 doi:10.20944/preprints202205.0341.v1

Article

A Mixed-Method National Study of Public Health Core Competencies in Undergraduate Medical Schools in Thailand to Find out the Need for Transformative Changes

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Abstract: Background: With new challenges to the health system, many new competencies within the scope of teaching public health need to be addressed in medical schools' curricula such as disaster risk management and health system science. The aims of this study were to identify the needs of public health competencies for medical doctors in Thailand and to assess the level of integration for technical collaboration in teaching public health. **Method:** A total of 17 out of 21 Thai medical schools participated in the national survey. Qualitative inquiries applied focus group interviews of community representatives from ten sample villages and in-depth interviews of representatives from stakeholder organizations particularly employers. The list of public health competencies framework recommended by WHO-SEARO was applied. Quantitative analysis applied descriptive analysis using STATA 15 and qualitative findings were validated by interrelating the meaning of themes from Word Clouds created in NVivo12. Data integration applied a mixed-method Quan-qual approach. **Results:** 17 medical schools returned the questionnaires (80.95 % yield). The most common regionally-defined public health competencies (in over 70% of schools) were shown to be: Biostatistics, Community Medicine, Epidemiology, Family Medicine, Medical Ethics and Professional Laws, Preventive Medicine, Health Promotion, Holistic Care, and Research. The curriculum in only one medical school lacked Health Economics, whilst Disaster Management was lacking in two other schools. Discipline-based subjects were found to be more prevalent than interdisciplinary competencies. A variety of methods were being applied for teaching public health. The majority of the schools applied lecture as the main teaching method and multiple-choice questions as the main assessment method. Thai communities expect the doctors to get in touch with the community more often, lead the primary health care team through training the health professionals and community health volunteers, and educate the community for better health. **Conclusion:** Human resource is the main challenge in addressing interdisciplinary competencies. It is necessary to establish a collaborating mechanism among the big and small medical schools and the faculties of public health to improve the teaching of public health to undergraduate students in medical

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schools. There is also a need to strengthen the health system science and leadership so that future MDs can lead health service delivery according to the needs of their employers such as the Ministry of Public Health and the Rural Doctors Association. The findings of this study may help to identify a national framework of public health core competencies for medical schools and create a common platform for interdisciplinary collaborations.

Keywords: medical education; public health; medical schools; community; global health; human resource

1. Introduction

Changes have occurred rapidly in many ways that impact medical education, in terms of technology for diagnosis, investigation, and treatment, the explosion of new knowledge, new diseases and new drugs, borderless communication, social, cultural, behavioral and demographic changes, as well as climate change and disaster. Medical schools are faced with the challenge of how to produce doctors to respond to all these changes. Epidemiological transition demands newer competencies of medical graduates (Duvivier, Stull et al. 2015). Public health competencies and health system-oriented practices are essential components in the education of the new generation of medical doctors in the 21st century. Therefore, transformative changes in educational institutions and medical schools have become mandatory in order to align with health system changes.

Public health core competencies are the essential sets of knowledge skills and attitudes transcending the boundaries of disciplines and independent of program and topics.(2014) Being the basic building blocks of public health education and professional development, they are the first step in articulating common standards, terminology and approaches among medical schools and institutions in recruitment, development and retention of the healthcare workforce. Recently WHO-SEARO published a teacher's guide for training those teaching public health in undergraduate medical schools (2015). (Chamberlain, Wang et al. 2008, Chamberlain, Wang et al. 2008) Public health core competencies were defined regionally after a series of expert meetings. Afterward, the WHOCC for Medical education, Faculty of Medicine, and Chulalongkorn University organized a regional level training of master trainers in January 2015 (2015). It produced specific training outcomes as well as hints for further implementation to improve teaching public health in Southeast Asia. Thailand was the first country to bring about universal health coverage in the WHO-SEARO region. In relation to education, Thailand is expected to become the example of how to initiate transformative changes to improve public health teaching in medical schools. Medical curricula are defined not only by the medical faculties, but also by important stakeholders such as employers, accreditation bodies and the public in each country, and therefore, are highly contextual. The competencies prioritized in each country are different. A study which could provide information about current core public health competencies taught in undergraduate medical schools has yet to be conducted in Southeast Asia. Our team wanted to know the situation in our country, Thailand, so it was decided to conduct research fulfilling this gap in the literature.

The report about Health Professionals for the 21st century (Frenk, Chen et al. 2010) challenged most medical schools to examine their own systems, policies, strategies, human resources, and outcomes. (Stigler, Duvivier et al. 2010) The three important required changes in medical students included active competency-driven learning, effective teamwork, and creativity. Teaching public health to undergraduate medical students is accepted by many schools as it represents an important element in the curriculum development that can prepare medical students for the 21st century. (Frenk, Chen et al. 2010, Stigler, Duvivier et al. 2010, Duvivier, Stull et al. 2015)). In many countries they have developed core competencies in public health to be applied by all medical schools. In the

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United States in 2003, medical schools were requested to teach public health for the better health of their population. In 2007 some new subjects were added with clearly-defined outcomes: leadership, emergency medicine, and community preventive diseases. However, many medical schools were using different strategies. The American Society of Doctors tried to create consistency by setting up 12 core competencies to be taught in all undergraduate medical schools. These competencies are: Health System Understanding, Public Health Role, Public Health Foundation, Health System and Policy, Inter-sectoral Cooperation, Clinic, Community and Culture, Clinical Prevention, Cultural Competence, Community Engagement, Population Health Science and Data, Research Application, Data Science, Surveillance, Environmental Health, and Global Health (Medicine 2003, Chamberlain, Wang et al. 2008, Finkelstein, McMahon et al. 2008, Zenzano, Allan et al. 2011, Kaufman, Roth et al. 2015, Morley, Rosas et al. 2017)(2,7,9,15,21,22,33). Recently the medical council of India revised the medical curriculum of India to be accountable to the population with the integration of population healthcare, namely Public Health, Family Medicine, Cultural Competence, Community Development and Advocacy, Research and Evidence-based Practice, and Generic Competence (Shewade, Jeyashree et al. 2017). In 2014, the Medical Council of South Africa suggested that medical schools revise the curricula objective for medical students to be able to be communicators, collaborators, leaders, managers, health advocates, scholars, and professionals in order to provide improved healthcare to the population when becoming doctors (Knight, Ross et al. 2017) The integration of public health was set up in the medical schools in Israel in 2017 including research, health promotion and prevention of diseases, health system and healthcare delivery of the population (Dankner, Gabbay et al. 2018), whilst in 2009 the Medical Council of England set up strategies for all medical schools to integrate the 8 core competencies of public health into their curricula (10,25)(Gillam and Bagade 2006, Gillam and Maudsley 2010).

The University of Toronto, Canada (1,14) (Johnson, Donovan et al. 2008, Busing, Rosenfield et al. 2009) was the lead to teach community medicine in all classes of medical schools in 1996 and follow up the outcomes. They found that the community was satisfied with the doctors' competencies and the students' satisfaction increased. So, the Medical Council of Canada decided to set up 8 domains of 51 public health objectives with teaching starting in 2009. The last update was carried out in 2019. Australia (11) outlines the doctors' roles in public health as to understand the principle of public health, participate in health promotion, prevent diseases, be accountable, and screen and report diseases that occur in the local areas. The regional WHO (Organization 2010)(27) held a conference on 8-10th December 2009 about the strengthening of public health teaching in undergraduate medical schools of the South-East Asia region starting with a revision of the medical curriculum. In 2015 WHO SEARO organized a workshop at Chulalongkorn medical school, Thailand, for faculty members from many medical schools in the South-East Asia region countries (31) with the goal that the attendants would be able to apply the strategies put forward.

The curricula of all medical schools in Thailand are reviewed and revised every 6-7 years in order to be up to date, before being approved by the Medical Council of Thailand (20). In 1971, the Thai Medical Consortium organized the 3rd National Medical Education Conference and set up a policy to improve the teaching of medical students to enable them to practice well after graduating by adding social and preventive medicine into the curriculum. Besides the new subjects, the medical students were also sent out to the provincial hospitals to gain more clinical experiences. Recently, in 2012, the Medical Council of Thailand revised the standard of the medical curriculum by adding the content of community medicine, so that every medical school would teach their students similar subjects. The 8th National Medical Education Conference (28) was carried out in 2009, with the theme "People-centered Health Care". It was suggested to revise the curriculum to be in line with this theme by integrating "patients' safety" into the curriculum. In this way it was expected that after graduation the doctor would be able to provide health care to the

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majority of people (population health) ill with common diseases. The suggestion also emphasized holistic care and included prevention, rehabilitation and health promotion. This provides clear evidence that public health has been incorporated into the medical curriculum. The theme of the 9th National Medical Education Conference (29) in 2015 was "Revise Medical Education for the Future Doctor". Important recommendations for medical schools were made, such as: (1) "To organize the healthcare delivery system of Thailand to be the most efficient, it needs to have doctors working in both government and private sectors with appropriate competency. The appropriate competency means that the doctor can be a specialist, general practitioner, teacher, researcher, or administrator. So, the medical schools should manage the way to produce different kinds of doctors; and (2). "Medical education should be of international standard but suitable for the Thai context. The medical schools should set the goals for their competencies that can respond to the needs of the health system and their lifestyle." From these policies it can clearly be seen that the goal to distribute doctors to cover the population adequately was set. Dumrongrat Lertrattananon (16)(Lertrattananon, Limsawart et al. 2019) reported on the opinions of 28 residents training in Family Medicine in Thailand, about their public health competencies while they were medical students. These residents reported that they were weak in communication with patients, care of emergency cases, care of gynecologic and pediatric cases, and did not have enough experience of work in the community.

In Thailand, all medical curricula must be approved by the Medical Council of Thailand. However, there is no agreement about the content of public health. During preparation for the 9th National Medical Education Conference (29) in 2015, the 2nd subcommittee analyzed the curricula and found that each medical school had different contents and a different emphasis on community medicine and family medicine. This stimulated us to study about the situation of public health contents in the curricula of undergraduate medical school in Thailand. The overall aim of this study is to improve the teaching of public health in medical schools through a transformative education strategy. The specific objectives are: (1) To provide the areas of integration for technical collaboration among Thai medical schools and departments teaching public health; (2) To create a common platform for interdisciplinary collaborations through a national framework of public health core competencies for Thai medical schools; and (3) To identify the need of public health competencies for the health workforce in Thailand.

2. Materials and Methods

This is a mixed method study in which quantitative and qualitative data are collected recursively in multiple steps (QUAN→←QUAL):

(1) Stakeholder meeting and analysis
(2) Data collection and analysis through national survey
(3) Focus-group interviews
(4) In-depth interviews

Stakeholder meetings and Stakeholder analyses

Identifying stakeholders is the very first step of participatory action research. The stakeholders in term of power, interest and legislation relating to the improvement of teaching public health in medical schools in Thailand were identified as follows:

1. Faculties which teach public health in medical schools
2. Researchers of the current project
3. Representatives of authoritative bodies:
(3.1) Medical Council of Thailand
(3.2) Ministry of Public Health
(3.3) Rural Doctors Association
4. Community of practice: public health educators

Data acquisition to initiate participatory action research (PAR) cycle

Quantitative methodology and qualitative inquiry were applied and interrelated to get a comprehensive answer and action model to improve the teaching of public health in

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medical schools. Data which was meaningful and stimulatory to start a change was essential to begin the PAR cycle. The study comprised the following to synthesize an action model (Tavakol and Sandars 2014)

1. National Survey
2. Qualitative inquiries:

2.1 Focus group discussions with the communities

2.2 In-depth interviews with the employers

2.1. National survey:

2.1.1. Study population:

This comprised all 21 medical schools in Thailand. For the national survey, the sampling frame consisted of all medical schools in Thailand providing MD Degree. A mailing survey approach was applied.

2.1.2. The respondents of the survey

Survey questionnaires were sent to all medical schools in Thailand by addressing them to the Dean of the medical schools and c/c to the Head of the department teaching Public Health. Two participants from each institution were invited to participate in the study: (1) Dean of the medical school; and (2) the person who was most responsible for teaching public health at each faculty of medicine.

For the qualitative inquiries, purposive sampling was applied to include medical schools from different provinces which were different in terms of geography, demography, sociology and epidemiology.

2.1.3. Survey data collection

The Institutional Review Board of the Faculty of Medicine, Chulalongkorn University approved the ethics of this study. (219,60, dated 20 June 2017) The approval of each medical school and informed consent of each respondent were acquired for data collection.

Survey data collection from August 2017 to December 2018 consisted of three sources of data:

1. Structured questionnaires
2. Open-ended questionnaires
3. Curricula maps

Structured questionnaires

A questionnaire was carefully prepared to be respondent-friendly. The instrument was developed and finalized with the participation and consultation of stakeholders. The content of the survey instrument was thoroughly checked to be congruent with the objectives of the study. The validity of the instrument was carefully secured through its content and face validity being checked by a panel of experts. A pilot study was conducted before the actual survey to test how comprehensive and time-consuming the questions were in order to make it respondent-friendly.

Secondly, the curriculum map was requested from each faculty. According to the present study objectives, researchers aimed to seek evidence-based practices to improve the teaching of public health in medical schools. The survey aimed to acquire representative evidence which might challenge the conventional way in which curricula are modified.

Investigation of the following areas was carried out:

1. Public health competencies, such as disciplinary and interdisciplinary competencies, currently being addressed in each medical school

2. Local faculties' opinion relating to priority of the WHO recommended public health competencies (Table 1) in each school

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3. Integration level among departments teaching public health and other competencies
4. Country's need of specific competencies in medical graduates
5. Teaching staff or academic workforce's delivery of those competencies to students
6. Techniques applied in teaching public health subjects
7. Techniques applied in assessment of public health subjects
8. Evaluation of public health courses within the medical curriculum

Open-ended questions

The survey was a systematically structured quantitative approach to find the current situation of public health teaching in medical schools. A few open-ended questions were embedded in the survey instrument to explore the free ideas of the respondents beyond the structured questions. After the survey findings the adequacy of the information and evidence was assessed.

The structured questionnaires were sent to medical schools through the national networks of medical education such as the Thai medical consortium. The content of the questionnaires covered:

1. Public health competencies taught in current public health curriculum (Table 2)
2. Priority of regionally-defined competencies in each regional context
3. Perceived barriers for implementation
4. Required support for sustained activity

2.1.4. Survey Data Analysis:

Survey data was analyzed using a descriptive approach presenting mean, median, and percentage using STATA SE version 16. Qualitative data were collected by Thai researchers and translated into English after confirmation by at least three researchers who spoke both Thai and English. Then narratives were coded into themes. In addition, narratives were analyzed using word cloud analysis in NVivo 12 Plus.

2.2. Qualitative Inquiries:

A qualitative approach was applied as follows:

(a) To understand the expectations of people in different Thai contexts relating to the health competencies of medical graduates;

(b) To understand the expectations of organizations and employers relating to the public health competencies of medical graduates.

We sought to understand better how people in different contexts of Thai communities defined the meaning of public health medicine and health system-oriented practice. Public health competencies advised by WHO and adopted at the national level might or might not sufficiently address the needs of the community served by each medical school. Researchers, therefore, proposed this qualitative part of the study to explore the meaning and the importance of public health reflected by the communities and the service they expect from future medical graduates. Therefore, it was important to appropriately identify the setting and participants for this study. Medical education researchers visited the communities served by medical schools. Thailand has several areas of differing contexts in terms of public health needs, and social and cultural diversity. Therefore, researchers chose places using a purposive sampling approach as shown in Figure 1. Communities in urban areas, rural areas, bordered-areas, disaster-prone areas, across all regions of Thailand were purposely selected as the study site communities. Field study was applied via focus group discussions to gather data from key informants of the community. (Stalmeijer, McNaughton et al. 2014) (24) These informants were interviewed via focus group discussion to better understand their expectation of the contribution of medical doctors in the scope of public health and health system-oriented approaches. Focus group discussion comprised the following stakeholders: (1) local leader of the lay board; (2) health volunteers; (3) attendants of primary care units; (4) family members of the attendant; and (5)

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nurses from primary care units. The team comprised a researcher, an assistant researcher and a note-taker. The narrative inquiry would not pose any serious ethical problems. Participants' privacy and their sense of security were assured by informing them about the study before beginning the focus group discussion. Local medical schools were requested to assist in organizing the focus groups. Data was recoded in notes and audio records.

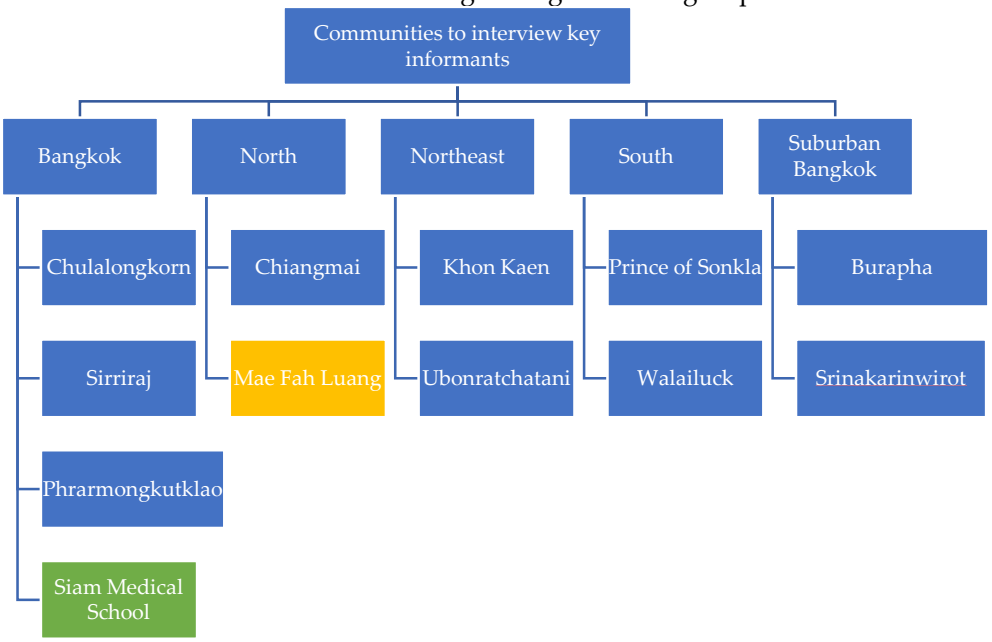

Figure 1. The selection of communities for qualitative inquiry in the communities. Note: *Yellow box shows a medical school in border area; Green box shows a private medical school*

Analysis was undertaken by way of content analysis as soon as data saturation was reached. People's opinion of the need of public health competencies was recoded, categorized and summarized into the public health competencies. These narrative inquiries were undertaken to investigate the context specific, public health education and competency of the medical doctors. The findings were validated by interrelating the meaning of the themes. Then, the findings were interpreted carefully in order to see the similarities and differences between the findings from the survey, the findings from interviews with employers, and other concurrent study findings.

2.2.1. In-depth interviews exploring the needs of employers:

There remained a gap and clear necessity to highlight the view of multiple-stakeholders who have direct interest in public health competencies of the medical graduates. Thus, additional narrative inquiries were conducted in the form of in-depth interviews. The interviews were arranged with the following stakeholders:

1. MOPH Permanent Secretary and Heads of related departments
2. Association of Provincial and Regional Hospital Doctors
3. Representative of the Thai Medical Council of Thailand

Trustworthiness of the research findings has been built by eliciting the standpoints of medical teachers, institutions, employers and the public. The invitation letters were sent to the above persons to make an appointment for interview by the research team. In the interview, the interviewer explained about the proposal and showed the table of competencies to the interviewees. The interviewees were asked to comment on the list from their perspective as employer.

3. Results

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3.1. Results and discussion of National Survey

Respondent information

We invited all 21 medical schools in Thailand. There were 19 replies. Two universities sent two replies. Therefore, altogether there were 17 respondents making a response rate of 80.95 percent. The oldest medical school was 131 years old and the youngest was 11 years old as of 2019. All the medical schools were more than 10 years old. The median age of the establishments was 29 years old. Schools aged 30 years and more were classified as 'old' and those aged less than 30 years were classified as 'new'. 47.6 percent of the medical schools were 'old' schools. The number of students enrolled to each medical school ranged from 32 to 313 per year. The median number of students enrolled per year was 135. Schools enrolling more than 100 students per year were classified as 'big' schools and those enrolling less than 100 students per years were classified as 'small' schools. 58.8 percent of the medical schools were big-sized school. Regarding accreditation, 76.4% of the medical schools received recent accreditation from the WFME or IMEAC. The number of teachers was significantly different between old and new schools and big and small schools. There were only three private schools.

In 2016, WHO SEARO introduced a set of defined competencies recommended for medical schools in Southeast Asia. We applied this set to find out how the medical schools addressed them.

Table 1. Public health competencies for undergraduate medical curriculum.

Discipline-Based Interdisciplinary	**Interdisciplinary**
1. Biostatistics	1. Communication and IT
2. Community Medicine	2. Critical Appraisal Skills
3. Epidemiology	3. Health promotion
4. Family Medicine	4. Holistic care
5. Health Economics	5. Leadership and Teamwork
6. Health Policy and Management	6. Oriental medicine
7. Medical Ethics and Professional Laws	7. Patient`s right and safety
8. Occupational and Environmental Health	8. Professional and Personal Development
9. Preventive Medicine	9. Quality of Health Care
10.Social and Behavioral Sciences	10.Social Responsibility/Accountability

The survey sought information regarding:

1. Public health competencies including both disciplinary and interdisciplinary competencies, which were currently being addressed in each medical school (Table1,2,3)

2. Local faculties' opinion about priority of the WHO recommended public health competencies in each school (Table 4)

3. Integration level among departments teaching public health and other competencies (Table 5)

4. Country's need of specific competencies in medical graduates (Table 6)

Current situation of addressing regionally-defined public health competencies

Table 2. Current situation of addressing regionally defined public health competencies.

Respond in n (%)	**Not in curriculum**	**just listed**	**Trying to address**	**Well addressed**	**Well established**

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Discipline-Based Competencies					
1. Biostatistics			1(5.88)	4(23.53)	12(70.59)
2. Community Medicine				2(11.76)	15(88.24)
3. Epidemiology				4(23.53)	13(76.47)
4. Family Medicine			2(11.76)	1(5.88)	14(82.35)
5. Health Economics	1(5.88)		5(29.41)	6(35.29)	5(29.41)
6. Health Policy and Management			3(17.65)	6(35.29)	8(47.06)
7. Medical Ethics and Professional Laws			1(5.88)	3(17.65)	13(76.47)
8. Occupational and Environmental Health		1(5.88)	1(5.88)	6(35.29)	9(52.94)
9. Preventive Medicine			1(5.88)	4(23.53)	12(70.59)
10.Social and Behavioural Sciences			3(17.65)	5(29.41)	9(52.94)
Interdisciplinary Competencies					
1. Communication and IT		1(5.88)	3(17.65)	3(17.65)	10(58.82)
2. Critical Appraisal Skills			3(17.65)	3(17.65)	11(64.71)
3. Health promotion				4(23.53)	13(76.47)
4. Holistic care			2(11.76)	2(11.76)	13(76.47)
5. Leadership and Teamwork		1(5.88)	2(11.76)	5(29.41)	9(52.94)
6. Oriental medicine		3(17.65)	5(29.41)	3(17.65)	6(35.29)
7. Patient`s Rights and Safety			3(17.65)	4(23.53)	10(41.18)
8. Professional and Personal Development			3(17.65)	5(29.41)	9(52.94)
9. Quality of Health Care			5(29.41)	5(29.41)	7(41.18)
10.Social Responsibility/Accountability			5(29.41)	5(29.41)	7(41.18)
11. Research				4(23.53)	13(76.47)
12. Health Care System			1(5.88)	9(52.94)	7(41.18)
13. Disaster Management	2(11.76)	2(11.76)	4(23.53)	3(17.65)	6(35.29)
14. Evidence-Based Medicine		1(5.88)	3(17.65)	2(11.76)	11(64.71)

Discipline-based subjects were found to be better addressed than interdisciplinary competencies. (Figure 2) Disciplinary-based competencies are basic competencies in public health and most of the medical schools have traditionally addressed these disciplines.

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With the changing health problems and newer challenges to the health system, new competencies require integration of multiple specialists. Some competencies were not addressed in many medical schools. Health economics, for example, was yet to be addressed in more than 25% of the medical schools. Interdisciplinary competencies may also be delivered not only by the public health department but also by the other departments. However, specifically some interdisciplinary competencies such as health-care system and health promotion were mostly confined to public health departments. Health promotion was addressed in all medical schools, whilst the health care system was addressed in almost all schools with one school answering that it was trying to address it.

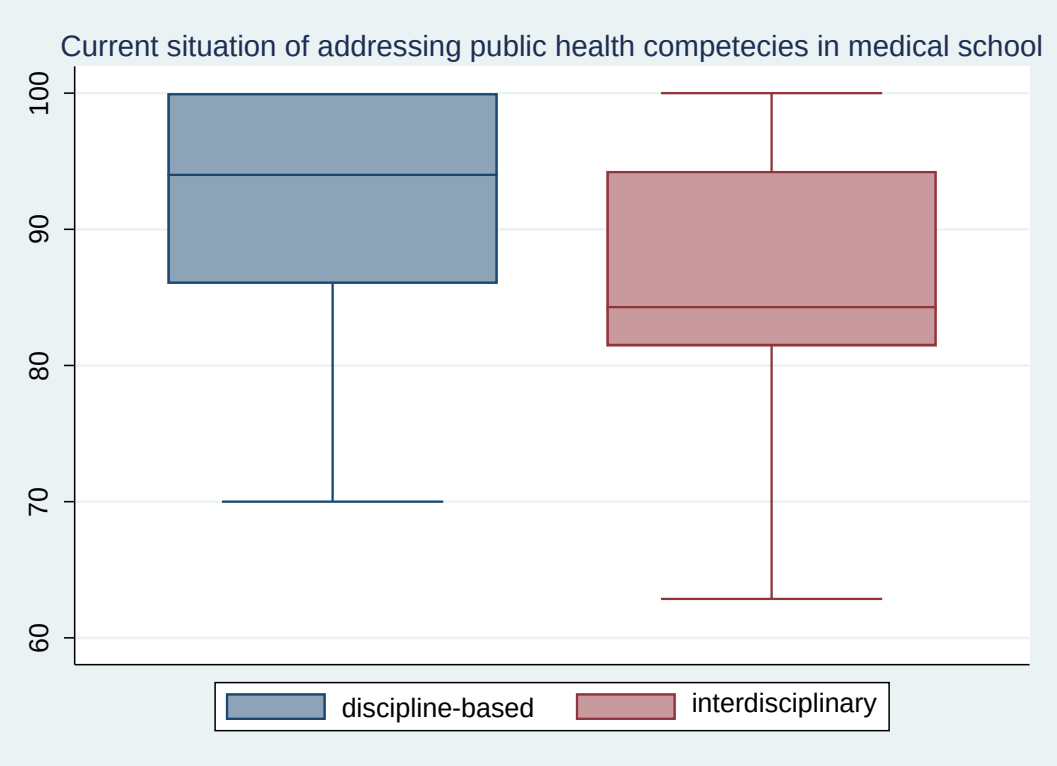

Figure 2. How competencies are addressed currently in undergraduate medical schools in Thailand.

Priority of public health competencies

We asked the question: "The priority of public health competencies is different in varying places and countries. How does your medical curriculum give priority to following public health competencies in the undergraduate medical curriculum?" (Figure 3)

Table 3. Opinion upon priority of the WHO recommended public health competencies in each school 2017.

Respond in n(%)	Not important	Just to know	To understand	To analyse	To apply in practice
Discipline-Based Competencies					
1. Biostatistics			2(11.76)	6(35.29)	9(52.94)
2. Community Medicine			1(5.88)	1(5.88)	15(88.24)
3. Epidemiology			2(11.76)	5(29.41)	10(58.82)

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4. Family Medicine				3(18.75)	13(82.25)
5. Health Economics		2(12.50)	10(62.50)	1(6.25)	3(18.75)
6. Health Policy and Management		1(6.25)	9(56.25)	3(18.75)	3(18.75)
7. Medical Ethics and Professional Laws			2(12.50)	1(6.25)	13(81.25)
8. Occupational and Environmental Health			3(17.65)	5(29.41)	9(52.94)
9. Preventive Medicine			5(29.41)	3(17.65)	9(52.94)
10.Social and Behavioural Sciences		2(11.76)	1(5.88)	4(23.53)	10(58.82)
Interdisciplinary Competencies					
1. Communication and IT		1(6.25)	2(12.50)	2(12.50)	11(68.75)
2. Critical Appraisal Skills			3(18.75)	4(25.00)	9(65.25)
3. Health promotion			2(11.76)	2(11.76)	13(76.47)
4. Holistic care			2(11.76)	1(5.88)	14(82.35)
5. Leadership and Teamwork			2(12.50)	3(18.75)	11(68.75)
6. Oriental medicine		6(37.50)	7(43.75)	1(6.25)	2(12.50)
7. Patient`s Rights and Safety		2(12.50)	2(12.50)	1(6.25)	11(68.75)
8. Professional and Personal Development		2(11.76)	1(5.88)	4(23.53)	10(58.82)
9. Quality of Health Care		2(12.50)	6(37.50)	4(25.00)	4(25.00)
10.Social Responsibility/Accountability		1(6.25)	4(25.00)	4(25.00)	7(43.75)
11. Research			3(18.75)	3(18.75)	10(62.50)
12. Health Care System			4(25.00)	5(31.25)	7(43.75)
13. Disaster Management		5(31.25)	4(25.00)	4(25.00)	3(18.75)
14. Evidence-based Medicine		2(12.50)	2(12.50)	2(12.50)	10(62.50)

Thai medical schools generally follow the guide of the Thailand Medical Council. They all conform to regulations set by the Thailand Medical Council and accreditation according to the WFME. However, they are autonomous to select competencies and craft their curricula content. Two medical schools answered that Health Economics was on a 'just to know' basis, and only one school answered that Health Policy and Management was 'just to know'. This highlights the level that these two competencies are addressed as shown in Table 2. When possible, it is necessary to discuss with the faculties teaching public health what competencies they consider teaching, and why and how. Among the interdisciplinary competencies, more than one third of medical schools answered that Disaster Management was on a 'just to know' basis. It is necessary to explore more about this to see whether it has been addressed by departments other than the public health teaching departments.

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Figure 3. How competencies are prioritized in undergraduate medical education in Thailand 2017 (P=0.89 sing rank test).

Integration in teaching public health

We asked the question: "Integration among multiple departments may have been designed to teach a broad range of public health subjects in your medical school. What level of integration exists to address the public health competencies in the undergraduate medical curriculum of your school?"

Table 4. Integration among many departments to deliver public health competencies in undergraduate medical schools in Thailand 2017-2018.

Respond in n(%)	Only by one department	There is idea	There is plan	Conceptual integration	System integration
Discipline-Based Competencies					
1. Biostatistics	7(41.18)		2(11.76)	4(23.53)	4(23.53)
2. Community Medicine	9(52.94)		2(11.76)	2(11.76)	4(23.53)
3. Epidemiology	6(35.29)		3(17.65)	2(11.76)	6(35.29)
4. Family Medicine	6(35.29)		2(11.76)	3(17.65)	6(35.29)
5. Health Economics	9(52.94)	1(5.88)	3(17.65)	2(11.76)	2(11.76)
6. Health Policy and Management	9(52.94)	2(11.76)	2(11.76)	2(11.76)	2(11.76)
7. Medical Ethics and Professional Laws	2(11.76)		3(17.65)	2(11.76)	10(58.82)
8. Occupational and Environmental Health	7(41.18)	1(5.88)	4(23.53)		5(29.41)
9. Preventive Medicine	5(29.41)	2(11.76)	2(11.76)	2(11.76)	6(35.29)

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10.Social and Behavioural Sciences	3(18.75)	1(6.25)	2(12.50)	5(31.25)	5(31.25)
Interdisciplinary Competencies					
1. Communication and IT	2(11.76)			6(35.29)	9(52.94)
2. Critical Appraisal Skills	2(11.76)	1(5.88)	3(17.65)	2(11.76)	9(52.94)
3. Health promotion	4(23.53)	1(5.88)	1(5.88)	3(17.65)	8(47.06)
4. Holistic care	3(17.65)		2(11.76)	1(5.88)	11(64.71)
5. Leadership and Teamwork	2(11.76)		3(17.65)	1(5.88)	11(64.71)
6. Oriental medicine	10(58.82)		4(23.53)	3(17.65)	
7. Patient`s Rights and Safety	1(5.88)	1(5.88)	4(23.53)	1(5.88)	10(58.82)
8. Professional and Personal Development	2(11.76)	1(5.88)	3(17.65)	1(5.88)	10(58.82)
9. Quality of Health Care	4(23.53)	2(11.76)	2(11.76)	2(11.76)	7(41.18)
10.Social Responsibility/Accountability	4(23.53)	2(11.76)	2(11.76)	4(23.53)	5(29.41)
11. Research	2(11.76)	1(5.88)	1(5.88)	6(35.29)	7(41.18)
12. Health Care System	8(47.06)		3(17.65)	4(23.53)	2(11.76)
13. Disaster Management	8(47.06)	2(11.76)	1(5.88)	3(17.65)	1(5.88)
14. Evidence Based Medicine	2(11.76)		4(23.53)	3(17.65)	8(47.06)

The results showed that there was a high level of integration in Thai medical schools to deliver interdisciplinary competencies. (Figure 4) Regarding Health Care System, however, almost half of the schools did not integrate it. The same was observed for Disaster Management, Health Policy and Management, and Health Economics. Considering the need to address those subjects in many schools, we should find out how to integrate them among the faculties within a school or faculties and expertise beyond the schools.

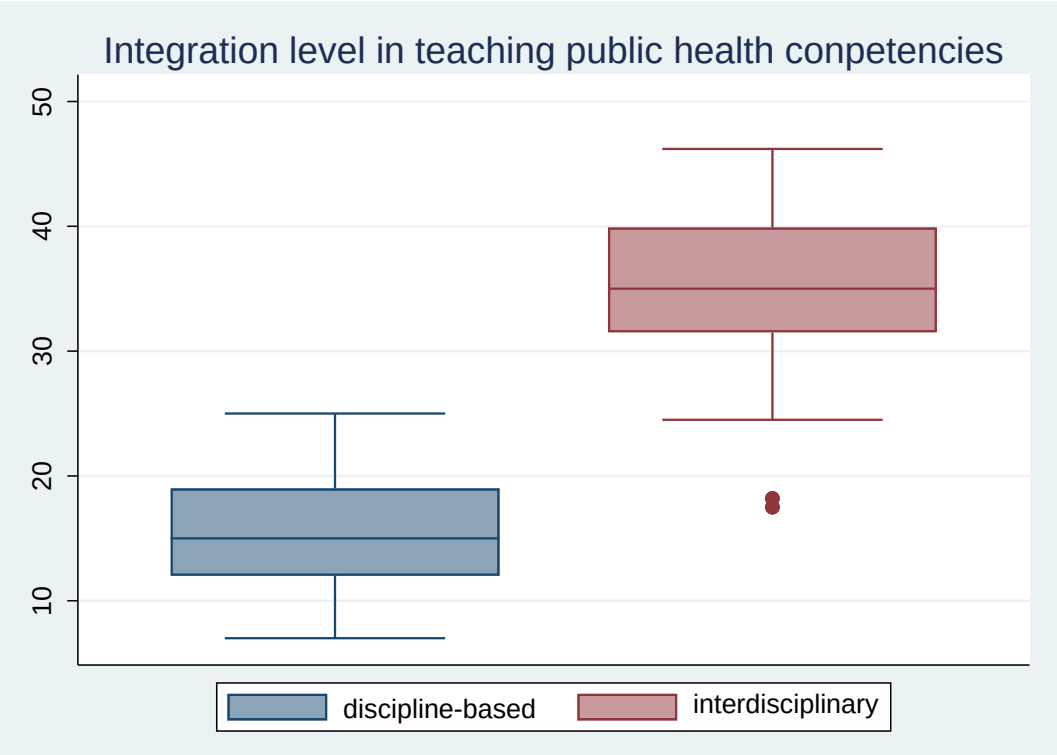

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Figure 4. The extent of integration in delivery of public health competencies. *Note: The integration level (X axis) was calculated multiplying 5 degree of integration and 10 competencies resulting in a level of 50. The integration in the blue box plot is less than the red box plot. (Referring to the Table 4)*

Country's need of public health competencies in medical graduates

We asked the question: "To what extent do current medical graduates possess public health competencies? This answer will assist preparing the need of public health competencies in future doctors."

Table 5. Country's need of public health competencies in medical graduates in Thailand 2017-2018.

Respond in n (%)	**Almost None**	**Insufficient**	**Sufficient**	**Strong**	**Very strong**
Discipline-Based Competencies					
1. Biostatistics		6(37.50)	7(43.75)	2(12.50)	1(6.25)
2. Community Medicine		2(12.50)	6(37.50)	6(37.50)	2(12.50)
3. Epidemiology		2(12.50)	8(50.00)	5(31.25)	1(6.25)
4. Family Medicine		3(18.75)	3(18.75)	7(43.75)	3(18.75)
5. Health Economics	1(6.25)	8(50.00)	7(43.75)		
6. Health Policy and Management		9(56.25)	6(37.50)	1(6.25)	
7. Medical Ethics and Professional Laws		3(18.75)	6(37.50)	6(37.50)	1(6.25)
8. Occupational and Environmental Health		4(25.00)	9(56.25)	2(12.50)	1(6.25)
9. Preventive Medicine		5(31.25)	7(43.75)	3(18.75)	1(6.25)
10.Social and Behavioural Sciences		5(31.25)	6(37.50)	5(31.25)	
Interdisciplinary Competencies					
1. Communication and IT		4(25.00)	7(43.75)	3(18.75)	2(12.50)
2. Critical Appraisal Skills		4(25.00)	7(43.75)	4(25.00)	1(6.25)
3. Health promotion		2(12.50)	9(56.25)	3(18.75)	2(12.50)
4. Holistic care		3(18.75)	5(31.25)	6(37.50)	2(12.50)
5. Leadership and Teamwork		6(37.50)	7(43.75)	1(6.25)	2(12.50)
6. Oriental medicine	1(6.25)	10(62.50)	5(31.25)		
7. Patient`s Rights and Safety		4(25.00)	5(31.25)	5(31.25)	2(12.50)
8. Professional and Personal Development		5(31.25)	5(31.25)	4(25.00)	2(12.50)
9. Quality of Health Care		7(43.75)	6(37.50)	2(12.50)	1(6.25)
10.Social Responsibility/Accountability		8(50.00)	2(12.50)	4(25.00)	2(12.50)
11. Research		3(18.75)	7(43.75)	5(31.25)	1(6.25)
12 Health Care System		6(37.50)	8(50.00)	1(6.25)	1(6.25)
13. Disaster Management	4(25.00)	7(43.75)	3(18.75)	1(6.25)	1(6.25)
14. Evidence Based Medicine		7(43.75)	4(25.00)	2(12.50)	3(18.75)

The purpose of this question was to know the faculty's opinion on the current graduates' strengths and the possible need to strengthen the competencies of future graduates.

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The responses showed that interdisciplinary competencies were considered as needing to be strengthened. This result was important and matched with the qualitative findings. The faculties' answers highlighted the need to strengthen Health Economics, Health Policy and Management, and Disaster Management. Another competency to strengthen was Social Responsibility and Accountability. This competence could be addressed by other departments as well. Regarding Oriental Medicine, Leadership and Teamwork, the findings pointed out that these areas needed to be strengthened too as the community sees doctors as leaders in the community. However, stakeholders in Thailand should discuss and decide on their need for Oriental Medicine competency from the MDs.

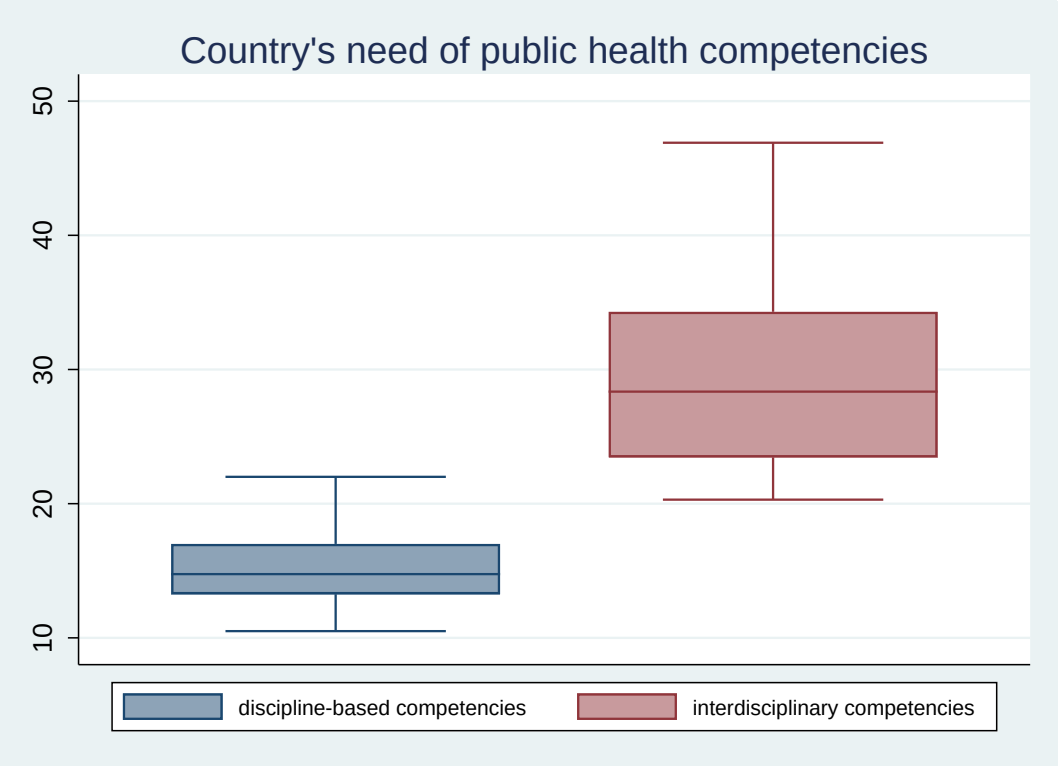

Figure 5. Faculty's opinion of the need to strengthen the teaching of public health in medical schools.

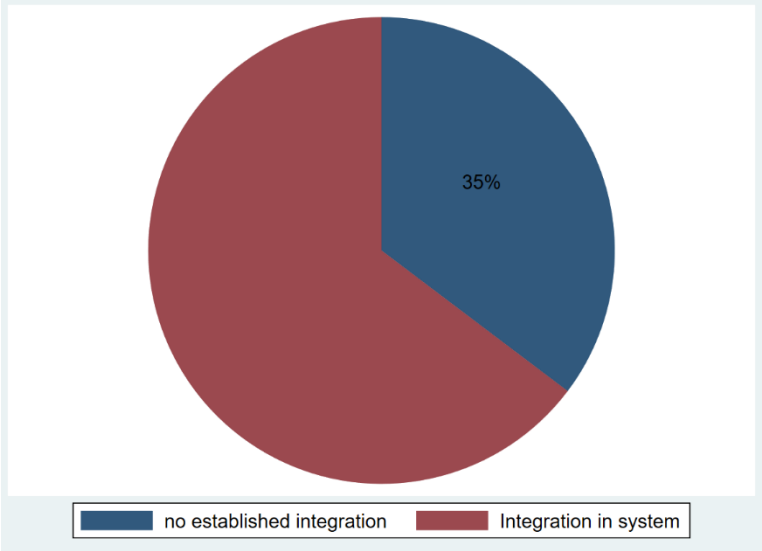

Figure 6. Integration to deliver public health competencies.

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The study showed 35% of medical schools did not have integration to deliver public health competencies in Thailand (2017-2018). (Figure 5,6)

Teaching methods applied in teaching public health in undergraduate medical schools in Thailand

Teaching methods applied in the delivery of public health were explored.

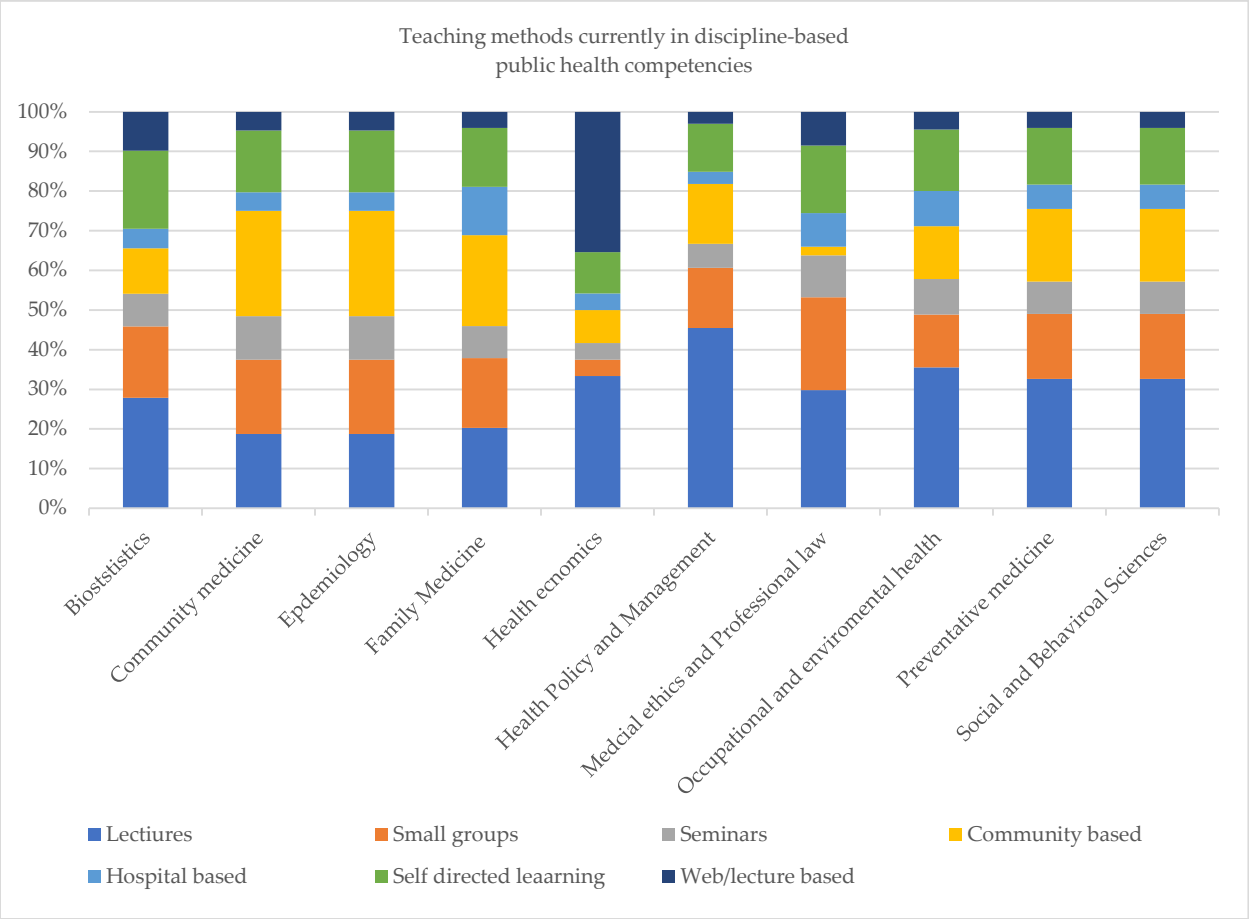

Figure 7. Teaching methods currently applied in the delivery of disciplinary-based competencies of public health.

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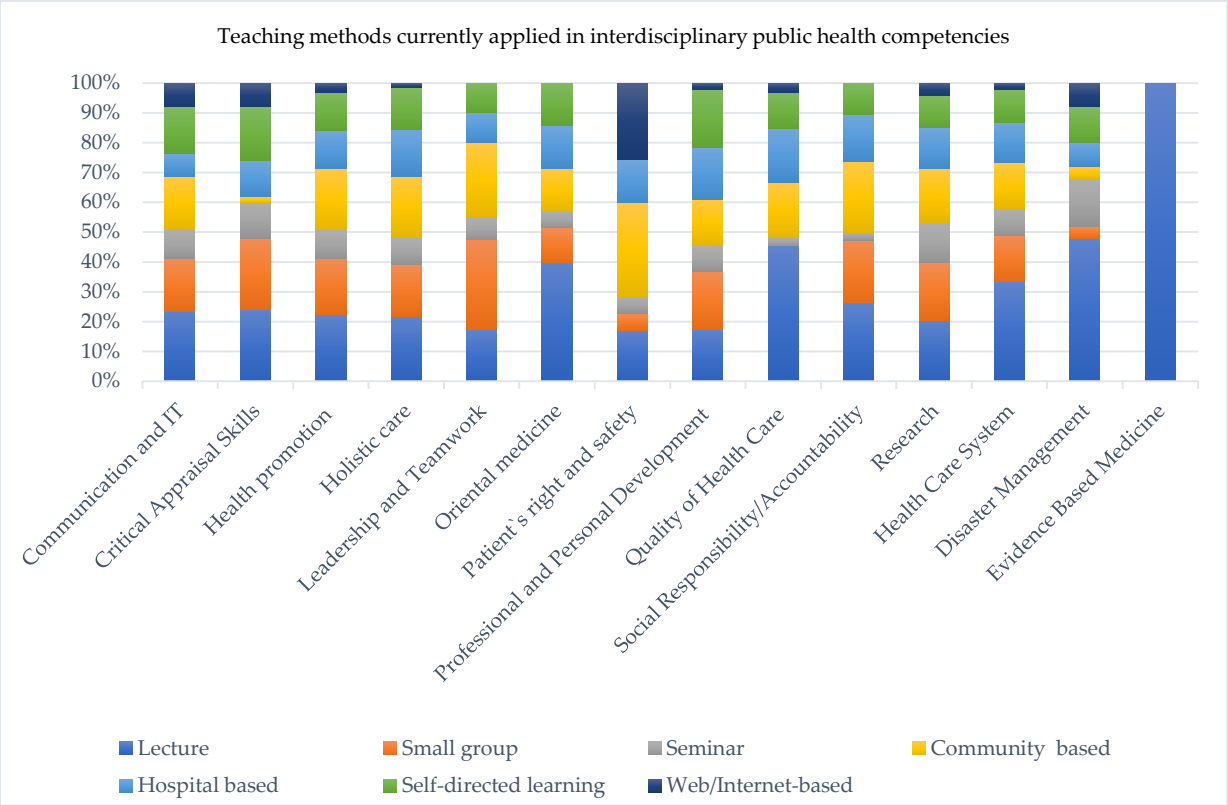

Figure 8. Teaching methods currently applied in the delivery of interdisciplinary based competencies of public health.

The colored graphs above clearly show how different methods were applied by departments teaching public health in Thailand. (Figure 7, 8) Community-based learning (yellow) and self-directed learning (sky-blue areas) indicate that departments applied experiential learning and active learning strategies in delivering public health competencies. Disaster Management was mostly taught via lectures. This probably indicates that drills and simulation games were not yet available. Resources, infrastructure and collaboration are fundamental for this. Evidence-based Medicine was taught mainly by lectures, yet it also required small group discussions and seminars. It was unique that Health Economics was delivered through web-based lectures unlike many other discipline-based competencies. (Figure 10)

Assessment methods applied in teaching public health in the undergraduate medical schools in Thailand

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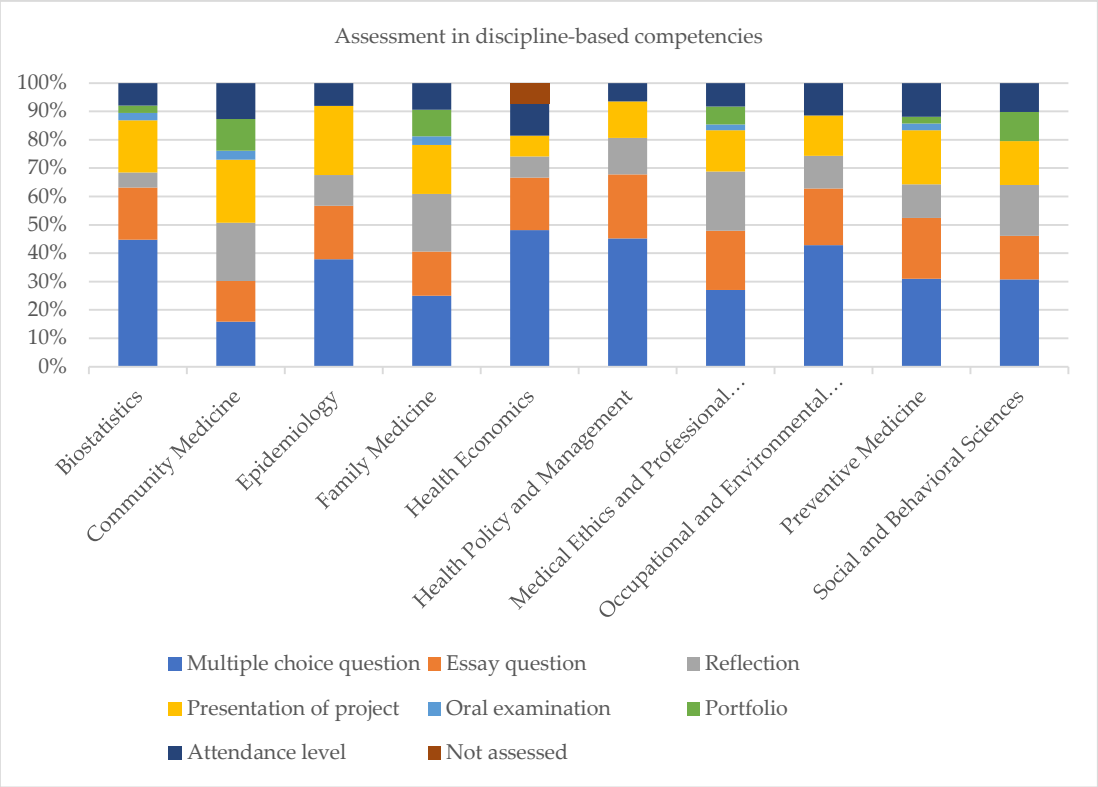

Figure 9. Assessment methods currently applied in undergraduate medical schools for discipline-based competencies in Thailand 2017-2018.

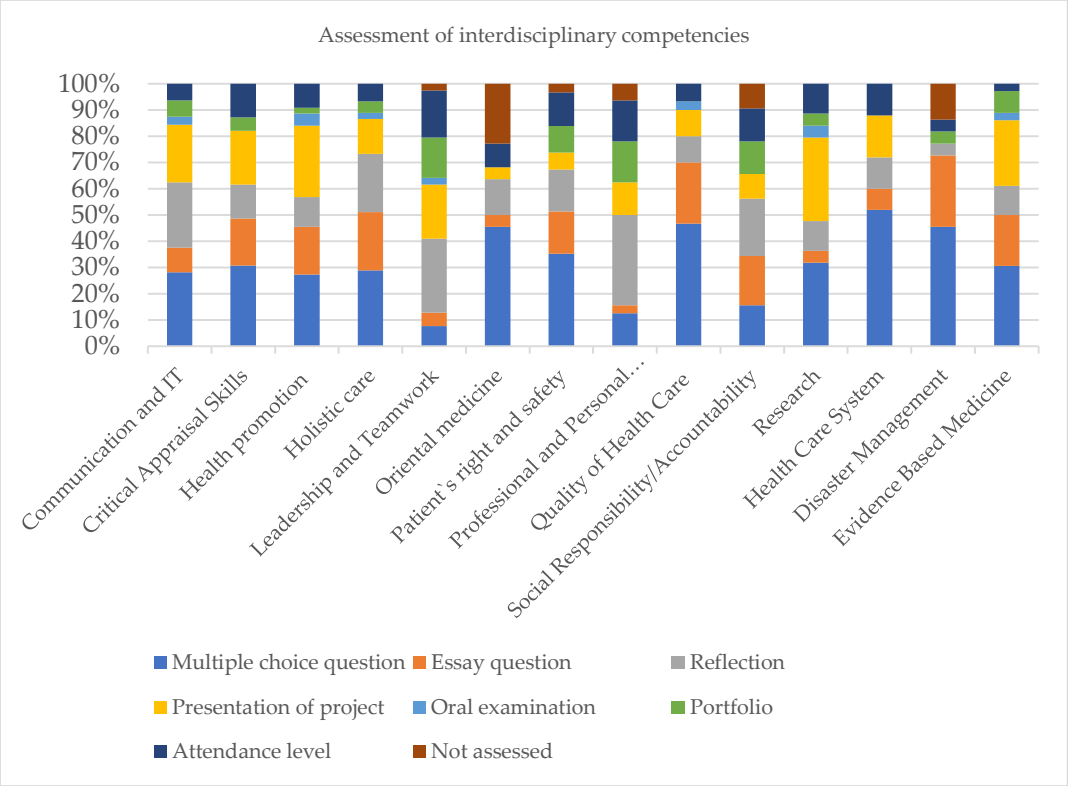

Figure 10. Assessment methods currently applied in undergraduate medical schools for interdisciplinary competencies in Thailand 2017-2018.

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In the Thai medical schools, community and family medicine departments applied different methodologies for assessment of public health competencies. (Figure 9, 10) Use of multiple choice questions (MCQs) was the main methodology for assessment of discipline-based competencies. Interestingly, the presentation of projects was clearly applied in the assessment for both Research and Health Promotion. There was no assessment for Oriental Medicine, Social Responsibility and Disaster Management in the Thai medical schools, reflecting the results of the competencies shown in table 5.

3.2. Results and discussion of qualitative inquiries

3.2.1. Results and discussion of focus group interviews

These narrative inquiries attempted to investigate the context specific, public health education and competency of the medical doctors. The findings were validated by interrelating the meaning of the themes. Analysis applied Word Clouds in NVivo12 software.

Structured interviews: The focus group interview content was prepared to find out the expectations of the communities of the contribution of medical doctors in the scope of public health and health system-oriented approaches.

The following focus group questions were asked to the interviewees:

1. Engagement question: "When was the last time you met a medical doctor for yourself or another person?

2. What was your experience of a medical doctors' service for the community?

3. What is your expectation of the medical doctor for the community?

4. What is your opinion and experience of a medical doctor as the leader of the team serving the community?

5. Is there anything else you would like to say about doctors' engagement with the community?

Most of the participants' discussion was based on their experience of meeting a doctor at the hospital for treatment and advice. Their impression of the visit showed that they were satisfied with the doctors' advice. The findings were based on the people's expectation of medical doctors in the community setting. Two different questions were used, but the answers reflected the same opinion after analysis of coded words in the Word Cloud analysis. Their expectation was that doctors should visit the community, provide advice in PCU, and educate the people for health.

People's expectations of medical doctors

Community residents may not have much opportunity to see a doctor. The findings indicate that they want doctors to visit communities more often providing advice to PCUs, do home visits to bed-ridden patients, and educate people in the communities. Regarding the doctor's role and leadership in the community, most opinions pointed out that doctors rarely come to the community usually only visiting the communities for health promotion and prevention campaigns. It is interesting to have a better understanding of how community residents perceive the doctor's role, as shown in Figure 11. Based on this finding, community integrated-projects or campaigns may serve to better engage the doctors and the community. However, at the time of our study, most of the communities do not have a doctor and are instead served by the primary health care team. This represents a public health project which can be implemented by departments teaching public health. Finally, the interviews sought to find out what kind of competencies the doctors are expected to have. They were expected to get in touch with the community more often, lead the primary health care team, train the health professionals and volunteers in the primary health care team, and educate the community for better health. The greatest overlap that emerged between the surveys and FGDs is a need to strengthen social responsibility/accountability.

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Figure 11. People's opinion of what public health competencies doctors should have.

3.2.2. Results and discussion of in-depth interviews

With the aim of highlighting the view of multiple stakeholders who have a direct interest in the public health competencies of medical graduates, narrative inquiries were conducted in the form of in-depth interviews. Trustworthiness of the research findings was built by considering the standpoints of medical teachers, institutions, employers and the public.

Three interviews were conducted with the following stakeholders:

1. Director from the Ministry of Public Health;
2. Representative from the Medical Council of Thailand;
3. Representative from the Doctors of Medical Centers and General Hospital's Society of Thailand.

The interview questionnaires were prepared by the researchers and brought to the interviews. The interviews were conducted by appointment with the interviewees at suitable private locations with informed consent that anonymity would be guaranteed.

Analysis of the interview data: The interview results were recorded and statements were analyzed via tabular analysis. Each statement representing an idea of the responder was counted to obtain the frequency of the same idea across all sites. The most frequent ideas were listed as matters of priority. The ideas were then listed in order of priority from top to bottom representing the needs of the communities.

Findings

The findings indicate that the new generation of medical doctors should have competencies for administrative skill and knowledge about legislation. They should have a good understanding of the health care delivery system as well as of interpersonal relationships and communication in order to lead teams. Others suggested competencies are media competency and health economics, in addition to basic science and clinical competencies.

3.2.3. Discussion of qualitative findings

From the focus group interviews carried out at 11 community health centers associated with the medical schools in different parts of the country it was shown that people in the communities seem to have a good knowledge of the referral system used in Thailand. The people in all 11 of these communities know that if they become sick, they must go to see the doctors in the hospital, and when they get better, they are referred back to the local health centers in the community close to their homes.

As for health care, the people know that they will receive primary care from the team of other health personnel. However, they still want care from doctors to assure them that they get proper care. The expectations of people in the communities in relation to the doctors are listed in Table 6, from the most frequent to the least frequent statement.

 doi:10.20944/preprints202205.0341.v1

Table 6. Summary of the voice of communities about their expectations of medical doctors: qualitative findings from focus group interviews in the communities across Thailand.

1. Doctors should provide health care in the local health centers.
2. Doctors should provide home visits together with medical students.
3. Doctors should provide home visits for the care of the elderly.
4. Doctors should improve their communication skills with the people in the communities.
The people expect the doctors to:
1. Provide care and advise them about self-healthcare more often, because they trust doctors and will change their behavior according to the doctors' advice. (9 out of 11 communities)
2. Be the community specialist. (3 out of 11 communities)
3. Live in the community to be able to care for them day and night. (3 out of 11 communities)
4. Be polite and gentle. (2 out of 11 communities)

Very few people had experience relating to the leadership role of doctors in the communities.
Besides care from the doctors, people want the doctors to provide the following activities:

1. Give advice and healthcare to the people in the community. (11 out of 11 communities)
2. Work in the community to provide care directly. (5 out of 11 communities)
3. Visit the communities more often. (5 out of 11 communities)
4. Provide holistic care. (2 out of 11 communities)

The other ideas about the doctors' activities that each appeared in only one community are that doctors should improve the ethics, listen to the patents' complaints, provide good communication, advocate government policy, advise people about the rational use of drugs, have a good doctor–patient relationship, provide care for mental illness, chronic illness, and family problems at least once a month, do home visits, train the community volunteers, be the one who treats the patient in the day time and night time, evaluate the volunteer performance, and participate in community activities.

As can be seen from the results, the need of the community is not about the competencies of doctors. The community residents trust that the doctors are well trained, but they are more concerned about the distribution of the doctors where no doctor works in the village. The representatives agreed that the WHO recommendations for competencies is suitable for the country. However, one opinion was that there are many contents that should be combined and reduced.

4. Discussion of integrated findings

Educating health professionals, especially medical students, is at the core of constructing a health system. Therefore, research examining the delivery of public health core competencies for undergraduate medical students is important in each country in order to bring about the transformative changes to tackle emerging challenges to the health system. Many countries, however, still do not have such evidence. This is the first such study that examines how public health core competencies are delivered to the undergraduate medical students in Thailand.

It may be of great benefit to define what level of competencies is required for an ordinary MD in the future and prepare a common text for use in undergraduate medical schools in Thailand. For example,

it was likely that there was a lack of faculties of teaching Health Economics, or this might be an elective subject in some medical schools. (Figure 10). Shedding light on this area may lead to faculty development and gap filling. Experts, such as health economists, usually work in big medical schools or schools of public health, but in limited numbers.

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Collaboration among the medical schools and the faculties of public health would be a solution as a national approach. Moreover, as WHO SEARO organized the training of master trainers in 2015, medical teachers who teach public health can be provided with opportunities to update their excellence in required areas. Participatory action research is required. The current study findings can serve as the starting point of the PAR cycle among teachers, medical schools and the medical council.

Regarding the doctor's role and leadership in the community, most of the opinions pointed out that doctors rarely come to the community tending to only visit the communities for health promotion and prevention campaigns. Therefore, field research projects for the medical students in the communities may serve to fill this gap and also serve as an experiential learning opportunity. As we can see from the results, the needs of the community are not with reference to the competencies of doctors whom they trust are well-trained. The community residents are more concerned about the distribution of the doctors. (Table 6) Finally, in terms of the WHO recommendations for competencies, the representatives agreed that they are suitable for the country.

Current study implied as participatory action research

The cycle of change starts with the results of the stakeholders' meeting and stakeholders' opinion analysis (M1) before initiating the survey and qualitative inquiries (M2) and followed by the delivery of action (M3). Moreover, after acquiring the evidence from this study, a stakeholder meeting will be sequentially arranged to design an action model and a cycle of change. The idea of the implementation sequence in the current study as a PAR is (1) to measure (quantitatively); (2) to reflect (qualitatively) and (3) to act (participatory action research).

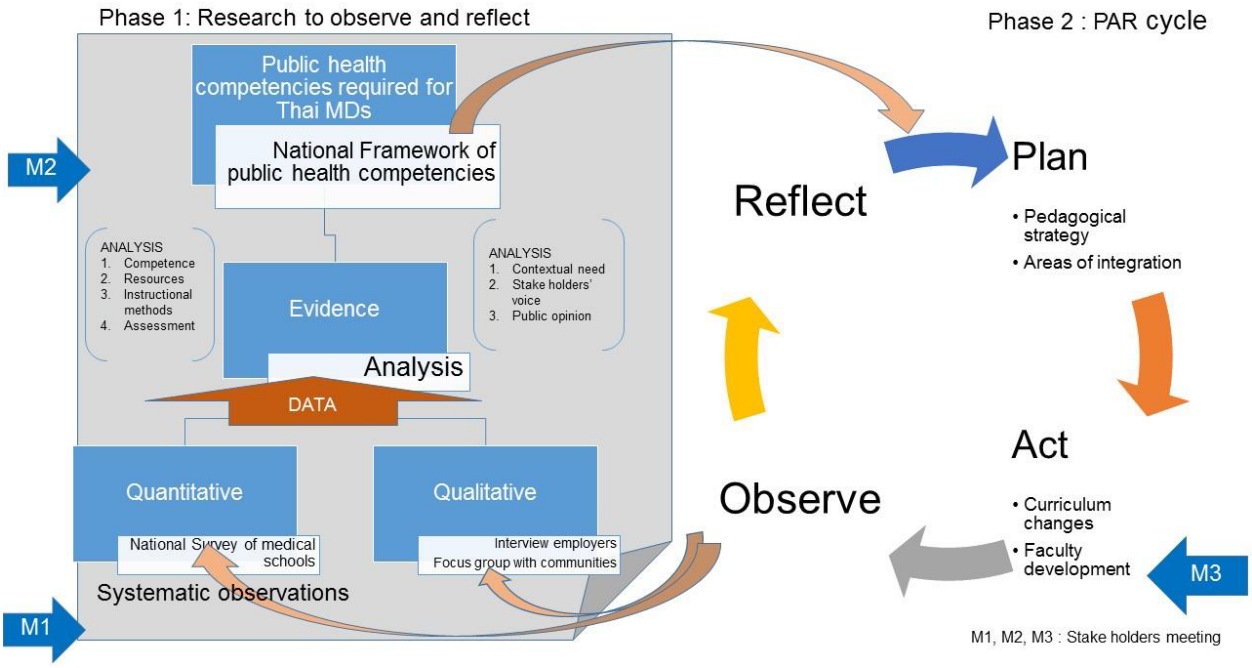

Figure 12. Recommended PAR cycle to improve the teaching of public health in medical schools in Thailand.

As the current study has measured and reflected on the public health education model, the authors expect that the next phase of action can be executed in the near future by stakeholders.

 doi:10.20944/preprints202205.0341.v1

Since measuring is a means for improving discussion and decision making, participation in this survey will lead to an improvement of measuring, learning, and social debate and the mobilization of participants' knowledge, idea and awareness to improve the teaching of public health in undergraduate medical curricula. (9) The findings of the present study will contribute to the evidence in the design of further action research. The researchers will participate in the process cycle of action and reflection.

Action orientated research outcomes:

1. Engaging policy makers, educators and health professionals to improve the teaching of public health in medical schools to initiate change.

2. Collaboration of medical schools to improve the teaching of public health in the undergraduate medical curriculum though a national framework of public health competencies.

3. Repeating the PAR cycle to bring about better models and transformative education leading to improved public health teaching through interdisciplinary integrations.

The areas of integrations and evidence-based pedagogical strategies will facilitate transformative education.

4. Conclusions

Thailand has celebrated its second decade of Universal Health coverage. While it is facing new challenges in public health, the strategy for development of human resources for health is critical for the future. In this study, we conducted a national survey of medical schools to investigate how public health competencies are delivered to medical students as well as listening to the people in the community and employers of medical doctors. There are several competencies which need to be focused on, in particular Health Economics, Health Policy and Management, and Disaster Management. Integration within each faculty of medicine or beyond the faculty of medicine would be an operational strategy for Health Policy and Management and Disaster Management. The number of teachers who teach public health is rather small. This might impact on subjects requiring specialist knowledge such as Health Economics. Schools have counteracted this by carrying out web-based lectures. Furthermore, discussion among medical schools as well as with public health schools may find a solution to overcome this issue.

Communities are keen for doctors to work near their vicinity. This is understandable, but is determined not only by medical education but also by whether doctors are happy to work in the primary health care setting. Within this area, the survey findings identified that social responsibility and accountability are competencies that need to be improved. Triangulation of the findings from the survey, FGDs and in-depth interviews, which represent the opinions of faculty members, community residents and MD employers, showed that Health Policy and Management, Health System, Health Economics, Social Responsibility and Accountability are the competencies that need to be improved. We believe that bringing this evidence to multiple stakeholders of medical education and public health teaching may lead to the creation of a national framework for public health competencies and further actions.

Funding: Authors acknowledged MRF- MedResNet Medical Research Foundation - Medical Research Network of the Consortium of Thai Medical Schools for the grant "National study of public health core competencies in undergraduate medical schools, Thailand "

Institutional Review Statement: This study was conducted in accordance with the Declaration of Helsinki.

Informed Consent Statement: Written Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are available and can be delivered on request to corresponding author.

Acknowledgments: Thin Nyein Nyein Aung, Department of Family Medicine, Faculty of Medicine, Chiang Mai University is acknowledged for assistance in data management.

Conflicts of Interests: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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