ORIGINAL ARTICLE

Factor analysis of the village health volunteers' core competencies in Thailand

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ABSTRACT

This survey research aimed to study the VHVs' core competencies, in particular by analyzing the VHVs' Competency Standards developed in 2007 in Thailand. The research used multistage probability random sampling. A total of 500 samples were collected from four regions in country through administering a questionnaire. The IOC was 0.70 –1, the CVI was 1, and the Cronbach's alpha coefficient was 0.98. Exploratory factor analysis was deployed with principal component analysis and the Promax method for factor extraction and rotation. The sampling adequacy was verified with appropriate values (KMO = 0.96 and MSA values for each item ranging from 0.94 - 0.98 and Bartlett's Test of Sphericity ($p < 0.001$)). The results demonstrated that there are seven core competencies for VHVs as follows: 1) Empowering children and youth to engage in community healthcare development, 2) Health promotion, 3) Disease prevention, 4) Basic medical care, 5) Policy implementation, 6) Fostering self-care awareness, and 7) Health risk monitoring and precaution. All competencies explained 70.02% of the variance. The results could serve as guidelines for developing VHVs' competencies to deliver high-quality healthcare services in the community.

Key words:
core competency; village health volunteers; competency standards

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INTRODUCTION

Village Health Volunteers, or VHVs, originated from the health development approach based on the principles of Primary Health Care (PHC) as specified in the Declaration of Alma-Ata. Thailand adopted these principles to develop the country's health system in 1978, emphasizing community involvement in taking care of their own health.[1] Afterwards, the MOPH initiated the VHV project by targeting the villagers who had willingness, voluntary spirit, and acceptance by their neighbors. The MOPH provided them with training to enhance their knowledge and skills in healthcare. This training was conducted by the MOPH 's service units, and those trained were appointed as VHVs to carry out healthcare duties in their communities.[2] Their responsibilities can be summarized by the motto: "Correcting misinformation, disseminating positive information, guiding public health services, coordinating public health activities, alleviating the suffering of the people, and serving as good role models".[3] Currently, there are more than one million VHVs in the country and they serve as a crucial PHC workforce under the MOPH.[4] Capacity-building plans for VHVs are formulated by the MOPH regularly to enhance their knowledge and skills.[17]

However, it has been observed that VHVs lack knowledge and skills related to their duties, such as note-taking skills,[5] health education,[6] and proficiency in employing utility tools.[7] Their writing and reading comprehension skills were at a moderate level.[8] Moreover, their provision of postnatal care, surveillance of malnutrition in children, nursing care, and pharmaceutical dispensing are also limited.[9] These findings indicate that past competency development efforts have not fully addressed the diverse competencies required by individual VHVs. Competency development should be continuous and aligned with competency standards, particularly for those who play community healthcare roles, such as Community Health Workers (CHWs).[10] Thailand's MOPH established the VHVs' Competency Standards in the Standard Training Course Manual developed in 2007. There are seven domains as follows: 1) Policy implementation, 2) Leadership in providing basic medical care, disease prevention, health promotion, and health risk monitoring, 3) Establishment and management of health care networks, 4) Community mobilization to raise awareness of self-care and responsibility in the community and environment, 5) Preparation and development of new social measures that reduce and eliminate health problems, 6) Public awareness in healthcare surveillance, and 7) Facilitating opportunities for children and youth to engage in healthcare development in the community.[3]

However, until now there has been no detailed definition provided for the VHVs' Competency Standards. According to the process of applying competencies for human resources development, there must be clear definitions and observable behaviors[11] and variables within the same domain should be highly interrelated.[12] The method of grouping related variables into the same variable is known as Factor Analysis.[12] This analytical method has been utilized for defining competencies in various studies such as "Development of indicators of the transformational leadership behavior of head nurses in private hospitals in Thailand"[13] or "Assessing emergency nurses' clinical competency: An exploratory factor analysis study"[14] or "Development of indicators of the personal initiative behavior of head nurses at private hospitals in Thailand"[15] or "Development and validation of an instrument for measuring competencies on public health informatics of primary healthcare workers in Indonesia".[16]

Thus, this research aimed to study the VHVs' core competencies by examining the VHVs' Competency Standard. The study adopted a survey research design and employed Exploratory Factor Analysis as the main statistical analysis technique. The study results were expected to provide a better understanding of VHVs' core competencies in Thailand, and could also serve as a guideline for formulating tailored capacity-building plans for VHVs. Ultimately, this will help VHVs deliver high-quality healthcare services to the people.

METHODS

Study design and population

This study used a survey research design. In the fiscal year 2023, there were 1,039,729 VHVs in Thailand.[17] The sample size was determined using Factor Analysis statistics. This is in line with the guidelines of Comrey and Lee (1992)[46], who recommended a sample size of 500.[18] Thus, 500 samples were collected, and a multi-stage probably random sampling design was employed[19] as follows. First, the total population was divided into four sub-groups based on regions in Thailand, and the sample size ratio in each region was determined. Then, one province was selected from each region using simple random sampling. Similarly, one district and sub-district were chosen using the same random sampling approach. Finally, the population in each sub-district was selected through lottery random sampling, based on the sample size from the first stage.

Research instrument

The research instrument used was the questionnaire, "Core competency components of VHVs in Thailand". The questionnaire was developed based on the VHV's Competency Standard in the Standard Training Course Manual 2007[3] and its quality was verified by three experts. The questionnaire had an IOC between 0.70 – 1.00, while the CVI = 1. After that, the questionnaire was tried out with a group of VHVs who had similar characteristics to those of the sample group. The reliability of the whole questionnaire was analyzed through the Cronbach's alpha coefficient, with a value of 0.98, which is considered an acceptable value.[20]

Data collection procedures

The data were collected by research assistants, and they supervised and facilitated the data gathering process. The researcher briefed the assistants on the research objectives and process, and protection of the rights of sample group members. The research assistants administered the questionnaires, performed a thorough check of the answer sheets, and sent the completed sheets back to the researcher by post.

Data analysis

The statistical analysis was carried out using IBM Statistical Product and Service Solution Version 26.0 software. Descriptive statistics were employed including the percentage, mean, median, and standard deviation of the data. Inferential statistics were also used to conduct Exploratory Factor Analysis (EFA) by applying the following steps:

1. EFA assumptions were verified by KMO-MSA > 0.5 and Bartlett's Test of Sphericity (sig < 0.001).[21,22]

2. Factor extraction was conducted using Principal Component Analysis (PCA), selecting components with Eigen values > 1 and a cumulative percentage of variance exceeding 60%.[23]

3. Factor rotation was performed using the Promax method, then considering the following criteria: 1) Eliminating variables with communalities below 0.5[24], 2) Eliminating variables with dual loading and differences less than 0.2[24], 3) Selecting variables with factor loading greater than 0.6[24], 4) Ensuring that there are more than two variables remaining for each factor,

and that the meaning of the questions is consistent.[24] Finally, new names are assigned to each competency.[24]

Ethical approval

The research was approved by the Human Research Ethics Committee, Mahasarakham University. No. 058-446/2023. Certification date: February 17, 2023 – February 23, 2024.

RESULTS

Participant characteristics

It was found that the majority of the participants were female (411 persons, accounting for 82.20%). Their ages were between 51-60 years old (210 persons, accounting for 42.00%), with the mean age of 54.39 years old (S.D.= 10.25, Min = 24, Max = 87). Most of them held a primary school qualification (266 persons, accounting for 53.20%). They had a duration of serving as VHVs between 11-20 years (195 persons, accounting for 39.00%), with the average duration of 15.02 years (S.D.= 9.24, Min = 1, Max = 39). Most of them had received training within the past year (437 persons, accounting for 87.40%), and they did not hold any other positions in their community (277 persons, accounting for 55.40%).

Participant competency level

The competency level of the participants was found to be at a good level overall ($\bar{x}$=3.62, S.D.=0.59). Moreover, the competency level in each dimension was also at a good level, including: 1) Policy implementation (mean=3.75, S.D.=0.53), 2) Leadership in providing basic healthcare, disease prevention, health promotion, and health monitoring (mean=3.69, S.D.=0.54), 3) Establishment and management of healthcare networks (mean=3.49, S.D.=0.62), 4) Community mobilization to raise awareness of self-care and responsibility in the community and the environment (mean=3.70, S.D.=0.59), 5) Preparation and development of new social measures that eliminate and reduce health problems (mean=3.50, S.D.=0.63), 6) Public awareness in healthcare surveillance (mean=3.76, S.D.=0.59) and 7) Facilitating opportunities for children and youth to engage in healthcare development in the community (mean=3.47, S.D.=0.66).

The VHVs' core competencies in Thailand

The VHVs' core competencies in Thailand were examined by EFA for seven rounds. It was found that there are seven core competencies as follows: 1) Facilitating opportunities for children and youth to engage in healthcare development in the community, 2) Health promotion, 3) Disease prevention, 4) Basic medical care, 5) Policy implementation, 6) Fostering self-care awareness, and 7) Health risk monitoring and precautions. Each competency can explain 70.02% of the variance, with the remaining 48 questions. The analysis was undertaken through the following steps:

1) The sampling adequacy was verified with appropriate values supported by a KMO value of 0.967 and MSA values for each item ranging from 0.945 - 0.987, while statistical significance was confirmed through Bartlett's Test of Sphericity (Chi-square=20099.76, df=1128, p-value < 0.001) (Table 1).

Table 1. Analysis of sampling adequacy (n = 500)

Statistics		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy: KMO-MSA		0.967
Bartlett's Test of Sphericity	Approx. Chi-square	20099.76
	Df	1128
	p-value	<0.0001*

* *p*-value < 0.001

2) Factor extraction

The factors were rotated using the Promax method. After examining the seven rounds, it was observed that there were no variables with communalities lower than 0.5, indicating a good proportion of common variance in each variable. Furthermore, there were no variables with dual-factor loading and factor loading values lower than 0.6. This indicates that the 7th round of EFA can categorize factors and variables clearly. The statistical values remained relatively constant. It was also found that there were seven factors, with factor No. 1 having the highest variance value (45.91%) and factor Nos. 2 - 7 having variance values between 2.39 – 8.50%, while the percentage of cumulative variance value was 70.02% (Tables 2-3).

Table 2. Factor extraction

Component	Eigen value	Percentage of variance	Percentage of cumulative variance
1	22.04	45.91	45.91
2	4.08	8.50	54.42
3	2.05	4.28	58.70
4	1.69	3.53	62.24
5	1.32	2.76	65.00
6	1.26	2.63	67.63
7	1.14	2.39	70.02

Table 3. VHVs' Core Competencies components

Item	Factor Loading
Factor 1 (10 items)	
y6: Capability of coordinating or supporting the equipment for children and youth groups to facilitate health activities	0.93
y5: Capability of supporting the formation of children and youth groups for health development activities	0.87
y7: Capability of collaborating with the community to organize physical exercise activities for children and youth groups	0.85
y3: Capability of collaborating with schools to organize health promotion activities for students	0.83
y1: Capability of compiling data on children and youth, within and outside the school system	0.82
y8: Capability of coordinating and encouraging children and youth groups to participate in drug abuse prevention activities	0.81

Item	Factor Loading
y2: Capability of providing information on children and youth both within and outside the school system to related authorities	0.80
y9: Capability of encouraging and providing knowledge to children and youth groups about road safety measures	0.79
y4: Capability of collaborating with local government organizations to organize health promotion activities for children and youth	0.68
y10: Capability of providing opportunities for children and youth to express their ideas for community health development	0.63
Eigenvalue = 22.04, % of Variance = 45.91, Cronbach's Alpha Coefficient = 0.95	
Factor 2 (9 items)	
lpm7: Capability of providing guidance on early antenatal care (before 12 weeks of pregnancy)	0.91
lpm6: Capability of monitoring the nutritional status of children aged 0-5 years, such as child's weight and height	0.85
lpm8: Capability of providing advice on breastfeeding	0.84
lpm4: Capability of tracking children aged 0-5 years for scheduled vaccinations	0.82
lpm5: Capability of providing advice and assessing child development	0.70
lpm1: Capability of advising on the importance of immunization in children aged 0-5 years old	0.66
lpm3: Capability of providing advice on pre-post vaccination procedures and vaccination side effects	0.65
lpm2: Capability of providing advice on key symptoms of vaccine-preventable diseases	0.64
lpm9: Capability of using screening and assessing health tools and recording data, such as mental health assessment tools and elderly screening forms	0.63
Eigenvalue = 4.08, % of Variance = 8.50, Cronbach's Alpha Coefficient = 0.93	
Factor 3 (8 items)	
lpv3: Capability of identifying the initial symptoms of infectious diseases that are problematic in the community	0.87
lpv2: Capability of identifying the causes of infectious diseases that are problematic in the community	0.85
lpv7: Capability of identifying risk behaviors for non-communicable diseases, such as diabetes, hypertension, and stroke	0.79
lpv8: Capability of using non-communicable disease screening tools, such as diabetes and hypertension screening forms	0.74
lpv6: Capability of identifying important risk factors for non-communicable diseases, such as diabetes, hypertension, and stroke	0.73
lpv1: Capability of explaining the seasonal outbreaks of infectious diseases that are problematic in the community area, such as dengue fever, leptospirosis, hand-foot-mouth disease, conjunctivitis, and diarrhea	0.72

Item	Factor Loading
lpv4: Capability of explaining the prevention and control of infectious diseases that are problematic in the community	0.64
lt9: Capability of using medical equipment, such as sphygmomanometer, thermometer, blood glucose meter, vision chart, and dressing kit	0.60
Eigenvalue = 2.05, % of Variance = 4.28, Cronbach's Alpha Coefficient = 0.92	
Factor 4 (5 items)	
lt3: Capability of providing advice for symptoms relief, such as fever, headache, cough, and muscle pain	0.85
lt4: Capability of safely and correctly storing drugs	0.81
lt5: Capability of identifying expired or deteriorated drugs	0.79
lt2: Capability of using nonprescription drugs to relieve symptoms, such as cough remedies, fever reducers, pain relievers, allergy drugs, wound care products, and herbal remedies	0.75
lt6: Capability of explaining to neighbors how to use medications appropriately as per necessity or as recommended by a physician	0.70
Eigenvalue = 1.65, % of Variance = 3.53, Cronbach's Alpha Coefficient = 0.89	
Factor 5 (5 items)	
p2: Capability of understanding the meaning and objectives of the Ministry of Public Health's policy	0.90
p1: Capability of receiving information about the Ministry of Public Health's policy from health officials	0.85
p3: Capability of understanding the details of the Ministry of Public Health's policy	0.83
p4: Capability of communicating verbally with neighbors one-on-one to inform about important policies	0.73
p10: Capability of collaborating with other VHVs to implement the policy as a team	0.64
Eigenvalue = 1.32, % of Variance = 2.76, Cronbach's Alpha Coefficient = 0.88	
Factor 6 (6 items)	
sc4: Capability of providing self-care advice to neighbors who have health problems	0.91
sc3: Capability of persuading neighbors to participate in healthcare and self-care activities	0.78
sc5: Capability of encouraging and supporting neighbors who are willing to take care of their own health	0.76
sc6: Capability of coordinating for healthcare activities	0.74
sc2: Capability of explaining to neighbors about the necessity of taking care of their health	0.73
sc1: Capability of serving as a role model for individuals and families	0.68
Eigenvalue = 1.26, % of Variance = 2.63, Cronbach's Alpha Coefficient = 0.91	

Item	Factor Loading
Factor 7 (5 items)	
lsv1: Capability of monitoring news and other situations that impact neighbors' health	0.83
lsv5: Capability of coordinating with relevant organizations for health risk prevention	0.82
lsv2: Capability of searching healthcare knowledge from accurate sources	0.77
lsv4: Capability of alerting neighbors about health risks	0.74
lsv3: Capability of making observations and verifying information that may be false	0.72
Eigenvalue = 1.14, % of Variance = 2.39, Cronbach's Alpha Coefficient = 0.90	

3) Internal consistency and new names of the competencies

The overall scale internal consistency of the Cronbach's alpha coefficients was 0.97, and each dimension ranged from 0.88 to 0.95. Item-total correlation ranged from 0.60 to 0.81. Furthermore, a new name was assigned to the competencies (Table 4).

Table 4. Internal consistency of the VHVs' Core Competencies in Thailand.

Core Competency	Number of items	Cronbach's alpha	Mean	Standard division	Range of Item-total correlation
1. Facilitating opportunities for children and youth to engage in health care development in the community	10	0.95	3.47	0.66	0.73-0.81
2. Health promotion	9	0.93	3.68	0.61	0.72-0.78
3. Disease prevention	8	0.92	3.64	0.64	0.67-0.79
4. Basic medical care	5	0.89	3.86	0.61	0.70-0.78
5. Policy implementation	5	0.88	3.96	0.56	0.60-0.80
6. Fostering self-care awareness	6	0.91	3.76	0.59	0.69-0.80
7. Health risk monitoring and precaution	5	0.90	3.65	0.62	0.72-0.78
	48	0.97			

DISCUSSION

This research was conducted with a large-scale sample group. The sampling adequacy was verified as the test measures sampling adequacy was accepted by a KMO value of 0.967 and MSA values for each item ranging from 0.945 - 0.987, while statistical significance was confirmed through Bartlett's Test of Sphericity (Chi-square= 20099.76, df=1128, p-value < 0.001).[21,22] The study's findings clearly demonstrated that a systematic study can exhibit the details of core competencies through behaviorally specific measurement. EFA was employed to categorize indicators with related characteristics into the same factors.[12] The indicators were classified into seven factors, in alignment with Reise et al. (2000) who suggested that if too few factors are extracted, a researcher may miss important distinctions among the items, and

the subsequently rotated solution may be distorted in nonsystematic ways.[25] However, if too many factors are retained, some rotated factors may be ill defined with only one or two salient loadings.[26] The findings revealed that there are 5-10 indicators in each factor. Thus, if there are few indicators in each factor, it will affect the content validity and it will not adequately cover the content of the underlying variables.[26] Therefore, this study reduced the number of indicators from 88 to 48, focusing on indicators with high interrelatedness. The seven dimensions were extracted with 70.02% of the total percentage of variance explained, which was acknowledged as adequate in capturing the main features of the phenomenon.[22] The results of Cronbach's alpha and item-total correlation showed good homogeneity. The range of each dimension of Cronbach's alpha was 0.88 to 0.95. It can be concluded that the items in each dimension are adequate samples of content represented in each dimension.[20]

The VHVs' core competencies across the seven factors had both similarities and differences when compared to the VHVs' competency standards as follows:

1) Facilitating opportunities for children and youth to engage in community healthcare development activities: this conforms to the VHVs' competency standards 2007.[3] Moreover, this is also expressed in the global health development direction announced by the WHO in the Global Strategy for Women's, Children's, and Adolescents' Health 2016-2030. The strategy suggests good health outcomes for adolescents.[27] This competency will be an important starting point to encourage the younger generation to address health issues in their communities. In the future, these new generations may become VHVs. According to the demographic structure of Thailand population, the country is undergoing a transition into an aging society.[28]

2) Health promotion: this differs from the VHVs' competency standards 2007, which define this competency as a sub-competency under the competency of leadership in health promotion, disease prevention, basic healthcare, and health surveillance.[3] However, this study has demonstrated health promotion as a core competency. This competency has been acknowledged as a significant element since the development of the PHC principle by identifying it as one component of the 14 Essential Primary Health Care [EPHC].[29] This is also in line with the WHO's suggestion that CHWs should undergo training courses in health promotion as part of the core competencies.[10] Moreover, it represents an expected competency for the PHC workforce in the 21st century.[37] This is also consistent with various studies that emphasize the importance of health promotion as a core aspect of VHVs' roles and responsibilities.[9,30,31]

3) Disease prevention: this also differs from the VHVs' competency standards 2007, which define this competency as a sub-competency under the competency of leadership in health promotion, disease prevention, basic healthcare, and health surveillance.[3] However, this study revealed it as a core competency. This competency has also been acknowledged as a significant element since the development of the PHC principle by identifying it as one of the 14 EPHC.[29] These days, disease outbreaks are unprecedented and occur rapidly. There are consistently emerging infectious diseases that previous knowledge cannot adequately address. Thus, this competency has become an anticipated skill of the primary healthcare workforce in the 21st century.[37] This conforms to the WHO's suggestion that CHWs should go through training courses in disease prevention as part of their core competencies.[10] This is also aligned with various studies that highlight the significance of disease prevention as

one of the important roles and responsibilities of VHVs.[4,30, 31, 32,33,40,43,44]

4) Basic medical care: this differs from the VHVs' competency standards 2007, which defines this competency as a sub-competency under the Competency of leadership in health promotion, disease prevention, basic healthcare, and health surveillance.[3] However, this study indicated it as a core competency. This competency has also been acknowledged as a significant element since the development of the PHC principle by identifying it as one of the 14 EPHC.[29] The WHO also suggested that CHWs should undergo training courses in medical care, disease diagnosis, and healthcare as part of their core competencies.[10] This is also in line with various studies that emphasize the significance of drug administration and basic medical care as core aspects of the VHVs' roles and responsibilities. [31, 32, 35, 36]

5) Policy implementation: this conforms to the VHVs' competency standards 2007.[4] It is also consistent with the MOPH's regulations on VHVs 2011.[3] Typically, VHVs deliver healthcare services in their community. If they are familiar with public health policy and aware of procedures, and apply them in collaboration with multidisciplinary teams, this will help people in the community to benefit from the policy. This competency has become an anticipated skill of the PHC workforce in the 21st century.[37] It is also consistent with studies that indicate a correlation between VHVs' policy implementation and COVID-19 prevention.[39,41,42,43]

6) Fostering self-care awareness: this competency is consistent with the VHVs' competency standards 2007.[3] It is a crucial competency for all VHVs, who act as community healthcare leaders, serving as healthy role models. They should have the capability to inspire and promote self-care awareness among their communities. This is stated in the PHC principles outlined in the Astana Declaration.[34] Additionally, it is also consistent with the competency of the PHC workforce in the 21st century.[37]

7) Health risk monitoring and precautions: this differs from the VHVs' competency standards 2007 which define this competency as a sub-competency under the competency of leadership in health promotion, disease prevention, basic healthcare and health surveillance.[3] However, this study revealed it as a core competency. This is also consistent with the WHO's suggestion that CHWs should undergo training courses in monitoring, surveillance, and analysis of various health risks in the community.[10] Furthermore, this is also aligned with the competency of the PHC workforce in the 21st century.[37] Previously, the WHO acknowledged that VHVs can transfer knowledge from the national level to the community level by effectively communicating in their local language, which enables better risk communication and community engagement. This is an important factor to prevent disease outbreaks in their community.[39,40,43,44]

Furthermore, the VHVs' competency standards have never been reviewed since their development in 2007. The key issue with the competency standards is that unless revised frequently they can quickly become outdated.[45] The competencies should be reviewed and revised since the skills and knowledge required for the VHVs change over time.

Limitations of the study: this study provides the VHVs' core competencies examining the Competency Standards in the Standard Training Course Manual 2007. However, in their actual duties, VHVs may have roles and responsibilities that go beyond what was mentioned.

RECOMMENDATIONS

The study shows that the VHVs' core competencies in Thailand consist of

seven competencies and 48 indicators. The competencies were systematically examined and validated through EFA. The findings of this study provided a better understanding of each competency, serving as a valuable guideline for VHVs to improve their practices and experiences. In addition, public health officials, as mentors of VHVs, can use the study's results to assess VHVs' performance, provide feedback, and plan the further development of VHVs tailored to their individual competencies. Ultimately, this will enhance the quality of VHVs to effectively deliver high-quality healthcare services and expand their reach within their communities.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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