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Utilizing the COM-B Model to Influence Low-Glycemic Dietary Behavior in Urban Thai Adults with Prediabetes

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Abstract

Background: Type 2 diabetes mellitus is an escalating public health issue in rapidly urbanizing middle-income countries. In Thailand, working-age adults increasingly develop prediabetes due to sedentary lifestyles, high glycemic diets, and limited access to supportive food environments. Existing research on determinants of low glycemic dietary practices remains fragmented, with few studies applying an integrated behavioral framework.

Objective: This study examined behavioral pathways influencing low GI dietary behavior among urban adults with prediabetes, guided by the capability–opportunity–motivation–behavior (COM-B) model.

Design and Methodology: A cross-sectional analytical study was conducted among 450 adults clinically diagnosed with prediabetes in Bangkok. Data were collected using COM-B based questionnaire for assessing psychological and physical capability, social and physical opportunity, and reflective and automatic motivation. Path analysis using maximum likelihood estimation in LISREL version 8.72 assessed model fit and structural relationships.

Results: The model demonstrated excellent fit ($\chi^2 = .32$, $df = 1$, $p = .57$; RMSEA = .000; CFI = 1.00; SRMR = .005). Psychological capability ($\beta = .47$), physical capability ($\beta = .42$), physical opportunity ($\beta = .53$), social opportunity ($\beta = .15$), automatic motivation ($\beta = .27$), and reflective motivation ($\beta = .09$) significantly predicted low GI dietary behavior, explaining 77% of the variance.

Conclusion and Implications: Capability and opportunity were the strongest determinants of low GI dietary behavior. Interventions that enhance nutritional skills and strengthen supportive social and physical food environments may be more effective than motivation focused strategies for improving dietary practices among urban adults with prediabetes.

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Type 2 diabetes mellitus (T2DM) represents a major and escalating public health challenge worldwide, particularly in middle-income countries undergoing rapid urbanization and lifestyle transitions. In 2021, an estimated 537 million adults were living with diabetes, and projections suggest this figure will reach 783 million by 2045 (Wang et al., 2022). Characterized by impaired glucose tolerance, prediabetes affects approximately 541 million individuals globally and substantially elevates the risk of developing diabetes and cardiovascular disease (Alvarez et al., 2025). Without timely intervention, up to 70% of people with prediabetes may progress to diabetes, underscoring the urgent need for effective preventive strategies, as emphasized in the Standards of Care in Diabetes—2023 issued by the ElSayed et al. (2023).

Across Asia, structural and lifestyle transitions marked by sedentary work patterns, westernization of diet, and the increased availability of high-glycemic, ultra-processed foods have accelerated this epidemic

(Malik & Hu, 2019; Popkin & Kenan, 2016; Ranasinghe et al., 2024). Thailand mirrors these regional dynamics despite ongoing national initiatives aimed at improving glycemic control and curbing obesity (Pongutta et al., 2019). Urban Thai adults, particularly those aged 20–60 years, represent the country’s most productive population segment but also face disproportionate stress, role overload, and limited time for healthy food preparation (Almeida et al., 2020; Halloran, 2024). National screening programs remain focused primarily on older adults (Bureau of Non-Communicable Diseases, 2022; Darmon & Drewnowski, 2015), while younger urban populations exposed to obesogenic environments receive comparatively limited behavioral support. Notably, national health surveys indicate that approximately one in three Thai adults has impaired fasting glucose or is at high risk for prediabetes, with prevalence disproportionately higher among working-age adults in urban areas (Bureau of Non-Communicable Diseases, 2022). This pattern highlights a critical prevention gap, as current screening and behavioral interventions remain largely oriented toward older populations.

Although low-glycemic index (low-GI) diets have been shown to improve glycated hemoglobin (HbA1c) and lipid profiles (Atkinson et al., 2021; Chiavaroli et al., 2021), adherence among working-age adults remains low due to cost, accessibility, and cultural food preferences (Gaupholm et al., 2023). Addressing these barriers requires an integrative behavioral framework that captures individual capability, social support, and environmental opportunity. The capability–opportunity–motivation–behavior (COM-B) model (Atkins et al., 2017; Michie et al., 2011; Michie et al., 2014) provides a comprehensive foundation for understanding how psychological, physical, and contextual determinants interact to shape behavior. However, its application to prediabetes prevention in urban Thai settings remains under-explored. While existing studies have examined selected behavioral or environmental factors related to dietary practices, empirical evidence remains limited in testing integrated COM-B pathways simultaneously. In particular, few studies have employed structural modeling approaches to examine how capability, opportunity, and motivation interact as a system to influence low-glycemic dietary behavior among urban Thai adults with prediabetes.

Accordingly, the present study employs the COM-B model within a path analysis framework to examine how capability, opportunity, and motivation interact to influence low-GI dietary behavior among urban Thai adults with prediabetes. The findings aim to extend behavioral science theory in a non-Western context and to inform the design of culturally tailored interventions that support Thailand’s commitment to the sustainable development goal (SDG) 3.4 for reducing premature mortality from noncommunicable diseases through prevention and health promotion (United Nations, 2023).

Literature Review

This section synthesizes theoretical and empirical evidence on determinants of low glycemic index (low GI) dietary behavior using the capability–opportunity–motivation–behavior (COM-B) model as the guiding framework. The review is organized into four domains: capability, physical opportunity, social opportunity, and motivation to illustrate how these components interact to shape dietary practices among urban adults with prediabetes.

The COM-B Model

Health behavior change is a multidimensional process shaped by the interaction of individual capability, environmental opportunity, and motivational processes. The COM-B model (Michie et al., 2011) conceptualizes behavior as the outcome of these interdependent determinants, positioning capability as the cognitive and physical skills necessary for action, opportunity as contextual conditions that enable or constrain behavior, and motivation as the reflective and automatic processes that direct and sustain action.

This system perspective aligns closely with contemporary dietary behavior frameworks similarly emphasizing that nutrition-related decisions arise from the interplay of individual competencies and the surrounding food environment (Atkins et al., 2017; Kwasnicka et al., 2016). This integration is particularly relevant to low-glycemic index (low-GI) dietary adherence, a key strategy for glycemic control and type 2 diabetes prevention (Atkinson et al., 2021; Chiavaroli et al., 2021). Adherence to a low-GI diet requires

individuals to interpret nutritional information, modify meal patterns and maintain consistency despite competing demands.

Capability

Evidence from South and Southeast Asia shows that cooking competence, household meal-planning skills, and food-management practices enhance adherence to low-GI recommendations, reinforcing the capability component of COM-B (Ranasinghe et al., 2024). These skills support individuals in applying nutritional knowledge to daily food choices and maintaining dietary consistency.

Physical Opportunity

Food-environment research further strengthens this integrative perspective. Studies in Southeast Asia indicate that aggressive marketing of high-GI foods, limited accessibility of healthier options, and a high density of ultra-processed food outlets exert substantial constraints on dietary choices (Gaupholm et al., 2023; Pongutta et al., 2019). Evidence from food-system analyses in low- and middle-income countries highlights disparities in food pricing, inconsistent nutritional labeling, and limited availability of healthier alternatives, which collectively undermine individuals' ability to act on nutritional knowledge (Barclay et al., 2021).

These constraints underscore the pivotal role of physical opportunity within the COM-B framework, particularly in urban Southeast Asian contexts. In Thailand, additional structural barriers include the higher cost of suitable low-GI staple foods, limited availability of healthier options, unreliable front-of-pack labeling, and the practical difficulty of applying low-GI principles to complex traditional dishes. Together, these factors make it challenging for urban adults to translate dietary knowledge and skills into sustained low-GI dietary behavior (Jindarattanaporn, 2022; Pongutta et al., 2019).

In Thailand's urban settings, structural limitations including pricing disparities and unreliable labeling make it difficult for adults to translate capability into sustained dietary action (Jindarattanaporn, 2022). Thus, literature increasingly suggests that dietary adherence emerges not from individual intention alone but from the combined influence of individual competence and external opportunity.

Social Opportunity

Sociocultural factors further shape dietary behavior, especially in collectivist Asian societies. Social support from family and peers, shared meal routines, and culturally embedded food practices have been shown to influence food-related decision-making (Ng et al., 2024). Within the COM-B framework, these influences reflect social opportunity, illustrating how cultural norms and interpersonal expectations interact with individual capability and motivation to shape behavior.

In the Thai context, family-based meal practices, workplace food routines, and social expectations surrounding shared eating can either reinforce or constrain individual dietary intentions, thereby directly affecting opportunities for sustained low-GI adherence.

Motivation

Motivation remains an essential component of the COM-B system. Reflective motivation refers to conscious, goal-directed processes such as intention formation, goal setting, and dietary planning that guide deliberate food choices. In contrast, automatic motivation encompasses habitual, emotional, and cue-driven processes that operate with minimal conscious deliberation and support the routinization of behavior (Futamura, 2018; Michie et al., 2011).

In behavioral science research, reflective motivation is commonly operationalized through indicators of planning, perceived importance, and evaluative reasoning, whereas automatic motivation is typically assessed through measures of habit strength, emotional responses, and reliance on contextual cues. Habit theory consistently demonstrates that automatic motivation stabilizes only when individuals are repeatedly exposed to consistent and supportive environmental cues (Kwasnicka et al., 2016). Consequently, deficits

in physical and social opportunity may constrain the development of stable dietary habits even when reflective motivation is present

Taken together, the literature indicates that adherence to low-GI dietary behavior is best understood through an integrated theoretical lens in which capability, opportunity, and motivation operate as a dynamic system rather than as isolated determinants. These components interact to influence both the initiation and maintenance of dietary behavior. The COM-B model therefore provides a theoretically coherent and context-sensitive framework for examining low-glycemic dietary behavior among urban Thai adults and for informing the design of interventions that enhance individual skills, restructure food environments, and reinforce motivational processes to support sustainable dietary behavior change and effective diabetes prevention.

The Research Variables

The study included four latent variables derived from the COM-B framework (Michie et al., 2011).

Two exogenous latent variables capability and opportunity were conceptualized as external determinants of dietary behavior.

Two endogenous latent variables motivation (mediator) and low-glycemic dietary behavior (outcome) represented internal processes and behavioral results.

Capability reflected psychological and physical skills in selecting low-GI foods; Opportunity represented environmental and social factors that facilitate healthy choices. Motivation comprised reflective (goal-directed) and automatic (habitual) processes influencing behavior, while low-glycemic dietary behavior indicated adherence to low-GI food practices.

In the hypothesized path model, capability and opportunity exerted both direct and indirect effects (through Motivation) on low-glycemic dietary behavior, consistent with the COM-B theoretical assumption that behavior arises from the interaction of capability, opportunity, and motivation.

Research Hypotheses

Based on the COM-B framework, five hypotheses were formulated:

- H1: Capability has a positive effect on motivation.
- H2: Opportunity has a positive effect on motivation.
- H3: Motivation has a positive effect on low-glycemic dietary behavior.
- H4: Capability has a direct positive effect on low-glycemic dietary behavior.
- H5: Opportunity has a direct positive effect on low-glycemic dietary behavior.

These hypotheses reflect both the direct and indirect (mediated) pathways proposed in the COM-B model, where motivation acts as a potential mediator between capability, opportunity, and behavioral outcomes (Kwasnicka et al., 2016; Michie et al., 2014).

Conceptual Framework

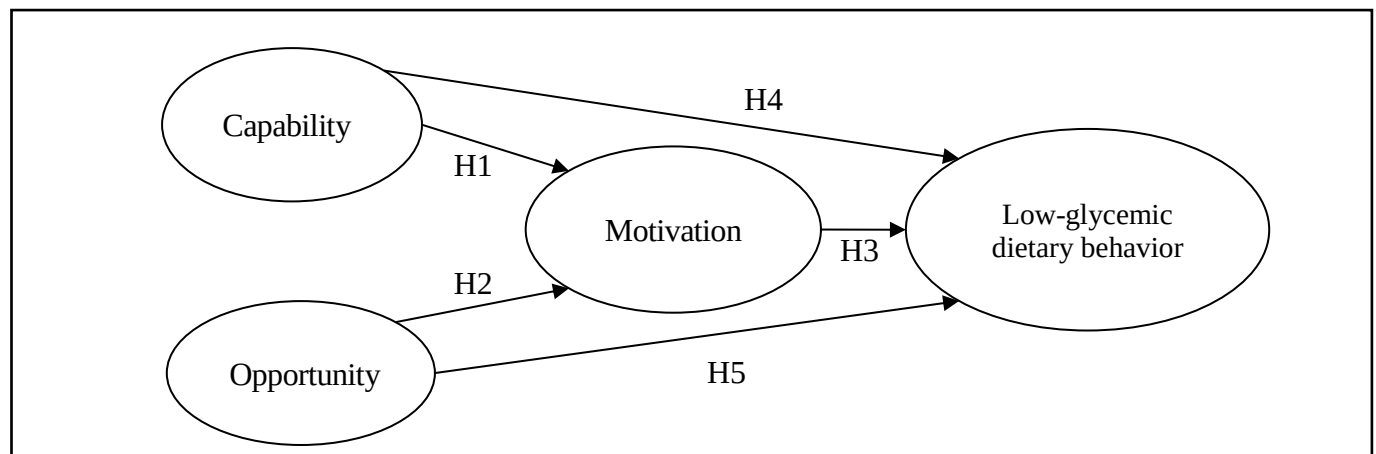
Grounded in the COM-B model proposed by Michie et al. (2011), this study conceptualizes low-glycemic dietary behavior as the product of three interdependent determinants: capability, opportunity, and motivation. Capability encompasses psychological and physical attributes such as nutritional literacy, cooking competence, and self-regulatory skills that enable individuals to perform the desired behavior. Opportunity reflects external conditions that facilitate or constrain action, including access to low-GI foods, affordability, labeling quality, and social support for healthy eating. Motivation comprises both reflective processes—such as goal formation, planning, and evaluative reasoning, with automatic processes driven by habit, emotion, and routine behavioral cues.

The conceptual framework posits that capability and opportunity exert both direct and indirect influences on low-glycemic dietary behavior, with motivation serving as a mediating mechanism. This structure aligns with contemporary interpretations of the COM-B model, which emphasize that behavior

emerges from the interaction of proximal determinants (capability and opportunity) and internal psychological processes (motivation) (Kwasnicka et al., 2016; Michie et al., 2014). Within the urban Thai context—characterized by environmental constraints, time scarcity, and cultural dietary norms—this integrated framework offers a nuanced lens for understanding how individuals translate knowledge and resources into consistent low-GI dietary practices.

Figure 1 presents the conceptual framework guiding this study, illustrating the hypothesized causal pathways evaluated through path analysis and showing how capability and opportunity influence motivation, which in turn shapes low-glycemic dietary behavior among urban adults with prediabetes residing in Bangkok.

Figure 1
Conceptual Framework



Note. H1–H5 represent the hypothesized relationships tested in the structural model. COM-B = Capability, opportunity, Motivation–behavior framework.

Method

Research Design

This study employed a cross-sectional analytical design to examine the behavioral determinants of low-glycemic index (low-GI) dietary behavior among urban Thai adults with prediabetes, guided by the COM-B model. The primary aim was to identify the relative influence of capability, opportunity, and motivation on dietary behavior in an urban, at-risk population.

Research Setting

The study was conducted in urban communities across five districts in Bangkok, Thailand. The districts were purposively selected to represent inner-city, middle, and outer urban zones, with the aim of capturing socioeconomic and environmental diversity relevant to dietary behavior and prediabetes prevention rather than achieving equal representation across zones. The selection of five districts reflected a balance between contextual coverage and feasibility for in-depth mixed methods data collection within a single metropolitan health system. Data were collected in collaboration with community health centers and public health volunteers to enhance contextual relevance and participant accessibility over a six-month period from April to September 2024.

Participants

The participants were Thai adults aged 20–60 years, representing a working-age population characterized by high productivity and increased susceptibility to metabolic disorders, including prediabetes and type 2 diabetes (Halloran, 2024). This age group was intentionally selected to capture modifiable dietary and lifestyle behaviors during a critical life stage associated with chronic stress, time

scarcity, and heightened exposure to urban food environments. Eligible participants were identified from registries maintained by community health centers in Bangkok based on medical records derived from routine health screenings and primary care referrals. Prediabetes was defined according to standard clinical criteria used by the participating community health centers, including impaired fasting plasma glucose (100–125 mg/dL) and impaired glucose tolerance (2-hour plasma glucose 140–199 mg/dL) in accordance with national and international clinical guidelines (ElSayed et al., 2023). No additional diagnostic procedures were conducted for the purposes of this study, thereby preserving ecological validity and minimizing participant burden.

The inclusion criteria required functional literacy in Thai and the ability to complete a self-administered questionnaire. Individuals with a confirmed diagnosis of diabetes mellitus or with chronic medical conditions requiring therapeutic dietary restrictions (e.g., advanced chronic kidney disease, cancer) were excluded to prevent confounding influences on dietary behavior. This sampling approach was designed to ensure the homogeneity of metabolic risk while maintaining relevance to the target population of urban adults at risk for glycemic progression.

Sampling and Procedures

A total of 450 participants were recruited through purposive sampling from community health center registries across multiple urban districts of Bangkok. The purposive criteria included documented prediabetes status, working-age classification, and residence within urban communities characterized by high exposure to commercialized food environments. This non-probability sampling strategy was selected to enhance ecological validity by focusing on individuals most representative of urban Thai adults at elevated metabolic risk rather than to achieve population-level prevalence estimates. The sample size was determined based on established methodological recommendations for path analysis suggesting a minimum of 10 to 20 participants per estimated parameter to ensure adequate statistical power and model stability (Hair et al., 2014; Kline, 2015).

All participants provided written informed consent prior to participation, and data collection adhered to ethical principles for research involving human subjects. The sampling framework was therefore designed to balance methodological rigor, contextual relevance, and ethical integrity.

Instruments

A structured, self-administered Thai questionnaire was developed to assess the behavioral determinants of low-glycemic index (low-GI) dietary practices. Instrument development followed the COM-B framework (Michie et al., 2011, 2014). The questionnaire comprised six subscales, psychological capability, physical capability, social opportunity, physical opportunity, reflective motivation, and automatic motivation, each consisting of five items (30 items in total). All items were rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), with higher scores indicating a stronger presence of the corresponding construct.

Psychological capability captured knowledge and understanding of low-GI foods (e.g., “I know the difference between high-GI and low-GI foods”). Physical capability reflected practical and self-regulatory dietary skills (e.g., “I can prepare meals that incorporate low-GI ingredients”). Physical opportunity represented environmental accessibility and resources (e.g., “Low-GI food options are available in stores near my residence”), while social opportunity reflected interpersonal support (e.g., “My family encourages me to consume healthy, low-GI foods”). Reflective motivation assessed intentional planning and health-related beliefs (e.g., “I believe that choosing low-GI foods is a worthwhile investment in my health”), whereas automatic motivation captured habitual and affective processes (e.g., “I automatically opt for low-GI foods out of habit”).

Behavioral outcomes were measured using a ten-item scale grounded in habit formation and behavior maintenance theory (Kwasnicka et al., 2016) emphasizing consistency, contextual cues, and self-regulatory

patterns. Items were culturally adapted using examples referenced from the Thai food composition database (Kongkachuichai et al., 2018), focusing on behavioral repetition, contextual cues, and self-regulatory patterns over the previous 14 days (e.g., “I choose brown rice or rice berry instead of white rice in at least one daily meal”). All behavioral items were rated on a five-point Likert scale (1 = never to 5 = almost every day).

Content validity was evaluated by five experts in behavioral science and public health, yielding Index of Item-Objective Congruence (IOC) values ranging from .87 to 1.00. A pilot study with 30 urban adults demonstrated good internal consistency, with Cronbach’s alpha coefficients ranging from .81 to .90 across the COM-B subscales and .85 for the behavioral outcome scale. Completion of the questionnaire required approximately 10–15 minutes.

Procedures

Data collection was conducted in collaboration with five community health centers in urban districts of Bangkok. Potential participants were initially identified through hospital-based screening records and subsequently referred to community health centers for recruitment. Public health volunteers and digital outreach channels were used to invite eligible individuals to participate. After eligibility confirmation, the participants received an electronic informed consent form outlining the study objectives, confidentiality protections, and voluntary participation rights. The self-administered questionnaire was delivered through a secure online platform allowing only one submission per participant. Most respondents completed the survey within 10–15 minutes in a single session. The research team monitored incoming data in real time to ensure completeness and minimize missing responses.

Data Analysis

Data were analyzed using LISREL version 8.72. Descriptive statistics were computed to summarize participant characteristics and study variables. Prior to model estimation, data were examined for completeness, normality, and multicollinearity. Path analysis grounded in the COM-B framework was performed using maximum likelihood estimation to assess direct and indirect relationships among capability, opportunity, motivation, and low-glycemic dietary behavior. Model fit was evaluated using the chi-square statistic (χ^2), root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker–Lewis index (TLI), and standardized root mean square residual (SRMR). Statistical significance was defined at $p < .05$.

Results

Sample Characteristics

A total of 450 adult participants residing in diverse urban communities across Bangkok were recruited for this study.

The participants ranged in age from 20 to 60 years ($M = 38.50$, $SD = 9.20$), representing the working-age population most vulnerable to lifestyle-related metabolic risks. Females comprised 61% of the sample, and the majority (78.4%) had attained at least secondary education. Based on body mass index (BMI) records from community health screenings, approximately 67% of participants were classified as overweight or obese, which is consistent with national urban health trends. These demographic characteristics illustrate a representative urban population with a moderate-to-high cardiometabolic risk profile, aligning with the study’s focus on the behavioral determinants of prediabetes prevention.

Descriptive Results

Descriptive statistics indicated moderate mean scores across all six components of the COM-B model. Psychological capability, reflecting participants’ knowledge and understanding of low-glycemic index (low-GI) food choices, had a mean score of 15.25 ($SD = 6.09$). Physical capability, encompassing skills and self-regulation related to dietary behaviors, showed a similar mean of 15.12 ($SD = 6.32$). Within the

opportunity domain, physical opportunity (e.g., availability of low-GI foods) had a mean of 14.96 ($SD = 6.25$), while social opportunity (e.g., family or peer support) was comparable ($M = 14.92$, $SD = 6.23$). Regarding motivation, reflective motivation associated with goal setting and intentional planning—yielded the highest mean ($M = 15.45$, $SD = 6.25$), followed by automatic motivation, reflecting habits and affective responses ($M = 14.75$, $SD = 6.16$).

The behavioral outcome variable, low-GI dietary behavior, showed a mean of 29.71 ($SD = 7.64$), indicating a moderate level of adherence to recommended dietary practices, with variability likely reflecting environmental and personal differences in implementation. Preliminary diagnostics confirmed data suitability for structural modeling; all skewness and kurtosis values were within acceptable thresholds (± 1), indicating approximate normality. Pearson's correlation analyses showed that most COM-B components were positively associated with low-GI dietary behavior, with correlation coefficients ranging from $r = -.05$ to $.55$ ($p < .05$). The few negligible negative correlations were close to zero and not theoretically meaningful. All intercorrelations were below the commonly accepted threshold ($r < .80$), indicating no evidence of multicollinearity. These results collectively support the appropriateness of applying the COM-B framework to dietary behavior among urban Thai adults.

Hypotheses Testing Results

The hypothesized structural model based on the COM-B framework was tested using maximum likelihood estimation. The model exhibited an excellent overall fit to the empirical data, as indicated by multiple goodness-of-fit indices: the chi-square statistic ($\chi^2 = 0.32$, $df = 1$, $p = .57$), the root mean square error of approximation (RMSEA = .000), the standardized root mean square residual (SRMR = .005), the comparative fit index (CFI = 1.00), and the Tucker–Lewis index (TLI = 1.00). All indices met or exceeded commonly accepted criteria for a well-fitting structural model (Hu & Bentler, 1999). Detailed coefficients and variance estimates are presented in Table 1, with a visual representation provided in Figure 1.

Table 1

Goodness-of-Fit Indices Before and After Model Adjustment and Evaluation Results

Fit Index	Acceptable Criterion	Observed Value	Evaluation Result
χ^2	Nonsignificant	Nonsignificant	Met criterion
RMSEA	< .08	.000	Met criterion
SRMR	< .08	.005	Met criterion
CFI	> .90	1.000	Met criterion
TLI	> .90	1.000	Met criterion

Building on these results, the primary hypothesis that capability, opportunity, and motivation collectively influence low-GI dietary behavior was empirically supported. The model explained a substantial proportion of variance in the behavioral outcome ($R^2 = .77$), indicating that the COM-B framework accounted for a large and theoretically coherent share of behavioral variability in this urban, at-risk population.

Direct, Indirect, and Total Effects

Table 2 summarizes the standardized direct, indirect, and total effects and R^2 values for the endogenous variables. All six exogenous variables exerted statistically significant direct effects on low-GI dietary behavior, underscoring the multifactorial nature of behavioral regulation. Psychological capability (C1; $\beta = .47$, $p = .01$) and physical capability (C2; $\beta = .42$, $p = .01$) emerged as strong predictors, highlighting the centrality of knowledge and self-regulatory skills in supporting healthy food choices. Similarly, physical opportunity (O1; $\beta = .15$, $p = .01$) and social opportunity (O2; $\beta = .53$, $p = .01$) had significant influences, indicating that accessibility and social reinforcement are key contextual enablers of dietary adherence.

Table 2

Direct, Indirect, and Total Effects of Independent Variables on Mediators and Behavioral Outcomes (R^2 Values and Standardized Coefficients)

Endogenous variable	R^2	Effect type	Exogenous variables					
			C1	C2	O1	O2	M1	M2
M1	.01	DE	.00	.10*	.02	.01	-	-
		IE	-	-	-	-	-	-
		TE	.00	.10*	.02	.01	-	-
M2	.00	DE	-.06	-.03	.00	.02	-	-
		IE	-	-	-	-	-	-
		TE	-.06	-.03	.00	.02	-	-
Low-glycemic dietary behavior	.77	DE	.47**	.42**	.15**	.53**	.09**	.27**
		IE	-.01	.00	.00	.01	-	-
		TE	.46**	.42**	.15**	.54**	.09**	.27**

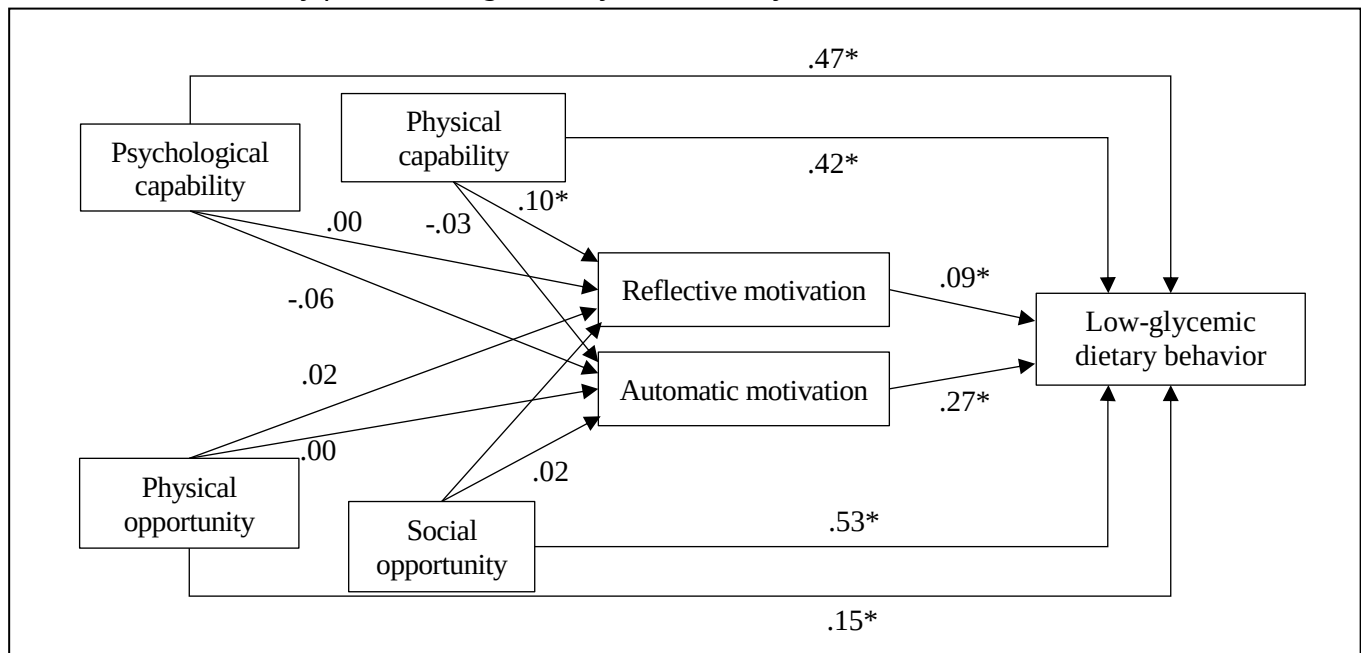
Note. C1 = Psychological capability, C2 = Physical capability, O1 = Physical opportunity, O2 = Social opportunity, M1 = Reflective motivation, M2 = Automatic motivation; DE = Direct effect, IE = Indirect effect, TE = Total effect
* $p < .05$, ** $p < .01$.

Reflective motivation (M1; $\beta = .09$, $p = .01$) and automatic motivation (M2; $\beta = .27$, $p = .01$) also contributed positively, although the magnitudes were smaller. These findings suggest that, while motivational processes remain relevant, behavioral execution in this context is driven more by capability and opportunity than by internal motivational states. The mediating analyses provided further nuance: physical capability (C2) exerted a small yet statistically significant indirect effect via reflective motivation (M1; $\beta = .10$, $p = .05$), accounting for 1% of the variance ($R^2 = .01$). Automatic motivation, however, exhibited no significant mediating influence, suggesting that habitual mechanisms may not yet be well established in this population. Collectively, the minimal indirect pathways and strong direct effects point toward a behavioral pattern in which action is facilitated directly by cognitive and environmental enablers, rather than through extended motivational processing. This finding reflects a pragmatic, context-driven form of behavior typical of urban working-age adults exposed to time and environmental constraints.

Summary and Interpretive Synthesis

The final model accounted for 77% of the variance in low-GI dietary behavior, demonstrating high explanatory capacity for a behavioral model of this type. All core COM-B domains showed significant direct associations with behavior, confirming the theoretical robustness of the framework in the context of urban dietary self-regulation.

However, the limited mediating role of motivation, particularly automatic motivation—indicates that stable habit formation may remain underdeveloped. This pattern suggests that behavior change in this population currently relies more on external and cognitive supports than on intrinsic motivational stability. From an applied perspective, these findings emphasize that strengthening dietary knowledge, self-regulatory skills, and supportive food environments may yield more immediate and sustainable behavioral improvements than motivation-focused strategies alone, as illustrated by the COM-B-guided structural pathways summarized in Figure 2.

Figure 2*COM-B Guided Pathway for Promoting Low-Glycemic Dietary Behavior in Urban Thai Adults*

Note. * $p < .05$.

Discussion and Conclusion

Discussion of Main Results

This study examined the determinants of low-glycemic index (low-GI) dietary behavior among urban Thai adults with prediabetes through the capability–opportunity–motivation–behavior (COM-B) model. The findings indicate a consistent and theoretically meaningful pattern: psychological and physical capability, along with physical and social opportunity, exerted substantial and direct influences on low-GI dietary behavior, whereas reflective and automatic motivation exerted comparatively modest effects. Such a pattern suggests that within the urban Thai context, characterized by structural constraints, market-driven food environments, and persistent time pressures, dietary behavior is shaped more strongly by cognitive competencies and contextual affordances than by motivational processes alone. Importantly, this configuration deviates from the classical COM-B proposition that capability and opportunity primarily influence behavior through motivation (Michie et al., 2011), underscoring the need for context-sensitive interpretation of the model.

The pronounced influence of psychological and physical capability aligns with emerging evidence from Asian and other low- and middle-income countries (LMICs) settings, which emphasize nutrition literacy, meal-planning competence, cooking confidence, and self-regulation skills as proximal determinants of dietary adherence (Ng et al., 2024; Ranasinghe et al., 2024). Meta-analytic evidence further corroborated this interpretation, demonstrating that behavioral skills, such as interpreting food labels, selecting low-GI alternatives, and adapting culturally embedded recipes, exert a more consistent impact on glycemic control than intention-based motivational constructs (Chiavaroli et al., 2021). Collectively, these findings suggest that in nutritionally complex and resource-constrained and nutritionally complex urban environments, capability-building may function as a necessary precursor for motivational processes to translate into sustained dietary behavior (Barclay et al., 2021).

Physical opportunity emerged as a particularly influential determinant, reinforcing extensive global and regional evidence that food environments exert strong leverage on dietary behavior, especially in rapidly urbanizing middle-income countries. Reviews of Southeast Asian food-environment consistently document structural barriers, including the high density of ultra-processed food outlets, limited affordability of healthier alternatives, and suboptimal nutritional labeling that constrain daily food choices, irrespective

of individual intention (Gaupholm et al., 2023). These structural constraints also provide a critical explanation for the relatively limited role of automatic motivation observed in this study. Habit formation requires repeated exposure to stable, supportive environmental cues; however, such cues are frequently disrupted in commercialized, convenience-oriented food landscapes such as those prevalent in Bangkok. Consequently, individuals often default to readily available, high-GI food options, even when they possessing adequate knowledge or favorable motivational orientations (Darmon & Drewnowski, 2015; Jindaratnanaporn, 2022).

The substantial effect of social opportunity reflects the sociocultural context of collectivist societies where social norms, familial expectations, and shared eating routines exert powerful influences on health-related behaviors. Empirical evidence from Thailand and neighboring countries indicates that interpersonal dynamics surrounding shared meals and family cohesion often override individual health intentions in shaping dietary practices (Almeida et al., 2020; Ng et al., 2024). Within this context, social opportunity operates not merely as a background condition but as an active behavioral regulator, suggesting that dietary interventions may be more effective when leveraging family-based and community-level mechanisms rather than relying solely on individual-level motivation.

The comparatively modest effects of reflective and automatic motivation can be further interpreted through habit theory and cognitive-load frameworks. Adults aged 20–60 years commonly experience chronic stress, extended working hours, and competing social and occupational demands, conditions known to reduce cognitive bandwidth for deliberative decision-making and sustained self-regulation (Almeida et al., 2020; Halloran, 2024). These pressures undermine both reflective planning processes and the stabilization of automatic habits. Supporting this interpretation, meta-analytic evidence indicates that habit strength predicts dietary behavior more robustly in high-income settings with supportive food environments than in LMIC contexts where environmental instability and structural barriers impede routine formation (Barclay et al., 2021). Thus, the limited role of automatic motivation observed in this study is not indicative of theoretical weakness but reflects the structural determinants of habit formation operating within constrained urban food environments.

Taken together, these findings offer a theoretically informed reinterpretation of the COM-B model under conditions of structural constraint. While the classical COM-B framework positions motivation as the primary mediator linking capability and opportunity to behavior, the present results indicate that, in LMIC urban settings, capability and opportunity may exert more immediate and direct effects on health-related behaviors. In such contexts, motivation may function more as a reinforcing or stabilizing mechanism rather than as the principal driver of action. This interpretation aligns with broader critiques of motivation-centric models, particularly in transitional societies where everyday behavior is shaped by economic pressures, convenience, and limited decision-making bandwidth (UN-Habitat, 2020). By elucidating how structural and cultural realities interact with behavioral mechanisms, this study advances a contextually grounded understanding of COM-B and enhances its applicability beyond Western and resource-rich settings.

Implications for Behavioral Science

From a behavioral science perspective, this study offers a refined theoretical contribution to the capability–opportunity–motivation–behavior (COM-B) model by situating behavioral determinants within the structural and sociocultural conditions of urban food systems in low- and middle-income countries (LMICs). While the COM-B framework has been widely applied in Western settings characterized by supportive food environments that facilitate motivational processes (Michie et al., 2011; Michie et al., 2014), the present findings illustrate that in Thailand’s urban context, psychological and physical capability—as well as physical and social opportunity—exert more immediate and direct influences on low-glycemic dietary behavior than motivational constructs. This pattern aligns with emerging evidence from Asian populations emphasizing the primacy of skill-based capability and environmental opportunity over internal motivation (Barclay et al., 2021; Ranasinghe et al., 2024).

Consequently, these results underscore the need for a contextualized interpretation of COM-B in environments where food choices are constrained by affordability, availability, marketing pressures, and time scarcity. In such settings, behavioral mechanisms shift away from motivation-dependent pathways toward pathways in which capability and opportunity serve as proximal determinants of action. Furthermore, the significance of social opportunity highlights the operation of collectivist cultural structures where shared meals, familial expectations, and social reinforcement drive decisions, thereby extending COM-B beyond its original cognitive-behavioral framing.

Based on this theoretical recalibration, diabetes-prevention strategies in this context should deprioritize purely motivational approaches in favor of capability and opportunity focused interventions. The findings suggest that enhancing nutritional literacy and environmental access must precede and ultimately strengthen motivational engagement. The proposed model-based intervention pathway, derived from the behavior change wheel (BCW) model, delineates three sequential phases:

1. Enhancing capability: strengthening psychological and physical capability through educational programs, cooking skill training, and label-reading literacy (Atkinson et al., 2021).
2. Expanding opportunity: increasing physical and social opportunity via food-environment restructuring, GI labeling, and community support mechanisms (Barclay et al., 2021; Pongutta et al., 2019).
3. Reinforcing motivation: using reflective goal setting and digital nudges to support habit formation and emotional engagement (Thaler & Sunstein, 2008).

These steps correspond directly to BCW's intervention functions and policy levers, grounding behavioral recommendations in a validated, albeit contextually refined, theoretical model. At the policy level, embedding these behavioral insights within Thailand's national NCD-prevention agenda, through mandatory GI labeling, healthier food procurement guidelines, and workplace wellness programs supports the SDG 3.4 by targeting the reduction of premature mortality from non-communicable diseases through precision prevention (United Nations, 2023).

Limitations

Several limitations warrant consideration. First, the cross-sectional design precludes causal inference; future longitudinal and intervention studies should examine whether enhancing opportunity and capability leads to sustained motivational changes over time. Second, self-report measures may introduce recall or social-desirability bias, particularly in dietary behavior assessment. Third, while the COM-B framework captures core determinants, integrating complementary theories such as habit formation, self-regulation, and environmental psychology could further enrich understanding of urban dietary dynamics. Fourth, although the study included districts from different urban zones of Bangkok, it was limited to five districts and did not aim to provide proportional representation across zones; therefore, the findings may not be generalizable to all urban or non-urban settings in Thailand. Despite these limitations, the study's methodological rigor, theoretical grounding, and high model explanatory power ($R^2 = .77$) provide a strong basis for advancing behavioral science research in emerging economies.

Conclusion

In summary, this study provides robust evidence that, in urban Thailand, low-GI dietary behavior among adults at risk for type 2 diabetes is predominantly shaped by knowledge, skills, and structural opportunity rather than motivation alone. These findings refine the COM-B framework for use in resource-constrained, urbanizing contexts and emphasize the centrality of capability and opportunity as precursors to motivation and action.

Translating these insights into practice, culturally tailored interventions that combine education, environmental restructuring, and behavioral design are likely to achieve broader and more sustainable health impacts. Future behavioral research should continue integrating multi-level approaches linking individual agency with systemic opportunity to promote equitable and context-responsive strategies for diabetes prevention.

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