One Health Core Competencies and Predicting Factors for One Health Workforce's Core Competencies at the Local Level in Thailand: A Case Study in Nakhon Sawan Province

Phitsanu Aphisamacharayothin[1]*, Anusak Kerdsin[2], and Tharisara Chirasatienpon[3]

[1] Master of Science Program in One Health Sciences, Faculty of Public Health, Kasetsart University, Thailand
[2] Faculty of Public Health, Kasetsart University, Thailand
[3] Faculty of Education, Kasetsart University, Thailand
* Phitsanu Aphisamacharayothin, corresponding author. Email: phitsanua@nu.ac.th
Submitted: 5 September 2025. Accepted: 12 November 2025. Published: 31 December 2025
Volume 34, 2026. pp. 884–904. http://doi.org/10.25133/JPSSv342026.044

Abstract

The One Health approach relies on multisectoral collaboration, and its practical implementation requires core competencies. This study aimed to examine the One Health core competencies, investigate associated factors, and analyze predictors of these competencies. This study used a cross-sectional, mixed-methods approach. The participants consisted of 144 workforces. Data were collected through questionnaires and in-depth interviews, and analyzed using descriptive statistics, Chi-square test, Pearson's correlation, multiple regression, and content analysis. The results revealed that related factors, including attitudes towards One Health (M = 2.76) and motivation (M = 2.55), were at a high level, while readiness (M = 2.00) and organizational support (M = 2.15) were at moderate levels. The overall level of One Health core competencies was moderate (M = 2.22). Attitudes were not associated with core competencies, whereas motivation, readiness, and organizational support showed positive correlations ($p < .001$). Regression analysis revealed that readiness and organizational support were significant predictors of core competencies ($p < .001$; $R^2 = 0.613$), accounting for 61.3% of the variance. The findings suggest that enhancing workforce readiness and organizational support is essential for strengthening One Health core competencies.

Keywords

Local level; One Health approach; One Health core competencies; predicting factors; workforces

Introduction

Competency refers to the combination of knowledge, skills, and attitude that helps individuals perform their jobs effectively (Spencer & Spencer, 1993). Competencies are key behaviors and abilities that are important for both personal quality and organizational success (McClelland, 1973). In practice, competencies are measurable capacities that support performance standards and professional development. Besides, in both individual, workforce, and organizational contexts, it is essential to possess core competencies, which are behavioral attributes linked to knowledge, skills, abilities, and attitudes that enable effective goal achievement. Core competencies serve as specialized strengths or outstanding capabilities that are important for fulfilling missions and creating a competitive advantage (Aphisamacharayothin, 2020).

One Health is an integrated approach that aims to achieve the best and most sustainable health for humans, animals, and the environment. This approach recognizes that the health of humans, domestic and wild animals, plants, and the environment is all interconnected and interdependent (Food and Agriculture Organization of the United Nations, 2024; World Health Organization [WHO], 2023). The One Health approach integrates human, animal, and environmental health through multisectoral collaboration to address complex health challenges. Effective implementation of One Health requires core competencies among health professionals to facilitate cross-sectoral coordination, risk management, and policy integration (Wilcox & Steele, 2021). The COVID-19 pandemic has heightened global attention to the One Health concept, underscoring its relevance as a practical framework for addressing complex health threats. To effectively implement this approach, it is crucial to strengthen the One Health workforce through interdisciplinary collaboration.

One Health Workforce refers to the multidisciplinary professionals who collaborate to address health issues at the interface of humans, animals, and the environment (Aphisamacharayothin, 2021), thereby ensuring the successful application of One Health strategies. A well-prepared One Health workforce is central to identifying potential threats, preparing for emerging crises, coordinating rapid responses, and supporting recovery in the aftermath of both natural and human-induced hazards. In alignment with this perspective, the Global Health Security Agenda (GHSA) underscores the need to build a multisectoral workforce by equipping professionals with essential capacities to bridge gaps across human, animal, and environmental health systems (Togami et al., 2023). Adopting a One Health approach across multiple disciplines presents substantial opportunities to simultaneously enhance human, animal, and environmental health. Implementing One Health strategies can significantly improve public health outcomes, particularly through strengthened surveillance systems and proactive upstream interventions that deliver timely, tangible benefits to populations (Atlas & Maloy, 2014).

The One Health framework acknowledges the dynamic interrelationship between humans, animals, and the environment, recognizing that the health of each is inseparably linked. Its primary goal is to foster collaboration, knowledge sharing, and capacity development among diverse stakeholders to sustain a balanced, healthier ecosystem. This perspective implies that One Health professionals must demonstrate both interdisciplinary and transdisciplinary skill sets, enabling them to integrate expertise from multiple sectors, bridge professional boundaries, and respond effectively to complex health challenges (Adeyemi et al., 2024). The

efficient execution of the One Health approach requires professionals equipped with One Health core competencies to address complex health challenges.

One Health core competencies refer to the fundamental skills and abilities necessary for professionals from diverse disciplines to work collaboratively in ensuring health security for humans, animals, and the environment. According to the World Health Organization (WHO) (2023), the One Health concept emphasizes the integration and coordination of three main sectors—human medicine, veterinary medicine, and environmental health—to address communicable diseases and transboundary health threats affecting both humans and animals. This approach has emerged in response to complex health challenges driven by climate change, population growth, and human and animal migration. The core competencies in One Health provide the essential foundation for multidisciplinary professionals to collaborate effectively in preventing and addressing health challenges holistically. These essential skills encompass key areas such as disease surveillance, prevention, and control (Centers for Disease Control and Prevention [CDC], 2024).

One Health core competencies provide the foundation for a coordinated, integrated approach to health, enabling teams to address complex, interrelated health challenges holistically. By fostering interdisciplinary collaboration, One Health core competencies help ensure timely, efficient, and sustainable responses to public health threats (Rüegg et al., 2017). In Thailand, the Thailand One Health University Network (THOHUN) (2015) has emphasized workforce development by introducing capacity-building programs and identifying seven domains of One Health core competencies. These domains include knowledge about One Health, systems thinking, leadership, communication and information, culture and ethics, collaboration and partnership, and planning and management. Together, they provide a comprehensive framework to strengthen the preparedness and performance of the One Health workforce at both local and national levels. To achieve effective One Health implementation, it is essential to develop a well-trained workforce with clearly defined core competencies that can operate across sectors and address both national and global health challenges.

In international settings, one of the major obstacles to effective global implementation of the One Health approach is the lack of a standardized competency framework, coupled with limited interdisciplinary collaboration. These barriers restrict the ability of health professionals from different sectors to work cohesively, ultimately affecting coordinated responses to complex health threats (Amuasi et al., 2020). At the national level, Thailand faces notable gaps in One Health workforce competencies. Weak integration of policies across sectors and insufficient collaboration between human, animal, and environmental health agencies further limit the effectiveness of One Health initiatives (Aphisamacharayothin, 2025; Ministry of Health, et al., 2022). Therefore, establishing and strengthening One Health core competencies is critical for building capable teams and ensuring the successful implementation of programs.

However, for success, effective One Health workforces should combine soft skills in interpersonal communication with hard skills in scientific knowledge to tackle multifaceted health challenges. Professionals who are skilled in both areas are better equipped to coordinate actions, respond to emerging threats, and sustain long-term health outcomes (Adeyemi et al., 2024; Togami et al., 2023). To address local-level challenges, it is crucial to focus on contexts where human, animal, and environmental health intersect, as seen in Nakhon Sawan province, which presents unique opportunities and challenges for implementing One Health strategies. Nakhon Sawan province was selected for this study due to its diverse population, significant agricultural and livestock activities, and existing

interactions between human, animal, and environmental health sectors. Compared to other provinces, it presents a combination of urban and rural settings, varied livestock density, and notable environmental challenges, making it an ideal site to examine the implementation of One Health strategies and assess workforce competencies.

Nakhon Sawan province is located in central Thailand. The province is of significant economic, agricultural, and livestock importance, with large-scale farming operations such as pig, dairy, and poultry farms, which are directly linked to human, animal, and environmental health (Nakhon Sawan Provincial Livestock Office, 2025). These areas frequently face risks from zoonotic diseases, including avian influenza and rabies, as well as environmental issues, such as contamination of public water sources by animal waste. Additionally, Nakhon Sawan is traversed by the Chao Phraya River, a critical water source for agriculture and community activities, which often floods and is contaminated by chemicals or pathogens during the rainy season. The interconnectedness of environmental problems and population health makes this context particularly important for planning and management within the One Health framework (Department of Groundwater Resources, 2024).

Moreover, Nakhon Sawan is a gateway between northern and central Thailand, making it essential for disease surveillance and health security. Strengthening the One Health workforce's core competencies here can enhance regional and national health preparedness. Therefore, conducting research in Nakhon Sawan is particularly important because humans, animals, and natural resources in the area are highly interconnected. If local professionals lack the necessary One Health core competencies, managing these challenges may be inefficient, potentially affecting community health and quality of life in the long term. Because One Health initiatives require interdisciplinary collaboration, even though operational models differ, identifying One Health core competencies provides a common foundation, enabling personnel to participate effectively in One Health activities (Laing et al., 2023).

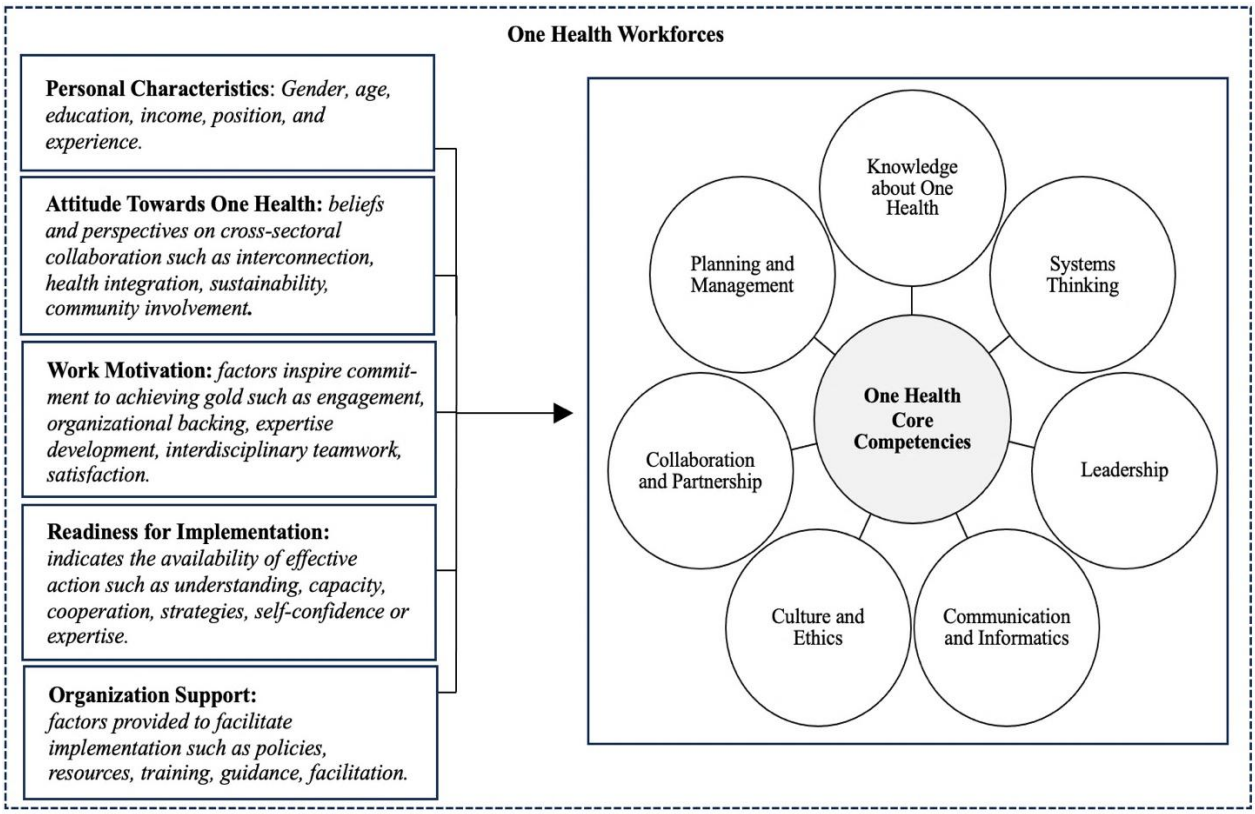
In this context, when strong networks of cooperation exist, combined with fully developed One Health core competencies, the workforce is better prepared to implement One Health initiatives efficiently. From the perspective of the Sustainable Development Goals (SDGs), Target 3: Good Health and Well-Being, Sub-Target 3C emphasizes the development of health workforces (United Nations, 2015), a critical component that directly influences the establishment of an effective One Health system. Even in the face of workforce shortages, strengthening the core competencies of workforces involved in One Health can significantly advance system performance. However, research in Thailand focusing specifically on One Health core competencies remains limited, particularly at the local level, which is essential for workforce planning and health system management.

This study aims to examine the core One Health competencies and factors influencing their development among local professionals, using Mueang district, Nakhon Sawan province, as a case study. The objectives of this study are to study the core competencies of the One Health workforce at the local level; to examine factors associated with One Health competency, including attitudes toward One Health, motivation, operational readiness, and organizational support among local personnel; and to analyze predictive factors of core competencies in the One Health workforce in Mueang district, Nakhon Sawan province. The findings will support strategic workforce capacity building for One Health implementation and provide foundational information to guide policy and planning, ultimately strengthening One Health management capacity at the community and local levels in Thailand.

The researcher has established a conceptual framework based on the One Health Core Competencies proposed by THOHUN (2015), comprising seven domains: knowledge of One Health; systems thinking; leadership; communication and information; culture and ethics; collaboration and partnership; and planning and management**.** The study examines predictors of these competencies, including attitudes toward One Health, work motivation, readiness for implementation, and organizational support. McClelland's (1973) Competency Model emphasizes the development of knowledge, skills, and personal traits that influence work behavior. In the context of One Health, competencies such as collaboration, initiative, and problem-solving are associated with positive attitudes toward One Health, greater work motivation, and readiness for implementation. Organizational support further reinforces these competencies, ensuring that personnel can effectively apply One Health strategies in practice. Thus, the model provides a coherent framework for understanding how individual and organizational factors interact to enhance workforce performance (Grenda & Palmunen, 2025; McClelland, 1973).

To understand the underlying mechanisms of competency development and operationalization at the local level, this study follows the competency development frameworks, which emphasize identifying and enhancing the knowledge, skills, and personal traits necessary for effective performance (Campion et al., 2011), and implementation science, which provides systematic approaches to translating competencies into practice while considering organizational and contextual factors (Damschroder et al., 2009). Investigating these factors at the local level provides a deeper understanding of the elements that facilitate or hinder the development of One Health competencies, thereby informing strategies to enhance workforce capacity. This framework is illustrated in Figure 1.

Figure 1: Conceptual Framework of One Health Workforce's Core Competencies



Research methodology

This cross-sectional study used a mixed-methods approach, combining qualitative and quantitative research. Qualitative research was conducted to explore the core competencies of the One Health workforce, while quantitative research addressed the One Health core competencies, investigated the associated factors with One Health competencies (including attitudes, motivation, operational readiness, and organizational support), and analyzed the predicting factors of core competencies among local workforces.

The study focused on 48 organizations involved in One Health activities in Mueang district, Nakhon Sawan province, including:

1) Human health agencies (Provincial Public Health Office and 22 Sub-district Health Promoting Hospitals),
2) Animal health agencies (Nakhon Sawan Provincial Livestock Office),
3) Environmental health agencies (Provincial Natural Resources and Environment Office),
4) Disease surveillance and control agencies (Disease Control Office III and Medical Sciences Center III), and
5) Local government organizations (Provincial Administrative Organization, Social Development and Human Security Office, and 19 municipalities and sub-district administrative organizations).

A total of 144 workforce members participated in this mixed-methods study, from whom quantitative and qualitative data were collected from April 1 to June 15, 2025.

Sample size

The sample size was determined using G*Power software for linear multiple regression analysis, based on Cohen's (1988) effect size criteria. Drawing on previous related studies, a medium effect size ($f^2 = 0.15$) was selected, with $\alpha = 0.05$, power $(1 - \beta) = 0.95$, nine total predictors, and four tested predictors. The calculated sample size was 129 participants. To account for potential attrition, 10% was added, yielding 142 participants, and two additional participants were included to ensure each of the 48 agencies had three participants, for a total of 144 participants.

The study established clear criteria for participant selection and study conduct to ensure validity and reliability. Inclusion criteria required participants to be part of the related local One Health workforce in Mueang district, Nakhon Sawan province, aged 20 years or older, with at least one year of work experience, full cognitive ability, and willingness to provide complete information via questionnaires or interviews. Participants were excluded if they were unable to participate due to health issues, or if they resigned or changed workplaces during data collection. Withdrawal criteria allowed participants to leave the study at any time or refrain from providing complete data.

Research instrument

This study employed a mixed-methods approach, integrating quantitative and qualitative methodologies.

Quantitative methodology

The quantitative data was collected using a researcher-developed, self-administered questionnaire. A total of 144 participants completed the questionnaires (and interview for qualitative methodology), representing 100% of the target sample, with no refusals or missing responses**.** To ensure data quality, the researcher implemented several control measures, including careful preparation of the questionnaire before data collection, consistent administration procedures during data collection, and thorough checks for completeness and consistency of the questionnaires before data entry and analysis. The questionnaire consisted of six sections:

- Section 1 addressed personal characteristics, including gender, age, education, income, position, work experience, and workforce type, using both open- and closed-ended questions.
- Section 2 focused on attitudes toward One Health, with five items rated on a 3-point scale (1 = low, 2 = moderate, 3 = high).
- Section 3 assessed motivation, with five items rated on a 3-point scale (1 = low, 2 = moderate, 3 = high).
- Section 4 measured operational readiness, with five items rated on a 3-point scale (1 = low, 2 = moderate, 3 = high).
- Section 5 evaluated organizational support, with five items rated on a 3-point scale (1 = low, 2 = moderate, 3 = high).
- Section 6 examined One Health core competencies proposed by THOHUN (2015), which comprise seven domains: knowledge about One Health, systems thinking, leadership, communication and information, culture and ethics, collaboration and partnership, and planning and management, with five items per domain rated on a 3-point scale (1 = low, 2 = moderate, 3 = high).

Qualitative methodology

The qualitative data were collected through face-to-face in-depth interviews conducted by the researcher at the participants' workplaces to ensure comfort and contextual relevance. A total of 144 participants, who were the same eligible respondents form the quantitative data collection (Data collection included both open-ended questions and follow-up interviews conducted after respondents completed the quantitative questionnaire, and the entire process took approximately 30–45 minutes.), represented key local workforce members involved in One Health implementation. Each participant was asked both structured and open-ended questions, and the in-depth interviews lasted approximately 30–45 minutes on average. All invited participants agreed to take part, resulting in a 100% response rate**.** To ensure data quality, the researcher followed standardized interview procedures, including the use of a semi-structured interview guide, careful preparation and briefing before each interview, and audio recording with participants' consent.

During and after data collection, the researcher transcribed all interviews verbatim, verified accuracy through transcript checking, and consulted with research advisors to enhance the credibility and consistency of the data. The interviews focused on the same One Health core competencies across seven domains. They aimed to identify practical, actionable indicators essential to effectively applying these competencies in real-world local settings. By exploring participants' experiences, challenges, and strategies in implementing One Health activities at the local level, the qualitative data provided an in-depth contextual understanding that complemented the quantitative findings.

Instrument quality assessment

The researcher developed the research instrument through a systematic process. Initially, relevant theories, concepts, principles, textbooks, literature, and previous studies were reviewed to guide the design of the questionnaire. The collected information was synthesized to establish the instrument's structure. Based on this framework, the questionnaire was constructed to cover all research objectives and the specific variables of interest.

To ensure the instrument's quality, several steps were taken. First, content validity was evaluated in both quantitative and qualitative instruments by three experts who assessed whether the items adequately represented the intended constructs, covered all essential aspects, and used appropriate language. The Index of Item-Objective Congruence (IOC) was calculated, with values of 0.6 or higher indicating acceptable content validity.

Next, the revised questionnaire was pilot-tested with 30 individuals outside the study sample using quantitative instruments. For the rating scale items, item discrimination was assessed by calculating the correlation between each item and the total score; coefficients of 0.2 or higher were considered satisfactory.

Finally, reliability was assessed using Cronbach's alpha for the rating scale items. The instrument's overall reliability was 0.839, indicating high internal consistency. The reliability coefficients for each section were as follows: attitudes toward One Health ($\alpha = 0.804$), motivation for implementation ($\alpha = 0.751$), readiness for implementation ($\alpha = 0.760$), organizational support ($\alpha = 0.768$), and core competencies in One Health ($\alpha = 0.814$). These results confirm that the instrument is both valid and reliable for assessing the targeted constructs.

Data collection

Data for this study were collected in strict accordance with research ethics, ensuring the protection of participants' rights, confidentiality, and anonymity. The researcher used a developed and validated questionnaire and interview questions guideline, and obtained formal permission through official letters to access each organization. Data collection was conducted on-site, with each session lasting approximately 45 minutes, and research assistants provided support as needed. The purpose of the study, procedures, and participants' rights—including the right to withdraw at any time without consequence—were clearly explained.

Written informed consent was obtained from all participants, who were assured that their responses would remain confidential and that no personal identifiers would be disclosed. The

study was carried out across 48 organizations in Nakhon Sawan province. Within each organization, three staff members were selected using a simple random sampling procedure (random draw), including one manager and two operational staff. In this method, the names of all eligible staff in each category were written on separate slips of paper, placed in a container, and the required number of names were randomly drawn from each category, ensuring equal probability of selection for all eligible participants. This process resulted in a total of 144 participants. Completed questionnaires were checked for completeness, coded, organized, and analyzed, ensuring that only fully completed responses were included.

Data analysis

In this study, data were analyzed using both qualitative and quantitative approaches.

Qualitative data from in-depth interviews were analyzed using content analysis, in which the researcher systematically identified key themes, patterns, and concepts. Special attention was given to practical, actionable indicators essential to effectively applying the One Health competencies in local settings. These qualitative findings also complemented the quantitative data, providing an in-depth understanding of which One Health core competencies participants considered most necessary and relevant in real-world local workforce contexts**.** The qualitative findings further supported and explained the trends observed in the quantitative results. The findings were then presented descriptively, with qualitative data from in-depth interviews used to support and explain the quantitative results. This provided a detailed understanding of the participants' perspectives on implementing the competencies (in Figure 2).

Quantitative data from structured questionnaires were analyzed using descriptive statistics, including frequency, percentages, means, and standard deviations, to summarize the participants' characteristics and responses. Inferential statistics were further employed to explore relationships and predictive influences among variables. The chi-square test was used to examine associations between categorical variables, Pearson's correlation coefficient assessed the strength and direction of linear relationships between continuous variables, and multiple regression analysis estimated the simultaneous effects of several independent variables on dependent variables. Based on these analyses, the researcher developed conceptual and statistical models to illustrate the relationships and influence of variables, and derived estimation equations to quantify their effects, providing a basis for interpreting and predicting the impact of key factors.

Ethical approval

This study was approved by the Human Research Ethics Committee of Nakhon Sawan province (Protocol No. NSWPHOEC-003/68) on March 25, 2025. The researcher adhered to the three core principles of human research ethics.

First, the principle of respect for persons was strictly followed, ensuring participants' dignity and autonomy. Participants were fully informed about the purpose, procedures, and potential implications of the study, and provided voluntary consent without any coercion, undue influence, or incentives. Privacy was protected throughout the study, with no personally identifiable information collected in the questionnaires. Special attention was given to

vulnerable individuals by maintaining anonymity, reporting results only in aggregate form, and securely storing the data for three years before destruction.

Second, the principles of beneficence and non-maleficence were observed, as the study posed no physical or psychological risks to participants. Questionnaires were used solely for research purposes, and participants' well-being was monitored throughout the study. The research offered both direct and indirect benefits, such as enhancing participants' health literacy and promoting preventive behaviors.

Third, the principle of justice was applied by establishing explicit inclusion and exclusion criteria, ensuring the equitable distribution of both benefits and potential burdens, and avoiding bias in participant selection.

Results

The participants' personal characteristics showed that the majority were female (77.1%), while males accounted for 22.9%. In terms of age, most were 30 years or younger (30.6%), followed by those aged 51 years and above (26.4%), 41–50 years (23.6%), and 31–40 years (19.4%). The youngest participant was 22, and the oldest was 59. Regarding educational attainment, most participants held a bachelor's degree (77.8%), while 20.8% had completed postgraduate education, and only 1.4% had education below the bachelor's level. Considering job positions, the largest group worked in public health professions (44.4%). This was followed by those in administrative, policy, and planning roles (22.9%), general support staff (22.2%), and those in community and organizational development and specific professional fields (10.5%).

Regarding monthly income, most participants earned less than 20,000 THB (31.9%), followed by those earning 20,001–30,000 THB (27.8%), 45,001–60,000 THB (17.4%), and 30,001–45,000 THB (9.7%). Only 13.2% had an income exceeding 60,000 THB. Reported incomes ranged from 10,000 to 80,000 THB, corresponding to approximately 300–2,400 USD at the average exchange rate during the data collection period. For work experience, most participants had less than 5 years (31.3%), followed by 11–20 years (27.1%), 21–30 years (13.9%), 5–10 years (13.2%), and more than 30 years (14.5%). Reported work experience ranged from 1 to 40 years. Finally, in terms of workforce type, more than half were from the human health sector (52.1%), followed by the local government, animal health, and environmental health sectors (47.9%).

Table 1 demonstrates the attitudes toward One Health among the 144 participants. Overall, attitudes were high, with a mean (M) score of 2.76 (SD = 0.328). When considering each item, the participants perceived that maintaining the health of the environment and animals is important for human health (M = 2.84, SD = 0.368). They also agreed that health professionals should participate in community activities promoting One Health (M = 2.79, SD = 0.441). Furthermore, they recognized that human, animal, and environmental health are closely interrelated (M = 2.74, SD = 0.438). The participants also agreed that collaboration among physicians, veterinarians, and environmental scientists is necessary for sustainable health development (M = 2.74, SD = 0.484). Finally, they supported the application of the One Health concept in managing zoonotic diseases (M = 2.67, SD = 0.502).

Table 1: Attitudes Toward One Health Among the Workforces (n = 144)

No.	Item	Mean	SD	Level
1	Human, animal, and environmental health are closely interrelated.	2.74	0.438	High
2	Maintaining the health of the environment and animals is important for human health.	2.84	0.368	High
3	The One Health concept should be applied in managing zoonotic diseases.	2.67	0.502	High
4	Collaboration among physicians, veterinarians, and environmental scientists is necessary for sustainable health development.	2.74	0.484	High
5	Health professionals should participate in community activities promoting One Health.	2.79	0.441	High
	Overall Attitudes	**2.76**	**0.328**	**High**

Table 2 shows the motivation of the 144 participants to implement One Health. Overall, motivation was high, with a mean score of 2.55 (SD = 0.398). When considering each item, participants reported feeling proud when they saw positive outcomes from One Health activities affecting humans, animals, and the environment (M = 2.67, SD = 0.471). They also indicated high motivation to promote One Health because they believe it is important (M = 2.57, SD = 0.524), high motivation to work collaboratively with professionals from other sectors, such as veterinarians and environmental scientists (M = 2.56, SD = 0.512), and high interest in developing knowledge and skills related to One Health implementation (M = 2.53, SD = 0.515). In addition, the participants perceived organizational or supervisor support for promoting the One Health concept at a moderate level (M = 2.42, SD = 0.585).

Table 2: Work Motivation to Implement One Health Among the Workforces (n = 144)

No.	Item	Mean	SD	Level
1	Motivation to promote One Health because it is considered important.	2.57	0.524	High
2	Support received from the organization or supervisor in promoting the One Health concept.	2.42	0.585	Moderate
3	Interest in developing knowledge and skills related to One Health implementation.	2.53	0.515	High
4	Motivation to collaborate with professionals from other sectors, such as veterinarians and environmental scientists.	2.56	0.512	High
5	Feeling proud when seeing positive outcomes from One Health activities affecting humans, animals, and the environment.	2.67	0.471	High
	Overall Motivation	**2.55**	**0.398**	**High**

Table 3 demonstrates the readiness to implement One Health among the 144 participants. Overall, readiness was moderate, with a mean score of 2.00 (SD = 0.532). When considering each item, the participants reported moderate confidence in the team's ability to achieve One Health goals (M = 2.06, SD = 0.628). They also indicated a moderate understanding of One Health principles and the ability to apply them in their work (M = 2.05, SD = 0.629). Furthermore, participants perceived their skills in collaborating with professionals from multiple sectors, such as physicians, veterinarians, environmental scientists, and community representatives, as moderate (M = 2.02, SD = 0.714). The availability

of adequate resources and equipment for implementing One Health activities was rated at a moderate level (M = 1.96, SD = 0.590), and the clarity of work plans or guidelines for One Health implementation in the area was also considered moderate (M = 1.92, SD = 0.642).

Table 3: Readiness to Implement One Health Among the Workforces (n = 144)

No.	Item	Mean	SD	Level
1	Understanding of One Health principles and ability to apply them in work.	2.05	0.629	Moderate
2	Availability of adequate resources and equipment to implement One Health activities.	1.96	0.590	Moderate
3	Skills to collaborate with professionals from multiple sectors, such as physicians, veterinarians, environmental scientists, or community representatives.	2.02	0.714	Moderate
4	Clear work plans or guidelines for implementing One Health in the area.	1.92	0.642	Moderate
5	Confidence in the team's ability to achieve One Health goals.	2.06	0.628	Moderate
	Overall Readiness	2.00	0.532	Moderate

Table 4 shows the perceived organizational support for implementing One Health among the 144 participants. Overall, perceived support was moderate, with a mean score of 2.15 (SD = 0.640). When considering each item, the participants reported moderate agreement that their organizations have clear policies to promote and support One Health implementation (M = 2.24, SD = 0.708). They also perceived moderate support for training or capacity building in One Health for personnel (M = 2.20, SD = 0.768), moderate support from relevant agencies or organizations for implementing One Health activities (M = 2.14, SD = 0.615), moderate availability of resources such as budget, equipment, and scientific information to support One Health activities (M = 2.10, SD = 0.745), and moderate guidance or follow-up from supervisors or management regarding One Health implementation (M = 2.07, SD = 0.605).

Table 4: Organizational Support for Implementation Among the Workforces (n = 144)

No.	Item	Mean	SD	Level
1	The organization has clear policies to promote and support One Health implementation.	2.24	0.708	Moderate
2	Support is received from relevant agencies or organizations for implementing One Health activities.	2.14	0.615	Moderate
3	Adequate resources, such as budget, equipment, and scientific information, are available to support One Health activities.	2.10	0.745	Moderate
4	The organization provides training or capacity building in One Health for personnel.	2.20	0.768	Moderate
5	Guidance or follow-up from supervisors or management regarding One Health implementation is provided.	2.07	0.605	Moderate
	Overall Organizational Support	2.15	0.640	Moderate

Table 5 demonstrates the overall One Health core competencies among the 144 participants. Overall, the participants had moderate competencies, with a mean score of 2.22 (SD = 0.379). When considering each domain separately, the competencies were also at a

moderate level across all domains, including Culture and Ethics (*M* = 2.41, *SD* = 0.440), Collaboration and Partnership (*M* = 2.28, *SD* = 0.438), Leadership (*M* = 2.25, *SD* = 0.454), Systems Thinking (*M* = 2.17, *SD* = 0.411), Communication and Information (*M* = 2.17, *SD* = 0.480), Planning and Management (*M* = 2.14, *SD* = 0.409), and Knowledge of One Health (*M* = 2.08, *SD* = 0.465). Across all domains, the participants demonstrated moderate abilities to apply One Health principles in practice, including ethical decision-making, interprofessional collaboration, effective communication, and strategic planning within the community context.

Table 5: One Health Core Competencies Among the Workforces (n = 144)

No.	Domains	Mean	SD	Level
1	Knowledge of One Health	2.08	0.465	Moderate
2	Systems Thinking	2.17	0.411	Moderate
3	Leadership	2.25	0.454	Moderate
4	Communication and Informatics	2.17	0.480	Moderate
5	Culture and Ethics	2.41	0.440	Moderate
6	Collaboration and Partnership	2.28	0.438	Moderate
7	Planning and Management	2.14	0.409	Moderate
Overall One Health Core Competencies		**2.22**	**0.379**	**Moderate**

The characteristics of the One Health core competencies of the relevant workforce were explored through interviews and analyzed using content analysis. The summarized findings are presented in Figure 2.

Figure 2: Characteristics of One Health Core Competencies of the Relevant Workforce

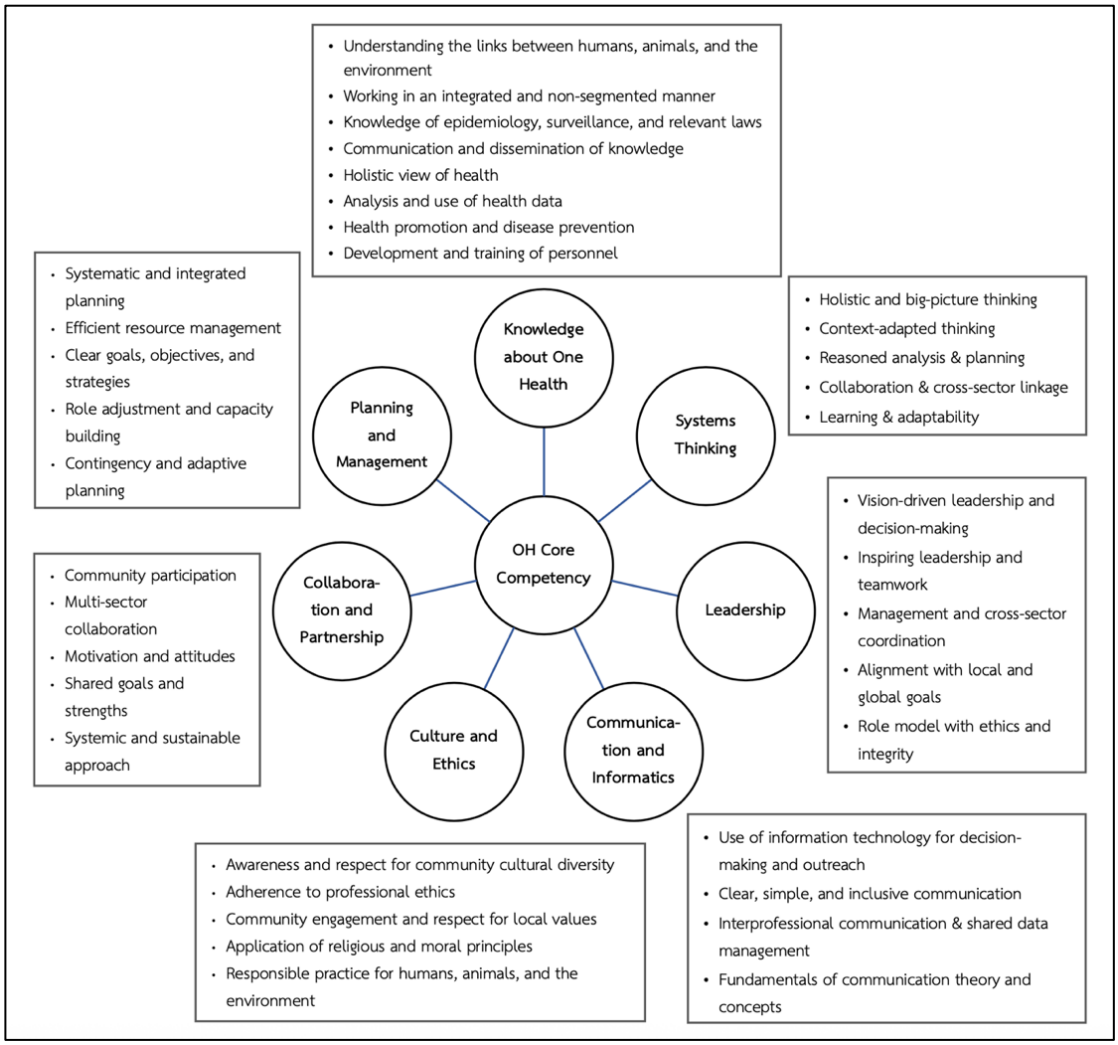


Table 6 demonstrates the relationships between personal characteristics and independent variables, and the One Health core competencies. The relationship between personal characteristics and One Health core competencies was analyzed using the Chi-Square (χ^2) test. The results indicated that gender, educational level, and job position were not significantly associated with One Health core competencies. In contrast, age, monthly income, and work experience were significantly associated with One Health core competencies at the 0.01 level, with χ^2 values of 22.303, 36.078, and 28.714, respectively.

Regarding age, participants under 40 years old had relatively high levels of moderate and high competencies (36.8% and 13.2%, respectively) compared with those aged 41–50 and 51+ years. For monthly income, participants earning up to 30,000 THB had moderate and high competency levels of 43.8% and 16.0%, respectively, while those earning more than 30,000 THB had 31.3% at the moderate level and only 4.9% at the high level. Regarding work experience, participants with ≤10 years of experience had moderate and high competency levels of 34.7% and 9.7%, respectively; those with 11–20 years of experience had 16.7% and 6.3%, respectively; and those with >20 years of experience had 23.6% and 4.9%, respectively.

The relationship between the independent variables—attitudes toward One Health (XATT), motivation for implementation (XMOT), readiness for implementation (XRED), and organizational support (XSUP)—and One Health core competencies (YCOH) was examined. The analysis revealed that attitudes toward One Health (XATT) were not significantly associated with YCOH across all domains. In contrast, motivation (XMOT), readiness (XRED), and organizational support (XSUP) demonstrated positive and statistically significant correlations with YCOH at the 0.01 level, with correlation coefficients of 0.402, 0.688, and 0.734, respectively.

Table 6: Relationships of Personal Characteristics and Independent Variables with One Health Core Competencies (YCOH)

Variable	Test	Interpretation
Personal Characteristic (Chi-Square: χ^2)		
Gender	Not significant	No association with YCOH
Educational Level	Not significant	No association with YCOH
Job Position	Not significant	No association with YCOH
Age	$\chi^2 = 22.303$, $p < .01$	< 40 yrs: moderate 36.8%, and high 13.2%; higher than 41–50 & 51+
Monthly Income	$\chi^2 = 36.078$, $p < .01$	≤ 30,000 THB: moderate 43.8%, and high 16.0%; > 30,000 THB: moderate 31.3%, and high 4.9%
Work Experience	$\chi^2 = 28.714$, $p < .01$	≤ 10 yrs: moderate 34.7%, and high 9.7%; 11–20 yrs: moderate 16.7%, and high 6.3%; > 20 yrs: moderate 23.6%, and high 4.9%
Independent Variable (Pearson Correlation: ***r***)		
Attitudes toward One Health (XATT)	Not significant	No correlation with YCOH
Motivation for Implementation (XMOT)	$r = 0.402$, $p < .01$	Higher XMOT → higher YCOH
Readiness for Implementation (XRED)	$r = 0.688$, $p < .01$	Higher XRED → higher YCOH
Organizational Support (XSUP)	$r = 0.734$, $p < .01$	Higher XSUP → higher YCOH

Table 7 presents the predictive factors for the One Health core competencies. The results indicate that readiness for implementation (XRED) and organizational support (XSUP) significantly predict One Health core competencies (YCOH) at the 0.01 level, with $F = 54.992$ ($p < .001$). The multiple correlation coefficient (R) is 0.783, and the coefficient of determination (R^2) is 0.613, indicating that the model can explain 61.3% of the variance in One Health core competencies.

Table 7: Predictive Factors of One Health Core Competencies (YCOH) Based on Multiple Regression Analysis

Predictor	β	t	*p* value
Constant	0.911	10.075	< .001
Attitudes toward One Health (XATT)	0.043	0.657	.512
Motivation for Implementation (XMOT)	-0.034	-0.528	.598
Readiness for Implementation (XRED)	0.497	7.086	< .001
Organizational Support (XSUP)	0.358	5.113	< .001
$R = 0.783$, $R^2 = 0.613$, $F = 54.992$, $p < .001$			

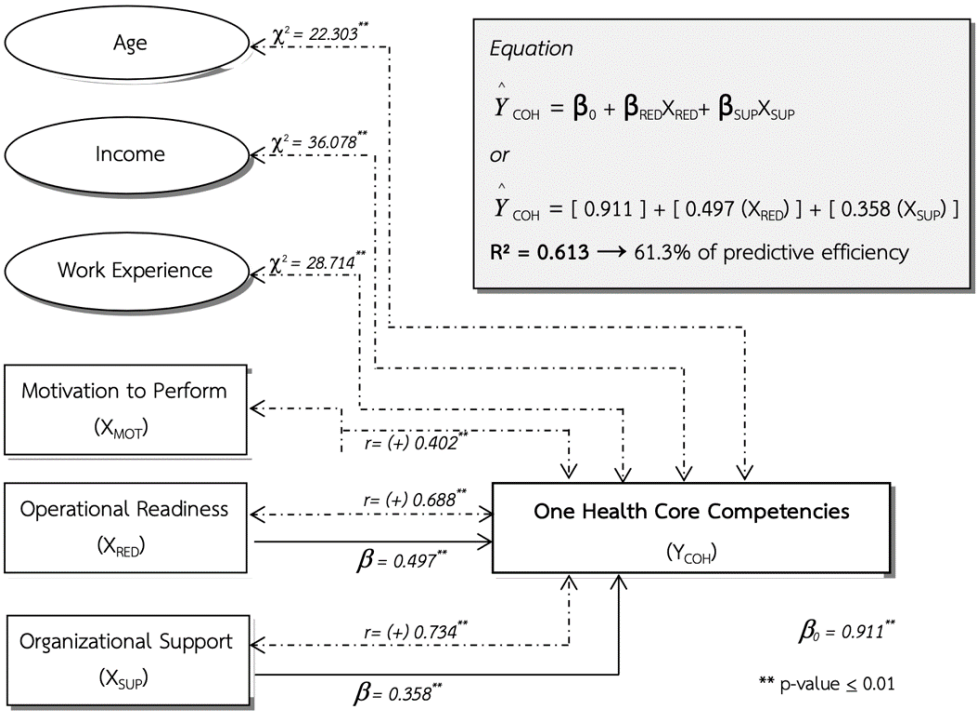
The estimated regression equation for predicting One Health core competencies is:

$$YCOH = 0.911 + 0.497(XRED) + 0.358(XSUP)$$

This model indicates that both readiness for implementation and organizational support are significant positive predictors of One Health core competencies, with an overall predictive power of 61.3% ($R^2 = 0.613$).

Based on the analysis of relationships and predictive influences of the factors, the predictive factors of One Health core competencies (YCOH) can be represented in a conceptual model that illustrates the relationships and the strength of each variable's influence on YCOH, as shown in Figure 3.

Figure 3: Conceptual model of predictive factors influencing One Health core competencies



Discussion

The study indicated that the local workforce possesses moderate levels of One Health core competencies. While workforces are generally able to manage routine responsibilities, their grasp of fundamental concepts and principles remains limited, revealing gaps in conceptual knowledge that could hinder effective cross-sector collaboration. Therefore, structured professional development and ongoing training programs are necessary to strengthen these competencies and equip staff to address complex health challenges effectively. The health professions education programs share similar curricula and learning expectations, and the One Health core competencies are widely recognized across multiple accreditation bodies. Such core competencies provide a guiding framework for preparing professionals in an era marked by emerging zoonotic diseases, increased human-animal interactions, and ongoing climate change impacts. By focusing on shared learning outcomes, educational programs can foster interdisciplinary skills, while core competencies provide a unifying foundation across disciplines, supporting the integration of One Health principles into practice (Larsen, 2020).

Interestingly, attitude alone was not significantly associated with the One Health core competencies, suggesting that having a positive mindset, while helpful, is not enough to achieve high-level proficiency. Core competencies for the workforce are still not consistently agreed upon, applied in the same way, or relevant in all contexts (Buke et al., 2025). This suggests that simply receiving content or having a positive attitude is not sufficient; other factors, such as motivation, readiness for implementation, and organizational support, play a more important role in determining overall competency levels. In contrast, motivation was positively related to core competencies. Highly motivated workforces tend to apply their knowledge and skills more effectively, thereby improving performance on One Health tasks. Motivation thus serves as a driving force, supporting learning, adaptation, and problem-solving in multidisciplinary settings, particularly in contexts where competency frameworks are still being developed and standardized.

Among the predictors examined, readiness for implementation emerged as the strongest determinant of One Health core competency, encompassing practical preparedness, access to necessary resources, and self-confidence in applying skills, which are essential for translating theoretical knowledge into practical action. Without adequate readiness, even well-trained personnel may struggle to implement One Health approaches efficiently. The operationalization of One Health requires structured, actionable components such as interoperable disease surveillance platforms, community-based early warning systems, and coordinated multisectoral efforts (Dunga et al., 2025). This highlights the importance of institutional and workforce readiness, data-sharing, infrastructure, and stakeholder engagement in enabling the workforce to respond effectively to emerging health problems, demonstrating how readiness translates conceptual strategies into practical solutions.

Similarly, organizational support—including sufficient budgets, access to equipment, clear policies, and proactive management guidance—creates the structural conditions that enable the workforce to perform One Health activities effectively. Together, readiness and organizational support form a foundation for developing and sustaining core competencies. One Health is a rapidly developing field integrating research and interventions at the human-animal-environment interface, emphasizing the inseparability of human, animal, and environmental health. This holistic, transdisciplinary framework requires cross-disciplinary collaboration, consideration of social and ecological factors, and incorporation of local

knowledge. By fostering preparedness, resource access, confidence, and strong institutional support, One Health core competencies can be effectively applied in practice, enabling staff to respond to endemic, epidemic, and pandemic threats in ecologically informed ways, bridging disciplinary silos and overcoming limitations of conventional approaches (Wilcox & Steele, 2021).

From a population perspective, the development of One Health core competencies can influence broader health outcomes, including reducing health inequalities, improving access to health services, and promoting community participation within an integrated health system (Brown et al., 2024; Solís & Nunn, 2021). This highlights that workforce preparedness and organizational support not only enhance individual or organizational performance but also contribute to better health equity and system-wide effectiveness at the community and population level. However, according to Social Capital Theory, the quality of social networks, trust, and community engagement strengthens collaboration across sectors and supports the effective implementation of One Health initiatives, linking workforce competencies to broader population health outcomes (Kawachi et al., 2008; Putnam, 2000).

The influence of personal factors also emerged as noteworthy. Younger workforces with lower monthly incomes and less work experience exhibited higher core competencies, whereas gender, educational background, and job position showed no significant association. This trend may reflect a generational shift, where younger workforces are often more adaptable, technologically literate, and engaged in continuous learning (Deloitte, 2022).

These findings have important implications for training and workforce development**.** Training programs should prioritize not only knowledge acquisition but also the development of practical and soft skills as core competencies (THOHUN, 2015). Incorporating hands-on experience, case-based learning, and problem-solving exercises across these domains ensures that the workforce can respond effectively to complex, interdisciplinary health challenges, such as zoonotic diseases, environmental hazards, and emerging infectious threats. Moreover, fostering a supportive organizational environment enhances the translation of training into practice, thereby improving overall workforce performance and sustainability of One Health initiatives.

Limitations

This study has several limitations. The cross-sectional design captures data at a single point in time, limiting the ability to infer causal relationships between factors and the One Health core competencies. The study was conducted in a single district (Mueang district, Nakhon Sawan province), which may limit the generalizability of the findings to other regions or contexts. Self-reported questionnaires and interviews may be subject to response bias, as participants might overestimate or underestimate their competencies, motivation, or readiness. Moreover, qualitative data were collected from a limited number of participants, which may not fully capture the diversity of experiences across all local One Health workforce members. Finally, the study focused on selected organizations involved in One Health activities, and some sectors or informal actors may have been underrepresented, potentially overlooking important aspects of local workforce core competencies. Finally, structural and contextual factors, such as local policy frameworks, population composition, and social systems, were not considered, which may limit understanding of broader social impacts.

Conclusion and recommendation

This study reveals that the local workforce in Mueang district, Nakhon Sawan province, possesses moderate levels of One Health core competencies. While personnel are generally capable of managing routine tasks, gaps remain in conceptual understanding, practical application, and cross-sectoral collaboration. Key factors, including operational readiness, organizational support, and motivation, were found to significantly influence competency levels, highlighting the importance of both individual and institutional preparedness. These findings emphasize the need for structured professional development programs that combine knowledge acquisition with practical skills and soft skills training. Enhancing organizational support and fostering a conducive environment are also essential to translate training into effective local-level practice. By specifically enhancing operational readiness through hands-on workshops, simulation exercises, and mentorship programs, stakeholders can ensure that personnel gain the confidence and practical skills necessary to apply One Health principles effectively. By addressing these factors, stakeholders can strengthen the One Health workforce, enabling effective responses to complex health challenges such as zoonotic diseases, environmental hazards, and emerging infectious threats. Future research should expand to other regions and include a broader range of organizations to improve generalizability and capture diverse local experiences.

Based on the study findings, strengthening the local One Health workforce requires targeted actions in several key areas. Knowledge of One Health and systems thinking should be enhanced, as gaps were observed in understanding core principles and analyzing complex health problems holistically. Practical skills in communication and information, as well as planning and management, should also be developed to ensure effective coordination and problem-solving across sectors. Readiness for implementation should be reinforced not only through access to necessary tools but also via practical training, scenario-based exercises, and mentorship, building confidence and ensuring practical application in real-world settings. Organizational support must be strengthened by providing sufficient resources, clear policies, managerial guidance, and mentoring, enabling personnel to translate knowledge and skills into practice efficiently. Moreover, it is recommended to expand data collection across multiple provinces (a multi-site design) to provide a broader perspective, enhance generalizability, and strengthen the explanatory power of social and population systems across Thailand. Together, these measures can develop a capable, confident, and responsive One Health workforce at the local level.

Acknowledgments

This research was conducted as part of the requirements for the Master of Science Program in One Health Sciences at the Faculty of Public Health, Kasetsart University, Thailand.

The authors acknowledge using ChatGPT for language translation and grammar checking. The final manuscript has been reviewed and approved by the authors to ensure accuracy and integrity.

References

Adeyemi, O. A., Agbabiaka, T. O., & Sujon, H. (2024). Global One Health post-graduate programmes: A review. *One Health Outlook, 6*, Article 7. https://doi.org/10.1186/s42522-024-00097-6

Amuasi, J. H., Lucas, T., Horton, R., & Winkler, A. S. (2020). Reconnecting for our future: The Lancet One Health Commission. *Lancet, 395*(10235), 1469–1471. https://doi.org/10.1016/S0140-6736(20)31027-8

Aphisamacharayothin, P. (2020). Strengthening district health system competency management to supply needs of youth females, teen moms, and families. *Sripatum Review of Humanities and Social Sciences*, *20*(1), 7–19. https://so05.tci-thaijo.org/index.php/spurhs/article/view/220650

Aphisamacharayothin, P. (2021). Career skills development for youth females, teen mothers, and families. *Kasetsart Journal of Social Sciences*, *42*(1), 185–190. https://so04.tci-thaijo.org/index.php/kjss/article/view/249472

Aphisamacharayothin, P. (2025). Kān sangsoe̜ng sāmrattana khǭng khrōpkhrua læ chumchon nai kān phatthanā khunnatham choe̜ng phruettikam khǭng wayarun nai sangkhom yuk dijiton: Kani sueksā nai sipchet changwat phāk nuea [Strengthening the competency of families and communities in moral behavior development of adolescences in a digital society: Case study in 17 Northern provinces]. *Sripatum Review of Humanities & Social Sciences*, *25*(1), 59–75. https://so05.tci-thaijo.org/index.php/spurhs/article/view/276164

Atlas, R. M., & Maloy, S. (2014). The future of One Health. *Microbiology Spectrum, 2*(1), 1–18. https://doi.org/10.1128/microbiolspec.OH-0018-2012

Brown, H. L., Isabella, G. P., Horton, D. L., & Roberto, M. L. (2024). One Health: A structured review and commentary on trends and themes. *One Health Outlook*, *6*, Article 17. https://doi.org/10.1186/s42522-024-00111-x

Buke, Y. W., Richards, S., Grace, D., Mutie, I., Caron, A., De Nys, H., Goregena, B., Kgosimore, M., Kimaro, E., Qekwana, N., Tadesse, Y., Knight-Jones, T., & Mutua, F. (2025). Building the future One Health workforce in Eastern and Southern Africa: Gaps and opportunities. *CABI One Health*, *4*(1), Article 0014. https://doi.org/10.1079/cabionehealth.2025.0014

Campion, M. A., Fink, A. A., Ruggeberg, B. J., Carr, L., Phillips, G. M., & Odman, R. B. (2011). Doing competencies well: Best practices in competency modelling. *Personnel Psychology*, *64*(1), 225–262. https://doi.org/10.1111/j.1744-6570.2010.01207.x

Centers for Disease Control and Prevention (CDC). (2024, 31 October). *One Health basics*. https://www.cdc.gov/onehealth/basics/index.html

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science, 4*, Article 50. https://doi.org/10.1186/1748-5908-4-50

Deloitte. (2022). *The Deloitte Global 2022 Gen Z and Millennial Survey: Striving for balance, advocating for change*. https://www.deloitte.com/content/dam/assets-shared/legacy/docs/about/2022/deloitte-2022-genz-millennial-survey.pdf

Dunga, K. E., Okoro, C. I., Onyenama, A. C., Ekuma, U. O., Ohanusi, I. N., & Izah, S. C. (2025). Implementing One Health approach to emerging zoonotic diseases: Bridging surveillance, sustainability and global governance. *Exon, 2*(3), 200–223. https://doi.org/10.69936/en12y0025

Department of Groundwater Resources. (2024, December 13). *Raingan Sathankan Nam Badan Prachampi Pho So 2565* [Groundwater Situation Report, 2022]. https://www.dgr.go.th/th/public-service/329

Food and Agriculture Organization of the United Nations (FAO). (2024, September 27). *One Health definition and principles*. https://www.fao.org/one-health/highlights/highlights-detail/one-health-definition-and-principles/

Grenda, D., & Palmunen, L. M. (2025). Constructing clarity in managerial competence: Seven primitives for future research. *Management Review Quarterly*. https://doi.org/10.1007/s11301-025-00501-z

Kawachi, I., Subramanian, S. V., & Kim, D. (2008). Social capital and health. In I. Kawachi, S. V. Subramanian, & D. Kim (Eds.), *Social capital and health* (pp. 1–26). Springer. https://doi.org/10.1007/978-0-387-71311-3_1

Laing, G., Duffy, E., Anderson, N., Antoine-Moussiaux, N., Aragrande, M., Beber, C. L., Berezowski, J., Boriani, E., Canali, M., Carmo, L. P., Chantziaras, I., Cousquer, G., Meneghi, D., Rodrigues Sanches da Fonseca, A. G., Garnier, J., Hitziger, M., Jaenisch, T., Keune, H., Lajaunie, C., & Häsler, B. (2023). Advancing One Health: Updated core competencies. *CABI One Health*, 2, Article 0002. https://doi.org/10.1079/cabionehealth.2023.0002

Larsen, R. J. (2020). Shared curricula and competencies in One Health and health professions education. *Medical Science Educator, 31*(1), 249–252. https://doi.org/10.1007/s40670-020-01140-7

McClelland, D. C. (1973). Testing for competence rather than for intelligence. *American Psychologist, 28* (1), 1–14. https://doi.org/10.1037/h0034092

Ministry of Health, Ministry of Agriculture and Cooperatives, World Health Organization, World Organisation for Animal Health, & Food and Agriculture Organization of the United Nations. (2022). *National Bridging Workshop on the International Health Regulations (IHR) and the Performance of Veterinary Services (PVS) Pathway – 20–22 July 2022, Bangkok, Thailand*. https://rr-asia.woah.org/app/uploads/2022/12/ihr-pvs-nbw-report-thailand-20-22-jul-2022.pdf

Nakhon Sawan Provincial Livestock Office. (2025, June 26). *Sān̆khanān̆kŏn pasūtsāt changwat Nakhon Sawan* [Livestock situation reports in Nakhon Sawan province] [Data portal]. https://nakhonsawan.gdcatalog.go.th/organization/nakhonsawan_dld

Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Simon & Schuster.

Rüegg, S. R., McMahon, B. J., Häsler, B., Esposito, R., Nielsen, L. R., Speranza, C., Ehlinger, T., Peyre, M., Aragrande, M., Zinsstag, J., Davies, P., Mihalca, A. D., Buttigieg, S. C., Rushton, J., Carmo, L. P., De Meneghi, D., Canali, M., Filippitzi, M. E., Goutard, F. L., Ilieski, V., Milićević, D., O'Shea, H., Radeski, M., Kock, R., Staines, A., & Lindberg, A. (2017). A blueprint to evaluate One Health. *Frontiers in Public Health, 5*(20), Article 20. https://doi.org/10.3389/fpubh.2017.00020

Spencer, M., & Spencer, M. S. (1993). *Competence at work: Models for superiors performance.* John Wiley & Sons.

Solís, A., & Nunn, C. L. (2021). One health disparities and COVID-19. *Evolution, Medicine, and Public Health*, *9*(1), 70–77. https://doi.org/10.1093/emph/eoab003

Thailand One Health University Network (THOHUN). (2017). *Operation manual for stakeholder mapping and identification of One Health core competencies for current Thai workforce*. Thailand One Health University Network, National Coordinating Office. https://thohun.org/wp-content/uploads/2023/10/OHCC-for-Current-Thai-Workforce-Book-EN.pdf

Togami, E., Behravesh, C. B., Dutcher, T. V., Hansen, G. R., King, L. J., Pelican, K. M., & Mazet, J. K. (2023). Characterizing the One Health workforce to promote interdisciplinary, multisectoral approaches in global health problem-solving. *PLOS ONE, 18*(5), Article e0285705. https://doi.org/10.1371/journal.pone.0285705

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. https://sdgs.un.org/2030agenda

Wilcox, B. A., & Steele, J. A. (2021). One Health and emerging zoonotic diseases: Framework, integration and challenges. In I. Kickbusch, D. Ganten, & M. Moeti (Eds.), *Handbook of global health* (pp. 1–49). Springer. https://doi.org/10.1007/978-3-030-05325-3_88-2

World Health Organization (WHO). (2023). *One Health.* https://www.who.int/health-topics/one-health#tab=tab_1