where limited time may coincide with restricted access to healthier convenient food alternatives and greater reliance on low-cost packaged foods. In contrast, the predicted probability among middle-class-and-above households remains relatively low and changes only modestly across parental employment arrangements, suggesting that greater resources may help buffer work-related time pressures through more diverse food choices, paid support, food services, or healthier ready-to-eat options.

Discussion

The findings in Table 3 highlight the importance of viewing children's exposure to ultra-processed foods not merely as an individual dietary outcome, but as a household-level food environment shaped by parental work, resources, and family composition. The positive association between dual parental employment and high household UPF exposure suggests that the nutritional implications of parental labor market participation may operate through household time constraints and food provisioning practices. This interpretation is consistent with evidence that parental work, particularly maternal work, can alter children's dietary environments by increasing reliance on prepared, processed, or convenience-oriented foods (Datar et al., 2014). However, the present findings extend this literature by showing that the relevant pattern is not maternal employment alone. The only mother employed category is not statistically significant, whereas the dual-employed-parent category is consistently associated with a shift toward high UPF exposure. This distinction is important because it avoids framing maternal employment as a nutritional risk in itself and instead points to broader work–family constraints within the household.

The result for households where neither parent is employed further suggests that high UPF exposure may arise from more than one mechanism. While dual parental employment may reflect time scarcity, the positive association among households with no employed parent may indicate economic vulnerability, non-standard household arrangements, or constrained food choices. In this sense, UPF exposure may be shaped by both time constraints and resource constraints. This is consistent with studies showing that economically disadvantaged families often face food environments in which low-cost, energy-dense, and highly processed foods are more accessible than healthier alternatives (Ravikumar et al., 2022; Leung et al., 2022). The findings therefore suggest that children's exposure to UPF-intensive household food environments should be understood as part of a broader social and economic pattern, rather than as a simple matter of parental preference.

Parental education emerges as a consistent protective factor. Higher maternal and paternal education are associated with lower probabilities of high UPF exposure and higher probabilities of being in lower UPF categories. This pattern is consistent with the idea that education may shape household food environments through nutrition knowledge, health literacy, food selection, and the ability to evaluate convenience foods more critically. Prior studies have shown that parental dietary behaviors, feeding practices, and the family food environment play an important role in shaping children's eating habits (Mahmood et al., 2021; Wang et al., 2022). In the Indonesian context, where processed and ready-to-eat foods are becoming increasingly available, parental education may help households navigate a rapidly changing food environment and reduce reliance on low-quality ultra-processed products.

The child age pattern also provides an important nuance. Children aged 8–13 years are less likely to live in households classified as having high UPF exposure compared with children aged 1–4 years, while child sex is not significantly associated with UPF exposure. The lower probability among older children may reflect differences in household life-cycle stages or the possibility that some food consumption among older children occurs outside the household and is not fully captured by household expenditure categories. This distinction is important because previous studies have documented high UPF consumption among adolescents and children in many contexts (Neri et al., 2022; Chavez-Ugalde et al., 2024; Mescoloto et al., 2024). Thus, the present result should not be read as evidence that older children consume fewer UPFs, but

rather that they are less likely to be observed in households classified as having high household-level UPF exposure.

Household composition appears to be one of the strongest correlates of high UPF exposure. The number of children aged 1–13 substantially increases the probability of high UPF exposure, suggesting that families with more children may face stronger demand for affordable, practical, and easily shared food items. Instant noodles, packaged snacks, biscuits, sweetened beverages, and similar products may be attractive in such contexts because they are inexpensive, widely available, easy to store, and require little preparation. This mechanism is consistent with broader evidence that UPFs are increasingly embedded in modern food systems because they are convenient, highly available, aggressively marketed, and often cheaper than healthier alternatives (Baker et al., 2020; Dicken et al., 2024). The finding also suggests that child nutrition policy should pay attention not only to individual children, but also to the structure and constraints of the household in which children live.

The socioeconomic and spatial gradients are particularly important. Relative to poor households, children in vulnerable, aspiring middle-class, and middle-class-and-above households are less likely to experience high household UPF exposure, while urban residence is also associated with a lower probability of high exposure. These patterns challenge the assumption that UPF exposure is necessarily concentrated among wealthier or urban households. Instead, they suggest that, in Indonesia, high UPF exposure may also reflect economic constraint and rural household food environments, where affordability, accessibility, convenience, and local food availability shape dietary choices (Choudhury et al., 2025). This interpretation is consistent with recent evidence of dietary transition in Indonesia, including rising consumption of sugar-sweetened beverages, processed foods, UPF, and ready-to-eat foods across urban, rural, and forested areas (Nurhasan et al., 2024), as well as evidence that UPF and beverage consumption among Indonesian adolescents is associated with socioeconomic and family-related factors (Ginting et al., 2024).

Overall, the results suggest that children's household-level UPF exposure is shaped by the intersection of parental employment, education, household composition, economic status, and place of residence. The policy implication is not to discourage parental employment, particularly maternal employment, but to ensure that working families have access to healthier, affordable, and convenient food options. This includes family-friendly work arrangements, nutritious ready-to-eat alternatives, nutrition education, regulation of unhealthy food marketing to children, and improved healthy food availability in disadvantaged communities. Such policy directions are consistent with evidence from Indonesia that food choices are shaped by economic considerations, convenience, product variety, and trust in local vendors (Colozza, 2025), and with broader LMIC evidence on the growing availability, affordability, and marketing of UPF in urban and peri-urban food environments (Margolies et al., 2026). More broadly, these findings position children's food environments as an important dimension of child well-being within social, labor, and nutrition policy frameworks, particularly as UPF increasingly penetrates young children's diets in low- and middle-income countries (Popkin & Laar, 2025).

The age-stratified estimates in Table 4 show that the association between parental employment arrangement and high household UPF exposure is not confined to a particular stage of childhood. Across children aged 1–4, 5–7, and 8–13 years, dual parental employment is

consistently associated with a higher probability of living in households with high UPF exposure relative to father-only-employed households. This finding suggests that children's food environments in dual-earner households may be shaped by the broader reallocation of household time, rather than by maternal employment alone. The result is consistent with the time-scarcity perspective, which argues that paid work may reduce the time available for food planning, cooking, and supervision, thereby increasing reliance on convenient, ready-to-eat, and ultra-processed food options (Datar et al., 2014; Djupegot et al., 2017; McDonnell & Doyle, 2019). The stronger association among children aged 1–4 years may indicate that younger children are more dependent on household-level food provisioning, although differences across age groups should be interpreted cautiously because the models are estimated separately.

Table 4 also suggests that household food exposure is shaped not only by parental work, but also by parental education, household composition, and place of residence. Higher maternal and paternal education generally shows a protective association, indicating that education may strengthen nutrition-related knowledge, feeding practices, and the capacity to navigate increasingly commercialized food environments (Mahmood et al., 2021; Prates et al., 2022). At the same time, the positive association between the number of children aged 1–13 and high UPF exposure suggests that larger child dependency may intensify demand for foods that are affordable, practical, shelf-stable, and acceptable to children. This is consistent with evidence that UPF consumption is shaped by a combination of convenience, taste preference, family requests, marketing exposure, and socioeconomic constraints (Colozza, 2024; Dicken et al., 2024). The negative association of urban residence with high UPF exposure in this study be interpreted urban areas may offer wider access to diverse food options, but they also contain heterogeneous food environments where healthy and unhealthy convenience foods coexist.

The heterogeneity analysis in Table 5 adds an important socioeconomic dimension to the main findings. The positive association between dual parental employment and high household UPF exposure is strongest among poor households, remains significant among vulnerable and aspiring middle-class households, but becomes small and statistically insignificant among middle-class-and-above households. This gradient suggests that dual-earner status does not operate uniformly across the socioeconomic distribution. For poorer working households, additional employment may not be sufficient to offset the combined pressures of limited time, limited purchasing power, and exposure to low-cost packaged foods.

By contrast, higher-income households may be better able to manage work-related time constraints through healthier convenience foods, paid support, more diverse food choices, or stronger food literacy. This interpretation is consistent with evidence that UPF consumption is closely linked to food affordability, household resources, family structure, and commercial food environments (Neri et al., 2022; Syatira & Ekaria, 2020; UNICEF, 2025). Overall, Table 4 and Table 5 suggest that children's exposure to UPF-intensive household food environments emerges at the intersection of parental work, time constraints, socioeconomic resources, and care demands. These findings support policy approaches that do not frame UPF exposure merely as a matter of individual parental choice, but as a structural issue requiring better support for working families, healthier food environments, and improved access to affordable nutritious foods (Lane et al., 2024; Monteiro et al., 2025; Baker et al., 2025).

Conclusion

This study contributes to a growing understanding of how parental employment arrangements are linked to children's exposure to ultra-processed food (UPF)-intensive household food environments in Indonesia. Children living in dual-earner households are more likely to experience high household UPF exposure than those in father-only-employed households, and this pattern remains visible across childhood age groups. The association appears particularly pronounced among younger children aged 1–4 years, suggesting that early childhood may be a more vulnerable stage because younger children depend more heavily on household food provisioning. The findings therefore suggest that the relationship between parental employment and children's food environments should not be interpreted simply as an effect of maternal employment, but as part of a broader household process in which paid work, time constraints, caregiving demands, and food provisioning practices interact.

The results also highlight the role of parental education, household composition, economic status, and place of residence. Higher parental education is generally associated with lower high UPF exposure, while a larger number of children in the household is associated with higher exposure. The socioeconomic gradient further suggests that high UPF exposure is not necessarily concentrated among wealthier households; rather, poorer and vulnerable households may face greater risks due to affordability constraints and limited access to healthier convenient foods. Therefore, the policy implication is not to discourage parental employment, particularly maternal employment, but to support working families through healthier food environments, family-friendly work arrangements, affordable nutritious foods, stronger nutrition education, and regulation of unhealthy food marketing to children, especially during early childhood when household food environments may have stronger influence.

Several limitations should be acknowledged. The use of cross-sectional data means that the estimated associations cannot be interpreted as causal effects, as parental employment arrangements may be correlated with unobserved household factors such as food preferences, nutrition awareness, caregiving support, time management strategies, and local food access. Moreover, expenditure-based UPF measure also cannot fully capture quantity consumed, intake frequency, nutritional quality, or the precise degree of industrial processing. In addition, parental employment is measured broadly and does not account for job quality, work schedules, commuting time, flexibility, childcare support, or informal work intensity, all of which may influence household food practices. Future research could address these limitations by using longitudinal data, individual-level dietary intake, richer measures of parental work conditions, and contextual food-environment data.

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Author Contribution Information

Dien Amalina Nur Asrofi: Conceptualization, Formal analysis, Methodology, Project administration, Resources, Writing – original draft.

Yuly Astuti: Conceptualization, Supervision, Writing – review & editing.

Disclosure Statement

The authors report there are no competing interests to declare.

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Data Availability Statement

The raw data used in this study were obtained from the 2025 National Socio-Economic Survey (SUSENAS). The data were accessed through the official data access mechanism of the Center for Data and Information (Pusdatin) of Badan Riset dan Inovasi Nasional under a collaboration agreement with Statistics Indonesia and were used under license for this study. Access to the raw microdata is restricted and requires permission from Pusdatin BRIN.

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