

# DETERMINANTS OF HEALTH BEHAVIOURS IN OLDER ADULTS POST-COVID-19: EVIDENCE FROM THAILAND

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## Abstract

Health behaviors of older adults have gained increasing attention following coronavirus infection due to their heightened vulnerability and unique recovery challenges, making it important to understand the factors that influence post-infection health behaviors to guide effective interventions for optimal recovery and well-being. This study examined the factors influencing the health behaviors of older adults after the COVID-19 pandemic, using the Health Belief Model as a theoretical framework. A descriptive cross-sectional study was conducted with 110 adults aged 60 years and older who were at least one-year post-COVID infection. Data were collected using demographic, health behavior, and health belief perception questionnaires and analyzed using descriptive statistics, Pearson's correlation, and stepwise regression. The participants demonstrated excellent health behaviors ( $M = 104.60$ ,  $SD = 8.65$ ). Health behaviors correlated positively with perceived self-efficacy in health behaviors ( $r = 0.628$ ,  $p < 0.001$ ), severity of illness ( $r = 0.532$ ,  $p < 0.001$ ), susceptibility to illness ( $r = 0.464$ ,  $p < 0.001$ ), and benefits of health behaviors ( $r = 0.220$ ,  $p < 0.05$ ), and negatively with perceived barriers to health behaviors ( $r = -0.290$ ,  $p < 0.001$ ). Regression analysis showed that perceived self-efficacy in health behaviors ( $\beta = 0.397$ ,  $p < 0.001$ ), severity of illness ( $\beta = 0.292$ ,  $p < 0.001$ ), and susceptibility to health behaviors ( $\beta = 0.219$ ,  $p < 0.005$ ) significantly predicted health behaviors, explaining 50.6% of the variance, while the perceived benefits and barriers of health behaviors were non-significant in the adjusted model. In conclusion, perceived self-efficacy, severity, and susceptibility are key determinants of older adults' post-COVID health behaviors, suggesting that interventions that explicitly strengthen these perceptions may yield greater behavioral gains and more efficient rehabilitation and chronic-care outcomes than approaches centered primarily on benefit and barrier messaging.

**Keywords:** Coronavirus; COVID-19; Health Behaviors; Health Belief Model; Older Adults

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## Introduction

The global coronavirus disease (COVID-19) pandemic induced by the severe acute respiratory syndrome coronavirus (SARS-CoV-2), has significantly affected older persons who exhibit heightened vulnerability to severe illness, complications, and mortality (Mueller *et al.*, 2020; Shahid *et al.*, 2020). Regarding age-related changes, such as loss of immune cell diversity, epigenetic alterations, and dysregulation of immune responses, which lead to increased risk of severe complications such as cytokine storms and multi-organ failure (Mueller *et al.*, 2020). Older people also have much higher rates of death and complications, especially those with underlying conditions such as hypertension, diabetes, and chronic kidney disease (Shahid *et al.*, 2020).

Many older adults continue to have symptoms and health problems following the acute phase of infection. This stage is referred to as post-acute COVID-19 syndrome or extended COVID (Crook *et al.*, 2021; Nalbandian *et al.*, 2021). Older adults generally experience more severe COVID-19 infections than younger adults due to deterioration in both the quantity and quality of cilia and ciliated cells in the respiratory tract, as well as a reduction in the size of the upper airways associated with age (Remelli *et al.*, 2022). Moreover, the majority of older persons possess chronic diseases, rendering them increasingly vulnerable to illness (Mahmoud *et al.*, 2021). Furthermore, older adults who recover from COVID-19 face a higher risk of persistent symptoms (long COVID) compared to their younger cohorts, potentially impacting their health in both the short and long term (Mansell *et al.*, 2022; Hu *et al.*, 2023). The study reveals that COVID-19 in older adults can be treated and have a better recovery trend with proper care and health behaviors (Tana *et al.*, 2023). Engaging in health-promoting behaviors is crucial for optimizing recovery, managing chronic symptoms, and preventing further health deterioration in this vulnerable population (Demeco *et al.*, 2020; Wang *et al.*, 2020).

Many people utilize the Health Belief Model (HBM) to analyze and predict health behaviors. The Health Belief Model posits that a person's inclination to participate in health-related behaviors is influenced by their perceptions of disease severity, susceptibility, benefits, and barriers to action, as well as self-efficacy (Rosenstock *et al.*, 1988). Older adults' motivation to engage in healthy behaviors arises when they possess beliefs and awareness that certain actions can lead to health risks and negative outcomes for their well-being.

These personal beliefs consist of: perceived susceptibility to illness, perceived severity of illness, perceived benefits of taking action, perceived barriers to taking action, and perceived self-efficacy in practicing healthy behaviors. If individuals perceive a disease as highly severe, this perception increases their motivation to act in order to avoid health consequences. Similarly, if they recognize substantial barriers leading to negative health effects, these individuals will seek to avoid the harmful actions. Conversely, when an individual perceives significant benefits from taking action, motivation and efforts to promote healthy behavior increase. Additionally, people with a strong sense of self-efficacy are more likely to make decisions that positively affect their health (Rosenstock *et al.*, 1988).

Previous studies have employed the Health Belief Model (HBM) to investigate health behaviors in various contexts. The intervention study examined the effects of a program to change health beliefs on medication adherence among older persons with chronic illnesses. The results revealed that the intervention enhanced participants' medication adherence by elevating their understanding of health risks and benefits, underscoring the need of targeted belief modifications (Yinghan and Sasat, 2021). Wong *et al.* (2020) employed the HBM to identify the determinants of individuals' intention to receive the COVID-19 vaccine and their willingness to pay. Perceived vulnerability, perceived severity, perceived advantages, and diminished barriers were significant predictors of vaccination intent; financial willingness was also associated with these attitudes. Other studies of preventive strategies against COVID-19, increased levels of perceived threat and reported that advantages were favorably connected with preventive measures, whereas perceived barriers adversely impacted preventive behaviors (Shahnazi *et al.*, 2020). The HBM was also utilized to examine adherence to COVID-19 precautions within a population sample. Perceptions of disease severity, vulnerability, and the efficacy of preventive measures influenced adherence rates, which were underpinned by overarching social belief systems (Tong *et al.*, 2020).

However, there is a scarcity of research examining the factors influencing health behaviors. Older persons who have contracted and recovered from COVID-19 may have unique challenges and incentives regarding health practices. The experience of illness and the potential for enduring symptoms or health complications may significantly affect risk perceptions, beliefs about the importance

of preventive measures, and confidence in this group's ability to engage in health-promoting behaviors (Davis *et al.*, 2021; Shi *et al.*, 2021).

This study aimed to address this gap by examining the factors affecting the health behaviors of older adults post-COVID-19 infection, employing the HBM as a conceptual framework. The HBM does this by demonstrating how the constructs not only guide preventive actions during outbreaks but also shape successful long-term recovery and chronic disease management strategies in the aftermath of pandemics. Understanding these characteristics is important for developing targeted therapies that facilitate optimal healing and well-being in this population.

## Methods

### Setting and Study Design

This study employed a cross-sectional design to investigate health behavior levels as well as associated influencing factors at least one year post-coronavirus infection among older adults who had received treatment at the Outpatient Medical Department. Data were collected from August to November 2024 at the outpatient medical department of a university hospital in Bangkok, Thailand. The participants were chosen via simple random sampling according to the following inclusion criteria: (1) age  $\geq 60$  years; (2) previous infection with COVID-19 confirmed by ATK or RT-PCR testing at least one year before enrollment; (3) COVID-19 infection severity classified as mild-to-moderate based on the severity criteria established by the National Institutes of Health (NIH, 2024), (4) absence of cognitive impairment indicated by a score of  $\leq 7$  on the 6-Item Cognitive Impairment Test (6CIT) (Aree-Ue and Youngcharoen, 2020). We first list all eligible patients during the day. Each patient on the list is assigned a unique number. Then, using a random number generator, a specified number of patients are chosen randomly from the list. The sample size was calculated using the G\*Power 3.1.9.4 software, establishing the effect size at 0.11 based on a previous study (Hongpanich, 2021), with a power of the test equal to 0.80, significance at 0.05, and a sample size of 110 cases.

### Ethical Consideration

This study obtained approval from the Research Ethics Review Board of the Faculty of Medicine, Chulalongkorn University, under Approval Number 0673/2024, dated 7 May 2024. Informed consent was obtained from all participants following a clear explanation of the study's

objectives, potential benefits, and associated risks. Furthermore, the participants were clearly informed of their right to refuse participation or to withdraw from the study at any stage without consequence.

### Data Collection

Data collection was conducted by the principal researcher and two research assistants, all of whom were affiliated with the outpatient department. The data collection process involved the utilization of all questionnaires described below. Before seeking the participants' informed consent, the researchers provided them with detailed explanations regarding the study's objectives, potential benefits, and potential associated risks. The participants were also informed of the right to decline participation or withdraw from the study at any time. To ensure consistency, the research team thoroughly briefed the research assistants about the data collection procedures and methods before commencing with the data collection process. The questionnaires were administered in the following sections:

### Data Collection Instrumentation

#### *Demographic and Health Characteristics Questionnaire*

The demographic characteristics questionnaire collected data on gender, age, educational level, current occupation, place of current residence (region), and sufficiency of income. It also contained questions regarding health characteristics such as underlying disease, smoking or use of electronic cigarettes, COVID-19 vaccination history, frequency of detected COVID-19 infection, and severity of COVID-19 illness at the most severe episode according to the NIH, 2023 criteria (NIH, 2024).

#### *Health Behavior Questionnaire*

The questionnaire aimed to gather information regarding the health habits of older adults after COVID-19 infection and comprised a modified version of the Public Health Behavior Assessment Tool (Division of Health Education, 2023), adapted by the researchers with permission. This revised instrument assessed health behaviors across seven domains consisting of 25 items: dietary habits, physical activity, stress management, smoking habits, alcohol intake, oral hygiene, and COVID-19 reinfection prevention. Example items: 'You do not eat high-fat foods, such as fried foods, coconut milk-based curries, or fatty cuts of meat', 'You often eat meals away from home, such as at markets, shopping malls, or restaurants' Responses were evaluated using a 5-point Likert scale ranging from 1 (never) to 5 (always), with elevated

scores signifying improved health behaviors. The cumulative scores of the health behavior evaluation varied from 25 to 125 points, encompassing all seven areas. The total scores were classified into four tiers: 25-74 points indicated poor health habits; 75-87.4, fair; 87.5-99, good; and 100-125, exceptional health behaviors. The scale's content validity index (S-CVI) was 0.88, while Cronbach's alpha coefficient was 0.81.

### **Health Belief Perception Questionnaire**

The research instrument for assessing health perception in older adults who had contracted COVID-19 was developed by the researcher, taking into consideration the Health Belief Model (HBM) by Rosenstock *et al.* (1988), as well as pertinent insight gained from the literature review. The HBM identifies five key components of health perception: 1) perceived susceptibility to illness; 2) perceived severity of illness; 3) perceived benefits of health behavior; 4) perceived barriers to health behavior; and 5) perceived self-efficacy in health behavior. Moreover, the health belief perception questionnaire was further refined following relevant literature to ensure its suitability for the study population. This instrument comprehensively covers all five aspects of health perception and consists of a total of 44 items. Example items: 'COVID-19 infection can require separation from one's family due to quarantine and treatment', 'Avoiding crowded places, such as shopping malls and markets, is difficult to do'. The responses were measured using a five-point Likert scale. The assessment was structured into the following domains: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and perceived self-efficacy. The S-CVI was 1, and Cronbach's alpha coefficient was 0.85. A higher total score indicated a higher level of health belief perception among older adults.

### **Data Analysis**

Descriptive statistics were applied to summarize the participants' demographic and health-related characteristics. Data on health behaviors and health belief perception questionnaire scores were expressed as means and standard deviations. To investigate the factors influencing health behavior, a forward stepwise regression analysis was employed to derive a parsimonious, interpretable model from admitting predictors only when they significantly improved model fit (entry  $p < 0.05$ ). Before selection, assumptions were evaluated (Tabachnick and Fidell, 2013). The data for all variables were measured on interval scales; distributions were screened and found acceptable

for normality. Independence of errors was indicated no substantive autocorrelation. Multicollinearity was assessed in the coefficients table and acceptable redundancy among predictors. Homoscedasticity was evaluated via residuals-versus-fitted scatterplots, which showed roughly constant variance around zero across the range of fitted values. Linearity between independent variables and the dependent variable was examined using scatterplots and appeared approximately linear within the observed ranges. Collectively, these diagnostics supported the adequacy of the regression assumptions for the present dataset. All statistical analyses were performed using the IBM SPSS Statistics Authorized User Version 27 (License Code:704f62646c79e60d7127). The significance level of the statistical analysis was set at 0.05.

## **Results**

### **Demographic and Health Characteristics of Participants**

Table 1 shows that the mean age of the participants was 67.79 (SD = 5.9) years; more than half (65.5%) were 60-69 years of age, and the numbers of women and men were of equal proportion (50.0%). Approximately two-fifths of the participants (39.1%) had undergraduate degrees, while about one quarter (27.3%) had completed only primary education. In terms of current occupational status, the majority (68.2%) were unemployed. Moreover, most participants (79.1%) resided in the Bangkok Metropolitan Area and reported having sufficient income to cover living expenses (63.6%). The data on health characteristics indicated that all participants (100%) had underlying diseases, and most had two diseases. Regarding smoking or the use of electronic cigarettes, the majority of the participants reported having never smoked (87.3%). In terms of history related to COVID-19, all participants (100%) had been vaccinated, whereas most (86.4%) reported one COVID-19 infection and had experienced mild symptoms (85.5%) during the most severe episode according to the NIH (2024) criteria.

### **Health Behavior Scores among Older Adults Previously Infected with COVID-19**

Table 2 indicates that most participants reported an excellent level of overall health behavior ( $M=104.6$ ,  $SD=8.65$ ). Regarding health behavior dimensions, the scores for smoking, alcohol consumption, and oral care were found to be at an excellent level. In addition, food consumption, physical activity, stress management, and prevention of reinfection with COVID-19 indicated a good level of health behavior.

**Table 1. Demographic and health characteristics of the older adults after coronavirus infection (n = 110)**

| Characteristics                                                                  | f   | (%)  |
|----------------------------------------------------------------------------------|-----|------|
| Age (M = 67.9, Min = 60, Max = 86, SD = 5.9)                                     |     |      |
| 60-69 years                                                                      | 72  | 65.5 |
| 70-79 years                                                                      | 33  | 30   |
| ≥80 years                                                                        | 5   | 4.5  |
| Gender                                                                           |     |      |
| Male                                                                             | 55  | 50   |
| Female                                                                           | 55  | 50   |
| Educational attainment                                                           |     |      |
| Primary                                                                          | 30  | 27.3 |
| Secondary                                                                        | 18  | 16.4 |
| Undergraduate                                                                    | 43  | 39.1 |
| Postgraduate                                                                     | 6   | 5.4  |
| Uneducated                                                                       | 2   | 1.8  |
| Current occupational status                                                      |     |      |
| Unemployed                                                                       | 75  | 68.2 |
| Government-sector employee                                                       | 12  | 10.9 |
| Retail business owner                                                            | 10  | 9.1  |
| Housewife                                                                        | 8   | 7.3  |
| Farmer                                                                           | 2   | 1.8  |
| Private-sector employee                                                          | 2   | 1.8  |
| Government Officer (retirement age extension)                                    | 1   | 0.9  |
| Place of current residence (region)                                              |     |      |
| Bangkok metropolitan area                                                        | 87  | 79.1 |
| Eastern region                                                                   | 10  | 9.1  |
| Central region                                                                   | 8   | 7.3  |
| Northeastern region                                                              | 4   | 3.6  |
| Western region                                                                   | 1   | 0.9  |
| Income                                                                           |     |      |
| Sufficient for Expenses                                                          | 70  | 63.6 |
| Sufficient with Savings                                                          | 30  | 27.3 |
| Insufficient for Expenses                                                        | 10  | 9.1  |
| Underlying diseases                                                              |     |      |
| No underlying disease                                                            | 0   | 0    |
| Underlying disease                                                               | 110 | 100  |
| One                                                                              | 36  | -    |
| Two                                                                              | 38  | -    |
| Three                                                                            | 26  | -    |
| Four                                                                             | 7   | -    |
| Five or More                                                                     | 3   | -    |
| Smoking or use of electronic cigarettes                                          |     |      |
| Never smoked                                                                     | 96  | 87.3 |
| Former smoker                                                                    | 10  | 9.1  |
| Current smoker                                                                   | 4   | 3.6  |
| Covid-19 vaccination history                                                     |     |      |
| Not vaccinated                                                                   | 0   | 0    |
| Vaccinated                                                                       | 110 | 100  |
| Number of COVID-19 infections                                                    |     |      |
| One                                                                              | 95  | 86.4 |
| Two                                                                              | 13  | 11.8 |
| Three or More                                                                    | 2   | 1.8  |
| Severity of COVID-19 illness (at the most severe episode) according to NIH, 2023 |     |      |
| Criteria                                                                         |     |      |
| None                                                                             | 11  | 10   |
| Mild                                                                             | 94  | 85.5 |
| Moderate                                                                         | 5   | 4.5  |

### Correlations Between Factors and Health Behavior

According to the data analysis findings (Table 3), perceived self-efficacy in health behavior ( $r = 0.628$ ,  $p < 0.001$ ), perceived severity of illness ( $r = 0.532$ ,  $p < 0.001$ ), perceived susceptibility to illness ( $r = 0.464$ ,  $p < 0.001$ ), and perceived benefits

of health behaviors had a positive correlation with health behavior ( $r = 0.220$ ,  $p < 0.05$ ). Meanwhile, perceived barriers to health behaviors showed a negative correlation with health behavior at a statistically significant level ( $r = -0.290$ ,  $p < 0.001$ ).

**Table 2. Mean, standard deviation, and level of health behavior scores among older adults previously infected with COVID-19 (n = 110)**

| Health Behavior                         | Mean   | SD   | Level of Health Behavior |
|-----------------------------------------|--------|------|--------------------------|
| Overall health behavior                 | 104.60 | 8.65 | Excellent                |
| Food consumption                        | 27.72  | 3.22 | Good                     |
| Physical activity                       | 7.81   | 1.81 | Good                     |
| Stress management                       | 12.35  | 1.74 | Good                     |
| Smoking                                 | 9.31   | 1.03 | Excellent                |
| Alcohol consumption                     | 9.51   | 0.71 | Excellent                |
| Oral care                               | 17.57  | 2.07 | Excellent                |
| Prevention of reinfection with COVID-19 | 20.34  | 2.94 | Good                     |

**Table 3. Correlation analysis for the factors related to health behavior (n = 110)**

| Factors                  | r      | 95%CI          | p-value  |
|--------------------------|--------|----------------|----------|
| Perceived susceptibility | 0.464  | (0.303-0.611)  | <0.001** |
| Perceived severity       | 0.532  | (0.348-0.682)  | <0.001** |
| Perceived benefits       | 0.220  | (-0.004-0.427) | <0.05*   |
| Perceived barriers       | -0.290 | (-0.485-0.075) | <0.001** |
| Perceived self-efficacy  | 0.628  | (0.440-0.774)  | <0.001** |

Notes: r: Pearson's correlation coefficient; (CI) Confidence interval;

\*Statistical significance at p-value of <0.05; \*\* <0.01

**Table 4. Multiple linear regression analysis of the factors related to health behavior (n=110)**

| Factors                     | B     | SE (B) | $\beta$ | t     | p-value |
|-----------------------------|-------|--------|---------|-------|---------|
| 1. Self-efficacy            | 0.991 | 0.207  | 0.397   | 4.789 | <0.001  |
| 2. Perceived severity       | 0.665 | 0.176  | 0.292   | 3.784 | <0.001  |
| 3. Perceived susceptibility | 0.553 | 0.192  | 0.219   | 2.887 | <0.01   |

Notes: B: regression coefficient, SE (B): standard error of B,

$\beta$ : standardized regression coefficient. F = 8.333, ( $p < 0.01$ ),

R = 0.712, R<sup>2</sup> = 0.506, Adjusted R<sup>2</sup> = 0.492, Constant = 28.198

### Factors Influencing Health Behavior in Older Adults Previously Infected with COVID-19

As shown in Table 4, the results indicated that perceived self-efficacy in health behavior ( $\beta = 0.397$ ,  $p < 0.001$ ), perceived severity of illness ( $\beta = 0.292$ ,  $p < 0.001$ ), and perceived susceptibility to illness ( $\beta = 0.219$ ,  $p < 0.01$ ) exerted a significant positive influence on health behavior ( $R^2 = 0.506$ ,  $p < 0.01$ ).

### Discussion

This study sought to examine the factors influencing health behaviors in older adults following COVID-19 infection. Our findings clarify the primary factors influencing health behaviors in this community and may significantly impact the development of focused interventions to enhance health and well-being in this population.

Overall, the results showed that the older adults had excellent health behaviors, with particularly high scores for smoking, alcohol consumption, and oral care, possibly due to the older adults having access to the health care system. All were vaccinated, and most were educated.

This suggests that many older adults who have recovered from COVID-19 are likely to adopt positive health behaviors, consistent with previous research showing that the pandemic intensified this demographic's knowledge and implementation of preventative health measures (Napattaradechanon *et al.*, 2024). Nonetheless, enhancement is necessary in domains such as food consumption, physical activity, stress management, and prevention of reinfection with COVID-19, as previous research has identified a deterioration in these behaviors among older adults (De Pue *et al.*, 2021; Maertl *et al.*, 2021).

The factors influencing health behaviors in older adults after COVID-19 infection, perceived self-efficacy in health behavior was identified as the most significant predictor of health behaviors ( $\beta = 0.397$ ,  $p < 0.001$ ), followed by perceived severity of illness ( $\beta = 0.292$ ,  $p < 0.001$ ), and perceived susceptibility to illness ( $\beta = 0.219$ ,  $p < 0.01$ ). These findings align with the Health Belief Model, which posits that individuals are more likely to engage in promoting health behaviors when they perceive themselves as vulnerable to a health threat, consider the threat as substantial, and have confidence in their ability to implement effective

measures (Rosenstock *et al.*, 1988). The significant influence of self-efficacy validates the role of this construct in behavior regulation as delineated by Bandura's Social Cognitive Theory (Bandura, 1998). The importance of perceived self-efficacy underscores the need to empower older individuals in health management following COVID-19.

Regarding the above findings, healthcare practitioners can significantly enhance self-efficacy by offering education, skills training, and continuous support customized to individual needs and capabilities (Rosenstock *et al.*, 1988). For example, doctors should help patients set realistic health behavior goals, give them advice on how to get past problems, and celebrate their successes along the way. Interventions that have effectively improved self-efficacy in older adults, as shown by the Chronic Disease Self-Management Program (Kerari *et al.*, 2024) may be modified for implementation among COVID-19 survivors.

Furthermore, the discovery that the perceived severity of disease forecasts health behaviors suggests that older adults' subjective experiences and perceptions of COVID-19 may affect their future health practices. This is consistent with research showing that older persons who see COVID-19 as a substantial threat are more likely to implement preventative strategies (Chou *et al.*, 2024). Individuals who have encountered more severe symptoms or complications may exhibit heightened motivation to implement measures for health protection and avert future issues. Consequently, healthcare personnel must evaluate patients' perceptions of their conditions and rectify any fears or misconceptions that may impede beneficial health behaviors (Eshete *et al.*, 2023).

Perceived susceptibility to illness was a significant predictor, suggesting that older adults who perceive a risk for further health complications are more inclined to engage in preventative behaviors. This conclusion aligns with existing research that demonstrates a correlation between perceived susceptibility to COVID-19 and heightened adherence to preventative measures among older persons (Wolf *et al.*, 2020). Public health messaging and patient education must emphasize the enduring risks and potential long-term effects of COVID-19, particularly for vulnerable populations such as older adults. Simultaneously, this type of communication should be balanced and not instill extreme fear or anxiety (Chou *et al.*, 2024).

Interestingly, even though the participants reported that perceived benefits of health behaviors were positively correlated with health behaviors ( $r = 0.220$ ,  $p < 0.001$ ) and perceived barriers to self-care behaviors showed a negative correlation

( $r = -0.290$ ,  $p < 0.001$ ), this aspect did not show up as a strong predictor in the regression analysis. This might be explained in that simply knowing the benefits of healthy perceptions may not be sufficient to drive behavior change in this population. Older Thai adults who have been infected with COVID-19 already tend to have high levels of perceived severity and perceived susceptibility due to the long-term health effects of the infection. Additionally, the experience of illness can enhance perceived self-efficacy in self-care practices. These three factors have become the main determinants in the decision to engage in health behaviors (DeDonno *et al.*, 2022). Consequently, the determinants of perceived benefits and barriers lack predictive impact, aligning with the findings of this study.

In addition, this study expanded the HBM to investigate health behaviors throughout the recovery phase of COVID-19 in older persons, which is in contrast to its primary applications focused on preventative behaviors during the acute pandemic phase (Zewdie *et al.*, 2022; Maneemai *et al.*, 2023). This study corroborates existing HBM linkages, particularly the predictive validity of self-efficacy ( $\beta = 0.397$ ,  $p < 0.001$ ), perceived severity ( $\beta = 0.292$ ,  $p < 0.001$ ), and susceptibility ( $\beta = 0.219$ ,  $p < 0.01$ ). The recovery context presents different aspects, including the transformation of health beliefs following infection and the experience-driven recalibration of threat perceptions (Siramaneerat *et al.*, 2022; Zewdie *et al.*, 2022). Particularly in the Thai context, these factors can shape health perceptions and behaviors, including Buddhist beliefs, respect for authority, and family-centered norms, which influence how individuals experience and act upon severity, susceptibility, benefits, barriers, and self-efficacy. Buddhist beliefs also emphasizing mindfulness and acceptance may reduce the emotional responses tied to perceived severity by fostering resilience and a balanced view of illness (Pholphirul and Srijamdee, 2025). This application fills a significant void in the long-term control of behavior following viral infection, while it reflects methodological strategies employed in previous chronic disease HBM research (Ryan *et al.*, 2024).

Our findings correspond with global trends identified in older Canadian persons, who exhibited a comparable emphasis on self-efficacy in health activities, despite varying risk perceptions (Yang *et al.*, 2024). Significantly, an Iranian study conducted during COVID-19 identified the same predictive patterns for susceptibility and severity dimensions, indicating cross-cultural stability in post-infection behavioral determinants (Alizadeh *et al.*, 2022). Nevertheless, Malaysian research

has demonstrated cultural disparities in barrier perception, indicating that collectivist ideals substantially influenced perceived behavioral control (Tan *et al.*, 2022). This is different from how our Thai group perceived barriers ( $r = -0.290$ ,  $p < 0.001$ ), which aligned more closely with individualistic societies, potentially reflecting the urban participants' characterization of higher education and healthcare access, which can enhance self-efficacy and diminish perceived barriers. The Thai participants likely showed lower barrier effects because of widespread healthcare access and comprehensive COVID-19 vaccination policies, with all participants vaccinated and most living in urban Bangkok, where medical services are more accessible. This environment limits structural and informational barriers, reducing their impact on health behaviors. Moreover, vaccination policies and public health support may have eased concerns that otherwise increase perceived barriers in less accessible settings.

After infection, the perceptions of severity and susceptibility significantly changed compared to pre-pandemic studies. Experiencing COVID-19 firsthand enhanced the older adults' awareness of disease risks and long-term effects, elevating both severity and susceptibility perceptions. This lived experience heightened motivation to engage in preventive and health-promoting behaviors. Thus, the post-infection individuals manifested stronger threat appraisal than in general population studies conducted before widespread exposure to the virus.

Moreover, psychological adaptation in older adults after health crises such as COVID-19 involves resilience, which is defined as positive adaptation, despite adversity, a crucial factor for sustaining health behaviors and overcoming psychological distress. In Thailand, cultural factors such as respect for elders, family support, and Buddhist values enhance resilience and coping mechanisms, helping older adults to manage fear, anxiety, and loneliness post-infection (Soonthornchaiya, 2020).

This study also indicates critical insights for healthcare providers aiming to enhance health outcomes for older adults concerning the effective management of potential future COVID-19 pandemics. The public health professionals' messages for older adults should shift from general awareness (benefits/barriers) to more tailored messages that reinforce self-efficacy and acknowledge their lived experience with the disease's severity. Providing practical support for behavioral transformation might be required. By empowering older adults to engage in health management, we can enhance the long-term outcomes of COVID-19 and encourage positive

health habits within this vulnerable population. However, a limitation of this study was its cross-sectional design, which inhibited causal inferences about the relationship between perceptions and behaviors across time. Future research should employ longitudinal designs to examine the progression of health beliefs and intervention studies to enhance the recovery process and beyond.

## Implications for Practice

Nursing and public health programs should enhance older adults' self-efficacy through tailored education, skills training, and psychosocial support to sustain healthy behaviors after COVID-19. Community rehabilitation should adopt culturally sensitive models that incorporate Buddhist mindfulness and collectivist values, strengthening resilience, social ties, and adherence to long-term health practices.

## Conclusions

This study concludes that perceived self-efficacy in health behavior, perceived severity of illness, and perceived susceptibility to illness are significant predictors of health behaviors in older persons who have recovered from COVID-19. These findings highlight the necessity of accounting for individual beliefs and perceptions when formulating interventions to enhance optimal health outcomes in this at-risk population. Healthcare practitioners, public health experts, and legislators must emphasize measures that boost self-efficacy, address illness perceptions, and effectively communicate knowledge regarding associated hazards, while offering practical assistance for behavioral modification. By enabling older adults to proactively oversee health during pandemics, we can alleviate the persistent effects of COVID-19 and enhance favorable health behaviors within this vulnerable demographic.

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## Author Contributions

All authors (H.K., M.U., and W.S.) contributed significantly to the conception and design of the

study, data collection and analysis, manuscript preparation, and critical revision of the manuscript. All authors read and approved the final version of the manuscript.

## Ethics Statement

This study was approved by the Research Ethics Review Board of the Faculty of Medicine, Chulalongkorn University (Approval No. 0673/2024). The research was conducted in accordance with the Declaration of Helsinki and relevant institutional and national guidelines and regulations. Informed consent was obtained from all participants prior to their inclusion in the study.

## Declaration of Generative AI Use

Generative Artificial Intelligence tools (Perplexity, powered by GPT-5.1) were used to assist with language editing and phrasing of selected sections of this manuscript. The authors carefully reviewed, verified, and revised all AI-assisted text and are fully responsible for the originality, accuracy, integrity, and scientific content of the final version.

## Conflict of Interest

The authors declare that they have no conflicts of interest related to this work.

## Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to participant privacy and institutional policy but are available from the corresponding author upon reasonable request.

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