

# ปัจจัยที่มีอิทธิพลต่อพฤติกรรมการป้องกันโรคโควิด-19 ของวัยแรงงาน ช่วงสถานการณ์ระบาดในเขตพัฒนาพิเศษภาคตะวันออกและเขตพื้นที่บริการมหาวิทยาลัยบูรพา Factors Influencing Health Behaviors for COVID-19 Prevention among Work-Force Age Individuals during Pandemic Situation in Eastern Economic Corridor and Burapha University Service Area

นิพนธ์ต้นฉบับ

Original Article

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## บทคัดย่อ

**วัตถุประสงค์:** เพื่อศึกษาพฤติกรรมการป้องกันโรคโควิด-19 และอิทธิพลของปัจจัยนำ ปัจจัยเอื้อ และปัจจัยเสริมตามแบบจำลองการวางแผนส่งเสริมสุขภาพ (PRECEDE-PROCEED MODEL) ต่อพฤติกรรมการป้องกันโรคของวัยแรงงาน **วิธีการศึกษา:** การวิจัยแบบทดสอบความสัมพันธ์เชิงทำนาย กลุ่มตัวอย่างเป็นประชาชนวัยแรงงานที่พำนักอยู่ในเขตพื้นที่ภาคตะวันออกและเขตพื้นที่บริการมหาวิทยาลัยบูรพา ช่วงการระบาดของโควิด -19 ระหว่างพฤศจิกายนถึงธันวาคม พ.ศ. 2564 จากการสุ่มแบบหลายขั้นตอนจำนวน 235 คน เครื่องมือเป็นแบบสอบถามพฤติกรรมการป้องกันโรคโควิด-19 และ 10 ปัจจัยที่อาจมีอิทธิพลวิเคราะห์ข้อมูลด้วยสถิติถดถอยพหุคูณแบบขั้นตอน **ผลการศึกษา:** กลุ่มตัวอย่างมีพฤติกรรมการป้องกันโรคโควิด-19 ในระดับสูงโดยคะแนนเฉลี่ยเป็นร้อยละ 84.18 ของคะแนนสูงสุดที่เป็นไปได้ ซึ่งการรับรู้สมรรถนะในการป้องกันโรคโควิด-19 ( $\beta = 0.312$ , P-value < 0.001) ทศนคติต่อมาตรการป้องกันโรคโควิด-19 ( $\beta = 0.271$ , P-value < 0.001) ความรู้เกี่ยวกับโรคและการป้องกันโรคโควิด-19 ( $\beta = 0.144$ , P-value < 0.05) และการเข้าถึงบริการสุขภาพ ( $\beta = 0.133$ , P-value < 0.05) เป็นปัจจัยที่มีนัยสำคัญทางสถิติที่ร่วมทำนายพฤติกรรมการป้องกันโรคโควิด-19 ได้ร้อยละ 37.4 ( $R^2 = 0.374$ , P-value < 0.05) **สรุป:** สามารถใช้ผลการศึกษาพัฒนากิจกรรมเพื่อส่งเสริมพฤติกรรมการป้องกันโรคโควิด-19 แก่กลุ่มวัยแรงงาน โดยมุ่งเน้นกิจกรรมเสริมสร้างการรับรู้สมรรถนะแห่งตน ทศนคติการยอมรับมาตรการป้องกันโรค การให้ความรู้ในการป้องกันการสัมผัสเชื้อ รวมทั้งการเอื้อให้เข้าถึงระบบบริการสุขภาพได้รวดเร็ว

**คำสำคัญ:** พฤติกรรมการป้องกันโรคโควิด-19, วัยแรงงาน, สถานการณ์การระบาดของโรคโควิด-19

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## Abstract

**Objective:** To study health behavior for COVID-19 prevention and the influence of predisposing, enabling, and reinforcing factors according to the PRECEDE-PROCEED MODEL on the behaviors among individuals with work-force age. **Method:** This predictive correlational study had 235 work-force age participants in the Eastern region and Burapha University service area during the COVID-19 pandemic between November and December 2021. Participants were selected through a multi-stage random sampling. The questionnaire assessed the behavior and its 10 influencing factors. Stepwise multiple linear regression was employed to test the associations. **Results:** The participants had a high level of health behavior for COVID-19 prevention (mean score of 84.18% of the possible total score). Perceived self-efficacy in COVID-19 prevention ( $\beta = 0.312$ , P-value < 0.001), attitude towards COVID-19 preventive measures ( $\beta = 0.271$ , P-value < 0.001), knowledge of COVID-19 and its prevention ( $\beta = 0.144$ , P-value < 0.05), and access to health services ( $\beta = 0.133$ , P-value < 0.05) were statistically significant predictors and could predict the behavior by 37.4% ( $R^2 = 0.374$ , P-value < 0.05). **Conclusion:** Findings could be used to develop activities promoting health behaviors for COVID-19 prevention among this work-force age by enhancing COVID-19 prevention self-efficacy, positive attitude towards COVID-19 preventive measures, knowledge about exposure prevention, and access to health service.

**Key words:** Health behaviors for COVID-19 prevention, work-force age, COVID-19 pandemic situation

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## Introduction

The coronavirus disease 2019 (COVID-19) pandemic began in December 2019. It was first identified in Wuhan, the capital city of Hubei province, People's Republic of China. Wuhan is a large city with a dense population, which caused the COVID-19 pandemic to spread rapidly through small droplets from person to person. On January 30, 2020, the

World Health Organization (WHO) announced this pandemic as a Public Health Emergency of International Concern (PHEIC). According to the confirmed cases in many countries, as of February 20, 2021, the global situation report of COVID-19 recorded a total of 111,218,170 cases and 2,462,186 deaths. Based on the reported statistics, it is predicted that

each day there will be approximately 3,000 - 4,000 new cases, including 200 - 300 deaths, mostly affecting the elderly and people with underlying disease.<sup>1</sup> Therefore, surveillance and self-protection from this exposure are crucial, and it is important for all people to strictly comply with preventive measures.

In response to the COVID-19 pandemic, the Department of Disease Control, Ministry of Public Health of Thailand opened an Emergency Operation Center (EOC) in early January 2020. The strategy was to screen infected people at the entry and exit routes of the country. However, clusters of this pandemic were found in areas where many people gathered, such as boxing stadiums and entertainment venues in Bangkok. Later, it spread to various industrial areas throughout the country, especially Chonburi, Rayong and the border trade in Sa Kaeo province. As of February 20, 2021, a total of 1,510 confirmed cases of COVID-19 infection were reported in the eastern region, with a rate of more than 51 new infection per week.<sup>2</sup> These statistics indicated a significant pandemic situation in the eastern region, which is an area with a high movement of workers and tourists. The government has recognized these problems and declared it as a controlled area. Therefore, if the working-age people in such area lack understanding and awareness, or have improper disease prevention behaviors, it can affect their health conditions and make them a high-risk group for spreading the infection to other areas. This is consistent with a study conducted by Phoglad which found that the movement in and out of this area and the integration of workers in the workplace increased the risk of exposure and were regarded as the main cause of the spread of infection from industrial areas.<sup>3</sup>

According to the requirements for the controlled area during the COVID-19 pandemic situation, the COVID-19 Administration Center has announced guidelines in the Government Gazette to prevent the spread of infection. The guidelines specify the following measures for disease control and prevention for individuals and workplaces. For example, indefinite refraining from participating in activities where gatherings of people would result in an increased risk of transmission, such as educational institutions, entertainment venues, department stores, and industrial factories. Tourism businesses in the country must stop or suspend business for customers coming from abroad. Individuals coming from abroad or those who have had a history of contact with the

virus or have entered places that were previously infested must confine themselves (self-quarantine) for at least 14 days. There are time limits for entering and exiting area, and it is mandatory to wear a mask and maintain a distance of at least 2 meters from other people. Additionally, cooperation is requested to work from home instead of onsite working.<sup>4</sup>

The performance of individuals in preventing disease by adhering strictly to various measures depends on many factors. A literature review on the determinants of health behaviors, using the PRECEDE-PROCEED MODEL by Green and Kreute, revealed that factors influencing disease control and prevention behaviors include 1) predisposing factors, which encompass knowledge and attitudes towards health promotion, perceived disease severity, and perceived susceptibility, 2) enabling factors including the availability of resources and policies that support health promotion to reduce risk factors diseases, and 3) reinforcing factors including obtaining information from various media and receiving support from family, community, and health personnel.<sup>5</sup> A study conducted by Yodmai and colleagues found statistically significant associations between these factors and COVID-19 prevention behaviors among the Thai elderly in rural communities.<sup>6</sup> These factors formed the basis of the conceptual framework PRECEDE-PROCEED model. The study identified health literacy as a key factor, referring to the cognitive skills that influence a person's motivation to adopt a behavior that promotes and maintains good health. Additionally, social support and access to health services and information are also important factors determining health behaviors for disease prevention. These factors mentioned thus far can contribute to the predicting Covid disease preventive behaviors up to 36.6%.<sup>6</sup>

In addition, a study reviewed 18 research reports conducted in Thailand which applied the PRECEDE-PROCEED model to examine its predictive relationships with health-promoting behaviors, revealed significant finding. Among the predisposing factors, knowledge and attitude had the strongest effect on health behaviors. Social support emerged as a crucial reinforcing factor, while enabling factors included access to health service sources, promoting skills, and creating environments both within and outside the home that encourage healthy behaviors. However, it is important to know that these three factors have distinct effects on behavior change. To enhance motivation and ensure the sustainability of appropriate behavior change, all three factors need to be

used together. Therefore, when considering changes in an individual's health behavior, the influence of these factors must be taken into account.<sup>7</sup>

From the conceptual framework of this model, we aimed to determine factors influencing behaviors for COVID-19 prevention. Since COVID-19 is an emerging disease and there have been no studies on multiple factors associated with the prevention of this disease, understanding these factors is crucial. Additionally, determinant factors of health conditions are rapidly changing with a large impact on public health. This situation poses a major public health problem in the country, particularly for the workforce in the Eastern Special Development Zone and within the service areas of Burapha University, which encompass agriculture, industry, fisheries, and tourism. The implementation of government controls and the need to adapt lifestyles have greatly affected these workers. They face challenges such as job loss and disruptions in various workplaces, leading to a reduction in income while the cost of living remains high. These circumstances may cause significant stress among the working-age population, reflecting changes in their family living conditions. Failure to adjust attitudes and behaviors in line with the "new normal" can result in health problems for these individuals.<sup>8</sup> Therefore, it is crucial to identify the factors that influence behaviors for COVID-19 prevention in this workforce age group. Understandings would assist health professionals and related organizations in applying the gathered information to develop a model that encourages proper action for preventing COVID-19. Furthermore, this information can serve as a crucial resource for further policy development.

This study specifically aimed to determine behaviors for COVID-19 prevention among individuals of work-force age in the Eastern Economic Corridor and the service area of Burapha University. We also examined the predictive power of the selected factors on behaviors for COVID-19 prevention including 1) knowledge for COVID-19 and its prevention, 2) attitude towards COVID-19 preventive measures, 3) confidence and trust in the nursing profession, 4) perceived risk of COVID-19 infection, 5) perceived severity of COVID-19, 6) perceived self-efficacy in COVID-19 prevention, 7) access to health services, 8) mental health status, 9) resilience, and 10) social support on COVID-19 prevention behaviors of working-age people.

Conceptually, the PRECEDE-PROCEED model proposed by Green and Kreuter as well as relevant literature guided the framework of the study. The first phase, known as PRECEDE (Predisposing, Reinforcing, and Enabling Causes in Educational Diagnosis and Evaluation), focuses on the diagnosis of the health issue. This phase involves identifying factors that influence behaviors and assessing the educational and organizational needs for behavior change. The second phase which involves developing a comprehensive plan to address the identified issues is PROCEED (Policy Regulatory and Organization Constructs in Educational and Environmental Development).<sup>5,7</sup> With the emphasis on the first phase of PRECEDE-PROCEED model, this study expected that each of the factors in the three groups (i.e., predisposing factors, enabling factors, and reinforcing factors) simultaneously, directly influenced the behaviors for COVID-19 prevention. Predisposing factors form the basis for the occurrence of behaviors and influence an individual's motivation to perform the behavior. They encompass knowledge, attitudes, beliefs, values, perceived benefits of behavioral practices, and perceived capacity to act on health behaviors. Specifically, this study examined the influence of knowledge about COVID-19 and its prevention, attitudes towards COVID-19 prevention measures, confidence and trust in the nursing profession, perceived risk of COVID-19 infection, perceived severity of COVID-19, and perceived self-efficacy in COVID-19 prevention. Enabling factors are those relevant to environmental influences that directly affect behavior. They can either promote or inhibit the behavior. Enabling factors included access to facilities and resources that support the behavior, such as convenient access to health services. This study focused on examining access to health services during the COVID-19 pandemic. Reinforcing factors are the results that individuals receive from engaging in healthy behaviors. They serve as incentives to continue performing the behavior and can be influenced by individuals or groups who support the behavior such as support from family members and health personnel. Reinforcing factors contribute to the sustainability and persistence of health behaviors and are relevant to an individual's psychological component. The reinforcing factors examined in this study included mental health status, resilience, and social support among the work-force age.<sup>5,7,9</sup> It was hypothesized that behaviors for COVID-19 prevention were associated with 1) knowledge for COVID-19 and its prevention, 2) attitude

towards COVID-19 preventive measures, 3) confidence and trust in the nursing profession, 4) perceived risk of COVID-19 infection, 5) perceived severity of COVID-19, 6) perceived self-efficacy in COVID-19 prevention, 7) access to health services, 8) mental health status, 9) resilience, and 10) social support on COVID-19 prevention behaviors of working-age people during the pandemic situation in the Eastern Economic Corridor and Burapha University service area.

## Methods

In this correlational predictive research, study population was working-age Thai individuals in the eastern region. Study sample was those in the study population who met the eligibility criteria. To be eligible, they had to reside in the Eastern Economic Corridor, specifically in the provinces of Chonburi, Chachoengsao, Rayong, Chanthaburi, and Sa Kaeo, be between 20 - 59 years old, be currently employed and earning income, have no underlying diseases diagnosed by physicians, have Thai nationality, be able to communicate in Thai through listening, speaking, and reading, and be willing to participate in the study. The exclusion criteria consisted of individuals who were self-employed, did not work with any agencies, organizations, or companies, and received irregular income each month (freelancers).

Sample size was estimated using the G\*Power program version 3.1.9.7. The estimation was based on power analysis of a linear multiple regression with a fixed model. The effect size was set at a medium level of 0.15 to obtain an adequate sample size, based on Cohen's suggested effect size.<sup>10</sup> With a medium effect size of 0.15, a type I error of 5%, a power of 95%, and 10 predictors, a sample size of 173 participants was needed. To account for potential drop-out during data collection due to the COVID-19 pandemic and a high number of questionnaire items, an additional 40% of participants were added, resulting in a final sample size of 250 participants.

The researchers employed a multi-stage sampling method to recruit the sample. First, one district was randomly selected out of each of the five provinces. In each selected district, three sub-districts were randomly selected resulting in 15 sub-districts. In each sub-district, simple random sampling without replacement was used to recruit participants. Approximately 16 - 17 people per sub-district were included in the sample. The village health volunteers were contacted and trained to assist in collecting the study data. Additionally, in step 3, the

researchers coordinated with the sub-district health promotion hospitals to obtain a list of working-age individuals in each sub-district, for facilitating the data collection process.

### Research instruments

The self-administered questionnaire contained 12 parts as follows. The **first part** collected demographic information of the participants. Ten questions were developed by the researcher including gender, age, education background, marital status, occupation, monthly family income, living arrangement status, underlying diseases, availability of health facilities for receiving services during the pandemic, and number of vaccinations received.

The **second part** of 13 questions assessed participants' **knowledge** regarding COVID-19 and how to protect themselves from the infection. The question were developed by the researcher as guided by literature. The response was "true," "false," or "don't know." One point was rewarded for a correct answer and 0 otherwise. With the possible total scores of 0 – 13 points, higher scores indicated better knowledge regarding COVID-19 and its prevention.

The **third part** of 16 questions assessed **attitude** towards COVID-19 preventive measures implemented to prevent exposure to COVID-19 infection, as announced in the Government Gazette and policies of the Department of Disease Control, Ministry of Public Health, Thailand. The questions were developed by the researcher as guided by literature. The response was a 4-point rating scale ranging from 0-strongly disagree, to 1-disagree, 2-agree, and 3-strongly agree. With the possible total scores of 0 – 48 points, higher scores indicated more positive attitude.

The **fourth part** was the **confidence and trust in the nursing profession** questionnaire which was originally developed by Radwin and Cabral.<sup>11</sup> The questionnaire was translated to Thai language by the researcher through back-translation.<sup>12</sup> It consisted of 9 questions that aimed to assess participants' confidence and trust in the knowledge, skills, and professional characteristics of nurses. The response was a 3-point rating scale ranging from 1-low, to 2-moderate and 3-high. With the possible total scores of 9 – 27 points, higher scores indicated a greater level of confidence and trust in the nursing profession.

The **fifth part** used a single question to evaluate **perceived risk of COVID-19 infection** on a scale ranging

from 0-no risk at all to 10-mostly at risk. A higher score indicated a higher perceived risk of COVID-19 infection.

The **sixth part** assessed the participant's **perceived severity** of COVID-19 using five questions developed by the researcher. The questions evaluating the perceived impact of the infection on individuals' health status and social functioning. The response was a 10-point rating scale ranging from 0-no to 10-yes, at most. With the possible total scores of 0 to 50 points, higher scores indicated a higher perceived severity of the disease.

The **seventh part** assessed **perceived self-efficacy** in COVID-19 prevention using 15 questions developed by the researcher as guided by literature. The questions asked how much the individuals' confidence in their ability to prevent COVID-19 in six components namely self-care, handwashing, wearing a mask, social distancing, avoidance of contact with infection, and prevention of spreading infection. The response was a 3-point rating scale ranging from 1-less confident, to 2-moderately confident, and 3-very confident. With the possible total scores of 15 to 45 points, higher scores indicated greater confidence in preventing COVID-19.

**Part 8** assessed **access to healthcare services** using 15 questions developed by the researcher as guided by literature. The scale measured five components including sufficiency of available services, accessibility to service sources, convenience when using the service, ability to pay service fees, and acceptability on the service. The response was a 5-point rating scale ranging from 1 -lowest, 2-low, 3-moderate, 4-high, and 5-highest. With the possible total scores of 15 – 75 points, higher scores indicated a greater level of access to healthcare services.

The **ninth part** assessed **mental health** status using the General Health Questionnaire-28 (GHQ-28) which was recommended by the Department of Mental Health, Ministry of Public Health. The 28 questions of GHQ-28 were originally developed by Goldberg for screening mental health problems in the community population.<sup>13</sup> The questionnaire was translated into Thai language.<sup>14</sup> The GHQ-28 assesses psychiatric symptoms across four components specifically somatic symptoms, anxiety and insomnia, social dysfunction, and severe depression. It is scored on a rating scale with four levels of response as follows. For an answer indicating the symptom was worse/poorer or more than usual, a score of 1 point was assigned. On the other hand, an answer indicating

the symptom was better, less, none, the same, or not more than usual, a score of 0 point was assigned. With the possible total scores of 0 to 28 points, total scores of 6 points or more indicated mental health problems. The GHQ-28 had a high internal consistency reliability (Cronbach's alpha coefficient of 0.94), a high sensitivity value of 85.3% and a high specificity value of 89.7% in previous study.<sup>15</sup>

**Part 10** assessed **resilience** using the Resilience Inventory developed by Nintachan et al<sup>16</sup> based on the concept of resilience as proposed by Grotberg (1999) which recognizes life strength in three dimensions of "I have," "I am," and "I can."<sup>17</sup> The questionnaire assesses external sources of support that promote life strength ("I have"), an individual's inner strength ("I am"), and skills in dealing with problems and interpersonal relationships ("I can"). The 20 questions were modified to suit the context of participants in the workforce age. The response was a 1-point rating scale ranging from - strongly disagree, to 2-disagree, 3-neutral, 4-agree, and 5-strongly agree. With the possible overall total scores of 20 to 100 points, higher overall scores indicated a greater level of life strength or resilience.

The **eleventh part** assessed **social support**. The 16 questions were originally developed based on the social support concept of Schaefer, Coyne, and Lazarus<sup>18</sup> and were translated in Thai language by Lueboonthavatchai.<sup>19</sup> It measured social support across three components specifically emotional support, information support, and instrumental support. The response was a 5-point rating scale ranging from 1-strongly disagree, to 2-disagree, 3-neutral, 4-agree, and 5-strongly agree. With the possible total overall scores of 16 to 80 points, higher overall scores indicated greater perceived social support.

In **part 12, behaviors** of COVID-19 prevention were assessed using questions developed by the researcher as guided by literature. The 24 questions were categorized into six components aligned with the campaign of the Disease Control Division, Ministry of Public Health, Thailand during the COVID-19 pandemic. These components included health care, hand washing, mask wearing, social distancing, contact avoidance, and prevention of COVID-19 infection. The response was a 4-point rating scale ranging from 0-never practice, to 1-rarely practice, 2-sometimes practice, and 3-frequently practice. With the possible total scores of 0 to 72 points, higher total scores indicated higher adherence to COVID-19 preventive behaviors.

### Research instrument quality assurance

Parts 2 to 12 of the questionnaire (i.e., knowledge for COVID-19 prevention, attitude towards COVID-19 preventive measures, confidence and trust in the nursing profession, perceived risk of COVID-19 infection, perceived severity of COVID-19, perceived self-efficacy in COVID-19 prevention, access to health services, and behaviors for COVID-19 prevention questionnaires) were examined for content validity by three experts who had specialty in behavioral science, psychology, and nursing science. All questions had acceptable content validity with Content Validity Index (CVI) ranging from 0.81 to 1.00. Revisions were done according to the experts' suggestions. For internal consistency reliability, it was tested in 30 individuals with characteristics comparable to the participants. Questions on knowledge regarding COVID-19 and its prevention had a borderline acceptable internal consistency reliability with Kuder–Richardson confidence (KR-20) value of 0.65. Questions in parts 3 – 12 had acceptable to high internal consistency reliability with Cronbach's alpha coefficients of 0.70, 0.81, 0.78, 0.70, 0.82, 0.83, 0.94, 0.89, 0.91, and 0.89, respectively.

### Ethical protection for participants

This study was approved by the Ethics Committee for Human Study of Burapha University (approval number: HU061/2563 (E1); approval date: September 14, 2020). Permission from sub-district health promoting hospitals to collect data from the participants was obtained before data collection. Participants were informed about study details, risks, benefits and voluntary nature of the study. Participants were informed that they could refuse or withdraw from this study at any time without any consequences for their health care services. Participants' anonymity and confidentiality were followed. Data were kept in a secure place. Results were presented as a summary not individual participants' data.

### Data collection procedure

Data were collected from October 2021 to January 2022. Directors at the selected sub-district health promoting hospitals were asked to identify village health volunteers to be trained as research assistants for data collection. Research assistants met with selected participants at the assigned place. Research assistants introduced themselves and provided the participant with details of study. After written informed consent was obtained, the participants were asked

to complete the self-administered questionnaire which took about 60 minutes.

### Data analysis

Descriptive statistics including frequency with percentage and men with standard deviation (SD) were used to summarize demographic characteristics and study factor scores of the participants. Bivariate correlations between score of behavior for COVID-19 prevention and its related factors were tested using Pearson's product moment correlation analysis. Associations between score of behavior for COVID-19 prevention and its predictive factors were tested using stepwise multiple linear regression analysis. Assumptions of multiple linear regression analysis were tested. Statistical significance was set a type I error of 5% (or P-value < 0.05). All statistical analyses were performed using the software program SPSS 20.0.

## Results

Of the required 250 participants, 235 questionnaires were completed resulting in a response rate of 94%. There were more women (66.0%) than men. The average age was 39.41 years old (SD = 11.26). Majority finished secondary education (31.9%), were married (52.8%), and were company employee (41.3%). Their average family income was 20,514.04 Bahts per month (SD = 15483.95). Majority lived with their spouse during the pandemic (30.6%), received services in public hospitals (66.0%), were vaccinated against COVID-19 (96.6%) with 2 doses of the vaccine (SD = 0.58).

Participants had a high level of health behaviors for COVID-19 prevention with an average score of 60.61 points (SD = 9.96) or 84.18% of its possible total score, and an actual range of 24 - 72 points (Table 1).

For factors related to behaviors for COVID-19 prevention, most positive factors has mean scores higher than 80% of their possible total scores including knowledge for COVID-19 and its prevention (92.77%), confidence and trust in the nursing profession (86.63%), perceived self-efficacy in COVID-19 prevention (83.84%), and perceived severity of COVID-19 (80.42%). Those with mean scores lower than 80% of their possible total scores were attitudes towards COVID-19 preventive measures (68.60%), perceived risk of COVID-19 infection (56.00%), access to health services (69.79%), resilience (76.72%), and social support (75.51%). For the

negative factor, mean health status mean scores was only 7.43% of the possible total score (Table 1).

**Table 1** Scores of behaviors of COVID-19 prevention and its predictive factors (N = 235).

Variables	Possible range	Actual range	mean	SD	% compared with upper limit
<b>Behaviors of COVID-19 prevention</b>	0 - 72	24-72	60.61	9.96	84.18
<b>Predictive factors</b>					
1. Knowledge for COVID-19 and its prevention	0 - 13	2-13	12.06	1.31	92.77
2. Attitudes towards COVID-19 preventive measures	0 - 48	17-48	32.93	5.86	68.60
3. Confidence and trust in the nursing profession	9 - 27	12-27	23.39	3.30	86.63
4. Perceived risk of COVID-19 infection	0 - 10	0-10	5.60	2.62	56.00
5. Perceived severity of COVID-19	0 - 50	8-50	40.21	8.58	80.42
6. Perceived self-efficacy in COVID-19 prevention	15 - 45	23-45	37.73	5.01	83.84
7. Access to health services	15 - 75	29-67	52.34	6.73	69.79
8. Mental health status	0 - 28	0-28	2.08	4.48	7.43
9. Resilience	20 - 100	54-100	76.72	9.57	76.72
10. Social support	16 - 80	32-80	60.41	9.71	75.51

It was found that Behavior of COVID-19 prevention was significantly correlated with most predictive factors (P-value < 0.05 for all) except mental health status (Table 2).

**Table 2** Correlations among independent and dependent variables (N = 235).

Factors	Pearson's correlation coefficient (r)
1. Knowledge for COVID-19 and its prevention	0.276 <sup>§</sup>
2. Attitudes towards COVID-19 preventive measures	0.488 <sup>§</sup>
3. Confidence and trust in the nursing profession	0.241 <sup>§</sup>
4. Perceived risk of COVID-19 infection	0.223 <sup>§</sup>
5. Perceived severity of COVID-19	0.179 <sup>†</sup>
6. Perceived self-efficacy in COVID-19 prevention	0.514 <sup>§</sup>
7. Mental health status	0.001
8. Resilience	0.223 <sup>§</sup>
9. Social support	0.269 <sup>§</sup>
10. Access to health services	0.313 <sup>§</sup>

\* P-value < 0.05; † P-value < 0.01; § P-value < 0.001.

In stepwise multiple linear regression analysis, all 235 participants were included. The number of cases was sufficient for the analysis. According to Tabachnick and Fidell, the required sample size using formula of  $N \geq 50 + 10xm$  where m = the number of independent variables, was 150 or more cases.<sup>20</sup> In this study, 235 cases were used for data analyses. Normal distribution assumption was met. No autocorrelation was found as indicated by Durbin-Watson value of 1.849. No multicollinearity among independent variables were found. Homoscedasticity was achieved. Variance of the residuals at all points on the regression line were equal.

Only four factors were significantly associated with the behavior of COVID-19 prevention with 37.4% of variance of the behavior explained ( $R^2 = 0.374$ , P-value < 0.001). Factor with the most influence was perceived self-efficacy in COVID-19 prevention, followed by attitudes towards COVID-19 preventive measures, knowledge of COVID-19 and its prevention, and access to health services ( $\beta = 0.312, 0.271, 0.144$ , and  $0.133$ , respectively, with P-value < 0.05 for all) (Table 3).

**Table 3** Associations between behaviors of COVID-19 prevention and its predictive factors by stepwise multiple linear regression analysis (N = 235).

Factors	B	SE	$\beta$	t	P-value
Perceived self-efficacy in COVID-19 prevention	0.619	0.122	0.312	5.081	< 0.001
Attitudes towards COVID-19 preventive measures	0.461	0.103	0.271	4.485	< 0.001
Knowledge for COVID-19 and its prevention	1.095	0.412	0.144	2.656	0.008
Access to health services	0.197	0.083	0.133	2.387	0.018
Constant = -1.473, $R^2 = 0.374$ , Adjusted $R^2 = 0.363$ , $F_{4,230} = 34.365$ , P-value < 0.001.					

## Discussions and Conclusion

In this survey of individuals with workforce age in the eastern region of Thailand during the COVID-19 pandemic, the overall behaviors of COVID-19 prevention was at a high level with mean score of 84.18% of the possible total score. These work-force age participants were alert to this pandemic situation. This could be because they were diligently seeking knowledge for self-care to prevent the risk of exposure to the COVID-19 infection, along with having their positive attitudes towards government campaigns aimed at preventing the spread of this virus. In addition, if the infection spreading was severe, it will affect the person's household income.<sup>21,22</sup> Furthermore, receiving welfare from agencies or organizations that they worked with would contribute to help this working age group's ability to access the health care system from the early stages of the detection for infection. These help them to receive treatment timely and received comprehensive vaccination. This possible explanation resulted in a satisfactory level of COVID-19 preventive behaviors in this population.<sup>8,23</sup>

Factors significantly influencing behaviors for COVID-19 prevention were perceived self-efficacy in COVID-19 prevention, attitudes towards COVID-19 preventive measures, knowledge for COVID-19 and its prevention, and access to health services. According to the PRECEDE-PROCEED model, perceived COVID-19 prevention self-efficacy served as

a predisposing factor which significantly associated with and predicted behaviors for COVID-19 prevention ( $\beta = 0.312$ , P-value  $< 0.001$ ). Participants reported a high level of perceived COVID-19 prevention self-efficacy with a mean of 83.84% of the possible total score. This could be because their perceived self-efficacy would lead to their confidence in performing health behaviors. For those who acknowledged and had confidence in their abilities, they would try hard and not give up on the obstacles until they reached their success in performing health behaviors.<sup>24</sup> This finding is consistent with a study revealing that there was a statistically significant difference between people who were able to control and those unable to control the virus (P-value  $< 0.05$ ).<sup>25</sup> The group that could control the virus had high perceived self-efficacy and were able to act on preventing their treatment failure by having appropriate health behaviors, such as cooperating taking antiretroviral medications despite the uncomfortable side effects, complying with strict self-protection against opportunistic and further infections.<sup>25</sup> This is consistent with a concluding that even during the lockdown period in Europe and America which caused difficulties in life, persons who had awareness and confidence in one's own competence made an effort to achieve their goals.<sup>26</sup> These fostered them to believe that they have sufficient potential to perform suitable behaviors. This can be done by providing a clear understanding and training and continually enhancing skills to achieve success as expected. It could help promote awareness of competency from their previous experiences.<sup>27</sup> Therefore, to build confidence among people, the government should build people's confidence by promoting a new way of life or "new normal" by simply changing health behaviors such as staying at home safely with a motto "safe at home." This campaign helped prevent COVID-19 infection. It also helped people to relieve anxiety and have confidence that they can perform by themselves to prevent COVID-19 infection effectively. As a result of the perceived high COVID-19 prevention efficacy, it helped reduce the rate of new infections because of inappropriate COVID-19 prevention behaviors.<sup>28</sup>

In addition, the influence of knowledge and attitudes also served as predisposing factors of COVID-19 preventive behaviors. There was a statistically significant correlation and prediction for behaviors of COVID-19 prevention from knowledge for COVID-19 and its prevention ( $\beta = 0.144$ , P-value = 0.008), and attitudes towards COVID-19 preventive measures ( $\beta = 0.271$ , P-value  $< 0.001$ ). Individuals with good

knowledge and attitudes will mutually strictly follow the protection measures announced by the government to protect themselves and those around them from getting the infection.<sup>9,21</sup> Therefore, the comprehensive campaign to educate the public through various communication channels, led by the Center for COVID-19 Situation Management (CCSA) and implemented by public health personnel, has played a crucial role in improving people's knowledge, understanding, and confidence in the government's efforts to control the pandemic. This, in turn, has resulted in a positive attitude among the population towards the implemented preventive measures and strict adherence to regulations. As people witness the effective outcomes of these actions, they develop a sense of personal responsibility in helping to prevent the spread of COVID-19 in Thailand.<sup>8</sup> This finding aligns with a study conducted in Turkey, where a similar educational campaign successfully increased public awareness and knowledge about COVID-19 prevention practices, leading to a decline in new infection cases.<sup>24</sup>

Access to health services served as an enabling factor that predicted behaviors for COVID-19 prevention ( $\beta = 0.133$ , P-value  $< 0.018$ ). This work-force age participants had good access to the health service system (mean score of 69.79% of the possible total score). A possible explanation was that the pandemic situation has affected the health care system and the need for modification because of various limitations in services provided to reduce the spread of this pandemic. For example, many public hospitals were required to close outpatient medical services and apply strategies to control traveling in and out of the area for a specified period. This results in a limitation of access to hospital services in spite of the fact that they still required access to the health services for maintaining their well-being.<sup>28</sup> It was reported about the change in the nature of people's access to health services during the COVID-19 crisis in accordance with guidelines issued by the Ministry of Public Health, Thailand which has been changed from being reactive in the hospital to being proactive in the community by the primary health care settings.<sup>3</sup>

There are 3 main working processes consisting of 9 key strategies as follows. For the first process of enhancing individual potential, it consists of 4 strategies, namely 1.1) organizing training to educate knowledge and skill development for both public health and administrative

personnel that focus on COVID- 19 prevention and control, 1.2) setting plans for meetings, 1.3) follow up on the action periodically, and 1.4) continually including performing their work in accordance with professional ethical standards. For the second process of servicing, it consists of 3 strategies including 2.1) organizing public health officials and health volunteers to screen at-risk groups; refer infected patients and dispense medications to people who were quarantined at home, 2.2) providing and preparing adequate protective equipment for distribution to the public, and 2.3) opening for business outside office hours to accommodate and reduce the congestion of service users. For the third process of accessing to service users, it consists of 2 strategies, namely 3.1) organizing field visits to follow up on patient care and 3.2) having online communication channels to notify and respond to information that the public should know through the mobile application. For example, the “Mohprompt application” and “Thaichana application.”<sup>3,29</sup>

It can be said that this implementation is one of the reasons that facilitate people to access the necessary health services conveniently, quickly, and comprehensively resulting in the appropriate COVID-19 preventive behaviors. Consistently with the study conducted by Tuczyńska and colleagues which systematically reviewed the literature on public access to health services during the pandemic.<sup>23</sup> Health services from the establishment of the workplace to the provision of services through various online networks which are easily accessible and help reduce the risk of exposure from traveling. These help people maintain effective self-care behaviors.<sup>23</sup>

In multiple linear regression analysis, there were no significant associations between behaviors for COVID-19 prevention and trust in the nursing profession, perceived risk of COVID-19 infection, perceived severity of COVID-19, resilience, or social support. However, these factors, except mental health status, exhibited statistically significant correlations with behaviors for COVID-19 prevention (P-value < 0.05). Individuals with work-force age in this study demonstrated high levels of perceived self-efficacy in COVID-19 prevention, knowledge of COVID-19 and its prevention, and positive attitudes towards disease prevention measures. These factors, considered as predisposing factors, could contribute to their high levels of behaviors for COVID-19 prevention. Consequently, the work-force age participants in this study had lower perceptions of the risks and severity of

COVID-19 that they may face. These factors also influenced their mental well-being, providing them with additional strength to cope with the challenges posed by the pandemic situation. This finding aligns with the PRECEDE-PROCEED model, which suggests that predisposing factors are fundamental in shaping behaviors and motivating individuals to engage in health-promoting behaviors. Individuals are driven by their reasons for performing such behaviors, and their behavioral decisions are influenced by factors such as knowledge, attitudes, perception of benefits, and perceived ability to act on their healthy behaviors.<sup>5,7</sup>

This study has certain limitations. We studied only Thais with work-force age who had full-time jobs and did not have underlying disease. The results might not be suitable for generalization to the work-force age people who are independent and receive payment for occasional employment, or those with underlying diseases and the immigrant workers.

The results of this study highlight the importance of enhancing perceived COVID-19 prevention self-efficacy among health personnel and relevant organizations in order to foster behaviors for COVID-19 prevention among the work-force age individuals. Additionally, it is recommended to focus on educating and promoting positive attitudes towards behaviors for COVID-19 prevention. Furthermore, facilitating convenient access to the health service system through the provision of proactive services in the community is crucial.

Health professionals should develop guidelines or programs to promote behaviors for COVID-19 prevention among the work-force age individuals by placing an emphasis on building their knowledge of self-care to prevent this disease and creating positive attitudes toward measures that promote disease prevention behaviors, along with increasing self-efficacy awareness about individuals' abilities to adapt to a new way of life sustainably.

In conclusion, perceived self-efficacy in COVID-19 prevention, attitudes towards COVID-19 preventive measures, knowledge of COVID-19 and its prevention, and access to health services served as the significant predictors of behaviors for COVID-19 prevention of individuals with work-force age during the pandemic situation in the Eastern Special Development Zone and Burapha University service area.

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