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Job incentives influencing health professionals working in rural and remote areas in Thailand: finding from discrete choice experiment to policy recommendation

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Abstract

Background This research aims to understand job incentives of health professionals who work in rural and remote areas, which could lead to the further development of policy proposals.

Methods The study design has been applied discrete choice experiment (DCE) to determine attribute preferences of: 1) doctors, dentists, and pharmacists, and 2) nurses and interdisciplinary teams. Four areas in northern Thailand were purposively selected. To determine the attributes and levels, a qualitative method was employed. An orthogonal array was adopted to produce 16 options for categorizing the employment preferences of each person. Conditional and mixed logit regressions were used to examine the major incentives influencing health workforce decision-making. In addition, willingness to pay (WTP) analysis according to beta coefficients from the regression models was performed.

Results The total number of participants in the first group was 34, and the latter group included 160 participants. Financial incentives, suitable accommodation, workload and job post in hometown were all significant criteria for both groups. Surprisingly, opportunity to continue study was not a significant consideration for doctors, dentists, or pharmacists to work in remote areas. When getting a 40% higher income than counterparts working in public hospitals in urban regions, the decision-making level among doctors, dentists and pharmacists influenced decisions by 4.2 times, while nurses and interdisciplinary teams were influenced twice as much. Regarding the WTP analysis, doctors, pharmacists, and dentists were willing to receive 8,126 (95% CI: 3,477; 15,442) Baht per month, and nurses and interdisciplinary teams were willing to receive 7,733 (95% CI: 4,926; 11,502) Baht per month to work more than 48 h per week. The results of mixed and conditional logit models were found consistently.

Conclusion Financial subsidies for all types of healthcare workers in rural and remote areas remain effective policies and need to be maintained. It is not merely a matter of national policy; hospital-level policies can change and contribute to resolving the problem of health personnel shortages. The short-term plan for retaining health staff would be to provide suitable, safe, and satisfying accommodations.

Keywords Incentive, Health workforce, Remote areas, Quality of living, Discrete choice experiment

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Introduction

The shortage of healthcare professionals in rural or remote areas has been a problem for decades in numerous countries. The World Health Organisation (WHO) predicted that there would be about a 14-million-person shortage in the health workforce globally by 2030. There will be a shortage of 2.3 million doctors worldwide, with 1.1 million in Africa and 1.0 million in Southeast Asia. Regarding the nurse situation, 7.6 million nurses will be needed, with 2.8 million in Africa and 1.9 in Southeast Asia [1]. Studies in both developed and underdeveloped countries such as the United States, India, Afghanistan including Thailand revealed a shortage of medical workforce, especially in rural or remote areas [2–4]. A systematic review study, investigating incentives for rural and remote areas found strong evidence of effective policy related to education, for example, the selection of university students from rural backgrounds and providing support for advanced studies impacted health workforce retention in rural and remote areas [5]. Another study in the Maluku Islands of Indonesia concluded that a sustained partnership between medical schools and local governments was required to implement strategies to increase the recruitment and retention of rural and remote doctors [6].

In Thailand, where the majority of healthcare facilities are dominated by the public sector, private hospitals operate primarily in urban areas [7]; in 2022, public hospitals accounted for 75.6% of the 1,385 healthcare facilities offering overnight stays, and 77.7% of outpatient visits and inpatient treatments took place in public hospitals [8]. Of the total 39,125 physicians, 79% were employed in public hospitals (and 92% of these full-time public doctors took additional part-time job in private hospitals). In contrast, more than half of dentists and pharmacists worked full-time in private dental clinics and private pharmacies respectively, but 85% of almost 200,000 nurses worked in public hospitals (while only 6% of these full-time public-hospital nurses took additional part-time job in private hospitals) [7]. Retaining the health workforce in public facilities has always been a challenge for government policy. The Thai government has aimed to create projects to support newly graduated physicians in working in their home provinces. One such initiative is the Collaborative Project to Increase Production of Rural Doctors (CPIRD), which requires applicants and their parents or legal guardians to have resided in the application area continuously for at least 5 years [8, 9]. Since 2005, CPIRD has launched up to four different medical training tracks: the regular CPIRD programme is the original CPIRD implemented in 1995 for high school students living or being educated in the designated areas; the One-district-one-doctor programme (ODOD), which was launched in 2005 to reach out to high school students living in remote rural areas; the regular postgraduate programme (Grad) is a post-graduate programme for those who already have medical-related bachelor's degrees and; the postgraduate programme for civil servants (Grad CS) is the outreach programme for high school students who live in remote areas [10]. It was found short term effectiveness of the CPIRD program [10], however, the long-term effectiveness of CPIRD still needs to be explored. Apart from educational relevance interventions, other factors included increasing the capacity of physician production and financial incentives for motivating the willingness of physicians working in rural or remote areas [11]. For example, there is an additional compensation of 30,000–60,000 Baht for doctors and dentists who work in a specific area far away from urbanisation and 3,000–5,000 Baht for nurses and interdisciplinary teams [12]. Civil servant positions are another incentive for retaining the health workforce in health facilities. Despite the high workload and low salary, working in public hospitals in Thailand still offers advantages such as being a civil servant, which entitles health professional to the Civil Servant Medical Benefit Scheme (CSMBS) and opportunities to receive grants for medical specialist studies or training abroad. CSMBS is considered advantageous due to its more comprehensive coverage and higher reimbursement rates, compared to UCS and SSS. Moreover, the provision of medical benefits extends to the dependents of civil servants, including their spouses, children, and parents, as well as to retired civil servants [13]. Furthermore, being a civil servant provides a lifetime pension [13].

Although several interventions have been implemented, the health workforce shortage remains problematic in Thailand. A study [14] indicated that the shortage of physician specialists was relatively high in community hospitals compared to hospitals located in urban areas, such as general and university hospitals. There was a shortage of 3,200 physicians in community hospitals, while only 195 in general and university hospitals. Nurses are another profession facing workforce distribution problems. The inequality between urban and suburban nurses and the issue of losing nurses from the system have persisted for many decades [15–17]. This shortage of nurses could be worse when considering the imbalance between nurse requirements and nurse supply in the near future. A study conducted in Thailand utilized provincial data to investigate the correlation between the doctor-to-population ratio and the gross provincial product (GPP), which serves as an indicator of economic status. The findings revealed that provinces with the highest GPP per capita exhibited the highest doctor-to-population ratio, followed by middle-high, middle-low, and

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low-income provinces, respectively. The study found that efforts to distribute newly graduated physicians based on service utilization have improved fairness to some extent, but ensuring the presence of current physicians in rural areas remains challenging [18]. The 2022 report on public health resource reveals a significant disparity in the doctor-to-population ratio between urban and rural regions. In Bangkok, the ratio wase one doctor to 542 people, whereas in rural northern and northeast areas, a doctor is responsible for approximately 2,000 to 3,000 individuals. A similar scenario arises for dentists, pharmacists and nurses [7].

Incentives, for example financial and non-financial incentives and extrinsic and intrinsic motivation have been challenged evidence for policy decision making in health workforce areas [19, 20]. Several motivation theories adopted for this public health areas including Maslow's Hierarchy of needs, Job characteristics model, self-determination theory and McClelland theory and Herzberg theory [20]. Public service motivation (PSM) refers to the intrinsic drive to contribute to societal welfare over personal gain, linked to values like altruism and compassion [21]. It enhances job satisfaction, commitment, and performance, offering insights for recruitment and retention strategies in the public sector [22, 23]. PSM research has evolved to include dimensions like public interest and self-sacrifice, with recent studies highlighting its impact on well-being and leadership's role in sustaining motivation [24]. In health settings, high PSM improves retention and job satisfaction, particularly in underserved areas, where recognition and career development are valued more than financial rewards [25, 26]. Aligning organizational values with PSM improves public service delivery and outcomes [27]. This current research aims to study the suitable incentives that encourage health professionals to be more willing to work in rural and remote areas, particularly the high mountains and highlands. This includes the incentives that increase employment retention among government health professionals. The target population comprised medical professionals who have experience working in remote and rural locations and are aware of their preferences. The conclusions of the study may influence the creation of policies that encourage medical practitioners to continue working in Thailand's distant regions and in other nations with comparable circumstances to deliver quality healthcare both today and in the future.

Methods
Study design
This research was carried out according to the research methodology recommended by the World Health Organisation following the manual titled "User Guide With Case Studies: How to Conduct a Discrete Choice Experiment for Health Workforce Recruitment and Retention in Remote and Rural Areas" [28], which offers an analysis of the characteristics that affect decision-making for working in remote areas under the concept of "Discrete Choice Experiment (DCE)". Both qualitative methods, used for the development of the DCE questionnaire including attributes and levels, and quantitative approaches, used for the analysis of DCE results, were adopted for the study.

Study sites and population
The population for this study included healthcare workers working in community hospitals and health promotion hospitals located in remote areas, which included doctors, nurses, pharmacists, public health academics and interdisciplinary teams. The study sites were purposefully selected and included Nam Nao District in Phetchabun Province, Ban Khok District in Uttaradit Province, and Nakhon Thai and Chat Trakan districts in Phitsanulok Province. These locations were chosen due to their distance of over 100 km from the city [29, 30] and their relatively low population densities [30–33]. Specifically, in Thai health policy, the Ministry of Public Health (MOPH) has successive policies intervening additional payments for workforces working in remote rural areas. For example, the MOPH circular 11 updates the classification system used to group remote rural hospitals according to specific criteria such as location, size, range of services offered, and level of care provided, ensuring appropriate healthcare coverage across diverse regions [34].

The Nam Nao District in Phetchabun Province and the Ban Khok District in Uttaradit Province are classified as level two areas, indicating that they are the most economically disadvantaged regions. The Nakhon Thai and Chat Trakan districts are classified as level one areas, indicating that they are the second most isolated regions [35].

Development of DCE questionnaires
The research processes for this task included a review of literature related to the motivation factors of healthcare professionals to work in remote or rural areas. Qualitative research approaches are commonly used to determine qualities and levels in DCEs in order to ensure that the attributes included in the experiments are both relevant and easily understood by the respondents. The methods using in this study included in-depth interviews, focus groups and participant observations [36]. The study includes a purposive selection of 38 interviewees, comprising doctors, dentists, pharmacists, nurses, and interdisciplinary health professionals. Attributes

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and their levels were then identified to develop the DCE questionnaire.

Thematic analysis was used as the qualitative analytical approach. This data from the qualitative study was centred on factual outcomes, including variables, elements affecting motivation, various workplace challenges, and practical matters related to achieving the research goal. The data had to be assembled (edited), grouped (segmented), summarised, and encoded (coded), with recordings made to serve as reminders (memorised), and lastly leading to the linkage of diverse information to the topic (Theme). A conceptual framework for the explanation was built by grouping the data and identifying patterns (patterns). Data from thematic analysis, together with a review of literature [11, 37–40] and expert advice, were taken to develop a DCE questionnaire. The identification of attributes and their levels were determined. The questionnaire was ensured to reflect the actual demand factors of hospital workers in remote areas. The details of the qualitative study and development of DCE questionnaires are explained in Supplementary Material 1.

Following the establishment of the attributes and their levels, hypothetical job possibilities with various combinations of attributes and levels must be built and offered to individuals. The Supplement contains an example of job choices presented within DCE. The number of possible job descriptions is determined by the number of attributes and levels. Both sets of DCE job characteristics have 7 attributes, with 6 attributes with 2 levels and 1 attribute with 4 levels. Therefore, the total number of job profiles is 256 ($2^6 \times 4$). To reduce the choice tasks, an orthogonal array was used, and 16 choices were generated to classify the job preferences of each individual.

The DCE questionnaire was administered in Thai to both groups and delivered to all respondents in October and November 2019. The focus groups were conducted to ensure that the respondents understood the questionnaire and were capable of providing logical responses to the questions. The participants were chosen from the whole pool of healthcare professionals, with the exception of supporting staffs, in the specified regions. Only the participants who were willing to response were included in the survey.

Data analysis

This research was carried out using the DCE technique, which is an applied technique that can be used as a fact-finding tool for a person to decide on two or more choices of preferences [28]. Each option consists of different attributes and levels of the attributes. DCE analysis is based on the random utility model. That is, each person has a hypothetical choice between the i job and the j job, where U represents their utility value as follows:

$$U_{ni} > U_{nj} \, \forall i \neq j \in \qquad (1)$$

The current study adopted both conditional and mixed logistic regressions. Conditional logistic regression can remedy the limitations of typical logistic regression, such as unobserved heterogeneity, matched case–control study design, dependence among observations, and within-cluster variation [41]. On the other hand, conditional logistic regression (fixed effect logistic regression) is suggested when the number of degrees of freedom is close to the number of respondents subtracted by 1. The conditional Logistic Regression Model is specified to be a linear-in-parameters function [42], and the probability of selecting the i job is shown as follows:

$$V_{ni} = x'_{ni}\beta + z'_n\gamma_i$$

$$P_{ni} = \frac{exp(\sigma_n V_{ni})}{\sum_{j=1}^{J} exp(\sigma_n V_{nj})}$$

The mixed logit models allow to use of random coefficients to relax all the assumptions of the conditional logit model. Mixed logit models generally provide output that can be used to calculate the proportion of respondents to identify the positive preference for a job scenario. Proportion positive can be calculated as the following equation.

$$Proportion \ positive = \Phi(\beta/SD)$$

where Φ is the standard normal cumulative distribution function and ß is positive. If this proportion is more than 50%, it will be considered that the beta coefficients have positive effects on the preferences. % *Proportion positive* denotes the percentage of the population or sample in which a particular coefficient exceeds zero represents the percentage of cases where this relationship is positive, and it facilitates the comprehension of how various individuals in the sample are affected by the variables in the model. The conditional and mixed logistic regression model analysis was applied using STATA based on the reason mentioned above and the suggestion by WHO [28]. The datasets used during the current study and data codes are available from the corresponding author upon reasonable request. More information on the random utility model is provided in Supplementary Material 2.

This study also estimated willingness to pay (WTP) to determine how much income health workers were willing to sacrifice for better working conditions. From the complete research report indexing the price of medical labour wages under the Office of the Permanent Secretary, MOPH, the average income of doctors, dentists and pharmacists was calculated to be 60,405 Baht per month, while those of nurses and interdisciplinary teams was

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43,132 Baht per month [43]. The levels of incomes earned by colleagues who work at the same level in urban areas with defined dummy variables of 20%, 40% and 60% were then calculated and used as a factor in regression models. The WTP values were estimated manually using the beta coefficients of the conditional logistic regression [28].

Results

According to qualitative research, the attributes and levels that affected the work of health professionals in remote areas among different types of health professionals were different. The study found that attributes should be separated into two different categories: 1) physicians, dentists, and pharmacists; and 2) nurses and interdisciplinary teams. These two groups have some different concerns on qualities of living and working and motivating factors, resulting in distinct motivational attributes. The group of physicians, dentists, and pharmacists prioritised motivating aspects such as 1) handling complaints, relating to policy or an administrator who has good relationships with the community and 2) the provision of good facilities and utilities, such as electricity, water, especially internet system which is important for both work and recreational purposes. On the other hand, nurses and interdisciplinary workers placed greater emphasis on 1) working relationships, especially friendships and working relationships among co-workers, and 2) being appointed as a civil servant or government employee. However, there were some attributes both groups shared in terms of comparable characteristics, such as 1) total workload (both during and outside of working hours), 2) opportunities for personal development, short-term training and opportunities to continue study, 3) having a safe and convenient home that provides privacy for both single and family living style, and 4) regular income that includes special allowances given to personnel in remote areas. Furthermore, it was shown that most of the people who work in rural areas have a decent quality of life but may feel overburdened at times due to the variety of responsibilities and high workloads. Climate, local environment, and local living conditions were also factors for working in remote regions. When considering the job, family concerns, particularly parents' health and children's education, were significant. The results also showed that some professionals encountered occupational inequality, which could lead to job dissatisfaction and a lower quality of life. Results from qualitative analysis together with literature review and expert opinions determined the attributes and their levels, including the reference or based variable, used for conducting DCE (Table 1).

The number of respondents and the general information of each group are expressed in Table 2; the majority of them were females, under 45 years old, and single. The current study achieved a response rate of 50.74% among doctors, dentists, and pharmacists, and a response rate of 68.38% among nurses and the interdisciplinary team.

The results from the conditional logit regression model among doctors, dentists, pharmacists, nurses, and interdisciplinary factors are shown in Table 3. Among doctors, dentists, and pharmacists, the factors of professional development opportunities and complaint management did not affect job uptake decisions. The factor that significantly influenced job uptake decisions was the amount of workload. For example, more workload resulted in a reduction of job uptake decisions by 38%. Employment outside their home provinces reduced the job uptake decision to work in remote areas by 42%. Having convenience stores in the area and private house-style accommodation impacted the incremental job uptake decision of health professionals by about 30% and 40%, respectively. The income factor was the most influential factor for decision-making for health professionals to work in rural or remote areas. For a 40% higher income compared to counterparts in a public urban hospital, the odds of the rural job uptake decision was 4.22 times higher; and the odds of the rural decision increased to 8.3 times when the income was a 60% higher (Table 3).

For nurses and interdisciplinary teams, the factors influencing their job uptake decision to work in rural areas were workload, opportunities to continue studying, professional development, working in their hometown, recognition from administrators, private home-style accommodation, and opportunities for civil service enrolment. For this group, the most influential factors for job uptake decision-making were income and employment in their home province. For example, the job uptake decision dropped by around 50% for not working in their home province. As for the income part, an income 40% higher increased the odds of the job uptake decision occurring by 2 times, and an income 60% higher increased the odds of the job uptake decision occurring by three times (Table 3). It is important to recognize that the odds ratios in Table 3 for the first and second qualities in both groups should be interpreted with caution, since they signify disincentives, whereas the other attributes denote incentives.

In terms of WTP analysis, it was found that receiving a subsidy of approximately 8,100 Baht per month would allow doctors, pharmacists, and dentists to work more than 48 h per week. If they do not work in their home province, a subsidy equal to 9,100 Baht per month should be received. For nurses and interdisciplinary teams, a subsidy of approximately 7,700 Baht per month would allow them to work more than 48 h per week. For employment outside of their hometown, a subsidy of

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Table 1 Overview of attributes, attribute levels and their explanations

Doctors, dentists and pharmacists		Nurses and interdisciplinary team	
Attribute	**Levels**	**Attribute**	**Levels**
The same attributes and levels			
Total workload including work hours and outside work hours	1. Less than 48 h per week Reference factor 2. More than 48 h per week (Workmore48) **Note:** Most of the health professionals expressed that health professionals in rural areas had to do overtime, but it should not exceed 6 days per week (under the assumption of working 8 h per day)	Total Workload including work hours and out-side work hours	1. Less than 48 h per week Reference factor 2. More than 48 h per week
Having a job in the home province	1. Work in the same province as the hometown Reference factor 2. Workplace and hometown are different	Having a job in the home province	1. Work in the same province as the hometown Reference factor 2. Workplace and hometown are different
Opportunity for self-improvement	1. Allow for self-improvement Reference factor 2. Allow for self-improvement and the possibility of additional study (e.g. specialist training)	Opportunity for self-improvement	1. Allow for self-improvement Reference factor 2. Allow for self-improvement and the possibility of additional study (e.g. short-term training, higher degree study)
Overall Income	1. Earning the same overall salary as counterparts working in urban areas. Reference factors 2. Earning 20% more than counterparts working in urban areas 3. Earning 40% more than counterparts working in urban areas 4. Earning 60% more than counterparts working in urban areas	Overall Income	1. Earning the same overall salary as counterparts working in urban areas Reference factors 2. Earning 20% more than counterparts working in urban areas 3. Earning 40% more than counterparts working in urban areas 4. Earning 60% more than counterparts working in urban areas
Different attributes and levels			
Ability to manage complaints	1. There is a well-organised and efficient mediation process. Reference factor 2. There is an efficient mediation process and the directors are concerned about this issue	Work relationship	1. Teamwork and positive relationships with co-workers Reference factor 2. Teamwork, positive relationships with co-workers, and the recognition of the importance of work by the director
Having sufficient facilities	1. Having high-speed internet Reference factor 2. Having high-speed internet and convenient stores	Opportunity to be a civil servant or government officer	1. Getting normal opportunity Reference factor 2. Having more opportunities compared to counter-parts working in urban areas
Having accommodation	1. Convenient and safe flat for residence (Flat) Reference factor 2. Convenient and safe flat for residence (House) **Note:** In this group, generally they get a private resident	Having accommodation	1. Share house with others Reference factor 2. Having a private house **Note:** In this group, generally they get a sharing based resident

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Table 2 General characteristics of respondents

Details		Doctors, Dentists and Pharmacists		Nurses and interdisciplinary team	
		Number (persons)	Percentage	Number (persons)	Percentage
Gender	Male	13	38.24	35	21.87
	Female	21	61.76	125	78.13
	Total	**34**	**100**	**160**	**100.00**
Age	20–34 yrs	17	50.00	100	62.50
	35–44 yrs	14	41.18	29	18.13
	>45 yrs	3	8.82	31	19.37
	Total	**34**	**100**	**160**	**100.00**
Marital Status	Married and living together	8	23.53	62	38.75
	Married but not living together	5	14.71	21	13.12
	Single	18	52.94	69	43.13
	Widowed	3	8.82	2	1.25
	Divorced	0	0	6	3.75
	Total	**34**	**100**	**160**	**100.00**

Table 3 Factors affecting health workers' rural work decisions: odds ratios from conditional logistic regressions

Doctors, Dentists and Pharmacists			Nurses and interdisciplinary team		
Choice	Odds Ratio	*P* > z	Choice	Odds Ratio	*P* > z
Working more than 48 h per week	0.623 (0.497, 0.780)	< 0.001	Working more than 48 h per week	0.715 (0.654, 0.782)	< 0.001
Employment beyond one's hometown	0.588 (0.471, 0.733)	< 0.001	Employment beyond one's hometown	0.476 (0.435, 0.522)	< 0.001
Opportunities to continue study	0.957 (0.758, 1.207)	0.710	Opportunities to continue study	1.198 (1.096, 1.309)	< 0.001
Higher income than their counterparts working in urban areas by 20%	1.591 (1.064, 2.377)	0.024	Higher income than counterparts working in urban areas by 20%	1.355 (1.167, 1.573)	< 0.001
Higher income than their counterparts working in urban areas by 40%	4.227 (2.678, 6.673)	< 0.001	Higher income than their counterparts working in urban areas by 40%	1.985 (1.677, 2.350)	< 0.001
Higher income than their counterparts working in urban areas by 60%	8.273 (5.125, 13.353)	< 0.001	Higher income than their counterparts working in urban areas by 60%	3.072 (2.608, 3.618)	< 0.001
Management pays attention to complaints	0.922 (0.696, 1.221)	0.571	Recognition from administrators	1.176 (1.075, 1.286)	0.007
Having a good internet system, convenience stores	1.286 (1.021, 1.620)	0.033	Faster enrolment in civil service compared to urban employees	1.339 (1.225, 1.464)	< 0.001
Comfortable accommodation	1.382 (1.076, 1.775)	0.011	Private accommodation	1.273 (1.163, 1.393)	< 0.001
Constant	1.006 (0.753, 1.343)	0.968	Constant	1.198 (1.098, 1.308)	< 0.001

The numbers in parentheses represent the 95% confidence intervals for the odds ratio

approximately 17,000 Baht per month will be needed, as detailed in Table 4.

In addition, it was found that the results from the conditional and mixed logistic were consistent in terms of the directions of regression coefficients. However, the beta coefficients for the conditional logit model are slightly lower than those of the mixed logit model (Tables 3 and 5).

In Table 5 The results show that, for the group of doctors and others, the proportion positive indicated a good internet system close to convenience stores, comfortable home, and a total income of more than 60%. For nurses

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Table 4 Willingness to pay of health workers' decisions

Doctors, Dentists and Pharmacists				Nurses and interdisciplinary team			
Choice	WTP (Baht)	95% confidence interval (Baht)		Choice	WTP (Baht)	95% confidence interval (Baht)	
Working more than 48 h per week	8125.6	3476.9	15,442.4	Working more than 48 h per week	7733.3	4925.6	11,502.4
Employment beyond one's hometown	9108.5	4347.6	16,601.9	Employment beyond one's hometown	17,109.3	13,083.9	22,513.0
Opportunities to continue study	N/A	N/A	N/A	Opportunities to continue study	−4195.5	−5449.0	−2512.7
Management pays attention to complaints	N/A	N/A	N/A	Recognition from administrators	17,109.3	13,083.9	22,513.0
Having a good internet system, convenience store	9108.5	4347.6	16,601.9	Faster enrolment in civil service compared to urban employees	−6670.6	−7610.6	−5408.7
Comfortable accommodation	−5551.6	−8047.8	−1622.7	Private accommodation	−5541.5	−6658.6	−4041.8

Table 5 Financial and non-financial incentive factors affecting health workers' decisions to work in rural or remote areas using a mixed logit model in the form of mean and standard deviation of beta coefficients

Doctors, Dentists and Pharmacists				Nurses and interdisciplinary team			
Choice	Mean of Beta	S.D. of Beta	%Pos	Choice	Mean of Beta	S.D. of Beta	%Pos
Working more than 48 h per week	−0.707***	0.977***	23.49	Working more than 48 h per week	−0.552***	0.784***	24.06
Employment beyond one's hometown	−0.844***	1.118***	22.51	Employment beyond one's hometown	−1.224***	1.547***	21.44
Opportunities to continue study	−0.050	0.256	N/A	Opportunities to continue study	0.310***	0.487***	73.82
Higher income than their counterparts working in urban areas by 20%	0.722***	0.206	N/A	Higher income than their counterparts working in urban areas by 20%	0.511***	−0.012	N/A
Higher income than their counterparts working in urban areas by 40%	2.223***	0.149	N/A	Higher income than their counterparts working in urban areas by 40%	1.153***	−0.030	N/A
Higher income than their counterparts working in urban areas by 60%	3.654***	1.674***	98.55	M Higher income than their counterparts working in urban areas by 60%	1.898***	1.212***	94.13
Management pays attention to complaints	−0.143	0.490	N/A	Recognition from administrators	0.253***	0.410***	73.14
Having a good internet system, convenience store	0.409**	0.590**	75.61	Faster enrolment in civil service compared to urban employees	0.471***	0.680***	75.57
Comfortable accommodation	0.519***	0.552***	82.65	Private accommodation	0.404***	0.782***	69.75
constant	−0.061	N/A	N/A	constant	1.899***	N/A	N/A

* $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$

and interdisciplinary teams, the proportion positive also indicated private accommodation, faster opportunities for civil service, and an income of more than 60%.

Discussion

Both qualitative and quantitative research found that the most important incentive was income or allowance received, which is consistent with the theory of incentive explaining the influence of wages and salaries affecting people to work, such as the theories of Herzberg and Maslow [44–46]. Regarding Herzberg, salary is considered a maintenance factor, an important factor to make employees feel satisfied, while motivation factors are

incentives to encourage employees to gain more potential [44]. Maslow 's theory consistently indicated that physiological needs are the basic requirements for humans; appropriate wages and salaries reflect the first level of requirements based on Maslow's concept [45, 46]. A previous DCE study in Thailand found that a pay raise was a motivational factor influencing newly graduated nurses decided to choose the temporary (contracted) position. If their salary was a 30–40% higher than the salary for a civil servant, the temporary registered nurses would decide to stay on the unstable position 3–4 times more [38], which was consistent with the decisions made by doctors to work in rural areas. In Thailand, Thai government have

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had financial incentive policy. For example, there is an additional compensation of 30,000–60,000 Baht for doctors and dentists and 3,000–5,000 Baht for nurses and interdisciplinary team who work in the most economically challenged districts [12]. In healthcare settings of Ethiopia, extra allowances and monetary rewards can be valuable tools for boosting motivation in the public sector if they reinforce the values of public service and are linked to performance that aligns with organizational goals [25]. The other study in Vietnam analysed the impact of team support and financial incentives on public service motivation. The research focused on employees in various public agencies, highlighting how well-structured financial rewards can enhance employee motivation in the context of an emerging economy [47]. This approach supports the idea that financial rewards can be effective if they are viewed as recognition for the sacrifices made, rather than as primary motivators. Although the results of the study support those extra allowances, the proper rate and proper different rates between sorts of health workforce should be considered and investigated in the future.

Part from financial incentives, working in home provinces was highly significant factor influencing working in rural and remote areas; this aspect was determined to be crucial among physicians, dentists, pharmacists, nurses, and the interdisciplinary team. According to the current DCE result, it was in line with the findings of the earlier study [5, 11]. The study by Pagaiya et al. [11] found that newly graduated physicians were 3.5 times more likely to choose rural placements if the location was near their hometown. The Thai government's CPIRD and ODOD initiatives strategically recruit high school graduates from rural areas into medical programs, resulting in significantly higher retention rates in rural placements compared to the standard track, particularly during the initial three years of service [48]. The ODOD program mandates a 12-year service obligation or an alternative penalty of 56,000 USD [49]. Over the past 15 years, graduates from the CPIRD and ODOD tracks have consistently accounted for 39% of new physician recruits in community hospitals annually, demonstrating lower attrition rates relative to standard track physicians [48, 49]. This study confirms the importance of interventions supporting health professionals willing to work in rural areas close to their hometowns. However, further research is needed to determine the long-term effects on the retention of rural health personnel. The study in China highlighted that public employees exhibit stronger motivation and lower turnover intentions when they can work near their hometowns. This sense of proximity to one's place of origin fosters greater job satisfaction and organizational commitment, as employees feel more connected to the community they serve [50]. Other research also noted that factors such as working conditions and job resources, including proximity to family, play a critical role in enhancing public service motivation by reducing personal stress and increasing employees' sense of purpose [51]. These findings suggest that creating opportunities for employees to work closer to their hometowns can effectively complement traditional incentives in promoting long-term commitment and motivation in the public sector.

One of the solutions for retaining health professionals might be a higher opportunity for civil service enrolment for rural employees compared to urban employees. The current study determined that fostering opportunities can increase health professionals working in remote areas by 1.3 times. Note that, the policy of limiting the number of civil servants in Thailand, not all nurses employed in public hospitals hold civil servant positions. Contracted (temporary) nurses are covered under the Social Security Scheme (SSS) instead of the Civil Servant Medical Benefit Scheme (CSMBS) of the permanent public nurses [52]. The Thailand Nursing and Midwifery Council [53] highlighted the lack of civil service positions and unfair hiring contracted nurses as the major cause of nurse shortage in public sector. Although the Government has assigned more civil servant positions to the MOPH, the quantity of these positions remains insufficient to address the issue of manpower scarcity. This study found that the opportunity to be a civil servant is an attribute for nurses and interdisciplinary teams, but not for doctors, dentists, and pharmacists. The Chairman of the University Hospital Network (UHOSNET) Board voiced three criteria identified as the causes for physician resignations from public sector: 1) heightened workload, 2) younger generation's perspectives on financial incentives, continuing education, and the potential consequences of legal action and 3) the surge in demand for healthcare professionals in both domestic and international hospitals following the COVID-19 pandemic [54]. Comparing to other factors, being a civil servant was less important for medical doctors. Further evidence would be needed to explore, which would lead to national policy might differ between these two groups. The opportunity to become a government officer is closely linked to retentions and performance improvements through its impact on PSM. According to Bright [55] in 2007 individuals who see government service as a means to fulfill their motivation to serve the public are more likely to experience higher job satisfaction and organizational commitment, which translates into better performance outcomes. Similarly, Perry & Wise [21] argued in 1990 that PSM-driven individuals are more inclined to seek

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public sector jobs, where their values align with the mission of serving society, thereby boosting their job engagement and effectiveness. The clear career opportunities, such as the chance to become a government officer, act as motivators that not only attract PSM-oriented individuals but also sustain high performance through role satisfaction and professional growth [56]. These findings suggest that providing structured career paths in government agencies can reinforce intrinsic motivations, ultimately leading to enhanced performance and a more committed workforce.

In terms of workload, the study indicated that a fair amount of workload affected employees' decisions to work in remote areas. This study found that working more than 48 h per week can be compensated with 7,000–8,000 Baht higher. This is in line with a previous study that indicated that doing 14 shifts per month decreased the worker's decision to work in remote areas by 10% compared to doing 7 shifts per month [11]. According to previous research, excessive workloads categorized as "hindrance demands" reduce PSM, leading to lower job satisfaction and decreased motivation due to resource depletion and burnout [51]. Similarly, Chen et al. [57] found in 2023 that high job demands, when perceived as unmanageable, undermine employees' intrinsic motivation, which is critical for maintaining high PSM and engagement. To counteract these effects, the provision of job resources, such as managerial support and skill development opportunities, can help sustain PSM by enhancing employees' ability to cope with high demands. This approach ensures that challenging workloads are seen as opportunities rather than obstacles, maintaining motivation even under high-pressure environments.

Having private, convenient, and safe accommodation was the other significant factor. Physicians, dentists and pharmacists are particularly concerned about having convenient stores and a stable internet system. Some of them stated that these factors played a part in keeping them feeling relaxed and benefited in terms of entertainment. Managing workload, home repair or accommodation arrangements depends on the policy and the budget of each hospital. The directors of hospitals in relevant areas should place importance on planning and providing proper accommodation as well as workload to retain health professionals and maintain the size of the workforce. Typically, the decision-making process for health workforce employment in rural areas associated with extrinsic motivation. This finding is consistent with earlier research with different targeted population conducted by the DEC in Thailand [11, 37, 38]. However, further research may be necessary to examine intrinsic motivation, which is crucial for the long-term retention of the health staff.

There were some strengths and limitations in the achievement of this study. One limitation of this study was small sample size. Only 4 areas were purposively selected, which comprised both rural and remote areas of a high mountain with low population density and located far from the city. Also, regarding the response rate of this study of around 60% on the average, the study might have non-response bias that could affect the generalizability of the findings. However, this sample size was adequate to working on DCE analysis: the sample size of DCE should not less than 30 [58] and a review study on DCE found that the average response rate was 50% [59]. The qualitative aspect is an important part of this study. Therefore, the attributes reflect the actual preferences of the health professionals having experience in working in rural and remote areas. The current DEC study samples have been working in remote locations, which differs from most studies exploring the attitudes of fresh graduates who have never worked [60–62], and then demonstrate the key factors in keeping health workers in the areas. The use of the study results for other areas with different contexts and different parts of Thailand may be limited. Other significant factors may be discovered due to differences in the cultures and traditions of Thailand's health workforce. Furthermore, the WTP rate would vary, since differences in purchasing power. Technically, the mixed logit model is more flexible and better suited to a correlation between alternatives and preference heterogeneity than the conditional logit model, even though both can be used to analyse discrete choice data [63]. However, mixed logit might lead to more complex computations and fewer comprehensible coefficients, e.g. computing choice probabilities for particular scenarios, which is frequently used in the model interpretation stage [64]. This study used both methods with their pros and cons and found consistent results indicating reliable conclusions regardless of the technology used. The results of this study could lead to proposed policy development to motivate health professionals to stay and work in remote areas of Thailand as well as help other countries having similar situations to provide adequate health services. Not only can national policies proposed by the Ministry of Public Health for Health be aided, but some of the results of this study can support area- or hospital-based policies related to medical workforce management to be more balanced and effective. This will also enable a sustainable healthcare service system in the long run.

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Conclusion

This article demonstrates the preference attributes or incentives on health workforce willing to work in rural and remote areas with public service motivation. This study used qualitative and DCE technique to reveal the opinions of healthcare workers. There were two target groups of the study: 1) Doctors, dentists and pharmacists and 2) Nurses and interdisciplinary team. Apart from small sample size, the current study confirmed that 1) providing financial subsidies to healthcare professionals in rural and remote locations remains a necessary and beneficial policy and 2) policy interventions supporting health workforce able to work in hometown are still needed. Both of them should be domestic policies. The results of this study also indicate an importance of hospital-level policy. The administrator of a hospital might consider offering appropriate, secure, and gratifying accommodations as hospital plan for retaining health staff in the hospitals.

Abbreviations

CPIRD   Collaborative project to increase production of rural doctors
DCE   Discrete choice experiment
MOPH   Ministry of public health
PSM   Public service motivation
WTP   Willingness to pay

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12913-025-12408-2.

> Supplementary Material 1.
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> Supplementary Material 2.
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> Supplementary Material 3.
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> Supplementary Material 4.
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> Supplementary Material 5.

Authors' contributions
P.P., A.S, S.P. and N.K. have made substantial contributions to the conception, design, and interpretation of this research. P.P. took mainly responsible for the part of quantitative analysis while A.S. focused on the part of qualitative analysis. P.P., A.S, S.P. designed the steps to conduct discrete choice experiment. A.S. and P.P. designed the discrete choice experiment questionnaires and collected both quantitative and qualitative data. P.P. and N.K. analysed quantitative data and were responsible for analyzing the regression models. N.K. interpreted the regression results and wrote in the manuscript. A.S. analyzed qualitative data. P.P. was the main person who wrote the first draft of this manuscript. N.K. particularly wrote the part of modelling technique. N.K., S.P. and A.S. read through the manuscript and revised. All authors read and approved this final manuscript.

Data availability
The datasets used during the current study and data codes are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
This research was reviewed by the Human Research Ethics Committee of Naresuan University (COA No. 036/2019 and IRB No. 1066/61) in accordance with the Declaration of Helsinki, The Belmont Report, CIOMS Guideline and International Conference on Harmonization in Good Clinical Practice (ICH-GCP). The informed consent to participate was obtained from all of the participants in the study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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