

# Assessing Self-Reported Core Competencies of Public Health Practitioners in Lebanon Using the WHO-ASPHER Validated Scale: A Pilot Study

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## Research Article

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## Abstract

**Background:** The World Health Organization and the Association of Schools of Public Health in the European Region recommend the self-assessment of public health core competencies to strengthen the public health workforce proficiency and prepare them for future challenges. A framework for these competencies is lacking and highly needed in Lebanon. This study aims to validate the WHO-ASPHER self-declared scale and evaluate the perceived competency level of the different categories of the Lebanese public health of practitioners.

**Methods:** This population-based cross-sectional study conducted online between July and September 2021 involved 66 public health practitioners who graduated from different universities in Lebanon. Data were collected using the snowball technique via a self-report questionnaire that assessed public health proficiency, categorized into 1) content and context, 2) relationship and interactions, and 3) performance and achievements. The rotated component matrix technique was used to test the construct validity of the scales. Bivariate and multivariate analyses were performed after ensuring the adequacy of the models. Significance was set at a  $p$ -value  $< 0.05$ .

**Results:** The factor analysis for scale domains showed that the Barlett test sphericity was significant ( $p < 0.001$ ), high loadings of items on factors, and Cronbach's alpha values of more than 0.9 in all three categories, showing an appropriate scale validity and reliability. The perceived level of competencies was significantly different between public health professionals and other health professionals with public health activities. All respondents scored low in most public health categories, mainly science and practice.

**Conclusion:** Data findings showed variability of self-declared gaps in knowledge and proficiency, suggesting a need to review the national public health education programs. Our study offers a valuable tool for academia and public health professionals to self-assess the level of public health proficiency and guide continuous education needs for professional development.

## Background

Public health is an organized societal effort based on different structures and processes intended to understand, safeguard and improve population health and reduce health inequalities [1–3]. It is the art of applying science in the context of politics to assess the influences of health systems and interventions on societies' mental and physical health promotion and efficiency, health protection, and disease prevention [1–8]. Public health tackles all socio-economic, political, physical, chemical, and biological conditions that impact or interact with the population health [9]. A high-performing public health system requires a competent public health workforce with adequate baseline capacity and transferrable skills to be held professionally accountable for the health of a defined population [9–14]. Therefore, a lack of workforce competence contributes to substandard service delivery [15] and leads to social, economic, and health burdens [14–16]. Alternatively, strengthening the performance and core competencies contribute to nations' sustainable development [14, 17].

To ensure a high level of proficiency and highlight the gaps in knowledge that need strengthening, self-assessment of core competencies in public health is considered a starting point. The baseline requirements for high-level public health performance and services delivery differ between countries [18]. More than ten frameworks for assessing core competencies in public health are available for use, originating from different countries such as the United States of America (USA), Canada, New Zealand, the United Kingdom, and other European countries [9, 19–28]. The knowledge and skills needed to carry out core professional functions in public health are complex [9, 10, 20].

Published studies used mainly a formulated survey to assess the perceived needs of public health practitioners for training and identify gaps in knowledge [29–31]. A recent review of the questions asked in 24 published articles showed a lack of consistency, thus limiting the generalizability of the findings [32]. Another systematic review published in 2012 has evaluated 126 public health workforce articles and gray literature and recommended the development of quantifiable output measures to offer baseline data to build models that address the workforce demand [33]. This finding highlights the need for a country-specific framework for the self-assessment of public health core competencies to overcome these barriers.

Consequently, in the absence of requirements for health workers to receive public health training and the lack of preset national core competencies to assess the competence of the public health workforce, matching population health priorities and professional competencies is very challenging [26]. The World Health Organization (WHO) and the Association of Schools of Public Health in the European Region (ASPHER) set a context-specific core competency framework designed to assess the gaps and weaknesses in the levels of knowledge, skills, aptitudes of public health practitioners, aiming to strengthen public health workforce [26]. The framework provides level descriptors to interpret the extent to which competencies are mastered based on the Dreyfus model of adult skill acquisition [34]. The assessment of competencies offers a broader perspective on how to serve the needs of populations and create people-centered services. It also helps improve the curricula and continuing professional development based on existing capacity and training requirements [26, 35].

Furthermore, lessons learned from the COVID-19 pandemic highlighted the gaps in global health systems readiness facing this threat and the need to strengthen the core competencies of the health workforce to deliver efficient public health functions [35–38]. More specifically, in Lebanon, the pandemic and the Port of Beirut explosion on August 4, 2020, revealed a chaotic Lebanese health system struggling to manage these concomitant public health crises with limited or lack of resources, drug shortages, a damaged infrastructure, health professionals' migration, and economic downturn [39]. This challenging situation shows the need for a national health system plan for humanitarian crises, relying on a highly competent and trained public health workforce. The public health workforce (PHW) is highly diverse and complex [40], including a broad range of occupational backgrounds trained in a variety of institutional settings involved in the protection and promotion of public health [40].

To our knowledge, little is known about the public health professionals' competencies in Lebanon. Public health education is delivered in schools/faculties of health sciences and/or health professions. Degrees offered can be undergraduate or graduate and can be professionally oriented or research-driven (i.e., to be completed by a PhD). Public health professionals work in public and private sectors (non-governmental organizations and health institutions), while some

teach in universities. The only professional association for public health workers in Lebanon is the Lebanese Epidemiological Association (LEA), which has been providing an umbrella to academic and field workers in epidemiology and public health in Lebanon since 1994. However, it does not have guidelines related to the job market of public health professionals and does not give directions regarding national educational needs in the field.

This study primarily aims to validate the public health self-assessment competency scale adapted from the WHO-ASPHER framework and assess the self-declared competencies of Lebanese public health professionals using a validated scale. The results would help determine the gaps in knowledge, prioritize the domains that need strengthening in public health, and identify the national public health educational program needs and necessary competencies for prospective public health bachelor or master graduates.

## Methods

### Study design and sampling

A population-based cross-sectional study conducted online between July 01, 2021, and September 30, 2021, involved 66 public health practitioners who graduated from different universities in Lebanon. Data were collected using the snowball technique via a self-report questionnaire (Appendix 1) developed on Google Forms (<https://forms.gle/J4wXjq5sZUBYdqfR7>) and shared on social media (WhatsApp, Facebook, and LinkedIn). Public health graduates and practitioners, healthcare professionals involved in public health activities in Lebanon, and epidemiologists were eligible to participate in the study.

### Ethics approval

The Lebanese International University research ethics committee approved this study (2020RC-047-LIUSOP). The objectives were stated on the landing page of the survey, and participants had to consent to participate before enrolling. They received no compensation in return for their participation, which was entirely voluntary.

The G-power software calculated a minimum sample of 50 participants based on an effect size  $f = 2\%$ , an alpha error of 5%, a power of 80%, and considering ten factors entered in the multivariable analysis.

### Questionnaire (Appendix 1)

The online survey tool was in English and included closed-ended questions. It was inspired by published articles and reports [14, 19, 25] and adapted by the authors (of whom three are public health experts) to fit the Lebanese context of the public health practice. Some items were clarified by adding the geographical location "in Lebanon", while others were removed or adapted to the Lebanese practice.

The questionnaire consisted of four main sections. The first section covered sociodemographic characteristics (age, gender, area of residence, specialization field, public health practice domain, and years of experience). The second section included public health essential operations, and the third section assessed the level of public health workforce competency (detailed below). In the fourth section, public health practitioners gave feedback on their experience.

### Competency assessment section

Competency assessment items were distributed over three main categories, each composed of several domains, as presented by the WHO-ASPHER framework [26]:

1. Content and context. This category encompasses four domains: 1) Science and practice; 2) Promoting health; 3) Law, policies, and health services; 4) One health and health security.
2. Relations and interactions. This category encompasses three domains: 1) Leadership and systems thinking; 2) Collaboration and partnerships; 3) Communication, culture, and advocacy.
3. Performance and achievements. This category encompasses three domains: 1) Governance and resource management; 2) Professional development and reflective ethical practice; 3) Organizational literacy and adaptability.

Participants were asked to rate their perceived level of proficiency on each competency statement in the three categories listed above [26], on a 4-point Likert scale: 1 (none: I am unaware or have very little knowledge of the skill), 2 (aware: I have heard of, but have limited knowledge or ability to apply the skill), 3 (knowledgeable: I am comfortable with my knowledge or ability to apply the skill), and 4 (proficient: I am very comfortable, am an expert, or could teach this skill to others). The average score for each category represents the total number of allocated scores per statement divided by the total number of statements per category. The results represent the average score for all domains. A score of 1–2 per domain means a low level of competency that needs strengthening, while a score of 3–4 is interpreted as a high level of competency of lower priority [26].

### Statistical analysis

Data were extracted from Google on an Excel spreadsheet and analyzed using SPSS version 25.0. A descriptive analysis evaluated the sample demographic characteristics using the absolute frequencies and percentages for categorical variables and means and standard deviations (SD) for quantitative measures.

The rotated component matrix technique was used to test the construct validity of the scales. The Kaiser-Meyer-Olkin's (KMO) measure of sampling adequacy and Bartlett's test of sphericity were calculated to ensure the adequacy of the model. Factors with eigenvalues values of more than one were retained, and the scree plot method was used to determine the number of components to extract [41]. Only items with factor loading greater than 0.4 were considered [42]. Cronbach's alpha was calculated to determine the internal consistency of the scale.

For bivariate analysis, the Chi-square test and the Fisher exact test were used to compare percentages, and the Student T-test and the Mann Whitney were applied to compare means between two groups. Multivariable analysis was performed for dependent variables modeling after ensuring the adequacy of the models, using dichotomous logistic regression for dichotomous variables and multiple regressions for continuous variables. The multivariate analysis of covariance (MANCOVA) considered the competency item per category as the dependent variable and the public health specialty versus others as the independent variable after adjusting for age, gender, and years of experience. In all cases, a value of  $p < 0.05$  was considered significant.

## Results

### Characteristics of the participants

Table 1 summarizes the sociodemographic characteristics of the study sample. Participants had a mean age of  $29.74 \pm 7.57$  years, were predominantly females (84.8%), mainly living in Mount Lebanon (59.1%), with five or fewer years of experience (71.2%). Study degrees were distributed as follows: Bachelor of Science (BS) in public health (33.3%), pharmacy (21.2%), nursing (10.6%), nutrition (10.6%), and medicine (3%). The vast majority of the respondents practiced in more than one area (63.6%). The fields of practice included academia (63.6%), research epidemiology (57.6%), non-governmental organizations (NGOs) (47%), Ministry of Public Health (MOPH) (37.9%), and medical settings (36.4%), added to fresh graduates with a degree in public health (21.2%).

### Factor analysis of the WHO-ASPHER competency scale

A factor analysis was performed to assess the validity of the public health competency scale and the adequacy of the model.

For the "Content and Context" category, the KMO measure of sampling adequacy was 0.923 for "Science and Practice", 0.924 for "Promoting Health", 0.915 for "Law, Policies, and Health Services", and 0.972 for "One Health and Health Security". For "Science and Practice", the first factor explained the most variance by 69.97%, followed by the second factor by 8.71%. For "Promoting Health", "Law, Policies, and Health Services", and "One Health and Health Security", the first factor explained all the variance by 76.16%, 81.91%, and 77%, respectively (Table 2A).

For the "Relations and Interactions" category, the KMO measure of sampling adequacy was 0.920 for the "Leadership and Systems Thinking", 0.880 for "Collaboration and Partnerships", and 0.917 for "Communication, Culture, and Advocacy". For the "Leadership and Systems Thinking", "Collaboration and Partnerships", and "Communication, Culture, and Advocacy", the first factor explained all the variance by 85.04%, 83.88%, and 82.94%, respectively (Table 2B).

Finally, for the "Performance and Achievements" category, the KMO measure of sampling adequacy was 0.915 for the "Governance and Resource Management", 0.856 for "Professional Development and Reflective Ethical Practice", and 0.918 for "Organizational Literacy and Adaptability". For the "Governance and Resource Management", "Professional Development and Reflective Ethical Practice", and "Organizational Literacy and Adaptability", the first factor explained all the variance by 73.23%, 87.65%, and 87.02%, respectively. In all categories, the Barlett's test of sphericity was significant ( $p < 0.001$ ), and the Cronbach's alpha value was more than 0.9 (Table 2C).

### Public Health essential operations

Table 3 describes the perceived level of knowledge for public health essential operations. Most participants declared being knowledgeable of the public health essential operations. Almost half of them (48.5%) considered they had adequate knowledge in assuring sustainable organizational structures and financing.

## Bivariate analysis

### Competency levels among specialties

Table 4 shows the differences in competency levels among all specialties and between public health professionals versus all the others. Overall, graduates with a BS in public health reported a lower competency compared to other specialties in most categories and domains, with percentages varying by 2 to 4 folds.

In category 1 (Content and Context), results show statistically significant differences between public health versus other specialties in the domains of "Science and Practice" ( $p=0.042$ ) and "Promoting Health" ( $p=0.005$ ), and among all specialties in the domains of "Promoting Health" ( $p=0.001$ ) and "Law, Policies and Health Security" ( $p=0.036$ ).

In category 2 (Relations and Interactions), statistically significant differences in the level of knowledge were found in all domains among all specialties and between public health and all others ( $p < 0.05$ ), except for a borderline difference ( $p=0.055$ ) when comparing the level of competency in the domain of "Communication, Culture, and Advocacy" between public health and other specialties.

In category 3 [performance and achievements], results show statistically significant differences between public health versus other specialties ( $p < 0.05$ ) and among all in the domain of "Governance and Resource Management" ( $p=0.005$ ).

However, the results showed non-significant differences in the level of competencies in category 1 (Content and Context), in the domain of "One Health and Health Security" among all specialties ( $p=0.121$ ) and between public health versus all others ( $p=0.155$ ).

# Feedback on the main competencies needed for public health practice

Table 5 highlights the feedback of the participants on the main competencies needed for public health practitioners, based on their experience. The vast majority of participants (90.9%) agreed that “having foundational training in a health discipline” is a priority. Less than half of them (43.9%) considered that “performing intuitively and only occasionally need deliberation” is a priority for public health practitioners.

## Multivariate analysis

Table 6 shows no significant associations were found between baseline specialties and self-declared competencies, while sociodemographic characteristics sometimes affected it (Figure 1).

Category 1 (Content and Context): female gender (Beta = 0.527) and older age (Beta = 0.045) were significantly associated with a higher score, while the years of experience were significantly associated with a lower “Science and Practice” score (Beta = -0.676). Female gender (beta = 0.547) and older age (beta = 0.040) were significantly associated with a higher “Promoting Health” score.

The female gender (beta = 0.568) was also significantly associated with a higher “One Health and Health Security” score. For the “Law, Policies, and Health Security” score taken as the dependent variable, results indicate no significant association with any covariate (age, gender, and years of experience).

Category 2 (Relations and Interactions): for the “Leadership and Systems Thinking” score considered as the dependent variable, results indicate no significant association with any covariate (age, gender, and years of experience). The female gender (Beta = 0.722) was significantly associated with a higher “Collaboration and Partnerships” score and a higher (Beta = 0.683) “Communication, Culture, and Advocacy” score.

Category 3 (Performance and Achievements): the results did not yield any significant association with any covariate (age, gender, and years of experience) for all competencies, namely, “Leadership and Systems Thinking”, “Organizational Literacy and Adaptability”, and “Professional Development and Reflective Ethical Practice”.

## Discussion

Our study is the first to validate a tool to assess self-declared public health competencies, namely the WHO ASPHER framework. The framework is composed of three categories, i.e., 1) Content and Context, 2) Relations and Interactions, and 3) Performance and Achievements, each divided into domains that include many items. The factor analysis for scale domains showed that Bartlett’s test of sphericity was significant ( $p < 0.001$ ), high loadings of items on factors, and Cronbach’s alpha values of more than 0.9 in all three categories, indicating an appropriate validity and reliability. These results show the possibility of applying a European framework in a developing country, which can be considered an innovation in the Lebanese context in the absence of a national framework. Our results are also close to those of Zwanikken and collaborators, who used Delphi rounds with experts and alumni feedback to validate their framework in low- and middle-income countries [43]; they came up with domains of a different structure than ours, but the content is overall comparable.

In Lebanon, the suggested framework would allow public health professionals to self-evaluate their proficiency level in different domains and determine the gaps in knowledge that need strengthening. The investment in the public health workforce is highly mandated now more than ever before [26, 44, 45]. The COVID-19 pandemic highlighted global weaknesses in the health systems against the threat of communicable diseases and disease outbreaks [26, 46]. Consequently, strengthening public health capacity and services has become a global priority [9, 26, 47–49], and the core competencies in the public health framework allow professionals to reach this goal [26] and help identify the essential individual attributes required to fulfill their role [50, 51]. Indeed, the Institute of Medicine (IOM) and other academic, governmental and non-governmental institutions emphasized the need to enhance academic preparedness to meet the 21st-century public health challenges [49, 52–60].

The suggested framework would also assist stakeholders, such as policy-makers, educational institutions, and public health institutes [26], in developing context-specific competency measures to improve education, performance, capacity-building, analysis, and monitoring, in addition to planning and investment [26]. Our study validated the framework to offer an evidence-based, comprehensive template that help the public health practitioner in identifying the domains that need strengthening and guide the academic sector to plan a curriculum that meets current and future public health challenges.

Data analysis of the survey showed that the perceived level of competencies was significantly different between the public health professionals and other health professionals with activities in public health. It is noteworthy that multivariate analysis showed that differences were no longer significant, likely due to the low sample size. Our findings also revealed that public health core competencies and workforce requirements are not yet well delineated at the national level. All respondents from different educational backgrounds scored low in most public health categories, mainly science and practice. Other studies reported similar results, highlighting the need to call for action to build a public health workforce [54, 61, 62]. Most participants agreed that having foundational training in a health discipline is the main competency needed for public health professionals. These findings shed light on the existing capacity and future training requirements to strengthen education tailored to national needs [26].

Similar studies using a formulated framework or survey showed that the main gaps were communication, budgeting and financial planning [29–31], systems thinking [30, 31, 63], policy development [29, 63, 64], and other management skills [29, 31, 63] among surveyed participants. Other gaps included developing a vision for a healthier community [30]. The level of competencies was significantly different between public health professionals and other health professionals with activities in public health. Creating a public health workforce that delivers the essential services in all domains of the three core competency categories is critical and challenging at the same time. According to the WHO-ASPHER, professionals are expected to demonstrate a subset of their competencies related to their role [26]. To build a highly-performing Lebanese public health workforce, linking education to practice and enhancing a

cross-disciplinary collaboration can help design an academic curriculum for excellence in public health practice. This study offers baseline data to conduct in-depth research across Lebanon that includes public health professionals from multiple disciplines and different universities, with variable levels of expertise and practice in the field.

## Strengths and limitations

Our study is the first to validate the scale for self-assessment of public health core competencies. It offers a valuable tool for academia and public health professionals to self-assess the level of public health proficiency and orientate continuous education needs for professional development on an individual level while also offering evidenced data for curriculum review and identification of training needs in the academic sector. The main limitation of the study is the low number of participants per specialty; thus, larger-scale studies are warranted to confirm these descriptive results. The survey was web-based, which may be amenable to sampling and response bias. Respondents were mainly females with one to five years of experience, which hampers the generalizability of the results. Participants self-rated their level of competency in public health services, reflecting their perception only and leading to reporting bias. However, the study design and method used are common to other tool validation studies.

## Conclusion

Data findings showed variability of self-declared gaps in knowledge and proficiency, suggesting a need to review the national public health education programs. Our study offers a valuable tool for academia and public health professionals to self-assess the level of public health proficiency and guide continuous education needs for professional development.

## Abbreviations

ASPHER: Association of Schools of Public Health in the European Region

BS: Bachelor of Science

KMO: Kaiser-Meyer-Olkin

MANCOVA: Multivariate analysis of covariance

MOPH: Ministry of Public Health

NGO: Non-governmental agency

PHW: Public health workforce

SD: Standard deviation

WHO: World Health Organization

## Declarations

### Ethics approval and consent to participate:

The research was conducted in accordance with the Declaration of Helsinki. The Lebanese International University research ethics committee approved this study (2020RC-047-LIUSOP).

### Consent for publication:

Not applicable

### Availability of data and materials:

The data that support the findings of this study are available from INSPECT-Lb. ([info@inspect-lb.org](mailto:info@inspect-lb.org)) but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of INSPECT-Lb.

### Competing interests:

Not applicable

## Funding:

Not applicable

## Authors' contributions:

PS, KI, AH, CH, MA, RZ, HS contributed to the conception, design of the work; CH, MA, HS, AH contributed to the acquisition of data; PS, CH contributed to the analysis of data; PS, KI, CH contributed to the interpretation of data; PS, KI, AH, CH, MA, RZ, HS revised the work and approved the submitted version; All authors agreed both to be personally accountable for their own contributions and ensure that questions related to the accuracy or integrity of any part of the work, even ones in which each author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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## Tables

Table 1

Sociodemographic and other characteristics of the participants (n=66).

Variable	n (%)
<b>Gender</b>	
Male	10 (15.2%)
Female	56 (84.8%)
<b>Area of residence</b>	
Beirut	18 (27.3%)
Mount Lebanon	39 (59.1%)
North	3 (4.5%)
South	4 (6.1%)
Bekaa	2 (3.0%)
<b>Years of experience</b>	
1 – 5 years	47 (71.2%)
6 – 10 years	10 (15.2%)
More than 10 years	9 (13.6%)
<b>Basic specialty degree</b>	
BS in Public health	22 (33.3%)
Pharmacy	14 (21.2%)
Nursing	7 (10.6%)
Nutrition	7 (10.6%)
Medicine	2 (3.0%)
Other	14 (21.2%)
<b>Area of practice*</b>	
Academia	42 (63.6%)
Medical setting	24 (36.4%)
Research epidemiology	38 (57.6%)
NGO	31 (47.0%)
MOPH	25 (37.9%)
Fresh graduate	14 (21.2%)
	<b>Mean ± SD</b>
<b>Age (years)</b>	29.74 ± 7.57
<b>* The same person could have several areas of practice</b>	
<b>Abbreviations:</b> BS: bachelor of sciences; MOPH: Ministry of Public Health; n: number of participants; NGO: non-governmental organization; SD, standard deviation.	

**Table 2**  
**Factor analysis of public health competencies according to categories and domains**

**Table 2A**  
**Promax rotated matrix, for category 1: Content and Context**

<b>Science and Practice domain</b>			
<b>Factor</b>	<b>Item</b>	<b>Factor 1</b>	<b>Factor 2</b>
Identify the strengths and weaknesses of routine data and use these data as part of the complex assessment of population needs	4	1.073	
Determine the key features of the epidemiology, trends, incidence, and prevalence of the significant diseases in Lebanon	2	0.833	
Address the main health needs of the Lebanese population	6	0.832	
Retrieve, analyze, and appraise evidence from all data sources to support decision-making	5	0.817	
Describe the features of national demographic structure and its implications for public health	1	0.799	
Use vital statistics and health indicators	3	0.798	
Compare and assess the needs and services provided to meet health needs	8	0.785	
Establish and monitor indicators of population health	7	0.766	
Contribute to or lead community-based health needs assessments	9	0.598	
Show a high level of knowledge of research methods and analysis techniques	12		1.055
Design and conduct qualitative and/or quantitative research that adds to the evidence base for public health practice	11		0.951
Review routine data and the literature to what actions should be taken to meet health needs	10		0.787
Evaluate local public health services and interventions, applying sound methods based on recognized evaluation models	13		0.692
<b>Percentage variance explained</b>	78.68	69.97	8.71
<b>Cronbach alpha= 0.964</b>			
<b>Kaiser-Meyer-Olkin (KMO)= 0.923</b>			
<b>Bartlett's test of sphericity p&lt;0.001</b>			
<b>Promoting Health domain</b>			
<b>Factor</b>	<b>Item</b>	<b>Factor 1</b>	
Know the rationale for screening programs and the basis of secondary prevention in my country	9	0.919	
Use health promotion theory and the options for delivering health-promotion initiatives	1	0.897	
Challenge incorrect information delivered to the public using a wide range of approaches, including communication with the media and politicians	8	0.897	
Promote the health of the public using evidence-based methods	3	0.886	
Raise health literacy	2	0.876	
Ensure that health education and health literacy activities are informed by evidence and/or theory	4	0.875	
Contribute to the evaluation of the effectiveness of activities to promote health to lead changes at various levels across different sectors	5	0.872	
Use appropriate methods to foster citizens empowerment and community engagement	6	0.864	
Consult with the public to engage meaningful decision-making that represents the wider societal views	7	0.855	
Focus on disease prevention, reduction of inequalities, and equity in access to health services	10	0.849	
Explore the underlying causes of morbidity and mortality, and recommendations to address these determinants of health and health services	11	0.805	
<b>Percentage variance explained</b>		76.16%	
<b>Cronbach alpha= 0.968</b>			
<b>Kaiser-Meyer-Olkin (KMO)= 0.924</b>			
<b>Bartlett's test of sphericity p&lt;0.001</b>			

<b>Law, Policies, and Health Services domain</b>		
<b>Factor</b>	<b>Item</b>	<b>Factor 1</b>
Develop and implement strategies based on relevant evidence, legislation, emergency planning, procedures regulations, and policies	6	0.927
Contribute to the delivery of equitable and effective health care and policies to improve the health of the public	5	0.923
Maximize opportunities to protect and promote health and well-being using applied laws and regulations	7	0.914
Comply with the legislation and professional codes of practice in my interaction with others	1	0.910
Understand and apply the laws and regulations directly or indirectly applicable to the practice of public health in Lebanon	2	0.903
Apply scientific principles and concepts to inform discussion of health-related fiscal, social, and political issues	3	0.886
Compare and contrast health and social service delivery systems between countries	4	0.871
<b>Percentage variance explained</b>		81.91%
<b>Cronbach alpha= 0.962</b>		
<b>Kaiser-Meyer-Olkin (KMO)= 0.915</b>		
<b>Bartlett's test of sphericity p&lt;0.001</b>		
<b>One Health and Health Security domain</b>		
<b>Factor</b>	<b>Item</b>	<b>Factor 1</b>
Comply with the requirements of both formal and informal surveillance systems and conduct risk assessment	9	0.911
Prevent risks and mitigate the health crises that originate at the interface between human, animals, and environments and affect the health of the population	2	0.902
Apply the International Health regulations to coordinate and develop strategic partnerships and resources in key sectors and disciplines for health security purposes	5	0.892
Understand the impact of climate on health and the responsibility of public health for protecting the natural environment	12	0.891
Analyze critically the changing nature, key factors, and resources that shape One Health	3	0.891
Promote occupational health and health and safety regulations and legislations	6	0.887
Identify and describe environmental determinants of health and connections between environmental protection and public health policy	11	0.882
Use multisectoral evidence-based guidelines for preventing and controlling health risks and diseases	8	0.881
Understand the One Health	4	0.875
Identify and assure minimum safety standards in delivering services	10	0.860
Understand the local implications of the One Health approach and its global interconnectivity	1	0.859
Apply the practical principles of food safety essential to public health	7	0.793
<b>Percentage variance explained</b>		77.00%
<b>Cronbach alpha= 0.972</b>		
<b>Kaiser-Meyer-Olkin (KMO)= 0.911</b>		
<b>Bartlett's test of sphericity p&lt;0.001</b>		

Table 2B

## Category 2: Relations and Interactions

Factor analysis, promax rotated matrix for Category 2: Leadership and Systems Thinking domain		
Factor	Item	Factor 1
Catalyze behavioral, and/or cultural changes	7	0.938
Lead and work as part of an interdisciplinary team	6	0.936
Support initiatives for change at the organization, community, or individual level	8	0.935
Understand principles of systems thinking to the improve delivery of public health services	9	0.926
Facilitate the development of other leaders	2	0.922
Identify and support the roles and responsibilities of all team members, including external stakeholders	3	0.922
Show practicality, flexibility, and adaptability in working with others to achieve public health goals	5	0.918
Demonstrate emotional intelligence and understand the impact of one's belief, values, and behaviors on decision-making and others' reactions	4	0.914
Motivate others to work toward common vision, program, and/or organizational goals	1	0.886
<b>Percentage variance explained</b>	85.04%	
<b>Cronbach alpha= 0.978</b>		
<b>Kaiser-Meyer-Olkin (KMO)= 0.920</b>		
<b>Bartlett's test of sphericity p&lt;0.001</b>		
<b>Collaboration and Partnerships domain</b>		
Factor	Item	Factor 1
Evaluate partnerships and address barriers to successful collaboration to improve public	5	0.943
Build, maintain, and effectively use strategic alliances, coalitions, professional networks, and partnerships to plan and generate evidence implement programs	4	0.935
Establish effective partnerships and understand the priorities and motivations of a wide range of stakeholders	2	0.934
Identify, connect, and manage relationships with stakeholders in interdisciplinary and intersectoral projects to improve public health services and goals	3	0.917
Understand and apply effective techniques for working with boards and governance	6	0.916
Work across sectors in organizational structures at the national and international levels	1	0.846
<b>Percentage variance explained</b>	83.88%	
<b>Cronbach alpha= 0.961</b>		
<b>Kaiser-Meyer-Olkin (KMO)= 0.880</b>		
<b>Bartlett's test of sphericity p&lt;0.001</b>		
<b>Communication, Culture, and Advocacy domain</b>		
Factor	Item	Factor 1
Understand and apply cultural awareness and sensitivity in communication with diverse populations	5	0.938
Communicate with respect when representing professional opinions, and encourage other team members	6	0.935
Recognize that social media and social marketing are increasingly important tools	4	0.927
Deliver administrative tasks that require communication within or across organizations	8	0.919
Advocate for health-related public policies and services to promote and protect human health and well-being	9	0.901
Prepare a meeting agenda	7	0.900
Convey information and complex scientific evidence in an understandable way to people	3	0.896
Communicate strategically by defining target audience, listening, and developing audience-appropriate messaging	1	0.894

Understand the importance of communication at different organizational levels to gain political commitment, policy support, and social acceptance for a health goal or program	2	0.886
<b>Percentage variance explained</b>	82.94%	
<b>Cronbach alpha= 0.974</b>		
<b>Kaiser-Meyer-Olkin (KMO)= 0.917</b>		
<b>Bartlett's test of sphericity p&lt;0.001</b>		

Table 2C

## Category 3: Performance and achievements

Factor analysis, promax rotated matrix for Category 3: Governance and Resource Management domain		
Factor	Item	Factor 1
Design proactively and monitor quality standards and apply quality improvement methods and tools to ensure that quality standards are met	7	0.916
Demonstrate knowledge of basic business practices and develop a business plan	6	0.899
Use risk management principles and programs	9	0.888
Develop descriptions to assure staffing at various organization levels	4	0.869
Use key accounting principles and financial management tools	8	0.869
Plan the allocation of work tasks to achieve the goals set by the organization	3	0.853
Understand and apply the principles of economic thinking in public health	10	0.843
Perform health evaluation and assessment of a given procedure, intervention strategy, or policy	11	0.840
Conduct hiring interviews and evaluate candidates	5	0.832
Apply knowledge of organizational systems, theories, and behaviors to set priorities for resources and achieve clear strategic goals and objectives	1	0.803
Manage people effectively by providing clarity on task responsibility, provide training, and give regular feedback on performance	2	0.793
<b>Percentage variance explained</b>	73.23%	
<b>Cronbach alpha= 0.963</b>		
<b>Kaiser-Meyer-Olkin (KMO)= 0.915</b>		
<b>Bartlett's test of sphericity p&lt;0.001</b>		
<b>Professional Development &amp; Reflective Ethical Practice domain</b>		
Factor	Item	Factor 1
Ensure the availability of development opportunities	5	0.950
Act and promote evidence-based professional practice	7	0.949
Demonstrate an ability to understand and manage conflict-of-interest situations	6	0.947
Act according to ethical standards and norms with integrity, and promote professional accountability, social responsibility, and the public health good	3	0.943
Demonstrate willingness to pursue learning in public health	1	0.932
Address your own development needs based on career goals and required competencies	2	0.931
Critically review and evaluate your own practices in relation with public health principles	4	0.900
<b>Percentage variance explained</b>	87.65%	
<b>Cronbach alpha= 0.976</b>		
<b>Kaiser-Meyer-Olkin (KMO)= 0.856</b>		
<b>Bartlett's test of sphericity p&lt;0.001</b>		
<b>Organizational Literacy and Adaptability domain</b>		
Factor	Item	Factor 1
Demonstrate persistence, perseverance, resilience, and the ability to call on personal resources and energy at time of challenge	2	0.933
Show entrepreneurial orientation through proactiveness, innovativeness, and risk-taking, generating potential solutions to critical situations	3	0.914
Apply for available funding sources and opportunities	5	0.907
Cope with uncertainty and manage work-related stress	1	0.905

Respond to call for project applications and grants	6	0.904
Adapt to changing professional environments and circumstances	4	0.894
Draft tender and project briefs	7	0.882
<b>Percentage variance explained</b>	82.02%	
<b>Cronbach alpha= 0.963</b>		
<b>Kaiser-Meyer-Olkin (KMO)= 0.918</b>		
<b>Bartlett's test of sphericity p&lt;0.001</b>		

	<b>Frequency (%)</b>
-	
Surveillance of population health and well-being	42 (63.6%)
Monitoring and response to health hazards and emergencies	41 (62.1%)
Health protection, including environmental, occupational, food safety, and other	46 (69.7%)
Health promotion, including action to address social determinants and health inequity	48 (72.7%)
Disease prevention, including early detection of illness	44 (66.7%)
Assuring governance for health and well-being	39 (59.1%)
Assuring a sufficient and competent health workforce	39 (59.1%)
Assuring sustainable organizational structures and financing	32 (48.5%)
Advocacy communication and social mobilization for health	40 (60.6%)
Advancing public health research to inform policy and practice	44 (66.7%)

Table 4

Differences in the levels of competencies between public health and other specialties.

	Public health with BS degree	Other Specialties	Pharmacist	Nursing	Nutrition	Medicine	Unspecified specialties	p-value between all the specialties and competencies*	p-value Public health vs other specialties*
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)		
<b>Category 1: Content and Context</b>									
<b>Science and Practice domain</b>									
Low competency	20 (90.9%)	30 (68.2%)	8 (57.1%)	5 (71.4%)	7 (100%)	1 (50.0%)	9 (64.3%)	0.056	<b>0.042</b>
High competency	2 (9.1%)	14 (31.8%)	6 (42.9%)	2 (28.6%)	0 (0.0%)	1 (50.0%)	5 (35.7%)		
<b>Promoting Health domain</b>									
Low competency	21 (95.5%)	28 (63.6%)	9 (64.3%)	3 (42.9%)	7 (100%)	0 (0.0%)	9 (64.3%)	<b>0.001</b>	<b>0.005</b>
High competency	1 (4.5%)	16 (36.4%)	5 (35.7%)	4 (57.1%)	0 (0.0%)	2 (100%)	5 (35.7%)		
<b>Law, Policies, and Health Security domain</b>									
Low competency	19 (86.4%)	28 (63.6%)	9 (64.3%)	6 (85.7%)	6 (85.7%)	0 (0.0%)	7 (50.0%)	<b>0.036</b>	0.055
High competency	3 (13.6%)	16 (36.4%)	5 (35.7%)	1 (14.3%)	1 (14.3%)	2 (100%)	7 (50.0%)		
<b>One Health and Health Security domain</b>									
Low competency	19 (86.4%)	31 (70.5%)	10 (71.4%)	4 (57.1%)	6 (85.7%)	0 (0.0%)	11 (78.6%)	0.121	0.155
High competency	3 (13.6%)	13 (29.5%)	4 (28.6%)	3 (42.9%)	1 (14.3%)	2 (100%)	3 (21.4%)		
<b>Category 2: Relations and Interactions</b>									
<b>Leadership and Systems Thinking domain</b>									
Low competency	20 (90.9%)	29 (65.9%)	11 (78.6%)	3 (42.9%)	7 (100%)	1 (50.0%)	7 (50.0%)	<b>0.008</b>	<b>0.029</b>
High competency	2 (9.1%)	15 (34.1%)	3 (21.4%)	4 (57.1%)	0 (0.0%)	1 (50.0%)	7 (50.0%)		
<b>Collaboration and Partnerships domain</b>									
Low competency	21 (95.5%)	25 (56.8%)	11 (78.6%)	2 (28.6%)	6 (85.7%)	0 (0%)	6 (42.9%)	<b>&lt;0.001</b>	
High competency	1 (4.5%)	19 (43.2%)	3 (21.4%)	5 (71.4%)	1 (14.3%)	2 (100%)	8 (57.1%)		<b>0.001</b>
<b>Communication, Culture, and Advocacy domain</b>									
Low competency	19 (86.4%)	28 (63.6%)	10 (71.4%)	3 (42.9%)	7 (100%)	2 (100%)	6 (42.9%)	<b>0.012</b>	0.055
High competency	3 (13.6%)	16 (36.4%)	4 (28.6%)	4 (57.1%)	0 (0%)	0 (0%)	8 (57.1%)		
<b>Category 3: Performance and achievements</b>									
<b>Governance and Resource Management domain</b>									
Low competency	21 (95.5%)	29 (65.9%)	10 (71.4%)	4 (57.1%)	7 (100%)	1 (50%)	7 (50%)	<b>0.005</b>	<b>0.008</b>
High competency	1 (4.5%)	15 (34.1%)	5 (28.6%)	3 (42.9%)	0 (0.0%)	1 (50%)	7 (50%)		
<b>Organizational Literacy and Adaptability domain</b>									
Low competency	19 (86.4%)	25 (56.8%)	9 (64.3%)	4 (57.1%)	5 (71.4%)	1 (50%)	6 (42.9%)	0.103	<b>0.016</b>
High competency	3 (13.6%)	19 (43.2%)	5 (35.7%)	3 (42.9%)	2 (28.6%)	1 (50%)	8 (57.1%)		

Professional Development and Reflective Ethical Practice domain									
Low competency	20 (90.9%)	28 (63.6%)	9 (64.3%)	3 (42.9%)	6 (85.7%)	1 (50%)	9 (64.3%)	0.067	<b>0.019</b>
High competency	2 (9.1%)	16 (36.4%)	5 (35.7%)	4 (57.1%)	1 (14.3%)	1 (50%)	5 (35.7%)		

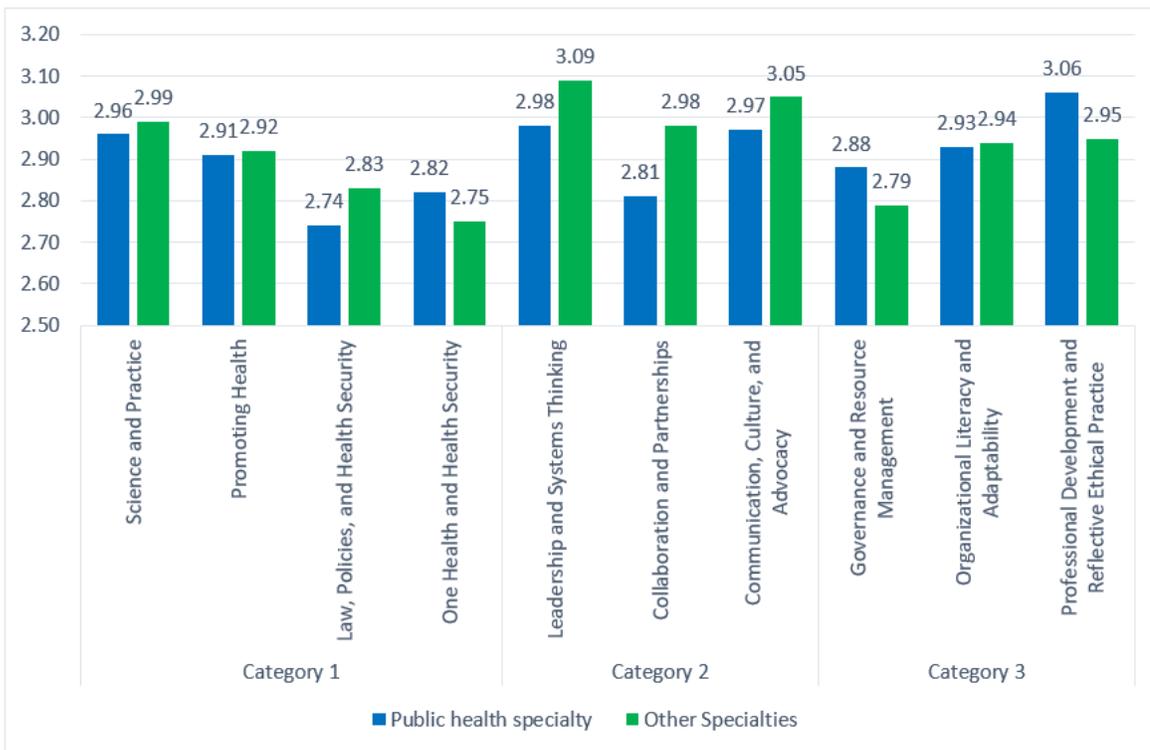
\*Numbers in bold indicate statistically significant results.

Table 5	
Feedback of participants on the main competencies that are needed for public health practitioners.	
-	Frequency (%)
Focus on the central aspects of a problem	51 (77.3%)
Perform intuitively and only occasionally need deliberation	29 (43.9%)
Reflect on how the system works	57 (86.4%)
Assess the quality of the work done in their organization	59 (89.4%)
Assume leadership roles	53 (80.3%)
Develop strategies and assign leadership responsibilities to others	55 (83.3%)
Have substantial authority and responsibility	56 (84.8%)
Supervise multiple tiers of staff	50 (75.8%)
Make decisions via intuition and analytical thinking	55 (83.3%)
See the situation and the interconnectedness of the decisions they make	58 (87.9%)
Have supervisory responsibility	51 (77.3%)
Have foundational training in a health discipline	60 (90.9%)
Rely heavily on their core public health competencies	53 (80.3%)
Recognize that complex work requires non-routine decision-making, to which hard and fast rules do not clearly apply	51 (77.3%)
Supervise smaller groups of staff	43 (65.2%)

<b>Table 6</b>				
<b>Association between the category of public health competency and public health specialty.</b>				
	<b>Beta</b>	<b>p-value</b>	<b>95% Confidence Interval</b>	
			<b>Lower Bound</b>	<b>Upper Bound</b>
<b>Category 1: Content and Context</b>				
<b>Science and Practice</b>				
Specialty (public health vs others*)	-0.022	0.895	-0.354	0.310
Age	0.045	<b>0.003</b>	0.016	0.075
Gender (females vs males)	0.527	<b>0.010</b>	0.132	0.923
Years of experience	-0.676	<b>0.027</b>	-1.273	-0.079
<b>Promoting Health</b>				
Specialty (public health vs others*)	-0.009	0.965	-0.398	0.381
Age	0.040	<b>0.023</b>	0.006	0.075
Gender (females vs males)	0.547	<b>0.021</b>	0.084	1.011
Years of experience	-0.359	0.309	-1.058	0.341
<b>Law, Policies, and Health Security</b>				
Specialty (public health vs others*)	-0.087	0.670	-0.494	0.320
Age	0.029	0.116	-0.007	0.065
Gender	0.415	0.092	-0.070	0.899
Years of experience	0.117	0.751	-0.615	0.848
<b>One Health and Health Security</b>				
Specialty (public health vs others*)	0.067	0.753	-0.357	0.490
Age	0.021	0.272	-0.017	0.059
Gender (females vs males)	0.568	<b>0.028</b>	0.064	1.072
Years of experience	-0.061	0.874	-0.821	0.700
<b>Category 2: Relations and Interactions</b>				
<b>Leadership and Systems Thinking</b>				
Specialty (public health vs others*)	-0.103	0.637	-0.538	0.332
Age	0.009	0.658	-0.030	0.047
Gender (females vs males)	0.399	0.129	-0.119	0.917
Years of experience	-0.015	0.970	-0.797	0.767
<b>Collaboration and Partnerships</b>				
Specialty (public health vs others*)	-0.169	0.423	-0.587	0.250
Age	0.017	0.366	-0.020	0.054
Gender (females vs males)	0.722	<b>0.005</b>	0.224	1.219
Years of experience	0.112	0.766	-0.639	0.864
<b>Communication, Culture, and Advocacy</b>				
Specialty (public health vs others*)	-0.086	0.672	-0.489	0.317
Age	0.015	0.419	-0.021	0.050
Gender (females vs males)	0.683	<b>0.006</b>	0.203	1.162
Years of experience	0.261	0.474	-0.463	0.985
<b>Category 3: Performance and achievements</b>				
<b>Governance and Resource Management</b>				
Specialty (public health vs others*)	0.085	0.685	-0.331	0.501

Age	0.024	0.201	-0.013	0.061
Gender (females vs males)	0.400	0.111	-0.095	0.896
Years of experience	0.166	0.659	-0.582	0.913
<b>Organizational Literacy and Adaptability</b>				
Specialty (public health vs others*)	-0.004	0.984	-0.455	0.446
Age	0.029	0.159	-0.012	0.069
Gender (females vs males)	0.507	0.063	-0.029	1.043
Years of experience	-0.155	0.703	-0.964	0.654
<b>Professional Development and Reflective Ethical Practice</b>				
Specialty (public health vs others*)	0.111	0.629	-0.345	0.566
Age	0.028	0.165	-0.012	0.069
Gender (females vs males)	0.506	0.067	-0.036	1.049
Years of experience	-0.050	0.903	-0.869	0.768
Note: In the global model, the independent variable is "specialty" (public health vs others*). Covariates are age, gender, and years of experience.				
*Reference group				

## Figures



**Figure 1**

Adjusted means of health competency domains according to the type of specialty (public health vs. other specialties). No significant difference between public health and other specialties in self-declared competency domains with  $p > 0.05$ .

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [PHPractitionersCoreCompetenciesQuestionnaire.pdf](#)