

## Research Article

# Evaluation of Public Health Education and Workforce Needs in the Kingdom of Saudi Arabia

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## ABSTRACT

**Background:** An efficient public health workforce is necessary for improving and maintaining the health of population and such a workforce can be prepared through proper educational programs and trainings.

**Objectives:** The present study aims to investigate the needs in the public health education programs, as well as need and availability of competent public health workforce in labour market of Saudi Arabia.

**Methods:** A descriptive, cross-sectional survey was administered in two phases in the college of Health Sciences at the Saudi Electronic University (SEU). The first phase was carried out between September 2015 and December 2015, which involved interview with administrative heads of four health-related organizations. The second phase was performed in September 2017 and June 2018 after starting an undergraduate course in public health at the university. A total of 41 faculty and 408 students from different branches of SEU participated in the online survey.

**Results:** According to administrative head of public health-related organization, there is a shortage of qualified workforce in public health. All the four organizations need workforce with the master degree in sub-speciality epidemiology. About 97.5% students agreed there is a shortage of public health speciality in these organizations. About 92.7% faculty had an opinion that there is a requirement to set-up educational programs in public health. To overcome the shortage of competent workforce, two organizations showed interest in updating their employees' skill through bridging courses. The students perceiving bachelor course in public health showed interest to accomplish master's degree in epidemiology (38.5%), public health education and promotion (36.5%) and infection control (35.5%).

**Conclusion:** There is a shortage of expertise in the public health organizations and there is a need for development of more public health schools in the Kingdom of Saudi Arabia. The establishment of public health courses especially in the field of epidemiology at undergraduate and graduate level will help in the development of efficient and competent public health workforce.

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## 1. INTRODUCTION

'Health human resources' is defined by the World Health Organization (WHO) as 'all people engaged in actions whose primary intent is to enhance health' [1]. This includes all people who contribute to a functional health system: those who provide health care directly and those (like public health professionals) who address the underlying health determinants, and others who support the overall effort in other ways [2]. Efficient public health services are key in minimizing diseases and increasing the standard of living. Public health is both multidisciplinary and interdisciplinary, as professional from different disciplines contribute their knowledge and skills for improving health [3]. There is a strong linkage

between the health workforce and public health education as public health require intellectually rich and challenging workforce [4].

The initiative in public health traces back to 1872, when American Public Health Association was formed. The first independent School of Public Health (SPH) began in 1916 in the United States (US) [5]. The school was funded privately major by the Rockefeller philanthropies, which in early 20th century helped to define public health profession [6,7]. The London School of Hygiene and Tropical Medicine, the first SPH in the United Kingdom (UK) was founded in 1924 with support of Rockefeller philanthropies [8]. However, for much of the 19th century, there was no concept of organized public health. In 1960, the Hill-Rhodes Bill helped to renew interest in the public health in US [5].

At this time there was evolution in teaching methods also, with greater emphasis to problem-based learning especially in medical

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schools [9]. In 2008, the American Association of Colleges and Universities surveyed their membership and found that 167 institutions offered undergraduate majors, minors or concentrations in public health in US [10]. Frenk et al. [9] in 2010 estimated that there are about 450 schools of public health worldwide irrespective of departments and courses. According to European Association of Schools of Public Health, over 80 institutions in European region qualify as SPH [11]. In 2011, UK had 30 universities offering post-graduate qualification in public health [12], 36 universities offering Masters in different disciplines of public health such as nutrition, policy, the environment, research, management, nursing or communicable disease prevention [13], and the Universities' Central Application Service shows more than 100 degrees that have a public health component [14].

In the Kingdom of Saudi Arabia (KSA), a royal decree from King Abdulaziz established the first public health department in Mecca in 1925, for providing free healthcare to the population and Hajj pilgrims [15]. The monitoring of healthcare services were done through series of hospitals and dispensaries. The second milestone achieved in the public health service in KSA was establishment of Ministry of Health (MOH) in 1950 under another decree. The MOH responsibility was to manage, plan health policies, supervise and monitor health services in private sector [16]. In KSA until 1980s, the main objective of MOH was to provide treatment for existing health problems for which expatriates were hired [16,17].

However, after the WHO General Assembly in 1978, in accordance to Alma-Ata declaration, the Saudi MOH began to develop preventive health service by adopting Primary Health Care (PHC) as one of its key health strategies [18]. The PHC focused on eight elements which included health education to prevent and control diseases, supply of safe water and basic sanitation, promotion of food supply and appropriate nutrition, maternal and child healthcare, immunization of children against major communicable diseases, appropriate treatment and providing of essential drugs [19].

In Saudi Arabia, pilgrims from over 160 countries gather to perform Hajj every year and in this period the risk of public health problems related to infectious diseases increase [20,21]. The Saudi government has taken a number of steps to improve the management of public health during Hajj but still outbreaks occur [22]. In 2009 there was a pandemic H1N1 influenza, the data analyses from Europe and the USA regarding the transmission dynamics of the virus estimated the basic reproduction number ( $R_0$ ) of the virus to be 1.2–1.7, with higher estimates in Japan  $R_0$  2.3; (95% CI: 2.0–2.6) and in New Zealand  $R_0$  1.96; (95% CI: 1.80–2.5) [23]. The Saudi government was concerned that pilgrims suffering with or at risk of H1N1 influenza could result in increased basic reproduction number and secondary attack rates of H1N1 influenza during Hajj. Therefore, the Saudi government collaborated with WHO to plan strategies to control the 2009 H1N1 influenza pandemic from spreading during the Hajj season [24].

According to Saudi Ministry of Education (MOE) Annual Report 2018 [25], only 14 (46.7%) out of 30 universities provide bachelor courses in different disciplines of public health and five universities (16.67%) offers master's degree in public health. Among the private universities and colleges, only four (13.3%) institutions provide bachelor course in public health and one (3.3%) offers a master's degree in public health. However, since 2015 public health education shows an approximate increase of 3% and 6% in bachelor

courses in public and private institutions respectively. The progress rate shows that it would take a long time to fulfil the need of competent public health workforce of the country.

Although some government and private institutions are offering courses related to public health in KSA, there continues to be challenges in producing competent public health professionals. One challenge is the lack of a standardized public health curriculum offered in all universities and educational institutions in the KSA. This is achievable through accreditation of educational institutions, which will lead to promote common standards in the course and training programs required for preparing competent public health workforce. Another challenge is to provide an appropriate and suitable practical exposure to the students so that they are able to justify the current trend of diseases [26].

Currently Saudi Arabia is experiencing outbreak of novel corona virus Middle East respiratory syndrome (MERS) caused by MERS-coronavirus (MERS-CoV) along with epidemiological and demographical transition, highlighting the importance of public health service and need of a competent public health workforce [26,27]. Moreover, the large size of the country and scattered population poses challenges to the health care service delivery, which include health facility planning and distribution of workforce. As public health is associated with the prevention and control of the diseases, it requires the local workforce for effective and efficient administration and management of public health programs. The government is working on strengthening the health care system, through eight elements of PHC approach. 'Vision 2030' is a long term plans in the KSA for strengthening the public sectors in the country that includes health, education, infrastructure, recreation and tourism thereby improving the economy of the country. The coordination between public health educational institutions and public health service organizations would help to achieve Vision 2030 goal of developing a sustainable public healthcare service in the KSA.

## 1.1. Rationale of the Study

The KSA is facing outbreak of several infectious diseases and going through an epidemiological and demographical transition so there is a need for competent public health work force. Only few studies are conducted related to public health education and workforce needs in which most of the studies are not comprehensive and would be prejudiced to generalize the results. So a comprehensive study was designed, using a mixed method tools to assess the existing public health courses in the country and to investigate the needs in the public health education programs to strengthen the current courses. Further, the study focuses on the need and availability of competent public health workforce to overcome the new challenges.

## 2. MATERIALS AND METHODS

In this descriptive cross-sectional research study, an exploratory mixed-method approach (qualitative and quantitative tools) was used to obtain information about public health education and workforce needs. Data were collected and analysed sequentially. The design begins with collection and analysis of qualitative data in the first phase, in order to develop Strength, Weakness, Opportunities and Threats (SWOT) model to identify the existing

gaps in capacities. Based on the exploratory result from the first phase, the researchers conducted the second quantitative phase.

## 2.1. Data Collection Methods

A baseline data on existing educational institutions that offer public health education in the KSA was obtained from MOE website and university website. As the study took long time to complete, the details of the educational institutions providing public health education was reviewed using 2018 Annual Report prepared by MOE to update the data collected at the baseline.

The data was collected through two phases.

### 2.1.1. First phase of study

It was conducted between September 2015 and December 2015. A face-to-face semi-structured interviews and meetings with the heads of four national public health administrations were carried out. All these heads belonged to different organizations were interviewed to perceive the paucity and needs of the organizations. The organizations were selected conveniently, and the interview focused on the qualifications held by the current employees of the organization, organization demands regarding qualifications and sub-specialty of Public Health and their perspective to support training programs for current employees. The different health organization administrative head selected for interview were Ministry of Municipal and Rural Affairs, Saudi Food and Drug Authority, Ministry of Environment, Water and Agriculture, and MOH.

### 2.1.2. Second phase of study

It was done in September 2017 and June 2018 among faculty members and students of College of Health Science, SEU. The study participants for the second phase were selected from different university branches in five major cities across Saudi Arabia. A random sample ( $N = 500$ ) students and ( $N = 50$ ) faculty members were contacted to participate in the study. However, 408 students (81.6% response rate) and 41 faculty members (82% response rate) returned the survey with complete response. An electronic capture of survey data is an efficient tool to collect information from large number of study participants. The results obtained from the thematic analysis of first phase of the study provided the base for preparing the questionnaire for the collection of quantitative data in the second phase. A web-based questionnaire was designed to gather the students and faculty member responses in this phase.

The faculty member questionnaire included six questions related to demographics (Table 1) and four close-ended questions related to need of public health educational programs in Saudi Arabia, their knowledge on the types of public health programs offered, and challenges in implementing these programs in other institutions (Table 2).

Similarly, a structured questionnaire survey was done among students after enrolling in an undergraduate course in public health at the SEU to gather their opinions about public health education and workforce needs. All students were included except who refuse to participate in the study. The questionnaire contained six questions

**Table 1** | Demographic characteristics of faculty members in the Saudi Electronic University

Demographic characteristics	Faculty members, $N = 41$
	$N$ (%)
Gender	
Male	24 (58.5)
Female	17 (41.5)
Age category	
25–35	21 (51.2)
36–45	16 (39.0)
>45	4 (9.8)
Qualification	
BSc	2 (4.9)
MSc/MPH	27 (65.9)
PhD	12 (29.3)
Current position	
Professor	2 (4.9)
Assistant professor	11 (26.8)
Lecturer	26 (63.4)
Teaching assistant	2 (4.9)
Experience	
<1 year	4 (9.8)
1–5 years	16 (39.0)
6–10 years	14 (34.1)
>10 years	7 (17.1)

MPH, Master of Public Health.

related to demographic profile (Table 3); five close-ended questions related to information about public health speciality and source of information, where public health specialists work, shortage in sub-specialty of public health, sub-specialty of their preference and if the participant was a staff member of a healthcare organization, whether they receive support from their organization for completing their educational studies. The last question was an open-end question about whether there is a need for public health speciality in the MOH and other public health organizations (Table 4).

## 2.2. Ethics Statement

The study protocol was reviewed and approved by Deanship of Scientific Research at SEU. An informed consent was obtained from all study participants, and they were instructed to participate or withdraw from the study at any stage voluntarily. Anonymized data were used for analysis and interpretation.

## 2.3. Data Analysis

Data was analysed descriptively using the statistical software program IBM Statistical Package for the Social Sciences (SPSS) version 23 (Chicago Inc., USA). The qualitative data obtained from the interview of administrative heads was used to develop SWOT model to identify the existing gaps in capacities, developing core messages needed; and estimated the capacity building needs for a comprehensive public health workforce program in the KSA. Descriptive statistics (Frequencies and percentages) were used to describe the main features of quantitative data and Chi-square test was used to assess the association between the demographic variables of students and their responses.  $p$ -value  $<0.05$  was considered statistically significant.

**Table 2** | Saudi Electronic University faculty member perception about education needs for Public Health Speciality in the Kingdom of Saudi Arabia

Questionnaire about education needs for Public Health Speciality in Saudi Arabia	Faculty member interviewed, N = 41	
	N	Percentage
Do you think there is a demand to establish educational programs in Saudi Universities related to Public Health field?	Yes 38	92.7
	No 3	7.3
If yes, what do you think the subspecialty in public health field that needs to be set up?		
Epidemiology	29	70.7
Biostatistics	20	48.8
Combating infection and vector diseases	22	53.7
Environmental health	24	58.5
Occupational health	20	48.8
Promotion of health and health education	23	56.1
Health policies	22	53.7
Health administration	22	53.7
Food safety and health surveillance	22	53.7
Nutrition and community health	10	24.4
In your opinion, what are the main challenges restrict establishing public health education programs in Saudi Arabian Universities?		
Shortage in academics specialized in this field	36	87.8
Conflicts between health related organizations in identifying their needs of subspecialties in public health	17	41.5
This specialty is new in Saudi Arabia and no enough information about it	15	36.6
Lack of awareness and importance of this course and roles and responsibilities of public health specialist should be defined	2	4.9
Other health related specialties can perform the tasks of a public health professional	9	22.0
There is no needs for public health graduates in the Saudi labor market	3	7.3

**Table 3** | Demographic characteristics of students of Saudi Electronic University

Demographic characteristics	Students interviewed, N = 408
	N (%)
Gender	
Male	200 (49.0)
Female	208 (51.0)
Age category (years)	
<25	117 (28.7)
25–35	214 (52.5)
>35	77 (18.9)
Level of study	
Bachelor of Health Sciences	387 (94.9)
Master of Healthcare Administration	19 (4.7)
Branch	
Riyadh	141 (34.6)
Dammam	157 (38.5)
Jeddah	55 (13.5)
Medina	21 (5.1)
Abha	33 (8.1)
Employment	
Yes	246 (60.3)
No	157 (38.5)
Work belongs to health sciences	
Yes	213 (85.2)
No	37 (14.8)

### 3. RESULTS

The baseline survey in 2015 revealed that there were 25 public universities, among them 11 (44%) offers undergraduate courses and four (16%) offers graduate courses in different disciplines of public health, while there were 26 private institutions, among them

only two (7.7%) provides undergraduate course in public health. A review of the educational institutions carried out in 2018 to update the baseline data showed that there are presently 30 public and 30 private institutions. Out of 30 public institutions, 14 (46.7%) provides undergraduate courses and five (16.7%) offers graduate courses in public health and among the 30 private institutions, four (13.33%) offers undergraduate courses and one (3.33%) offers graduate course in public health. The distribution of sub-specialty of public health offered by public educational institutions in 2015 and 2018 is shown in [Figure 1](#).

#### 3.1. Shortage and Need in Public Health Specialty

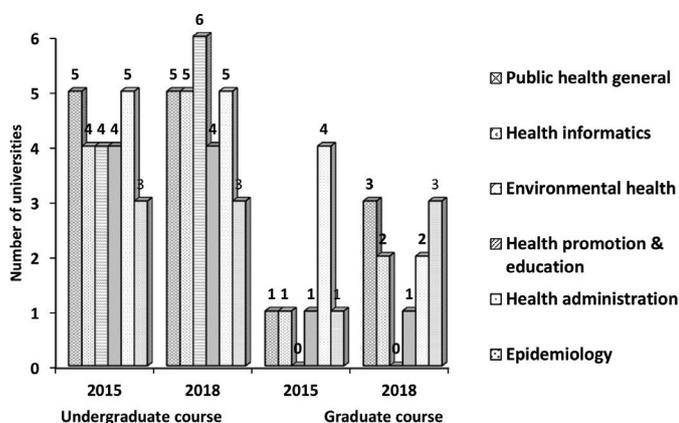
The qualitative data obtained in first phase from the administrative head of public health organizations, showed that the employees presently possess an associate degree or bachelor degree in disciplines not related to public health ([Table 5](#)). Moreover, it also found a shortage of competent workforce and a need of employees with bachelor (25%) or master degrees (100%) in public health. The quantitative data obtained in second phase showed student perceptions of 97.5% agreement with the need of public health specialty in the public health organizations ([Table 4](#)). According to 92.7% faculty member, there is a need to set up educational program in public health in the KSA ([Table 3](#)).

#### 3.2. Demand of Sub-specialty in Public Health

The qualitative data obtained in first phase showed that all the four public health organizations (100%) had demand for employees with epidemiology as sub-specialty. The other sub-specialty, which

**Table 4** | Views of students of Saudi Electronic University about the public health education and the training needs of the Public Health workforce in the Kingdom Saudi Arabia

Questionnaire on public health education and the training needs of the Saudi Arabian Public Health workforce	Students interviewed, N = 408	
	N	Percentage
Do you have sufficient information about the public health specialty in general?	Yes 292	71.6
If yes, what is the source of this information?	No 116	28.4
Friends	59	20.1
Family members or relatives	67	22.8
Media	61	20.7
Scientific books and magazines	110	37.4
Relevant health authorities	68	23.1
Social media	88	29.9
Specialists in this field	151	51.4
Other	39	13.3
Do you think there is a need for public health specialty in the Ministry of Health and other organizations? (yes)	398	97.5
If the answer is yes, please indicating the reason?		
The shortage of public health specialty in Saudi Arabia	252	64.1
The emergence of epidemic diseases and new infectious diseases need specialists in this area	231	58.8
The development of new public health departments in the relevant health organizations require specialized public health professionals	204	51.9
Other	4	1.0
If the answer is no, what are the reasons in your opinion?	10	2.5
Nurses and other medical specialties can perform the functions of a public health specialist	7	70.0
Health professionals in medical specialties can be trained to work as public health specialist	1	10.0
Other	2	20.0
In your opinion, in what places can public health specialist work in Saudi Arabia? Select at least three:		
Disease control	342	83.8
Municipalities	176	43.1
Ministry of Health	340	83.3
Hospitals	331	81.1
Primary Health Care Centers	318	77.9
Air and sea ports Authorities	157	38.5
Health directorates	14	3.4
Food and Drug Authorities	157	38.5
Ministry of Agriculture	62	15.2
Related research centers	49	12.0
Other	1	0.2
In your opinion, based on the demand in the national institutions and organizations, what is the sub-specialty of public health that you think there is a shortage and need more than others?		
Epidemiology	234	57.4
Biostatistics	170	41.7
Combating infection and vector diseases	230	56.4
Environmental health	168	41.2
Occupational health	139	34.1
Promotion of health and health education	195	47.8
Health policies	125	30.6
Health administration	104	25.5
Food safety and health surveillance	155	38
Nutrition and community health	136	33.3
Other (please specify)	1	0.2
What is the sub-specialty of public health that you prefer to study?		
Epidemiology	157	38.5
Biostatistics	83	20.3
Combating infection and vector diseases	145	35.5
Environmental health	99	24.3
Occupational health	82	20.1
Health promotion and health education	149	36.5
Health policies	76	18.6
Health management	126	30.9
Food safety and health surveillance	100	24.5
Nutrition and community health	120	29.4
Other (please specify)	3	0.7
If you are a staff of a healthcare organization, do you think that the organization that you belong to will support you in completing your public health study?	Yes 203	60.6
	No 132	29.4



**Figure 1** | Distribution of sub-specialty of public health courses offered by public educational institution in 2015 and 2018.

**Table 5** | Present public health workforce qualification, demand for Public Health Qualifications and public health speciality by public health related service organizations

Qualifications	Public health related service organizations (n = 4) (%)
Present qualification	
Bachelor degree in other than public health	2 (50)
Bachelor degree in other than public health or diploma	1 (25)
Qualification required	
Master	4 (100)
Bridging up	2 (50)
Bachelor	1 (25)
Diploma	1 (25)
Public health sub-specialty demand	
Epidemiology	4 (100)
Food safety	2 (50)
Nutrition and infection control	2 (50)
Public health	2 (50)
Environmental health	1 (25)

are in demand in these organizations are food safety (50%), public health general track (50%), infection control (50%) and environmental health (25%) (Table 5). The quantitative data obtained in second phase showed the student's perception about three sub-specialties in high demand as epidemiology (57.4%), infection control (56.4%) and public health education and promotion (47.8%). The sub-specialty public health general track, food safety and environmental health, which are in demand in public health-related organizations, received lesser response from students 33.3%, 38% and 41.2% respectively (Table 4).

### 3.3. Strategy to Overcome Competent Workforce Shortage

The qualitative data obtained in first phase put forward that administrative heads of public health organizations are planning to restrict the new recruitment to public health specialty to overcome competent workforce shortage. Two organizations (50%) showed interest in supporting their existing experienced workforce to

update their knowledge, and skills through bridging course in the specialty of public health to attain competency (Table 5). The quantitative data obtained in second phase showed the faculty member's perspective about public health courses with sub-specialty needed to be set up in educational institutions to create competent workforce in public health were epidemiology (70.7%), environmental health (58.5%), public health education and promotion (56.1%), food safety (53.7%) and infection control (53.7%) should (Table 3). The students showed interest in perceiving the public health in sub-specialty epidemiology (38.5%), public health education and promotion (36.5%) and infection control (35.5%) and this finding shows availability of competent workforce in future (Table 4).

### 3.4. SWOT Analysis of Qualitative Data Obtained in the First Phase

In SWOT analysis, the main strength of the organizations related to public health was found to be the willingness and commitment of ministries and other stakeholders to develop public health workforce programs. The weaknesses of the organizations found were shortage of resources and capacity to carry out public health workforce programs. The main opportunity for the organizations are the availability of global public health agency for partnership, but the lack of long-term commitment from the partner is the threat associated with it (Figure 2).

### 3.5. Association Between the Demographic Variables of Students and their Responses

Health authorities and specialists were the main response for source of information among male students (59%) than female students (30.8%) ( $p = 0.0001$ ). The male students had more knowledge about the different work areas of public health specialist as 74.5% of male students responded for other work area than the four main area of work compared with 52.4% female students ( $p = 0.023$ ). A significantly higher percentage of male students (46%) preferred to pursue sub-specialty environmental or occupational health as compared with 35.6% female students ( $p = 0.037$ ) (Table 6).

No significant association was found in the responses of students pursuing bachelor degree and master degree for all the variables ( $p > 0.05$ ) (Table 7). The association between student employment status and their response revealed that the majority of employed students (56.9%) source of information was health authorities and specialist as compared with 26.7% among unemployed students ( $p = 0.0001$ ). Moreover, friends and family members as source of information was significantly higher among the unemployed students (38.8%) compared with 19.1% among employed students ( $p = 0.0001$ ) (Table 8). A significantly higher percentage of employed students (65.4%) responded that there is a need of public health specialty for development of new public health professionals than unemployed students (54.1%) ( $p < 0.0001$ ). The employed students had more knowledge about the different work areas of public health specialist as 62.6% of employed students responded for other work area than the four main area of work compared with 50.3% unemployed students ( $p = 0.030$ ) (Table 8). Food safety, health surveillance, nutrition and community health were more preferred as sub-specialty by the unemployed students (50.9%) than by the employed students ( $p = 0.036$ ) (Table 8).

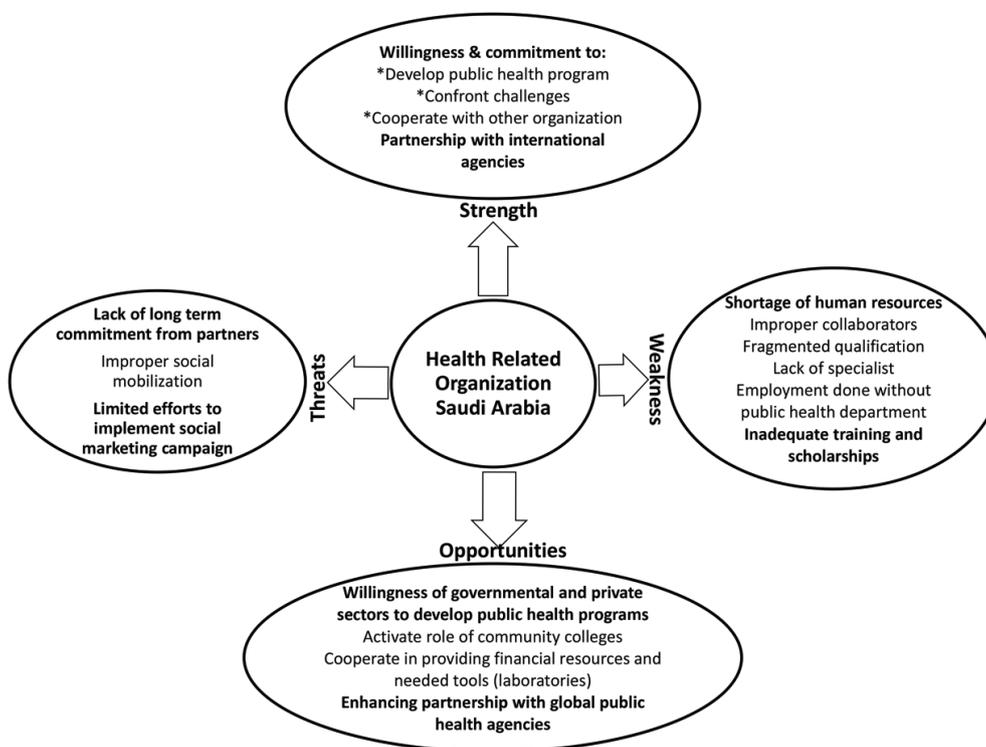


Figure 2 | SWOT analysis of health related organizations Saudi Arabia.

Table 6 | Comparison between sex of the student and their responses

	Sex		p-value
	Male (N = 200) (%)	Female (N = 208) (%)	
Source of information			
Friends and family members	41 (20.5)	42 (20.2)	0.211
Social media and books and magazines	92 (46.0)	86 (41.3)	0.185
Health authorities and specialists in this field	118 (59.0)	64 (30.8)	0.001*
Other	17 (8.5)	22 (10.6)	0.115
Need for public health specialty	196 (98.0)	202 (97.1)	0.563
The shortage of public health specialty in Saudi Arabia	114 (57.0)	105 (50.5)	0.587
The emergence of epidemic diseases and new infectious diseases need specialists in this area	121 (60.5)	107 (51.4)	0.854
The development of new public health departments in the relevant health organizations require specialized public health professionals	133 (66.5)	107 (51.4)	0.476
Area of public health specialist work			
Disease control	159 (79.5)	154 (74.0)	0.839
Hospitals and primary health care centers	172 (86.0)	186 (89.4)	0.159
Municipalities/Ministry of Health/Health Directorates	182 (91.0)	177 (85.1)	0.790
Food and Drug Authorities	140 (70.0)	135 (64.9)	0.883
Other	149 (74.5)	109 (52.4)	0.023*
Demand of sub-specialty of public health			
Epidemiology/Biostatistics	155 (77.5)	150 (72.1)	0.622
Combating infection and vector diseases	118 (59.0)	127 (61.1)	0.622
Environmental/Occupational health	125 (62.5)	125 (60.1)	0.883
Health policies/health administration/Promotion and health education	132 (66.0)	133 (63.9)	0.933
Food safety and health surveillance/Nutrition and community health	122 (61.0)	128 (61.5)	0.783
Preferred sub-specialty of public health			
Epidemiology/Biostatistics	84 (42.0)	105 (50.5)	0.255
Combating infection and vector diseases	70 (35.0)	80 (38.5)	0.695
Environmental/Occupational health	92 (46.0)	74 (35.6)	0.037*
Health policies/health administration/Promotion and health education	117 (58.5)	119 (57.2)	0.605
Food safety and health surveillance/Nutrition and community health	74 (37.0)	93 (44.7)	0.274

\*p < 0.05, statistically significant.

**Table 7** | Comparison between education level of the student and their responses

	Level of education		p-value
	Bachelor (N = 387) (%)	Master (N = 19) (%)	
Source of information			
Friends and family members	80 (20.7)	3 (15.8)	0.380
Social Media and Books and magazines	169 (43.7)	9 (47.4)	0.672
Health authorities and specialists in this field	167 (43.1)	15 (78.9)	0.530
Other	36 (9.3)	3 (15.8)	0.561
Need for public health specialty	377 (97.4)	19 (100)	0.485
The shortage of public health specialty in Saudi Arabia	203 (52.4)	10 (52.6)	0.778
The emergence of epidemic diseases and new infectious diseases need specialists in this area	220 (56.8)	11 (57.9)	0.718
The development of new public health departments in the relevant health organizations require specialized public health professionals	234 (60.5)	9 (47.4)	0.529
Area of public health specialist work			
Disease control	299 (77.3)	14 (73.7)	0.682
Hospitals and primary health care centers	341 (88.1)	17 (89.5)	0.864
Municipalities/Ministry of Health/Health Directorates	342 (88.4)	17 (89.5)	0.854
Food and Drug Authorities	262 (67.7)	13 (68.4)	0.871
Other	242 (62.5)	16 (84.2)	0.298
Demand of sub-specialty of public health			
Epidemiology/Biostatistics	290 (74.9)	15 (78.9)	0.962
Combating infection and vector diseases	233 (60.2)	12 (63.2)	0.980
Environmental/Occupational health	238 (61.5)	12 (63.2)	0.956
Health policies/Health administration/Promotion and health education	251 (64.9)	14 (73.7)	0.725
Food safety and health surveillance/Nutrition and community health	239 (61.8)	11 (57.9)	0.703
Preferred sub-specialty of public health			
Epidemiology/Biostatistics	182 (47.0)	6 (31.6)	0.996
Combating infection and vector diseases	146 (37.7)	4 (21.0)	0.686
Environmental/Occupational health	163 (42.1)	3 (15.8)	0.260
Health policies/Health administration/Promotion and health education	225 (58.1)	11 (57.9)	0.137
Food safety and health surveillance/Nutrition and community health	162 (41.9)	5 (26.3)	0.869

## 4. DISCUSSION

The present study results showed that the health workers in Saudi Arabia health organizations have an associate degree or a bachelor degree in other than public health as qualifications. This reflects the lack of appropriate qualifications, skills and experience to deal with challenges that arise in the public health field. A movement toward defining criteria for professional competence has evolved recently because it was a common practice in the past to recruit or promote an individual within public health agencies based on outdated concepts of professional qualification eligibility, seniority or sometimes due to the political interference without paying attention to the adequacy of their knowledge, attitudes and skills in public health [2].

In the present study, all the public health-related organizations (100%) reported a need of specialized health workers with a qualification of at least master degree in public health sub-specialty epidemiology. This assessment of the educational needs of local public health organizations is an important step toward development of appropriate programs at the academic level to improve core competencies for public health professionals. Most of the western countries demand Master of Public Health degree, or its equivalent that is Master of Science in Public Health or Master of Health Sciences, as professional entry-level qualification for public health [28]. Master of Science in public health is programmed with emphasize to develop academically thought-provoking, student-centered learning, problem-solving and acquisition of skill necessary to

practice public health. Therefore, recruitment of highly qualified employees and focus on continuing education for updating recent development will be sufficient for valuable and competent work [28]. The public health college and medical colleges must work together in an integrated model. This will help to generate the best possible healthcare workforce, develop innovative tools and approaches through research and eventually achieve the maximum potential for improving the public health.

Public health in the Middle Eastern countries is facing challenges both at the recruitment and retention of appropriate skills and expertise, in terms of both quality and quantity [29]. The present study found the same opinions from the administrative heads of the various health organizations. There is an overarching need to improve the ways to address health determinants; which requires cadres of professionals appropriately trained in public health measures [28]. The knowledge obtained from the SWOT analysis about the strengths and the opportunities can be utilized by the organization to develop the required workforce in public health-related departments. Moreover, the knowledge about the weaknesses will help the organization to improve the competency level of the workforce and the threats associated with the organization will guide the organization to prepare for adverse conditions in advance.

As per Saudi MOE Annual Report 2018, <50% government universities are providing bachelor courses in public health and <20% is providing master course [25]. The government of KSA is working hard on strengthening the health care system, through eight elements of PHC approach. To achieve Vision 2030 goal of developing

**Table 8** | Comparison between employment status of the student and their responses

	Employment		p-value
	Yes (N = 246) (%)	No (N = 157) (%)	
Source of information			
Friends and family members	47 (19.1)	61 (38.8)	0.0001*
Social Media and Books and Magazines	109 (44.3)	69 (43.9)	0.659
Health authorities and specialists in this field	140 (56.9)	42 (26.7)	0.0001*
Other	21 (8.5)	18 (11.5)	0.244
Need for public health specialty	238 (96.7)	155 (98.7)	0.213
The shortage of public health specialty in Saudi Arabia	137 (55.7)	78 (49.7)	0.949
The emergence of epidemic diseases and new infectious diseases need specialists in this area	143 (58.1)	90 (57.3)	0.398
The development of new public health departments in the relevant health organizations require specialized public health professionals	161 (65.4)	85 (54.1)	<0.0001*
Area of public health specialist work			
Disease control	198 (80.5)	115 (73.2)	0.985
Hospitals and primary health care centers	213 (86.6)	145 (92.3)	0.077
Municipalities/Ministry of Health/Health Directorates	223 (90.6)	136 (86.6)	0.552
Food and Drug Authorities	175 (71.1)	100 (63.7)	0.942
Other	179 (72.8)	79 (50.3)	0.030*
Demand of sub-specialty of public health			
Epidemiology/Biostatistics	187 (76.0)	118 (75.2)	0.969
Combating infection and vector diseases	149 (60.6)	96 (61.1)	0.322
Environmental/Occupational health	157 (63.8)	93 (59.2)	0.568
Health policies/Health administration/Promotion and health education	158 (64.2)	107 (68.1)	0.551
Food safety and health surveillance/Nutrition and community health	154 (62.6)	96 (61.1)	0.890
Preferred sub-specialty of public health			
Epidemiology/Biostatistics	108 (43.9)	80 (50.9)	0.558
Combating infection and vector diseases	88 (35.8)	62 (39.5)	0.859
Environmental/Occupational health	108 (43.9)	58 (36.9)	0.096
Health policies/Health administration/Promotion and health education	147 (59.8)	89 (56.7)	0.280
Food safety and health surveillance/Nutrition and community health	87 (35.4)	80 (50.9)	0.036*

\*p-value significant.

a sustainable public healthcare services in the KSA, more public and private educational institutions should develop public health courses at undergraduate and graduate level, so that competent public healthcare workforce is produced.

The sub-specialty on high demand by organizations was epidemiology. As the KSA is at its initial phase of developing public health services, emphasis is placed on the need for epidemiological skills. The workforce with specialty in epidemiology have skills to enable priority settings, service planning and evaluation of outcomes, have ability to develop and implement health improvement programs, surveillance of non-communicable disease and competent in proving advice on arrange of public health issues to local organizations and the public [8]. At present, only three government universities and one private university is providing master course in epidemiology along with hospital administration. Only few institutions about 16.7% provide master course in public health with focus mainly on health administration. Therefore, approximately 92.7% of Health Science faculty members and 97.5% of students had the opinion that there is a need to establish educational programs in Saudi Universities related to Public Health. According to the 65.4% employed students, there is a need of public health specialty especially for the development of new public health departments.

In the present study, 50% of the public health related organizations showed interest in bridging course for their experienced employees. This finding is supported by 60.6% of the students working in health organizations who reported organization cares for their

public health studies (Figure 3). This reflects the organizations in public health need their employees to be up-graded to stand the competency required in the field. This gives a positive signal for the academic institutions to introduce more post-graduate courses in the public health as the demand for this course is increasing. The online courses can be considered as promising new development for continuing education and bridging courses. The development programs as Training Programs in Epidemiology and Public Health Interventions Network and online courses should be viewed as a component of, or adjunct to, internal capacity development, but not as a replacement for it [28].

The demand for competent public health workforce will further increase as the government is focusing on enlarging the network of health services at PHC level to reach all the corners of the country [27]. Moreover, the government project of the Custodian of the Two Holy Mosques has planned to create around 2000 highly developed PHC center and also to upgrade the existing PHC center with well-equipped buildings, skilled and competent workforce, this will result in high demand of public health courses in the KSA [15].

According to the demand of organizations, students and faculty members, MPH program needs to focus on disciplinary areas such as epidemiology, infection control, food safety, and environmental and occupational health sciences. The MPH degree program development needs to emphasize on student centered learning, problem resolving and gaining of skills necessary to the practice of public health. The lack of resemblance between the taught and required could affect in public health workers being ill-prepared for the

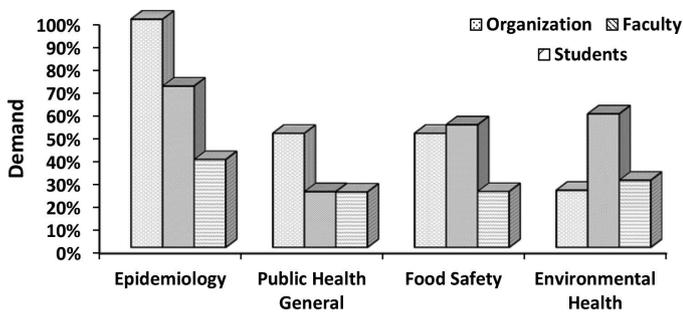


Figure 3 Sub-specialty in public health.

requirements of the real world [30]. Therefore, educational institutions should spread the health education by engaging the whole of society through community outreach programs.

The study from Hawai'i also assessed the needs for public health education in their state and reported lack of awareness about the MPH and MS programs in university of Hawai'i [31]. A study from Nepal reported there is a need for trained public health professionals in Nepal and educational institutions requires development of effective graduate programs [32]. The accreditation of the public health schools is an essential step toward the improvement and standardization of teaching programs as well as the establishment of competencies [33]. The affiliations of SPH to the local government will probably improve the balance between the needs of government and the autonomy of academic schools [33]. The public health schools should focus on research process of public health such as planning, evaluation, surveillance, investigation, and problem and pathway analyses. Building of well-organized public health educational institution requires structuring strong research and development skills among students, practitioners and faculty equally. The accreditation of SPH with local government will likely promote targeted research with appropriate funding.

Moreover, students who participated in this study had limited information about the place of work and public health-related organizations demand of sub-specialty in the KSA. The students Report convened by Welcome Trust highlighted that the health improvement can be achieved only when people are fully engaged in their own health and the health service is focused toward the promotion of good health and prevention of illness [34]. The youth should be updated about the scope of public health and encouraged to take admission in various public health courses, as it will elevate their general awareness of issues that affect individuals, families and communities. This will be a complementary social gain to promote health literacy, and development of a more active civil society in the health field.

## 5. CONCLUSION

The efforts and activities in public health in the KSA need more attention. Only few universities are providing master course in public health education, which shows that the local educational institutions are not keeping up with the demand for maintaining and improving the public health workforce. The work of public health professionals is important because public health initiatives affect people every day in every part of the world. There is a shortage of expertise in the public health organizations and there is a need for development of more public health schools in the KSA. The establishment of public health courses especially in the field of

epidemiology at undergraduate and graduate level will help in the development of efficient and competent public health workforce.

## CONFLICTS OF INTEREST

The authors declare they have no conflicts of interest.

## AUTHORS' CONTRIBUTION

MAM contributed in data curation, investigation, project administration, software and supervision. NBJ contributed in formal analysis. MAM and NBJ contributed in resources and writing (original draft). AMEE, MT, SC, AH and FEME contributed in validation and visualization. All authors contributed in methodology and writing (review and editing).

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