Original Research Article

Voices of Thai Patients With Non-Communicable Diseases Towards Healthy and Ready Meal Products: A Mixed-Methods Research

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Abstract

Introduction: Healthy diets reduce the risk of several non-communicable diseases (NCDs) from diabetes to heart disease and hypertension to cancer. Given their busy lifestyles, it is difficult for individuals to routinely prepare healthy food. Therefore, healthy and ready meal products have been developed and commercially launched in Thailand.

Objectives: Considering ready and healthy meals as an innovative product line in the Thai market, the aim of this study was to identify the factors that influence NCD patients to adopt this product innovation.

Methods: This study used a mixed-methods approach based on Roger's model of innovation adoption. Two hundred and twenty NCD patients completed a questionnaire regarding their expectations towards healthy meal products. In-depth interviews were conducted with 20 respondents to explore the underlying reasons behind their scoring decisions in the questionnaires.

Results: The findings revealed that the highest rated items were the expectation that healthy meals reduce the severity of disease, help avoid high-cholesterol food, and comprise a variety of meal choices. Instead of celebrity marketing and corporate branding, the patients preferred healthy meals that are recommended by health professionals and produced by university research teams. The qualitative findings also demonstrated that most patients welcomed healthy menus as a preventive treatment, but still have concerns regarding the availability and quality of the products.

Conclusion: This study reveals the expectations of prospective consumers, specifically NCD patients, towards healthy and ready meal products. It adds key information for food producers, health professionals, and policymakers to foster healthy food innovation, especially in the context of emerging economies like Thailand where healthy food choices are limited.

Keywords

healthy food, innovation adoption, non-communicable diseases

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Introduction

Non-communicable diseases (NCDs), including cardiovascular disease, cancer, chronic respiratory disease, and diabetes, are the world's leading cause of death, contributing to over 70% of deaths worldwide (World Health Organization [WHO], 2020). Premature mortality from NCDs, before the age of 70, is now common, especially in low- and middle-income countries (Malekzadeh et al., 2020). The death statistics according to each country's profile indicate that Thailand has more NCD deaths per year than the world average and are anticipated to increase in the future (WHO, 2018a).

Food systems including physical, economic, and sociocultural conditions that shape people's dietary choices have been increasingly stressed as risk factors for NCDs (WHO, 2018b). The important link between food and NCDs has

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been increasingly demonstrated. Processed meat consumption increases the risk of Type II diabetes mellitus and coronary heart disease (Micha et al., 2010). High sodium intake is associated with cardiovascular disease (Cogswell et al., 2016) and gastric cancer (Umesawa et al., 2016). The impact of ultra-processed food is also stressed as a critical cause of being overweight and obese that increase the risk of NCDs (de Araújo et al., 2021). Because a poor quality diet and malnutrition are the biggest risk factors for NCDs, improving the current food systems to increase the availability, affordability, and consumption of nutritious and safe diets is an important approach to cope with food-related NCDs (Branca et al., 2019). Indeed, a poor diet generates a larger NCD burden than tobacco, alcohol, and physical inactivity combined, which has gained the attention of policymakers to improve population dietary patterns and prevent diet-related NCDs (Hyseni et al., 2017).

Literature Review

The concept of therapeutic food is based on the functional properties of its ingredients, as therapeutic agents, to benefit health, and well-being. The consumption of therapeutic recipes to prevent cancer, heart disease, and diabetes has been increasingly documented and are specifically designed to suit each ailment (Al-Muzafar & Amin, 2017; Mijan & Lim, 2018). Certain foods, such as fish, are known to contain beneficial dietary components that have preventive and therapeutic effects on NCDs and are proposed as an essential component of a healthy diet (Jamiol-Milc et al., 2021). The dietary approaches to stop hypertension (DASH) diet, which contains more fruit, vegetables, and whole grains, as well as low-fat or fat-free dairy products, has been designed as an eating plan for managing hypertension (Most, 2004). However, balancing a busy life and healthy meal preparation remains challenging, especially among young adults (Pelletier & Laska, 2012). In Thailand, a product development program for various kinds of healthier food choices has been promoted by the public and private sectors to curb NCDs. Although there are currently no specific menus sold for each disease, patients are more educated how to search for menus that are suitable to their health conditions.

Peoples' attitudes and motivation towards healthy eating are associated with many factors, including dietary behavior and lifestyle (Hearty et al., 2007). The present study explored the perspectives of consumers about whether they are ready to adopt healthier food for reducing NCDs. Ready meal products are this study's focus because it is a high-growth product category, and becoming more popular in Thailand. According to Rogers' innovation-diffusion theory, it usually takes time for new products to be adopted, due to multiple influential factors (Rogers, 1995). In the present study, healthier meals are considered as product innovation to be adopted by each consumer for his/her own reasons. Therefore, the objective of this study was to identify the factors that influence NCD patients to adopt the innovative healthier foods. Understanding the influential factors in a consumer's decision is a critical step to develop effective strategies to introduce and promote making long-term healthier food choices.

Methods

Design

This study used the mixed-methods approach to combine quantitative and qualitative investigations. A quantitative survey was first used to explore the patients' preferences in each critical dimension that likely influenced their adoption of healthy food products. Qualitative research was also conducted to explore in-depth why customers have a high/low preference toward some critical items asked in the quantitative survey.

Participants

The population for this study was Thai patients > 30 years old, with a non-communicable disease including cardiovascular disease, cancer, chronic respiratory disease, diabetes, and other NCDs. Referring to the WHO's data (WHO, 2020), the critical age range of people who suffer and die from NCD starts from 30 years old onward.

Setting

This study's research process took place in public hospitals while the NCD patients were waiting for doctors, mainly in the Department of Internal Medicine. The team of researchers individually approached potential respondents, described the aim of the research, and asked if they were NCD patients. Consent was obtained from each respondent before giving them the questionnaire or interview questions.

Given the anonymous setting, their privacy was maintained by not asking questions regarding their personal data and specific diseases. This research protocol was approved by the institutional review board and shared with the hospital executives in advance with full permission received.

Instrument

The critical attributes from Roger's model of innovation adoption were used to understand the NCD patients' expectations towards adopting pre-cooked healthy menus. The survey questionnaire was developed and reviewed during the pilot stage by consulting the leaders of healthy food companies. These executives are acknowledged as experts who provide rough ideas regarding the triggers to customers' demands in their industry. In addition, the hospital executives where this study was conducted also helped review the questionnaire. Given open-ended questions, their feedback was used to design and improve the questionnaire. Finally, the

questionnaires were developed to identify each respondent's expectation in five dimensions, (1) relative advantage, (2) compatibility, (3) observability, (4) trialability, and (5) healthy meal producers. Each question was designed to explore whether patients agreed/disagreed with each stated preference. For example, patients had to choose whether they agreed/disagreed that healthy food has a similar function to drugs.

Data Collection

The quantitative survey was given to potential respondents who were approached via random sampling. The sample size was determined by Yamane's table (Yamane, 1967). In the present study, the population size was larger than 100,000 people. Based on criteria at a 95% confidence level and ±7% precision, the minimum sample size was 204. During this phase, 220 paper-based questionnaires were given to the respondents, along with consent letters. In the questionnaire, 30 questions were attached with the research objective and guidelines that gave the definitions and examples of healthy food products to ensure correct understanding among respondents. At this stage, the patients who did not want to participate were excluded from the study. If they were willing to continue, the respondents were asked to what degree they agreed with the item presented in each question. The response for each question was measured using a 5-point Likert scale. Based on the Likert survey scale, the answers were arranged from *strongly agree* (5), *agree* (4), *neutral* (3), *disagree* (2), and *strongly disagree* (1). The questionnaire took approximately 10 min to complete.

A qualitative research approach was used to further explore the details based on the quantitative survey results. The sampling criteria were the same as the quantitative phase; however, the respondents for the qualitative research had to be willing to spend more time with the researchers. In-depth interviews were conducted with 20 respondents to ask why they agreed or disagreed with some items in the questionnaires. The interview questions were based on the items with the highest and lowest scores within each questionnaire category. The aim of the qualitative research phase was to understand the underlying reasons behind the scoring decisions found in the questionnaire survey results. Along the process, both authors (one male and one female) conducted interview sessions together with same questions given to every participant. To maintain their privacy, the time spent with each respondent was approximately 30 min in an anonymous setting without further contact. Additional respondents were approached until the data saturation stage when little new information was gained from the interviews. The data collection stage was completed in 6 months from January 2022 to June 2022.

Data Analysis

The quantitative data were analyzed by descriptive statistics using SPSS for Windows, Version 28.0 (IBM Corp., Armonk, NY, USA). Interview recordings were transcribed, coded, and interpreted by the authors. The qualitative data were analyzed by matching each respondent's description with the relevant theme of innovation adoption found in the quantitative studies. The quantitative and qualitative data were used for the discussion based on the mixed-methodology approach. During the pilot stage, these findings were validated by consulting the leaders of healthy food companies who shared ideas regarding consumer behavior in their industry.

Ethical Consideration

The research protocol was approved by the Human Research Ethics Committee at the author's workplace. The researchers strictly followed the approved protocol by explaining the research objective and asking for consent from the respondents before giving them the questionnaire and interview questions.

Results

Quantitative Findings

The questionnaires were completed by 220 respondents. The demographic profile of the sample group is presented in Table 1. Approximately 60% of the respondents were female. Most respondents (40.9%) were between 30 and 40 years old. In terms of education, patients with backgrounds in secondary education (35.9%) and a bachelor's degree (31.8%) were the two largest groups of respondents. In terms of occupation, public/corporate officer (31.4%) and freelance (28.2%) were the two largest groups of respondents.

Table 1. Demographic Characteristics of The Study Respondents.

Demographic characteristics	Percentage (n = 220)
Sex	
Male	41.4
Female	58.6
Age	
30–40 years old	40.9
41–50 years old	29.1
51–60 years old	26.8
Above 61 years old	3.2
Education	
Primary education	6.8
Secondary education	35.9
Vocational education	18.6
Bachelor's degree	31.8
Master's degree and above	6.8
Occupation	
Public/corporate officer	31.4
Freelance	28.2
Entrepreneur	22.7
Housewife	9.1
Other	8.6

The first set of questions revealed the expected advantages of healthy food products for NCDs (Table 2). The highest rated item ($M = 4.03$) was the expectation that healthy food helps reduce the severity of the disease. The lowest rated item ($M = 3.82$) was the expectation that healthy food could act like personalized medicine. To examine the data in detail, the researchers determined the frequency distribution of each score (5–1) for each item. The data illustrated that approximately one-third (34.1%) of the respondents strongly agreed that healthy food could help reduce the severity of the disease. However, a slightly lower proportion of respondents (25.9%) strongly agreed that healthy food is specifically developed like medicine.

The second set of questions identified the expectations regarding the compatibility of healthy food to the eating lifestyle of NCD patients (Table 2). The highest rated item ($M = 4.20$) was their need to avoid high-cholesterol food. The lowest rated item ($M = 3.93$) was their need to eat more vegetables and fruits. Furthermore, the frequency distribution of each score (5–1) for each item was determined. Almost half of the respondents (43.6%) strongly agreed that healthy food products were compatible with their need to avoid high-cholesterol food. In contrast, approximately one-third of the respondents (30%) strongly agreed that healthy food was compatible with their need to eat vegetables and fruits.

The third set of questions identified the groups of people that might influence NCD patients to try healthy food products (Table 2). The highest rated item ($M = 4.15$) was healthcare professionals who recommended healthy meals for their patients. The lowest rated item ($M = 3.56$) was famous or highly respected people in society. The researchers also determined the frequency distribution of each score (5–1) for each item. The data illustrated that nearly half of the respondents (43.6%) strongly agreed that healthcare professionals influenced their decision to try healthy food products. In contrast, only 18.6% of the respondents strongly agreed that famous or highly respected people influenced them to try healthy food products.

The fourth set of questions determined the expected experiences that could influence NCD patients to try healthy food products (Table 2). The highest rated item ($M = 4.16$) was the expectation for a variety of healthy meals, similar to general food. The lowest rated item ($M = 3.46$) was the expectation for new food recipes with a unique taste. The researchers also determined the frequency distribution of each score (5–1) for each item. Approximately half of the respondents (43.6%) strongly agreed that a variety of healthy food products could influence them to try them. However, only 16.4% of the respondents strongly agreed that their preference for trying a new food recipe was the key reason for trying healthy food products.

The fifth set of questions investigated consumer's preferences about the type of producer that might encourage NCD patients to try healthy food products (Table 2). The highest rated item ($M = 4.20$) was the preference for healthy foods produced by a university research team. The lowest rated item ($M = 3.71$) was the preference for healthy foods produced by a large company. To gain more insight into the respondents' opinions, the frequency distribution of each score (5–1) for each item was determined. The researchers found that 45% of the respondents strongly agreed that ready meals produced by a university research team could encourage them to try them (Table 2). Furthermore, only 26.4% of the respondents strongly agreed that large food company producers could encourage them to try healthy food.

Qualitative Findings

To explore the opinions of the respondents as to why they agreed or disagreed with the highest rated item and lowest rated item in the category of questions, in-depth interviews were conducted with 20 respondents. Referring to question 1.1 (Table 2), the interview data indicated that the respondents had different views on whether healthy food products could relieve the severity of the disease. The respondents who agreed tended to understand the benefit of eating healthy food while also understanding the threat of eating unhealthy food that affected their diseases. In contrast, the respondents who did not agree were not aware of the strong link between food and their health condition. These respondents believed that regular meals were still acceptable and perceived healthy food products as expensive and unnecessary items. A sample of the respondents' quotes is displayed below.

> When I strictly controlled my diet, my dizziness problem was gone. However, it came back severely any time I did not pay serious attention to my eating habits.

> Healthy meals were good but not necessary things. In fact, regular meals were already okay for me. The only thing we needed was just to avoid food high in fat and sugar.

Referring to question 1.4 (Table 2), the interview data demonstrated that there were also different respondent ideas on whether healthy food products could act like personalized medicine. The respondents who agreed liked the idea of consuming healthy meals when their ingredients specifically matched each disease. In contrast, the respondents who did not agree had concerns regarding the side effects from some ingredients that lacked scientific proof from a medical perspective. Example respondents' quotes are seen below.

> I like the idea of matching food with disease, like medicine. No need to worry about what to eat, where to find it, or whether it is harmful to my disease.

Table 2. Key Reasons for Adopting Healthy Food Innovation.

Key reasons for adopting healthy food innovation	Total (n = 220)		Frequency distribution of each score (%n)				
	M	*SD*	5 Strongly agree	4	3	2	1 Strongly disagree
1. Perceive advantage of healthy food products.							
1.1 It is more nutritious than general food.	3.84	0.82	21.4	46.4	27.3	5.0	0
1.2 It can reduce the severity of the disease.	4.03	0.90	34.1	41.4	18.2	5.9	0.5
1.3 It can enhance a treatment response.	3.88	0.88	25.9	43.2	24.5	5.9	0.5
1.4 It can act as personalized medicine.	3.82	0.92	25.9	38.2	28.2	7.3	0.5
2. Compatibility of healthy food products to NCD patients.							
2.1 Avoid high-cholesterol foods.	4.20	0.88	43.6	39.1	11.4	5.5	0.5
2.2 Avoid salty food.	4.01	0.86	30.9	44.5	19.5	4.5	0.5
2.3 Control my blood glucose.	4.03	0.98	38.6	35.0	18.2	6.8	1.4
2.4 Consume more vegetables and fruits.	3.93	0.92	30.0	40.5	22.7	5.9	0.9
3. Community of users that influence the adoption of healthy food products.							
3.1 My friends consume it.	3.63	0.91	16.8	40.9	32.3	8.6	1.4
3.2 Famous people that I like or respect consume it.	3.56	0.98	18.6	33.6	35	10.5	2.3
3.3 Patients in the same disease group consume it.	3.90	0.94	29.1	40.5	22.3	7.3	0.9
3.4 Healthcare professionals recommend these foods to most patients.	4.15	0.94	43.6	35.5	13.6	6.4	0.9
4. Expected consuming experiences that influence the adoption of healthy food products.							
4.1 It looks like a new food recipe with a unique taste.	3.46	1.03	16.4	33.2	34.5	11.8	4.1
4.2 It tastes like other healthy food products.	3.69	1.02	22.3	41.4	20.9	13.6	1.8
4.3 It tastes like normal food.	4.04	0.84	32.7	42.7	20.0	4.5	0
4.4 There are various menus like normal food.	4.16	0.90	43.6	34.5	16.8	4.5	0.5
5. Producers of healthy food products.							
5.1 It is produced as a homemade style	3.93	0.93	31.4	37.7	24.5	5.5	0.9
5.2 It is produced by a large company.	3.71	1.03	26.4	31.8	30.9	8.2	2.7
5.3 It is produced by a university research team.	4.20	0.91	45.0	36.4	12.7	5.0	0.9

> They were not well researched like medicine. Some specific ingredients, including herbs, might be good for someone but not others. This is my concern.

Referring to question 2.1 (Table 2), the interview data identified that the respondents had disparate opinions about whether healthy food products were compatible with their need to avoid high-cholesterol food. The respondents who agreed commonly had difficulty in preparing suitable meals for themselves and their families. Differently, the respondents who did not agree believed that the need to avoid cholesterol-containing food was not the most important reason for consuming healthy food products. They could choose low-cholesterol meals by themselves from ordinary food choices. A sample set of respondents' quotes is presented below.

> The doctor asked me to avoid high cholesterol food. When I cooked by myself, however, nobody in my family liked my meals. It will be much easier for me to buy healthy food products.

> I knew I needed to avoid high cholesterol food. I knew what kinds of food I should avoid. Therefore, we could eat ordinary meals as usual. There was no need at all for healthy food products.

Referring to question 2.4 (Table 2), the respondents expressed differing views on whether healthy food products were compatible with their need to regularly consume fruit and vegetables. The respondents who agreed felt that it was difficult to shop for fruit and vegetables compared with pork and other meat products. However, some respondents disagreed that needing to consume vegetables and fruit was the most important reason for buying healthy food products. They felt that the vegetables commonly contained in Thai dishes were already enough for them. Representative respondents' quotes are shown below.

> Fruit and vegetables have large benefits for my health conditions. However, I did not have much chance to eat them. Meat-containing meals were much easier to buy in a convenience store.

> I did not think that we needed healthy meal products. Thai traditional meals, such as papaya salad and chili paste dishes, usually contain vegetables that are good for health.

Referring to question 3.4 (Table 2), the interview data illustrated that the respondents had dissimilar opinions on whether healthcare professionals influenced them to try healthy food products. The respondents who agreed typically understood the role of a doctor as an expert who could guide them about what to eat. In contrast, there were respondents who were not influenced by healthcare professionals. In their opinion, there were many factors, such as price, taste, and shopping place to be considered. Sample respondents' quotes are displayed below.

> Advice from doctors sounded the most reliable because they knew what kinds of food were suitable for my illness. Although it is healthy food, we still need to know what to eat and what to avoid.

> Doctor's recommendation was just one factor. I still had other concerns about taste, price, and convenience of buying these healthy food products.

Referring to question 3.2 (Table 2), during the interviews the respondents presented a variety of ideas concerning whether famous people influenced them to try healthy food products. The respondents who agreed tended to value user reviews, especially if it was provided by someone they knew. However, other respondents were not influenced by famous people. These respondents suspected that commercial benefits, rather than the facts, were behind the comments from famous people. A sample set of respondents' quotes is shown below.

> Watching ads and reading reviews usually made me interested in trying new things. Their experiences would sound more credible especially if they came from famous people whom I like.

> Reviews by celebrities sounded meaningless to me. We never knew if there were commercial reasons behind it. Rather, we need facts, especially in case of healthy food products.

Referring to question 4.4 (Table 2), the respondents reported a range of opinions in the interviews about whether a variety of meals could cause them to try healthy food products. The respondents who agreed typically complained about the limited number of healthy meals that lacked diversity and appeal. Other respondents thought that a variety of meals was not the main reason that could influence them to try healthy food products. Other reasons, such as price or convenience tended to be the reason for them to try and keep consuming healthy food products. Sample respondent quotes are presented below.

> Healthy foods generally look boring and not appealing. There were too few meals compared with ordinary food. To eat it every day, we need more variety.

> A variety of meals is important, but still not a big problem for me. Rather, my most important concern was about the price. Why are healthy foods always much more expensive?

Referring to question 4.1 (Table 2), the interview data showed that the respondents had various ideas on whether their preference for trying new food recipes could influence them to try healthy food products. The respondents who agreed understood the health benefits that could attract the attention of new eaters to healthy food products. Differently, there were respondents who thought that the preference for trying new food recipes could not influence them. They believed that healthy food products had no attraction at all for people who enjoy eating and trying new meals.

> I usually enjoy eating and trying new meals. If they also bring health benefits, there will be many people who want to try them. Why not?

> Eating is always my enjoyment. However, I never think about trying healthy food products. From my experience, it was hard to find meals that were both delicious and healthy.

Referring to question 5.3 (Table 2), the respondents demonstrated different opinions about whether the ready meals produced by a university research team could stimulate them to try healthy food products. The respondents who agreed liked the expertise of university researchers who matched healthy recipes with specific diseases. However, there were respondents who thought that having a university team as the producer could not stimulate them to try healthy food products. Rather, they thought that a university brand might only mean experimental projects that would not be produced in large amounts and would be difficult to find. Several respondent's quotes are shown below.

> This kind of food has to be well-researched and customized towards each disease. I think a university research team will be the most reliable producer in the views of consumers.

> I occasionally heard about product development projects run by the universities. However, I wonder whether it was just their experiments. Will those products be available on the market? Where to buy them?

Referring to question 5.2 (Table 2), the respondents' ideas about whether healthy meals produced by large food companies could make them want to try healthy food products varied. The respondents who agreed recognized the strength of large food companies that have high production standards and pricing advantages. However, other respondents thought that having a large company as the producer could not influence them to try healthy food products. They thought that healthy food products launched by large companies tended

to be only marketing strategies, rather than a serious commitment to healthy food product development.

> Large-sized food companies usually have a high standard of production and affordable prices. It will be good news for NCD patients if they start selling healthy meals too.

> Food products from large companies are heavily promoted through marketing campaigns. I am not sure if they are seriously developed as healthy food products.

Discussion

The present study used Rogers's theory of innovation adoption to explore the perspectives of NCD patients on adopting healthy food. The rationale of the first set of questions was based on the relative advantage (Rogers, 1995) of healthy food products and the various ways individuals perceived the advantage. In this concept, adopting innovative products will be motivating if the benefits are perceived as gaining an advantage over existing products. Four scenarios about consuming healthy food products for increasing nutrition, reducing the severity of NCDs, complementing the current treatment, and as a type of medicine were investigated. The findings revealed that the NCD patients had the strongest perception of healthy food product consumption as a preventive measure to reduce the severity of NCD diseases. However, the NCD patients had the weakest perception of healthy food product consumption as a medicine.

It is well known that nutrient deficiency or excessive food intake are key contributors to the pathogenesis of NCDs (Branca et al., 2019). Increased intake of specific nutrients is necessary to reduce the severity of NCDs, such as cardiometabolic diseases (Bruins et al., 2019). Respondents consistently perceived this knowledge as a relative advantage that encouraged them to try healthy food products to reduce the severity of their diseases. This finding is also well aligned with the market growth of dietary supplements and nutraceuticals, especially during the coronavirus pandemic when consumers looked for additional protection against the virus (Lordan, 2021). Furthermore, the findings from this study indicated that the respondents did not have a strong perception of healthy food products as being the same as medicine. This perception might reflect the common belief that taking drugs is the most important treatment for NCD patients. Based on this belief, healthy food products may be occasionally consumed, but are not viewed as a replacement for a prescribed medication. This suggests that health professionals can feel comfortable recommending healthy food products without being concerned about medication nonadherence (Jimmy & Jose, 2011).

The changes in eating lifestyle due to rapid urbanization increase the risk of NCDs (Khatib, 2004; Lachat et al., 2013). Therefore, the rationale of the second set of questions was to probe for the perceived compatibility that matches the eating lifestyle of NCD patients. They were asked about four key reasons concerning the need to consume less cholesterol-containing food, sugar, salty food, or more vegetables. This study found that NCD patients had the strongest opinion about consuming healthy food because of the need to avoid high-cholesterol food. These growing concerns are somewhat driven by healthcare professionals' practices that closely monitor cholesterol levels. In contrast, NCD patients had the weakest opinion about consuming healthy meals because of the need to eat more vegetables and fruit.

Healthy dietary patterns, such as diets that are high in fruit, vegetables, and whole grains are widely known to reduce the risk of mortality from chronic diseases, such as cardiovascular disease, diabetes mellitus, and cancer (Aune et al., 2017; Jayedi et al., 2020; Neuhouser, 2019). However, the study's results revealed that the need to eat more vegetables and fruit is not a key trigger for consuming healthy food products. An underlying reason might come from the view that common Thai meals already contain enough vegetables and fruit. Thus, there is no additional need to consume healthy food meals. This view might be true for traditional Thai dishes. However, the data from the Thailand National Health Examination Survey III presented that the fruit and vegetable intake by Thai people was much lower than the level recommended (Satheannoppakao et al., 2009). Similarly, a systematic review and meta-analysis found that the amount of fruit and vegetables consumed by South Asian people is lower than the level recommended by the WHO (Jayawardena et al., 2020). This low fruit and vegetable consumption may be due to financial concerns and the unavailability of fruit and vegetables in markets (Cheung et al., 2021). In China, the increased income and busy lifestyle have raised the demand for fast-food restaurants, which have expanded to over 2 million restaurants (Wang et al., 2016). With changing lifestyles, traditional meals are being increasingly replaced by quick meals that are usually made of fried and fatty ingredients. Correspondingly, this study revealed that the need to avoid high-fat food was acknowledged as the most important reason to consume healthy food products. To solve the problem of a low-nutrition diet, healthier meal choices have been promoted in fast food restaurants (Choi & Reid, 2018). Alternatively, the market for plant-based meat analogs has continuously increased (Thavamani et al., 2020). A randomized trial on the effect of plant-based meat revealed that compared with animal-based meat, plant-based meat improved several cardiovascular disease risk factors without adverse effects (Crimarco et al., 2020).

The third set of questions asked about the group of people who could influence patients to try healthy food products. The rationale of these questions was based on observable factors (Rogers, 1995) in terms of the people who introduce healthy products to NCD patients. Four categories of the people in an individual's nearby community, friends,

famous people, patients in the same disease group, and medical professionals were explored. This study found that NCD patients have the strongest tendency to follow the suggestions of medical professionals. In contrast, there was a weak tendency for NCD patients to be swayed by famous people regarding healthy food product choice.

Although celebrity endorsements are a firmly established advertising strategy, this study found relatively low scores on the influence of famous people on choosing healthy food products. An underlying reason for these findings may derive from the need for nutritional information, rather than the lifestyle of the consumers, for choosing suitable healthy food products for each individual's illness. Indeed, the effectiveness of celebrity endorsements varies among product categories, depending on how well the celebrities and products are matched to each other (Knoll & Matthes, 2017). In contrast, the findings from this study indicated a strong preference for medical professionals who recommend healthy food products to NCD patients. An underlying reason for these findings may come from the technical expertise and credibility of medical professionals. Thus, healthy food products are similarly perceived as pharmaceutical and nutritional products. Higher amounts of specific ingredients in the diet may increase the risk of food–drug interactions that require guidance from professionals in the healthcare sector (Eussen et al., 2011).

The fourth set of questions asked about the expected consuming experiences that may influence NCD patients to try healthy meals for the first time. The rationale for these questions was to identify the critical reasons that foster trialability (Rogers, 1995) that bring opportunities for healthy products to be adopted. The four categories of an individual's expectations comprised new eating experiences, tastes of food, similarities to other healthy meals, and a variety of meals. The results demonstrated that NCD patients have the strongest tendency to try healthy foods if there are various meals available. In contrast, there is a weak tendency for NCD patients to try healthy foods due to seeking new experiences of consuming new meals.

The taste and packaging of food play a key role in consumers' food behavior (Gutjar et al., 2014). A study on young adults reported that the participants who prioritized the taste of food tended to have a poor-quality diet (Kourouniotis et al., 2016). Similarly, respondents in this study perceived healthy food as a diet that lacks appeal and desirability. Therefore, people only expect functional benefits, but not a new dining experience, when consuming healthier meals. Rather than seeking new meals to try, people only need ordinary food that they consume in their daily lives. This interpretation was drawn from the relatively high expectations towards a diversity of healthy foods that should be comparable to ordinary food. It has been shown that the increased availability of healthy options is a key factor in food environment intervention to improve the diet behavior of young adults (Roy et al., 2015). In addition, meal color variety can be used as a strategy to boost healthy food consumption (Konig and Renner, 2019).

The last set of questions asked about each consumer's preference toward the healthy food producers. The rationale for these questions was based on the various types of emerging competitors in the healthy food market. Three categories of food producers, small-scale entrepreneurs, large companies, and university-based ventures were compared. The results indicated that potential consumers have the strongest preference towards university-based ventures, and the lowest preference towards large companies as NCD food producers.

Although large multinational companies are the key players in the food industry (Lauber et al., 2021), this study's respondents had a weak preference towards large-sized companies as NCD food producers. As mentioned by respondents, an underlying reason for these findings might come from their profit-making behavior in various market segments, including non-healthy products. To protect their markets, corporate political activities have been used to influence health policy (Fooks et al., 2019; Mialon et al., 2020). Thus, large-sized companies may not be well perceived in the healthy food market, especially for non-communicable diseases (Freudenberg, 2012). Surprisingly, the university was the preferred choice of healthy food producers. An underlying reason for these findings might be due to their research expertise in matching specific ingredients to each disease. Furthermore, people have become aware of the universities' role as emerging innovators who have potentially transformed their research into new products launched to the market (Miller et al., 2015). Indeed, increased attention is being paid to university ventures that can promote product innovation in the food sector through its expertise in biotechnology, food science, and nutrition (Oliveira & Cardoso, 2021). To sustain their long-term operations, however, remains challenging in the eyes of consumers.

Strengths and Limitations

The strength of this research comes from its mixed-methods approach. Applying quantitative and qualitative research designs allows researchers to see patients' preferences and understand the underlying reasons why they adopt/not adopt ready-made healthy food. However, this study can be conducted only in hospitals where patients have trust in sharing their personal data and ideas with the research team. Otherwise, Thai people tend to be reluctant to share their health information, given the increasing concern about data privacy and digital crime. The collaboration with hospitals is thus important, but only possible where the research team has a personal connection with them. Sampling and data collection thus remains a critical limitation in this study. Further research should be conducted in a larger scale to replicate the results, see variations among each group of patients (e.g., age, sex career), or gain further understanding from more diverse questions. Some existing

questions can be further investigated, such as the differences among doctors, nurses, or nutritionists when they give advice on food choices for patients.

Implications for Practice

The novel outcome of this study is that it reveals several critical expectations of prospective consumers that could influence their adoption of ready-made healthy meals.

In terms of demand, NCD patients expect that healthy foods will reduce disease severity, help avoid high-cholesterol food, and comprise a variety of meals. These findings imply critical differences between drug intake versus healthy food consumption in the eyes of patients. Drugs are purposefully used for treating diseases; however, healthy foods are supposed to be regularly consumed as a preventive measure. Although nutrition misinformation and disinformation (Diekman et al., 2023) are increasingly exploited as a selling strategy, healthy food entrepreneurs should not claim that an advantage of their products is they act like drugs. What they rather need is a product development process that increases the variety of menus to be consumed on regular basis, given low cholesterol and other unhealthy ingredients. The benefits of each menu should be clearly described so that consumers can choose foods that are complementary to medication for their diseases.

Rather than celebrity marketing and corporate branding, the patients preferred healthy meals that are supplied by university research teams and recommended by healthcare professionals. These findings imply an expectation for knowledge-intensive product development and communication by new entrants to the healthy food industry. Collaborations between food scientists and health professionals are needed to foster healthy food start-up companies and ensure their sustainable operation. Health professionals, especially nursing teams, are expected not only to give advice regarding healthy menus but also to bring back feedback from the patient as input for further product development. Given that nurses are the ones who work closely with patients, they will be a critical stakeholder who fosters healthy food choices for NCDs.

Conclusions

The aim of this study was to identify the critical expectations of NCD patients that could influence them to consume ready-made healthy meals. Based on the mixed-methods approach, the findings from the quantitative and qualitative research reveal patients' preferences and in-depth reasons that encourage/discourage new product adoption. Specifically, NCD patients expect that healthy foods will reduce disease severity, help avoid high-cholesterol food, and comprise a variety of meals. Instead of celebrity marketing and corporate branding, the patients preferred healthy meals that are recommended by healthcare professionals and produced by university research teams.

The qualitative findings further reveal that most patients welcome healthy menus as preventive treatment, but still have concerns regarding the availability and quality of products. These findings allow producers to further understand and develop healthy food products that meet patients' expectations. The implications of this study call for university and health professionals to foster ready-meal product adoption as healthy food choices for NCDs.

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Authors' Contribution

Both authors contributed to the conceptualization, methodology, formal analysis, investigation, and original draft preparation with shared responsibilities.

Availability of Data and Materials

Data and materials are available on request.

Consent for Publication

The manuscript has consent for publication from both authors.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

The research protocol was approved by the Human Research Ethics Committee of the Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand (HREC-DCU 2021-036).

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Use of AI Software

There is no AI software used in this study.

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