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# Environmental Health Services and Professionals Level of Engagement in Different Sectors in Eastern Ethiopia: A Mixed Methods Study Design

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## ABSTRACT

**INTRODUCTION:** Environmental health (EH) services have a long history in Ethiopia, but data on environmental health services quality and the magnitude of environmental health professionals' engagement has never been addressed. This study was conducted to assess the quality of environmental health services in different sectors and professionals' level of engagement in Eastern Ethiopia.

**METHODS:** Institution based cross-sectional mixed study design was implemented. A cluster sampling technique was employed to select 83 participants. Data were collected using a pretested questionnaire and an interview guide. Descriptive, bivariate, multivariate, and thematic analysis was carried out.

**RESULTS:** Professionals' performance in most services were reported to be average or low. Only 19.5% of participants responded as having good satisfaction in their job. The multiple logistic regression analysis showed factors associated with selected environmental health services. The odds of identifying environmental problems was associated with profession (adjusted odds ratio (AOR): 4.1; 95% confidence interval (CI): 1.3-7.6) and level of education (AOR: 3.1; 95%CI: 0.9-5.9). The factors contributing to introducing innovative solutions to EH problems were type of institution (AOR: 3.1, 95%CI = 1.6-9.3), profession (AOR: 3.4, 95%CI = 1.1-12.2), and level of support and emphasis offered (OR: 5.6, 95% CI = 2.2-11.9). Level of job satisfaction was also associated with the above-mentioned independent variables.

**CONCLUSION:** The current study showed low level of professionals' engagement and factors associated with the quality of environmental health services in different sectors. Therefore, Ethiopian Federal Ministry of Health and other concerned ministries, agencies, and authorities should intervene accordingly to improve the service and level of professionals' engagement.

**KEYWORDS:** Environmental health, services, level of engagement, professionals, Ethiopia

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## Introduction

Environmental health may be defined as the art and science of controlling physical, chemical, and biological factors external to a person, and all related factors impacting behavior. It encompasses the assessment and control of those environmental factors that can potentially affect human health.<sup>1-5</sup> Environmental health (EH) is a critical component of most government public health programs at national, regional, and local level.<sup>6,7</sup> Environmental health services are delivered through Ministry of Health (MOH), public health agencies, environmental protection agencies, or other related sectors.<sup>5,7,8</sup>

The scope of Environmental health services in Ethiopia is wide and varies in each sector.<sup>9</sup> The service includes environmental protection (solid and liquid waste management, air quality monitoring, and environmental impact assessment), disease prevention and control (vector and rodent control, routine community diagnosis and inspection), occupational health and safety, food safety (registration, licensing, and inspection of food establishments), and institutional and residential health

services.<sup>6,9,10</sup> Despite the involvement of a wide array of sectors in environmental health services (EHS), the principles of environmental health are universal and applicable in each sector.<sup>4,11</sup>

Environmental health services in Ethiopia dates to 1908 when hygiene and sanitation activities were included as a single service in the first formal health services program of the country.<sup>9,12</sup> This was followed by a proclamation formulated by Ministry of Interior in 1942 to 1943 about hygiene and sanitation.<sup>12,13</sup> Although there was little progress over the next some decades, a recognizable hierarchy and specific responsibility was established during the shift in health policy to a primary health care setting in the 1970s.<sup>14</sup> At the time, the Department of Environmental health under the Ministry of Public Health was given the responsibility for water and sanitation, food hygiene, industrial hygiene, and quarantine services.<sup>12</sup>

Following the change of government in 1991, the new government acknowledged the importance of EH as indicated in Article 44/1 of the Federal Democratic Republic of Ethiopian



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constitution which describes the right of all peoples to have a clean and healthy environment.<sup>15</sup> Moreover, environmental health service development was mentioned among the priorities in the National health policy.<sup>14,16,17</sup>

Although environmental health service has a long history in Ethiopia, there was no specific EH personnel designated for the service until the UN Relief and Rehabilitation Administration (UNRRA) trained sanitary personnel for the duration of 6 months in 1946.<sup>14</sup> The establishment of Gondar Public Health College and Training Center in 1954 enabled to train sanitarians at diploma level and the first batch graduated in 1957.<sup>18</sup> In 1988, Jimma Health Sciences Institute started to produce EH technicians at advanced diploma level, and initiated to train Environmental health graduates at Bachelor degree level in 1993.<sup>14</sup> Later, other institutions including Haramaya University (formerly known as Alemaya University) and Debub University, currently known as Hawassa University, started to train EH technicians at diploma level which later upgraded to produce Bachelor of science graduates as Environmental health officers (EHOs) since 2003.<sup>12,19</sup> The involvement of these professionals was mainly in the Ministry of Health and the focus was on water, sanitation and hygiene, and disease prevention and control.<sup>12</sup>

Although EH service has a long history in Ethiopia, it has given very little attention to date.<sup>9</sup> Currently, the service encompasses components such as solid waste management, liquid waste management, water supply, food safety, residential and institutional health, occupational health, personal hygiene, vector control, and related activities.<sup>13,16,20</sup> Now, the provision of environmental health services is not also restricted under the Ministry of Health. In addition, Ministry of Urban Development and Construction, Ministry of Water, Irrigation and Energy, Environment, Forest and Climate change Commission, Ethiopian Environmental protection agency, Ethiopian Standard Agency, Food, Medicine and Health Care Administration and Control Authority, and non-governmental organizations (NGOs) are widely involved in Environmental health services delivery.<sup>9,12</sup> The Ministry of Urban Development and Construction is responsible for solid waste management, parks and green areas development, and housing safety related environmental health services.<sup>21,22</sup> Meanwhile, environmental health services related to water quality and wastewater management, are mainly the responsibility of Ministry of Water, Irrigation, and Energy.<sup>23</sup> The implementation of these programs is mainly through city and town municipalities. Environmental protection agency, Ethiopian Standard Agency and, Food, Medicine, and Health Care Administration and Control Authority of Ethiopia are primarily regulatory bodies and law enforcers associated to environmental emissions, food safety, institutional health, and related services.<sup>24</sup> Similarly, the composition of professionals is from a wide array of educational backgrounds. It ranges from Environmental health officers and Environmental health technicians to medical doctors and engineers.<sup>12,25-27</sup>

Data on environmental health services and professionals' level of engagement are also limited.<sup>28-30</sup> So far there are no studies conducted to assess environmental health services and professionals' level of engagement in the study area as well as in Ethiopia. Thus, this study aimed to assess environmental health services in different sectors, professionals' level of engagement and its associated factors. The findings of this study will provide significant evidence related to the planning and implementation of environmental health services. Therefore, the findings will offer pertinent information to policy makers, health planners, town municipalities, researchers, health bureaus, non-governmental organizations, and other sectors involved in environmental health service provision. Moreover, the results of this study could be used for integrated environmental health services delivery among different stakeholders.

## Methods

### *Study design and setting*

An institution-based mixed methods cross-sectional study was conducted in selected areas of Eastern Ethiopia, namely East Hararghe Zone, Harari region, and Dire Dawa city administration council from June 01 to August 31, 2014. The selected areas are geographically dispersed and divided into a number of "woreda" (districts) and sub-cities (in the case of Dire dawa city). Moreover, the selected areas are under 3 different regional administrations (Eastern Hararge Zone is under Oromia Region, Dire dawa city administration council is under the administration of the federal government and Harari region is a separate regional administration by itself). Institutions identified as environmental health service providers (health bureaus, hospitals, health centers, town municipalities, urban beautification agencies, environmental protection agencies, different NGOs, and Food, Medicine and Health Care Administration and Control Authorities at city and region level) were included in this study.

### *Study population and sample size*

All professionals recognized and responsible for environmental health services provision in different sectors in the selected areas were the source population. Cluster sampling was employed because of geographically dispersed areas and politically separate regional administrations. We have considered each "woreda" (district) in East Hararghe zone and Harari region as clusters. Meanwhile, sub-cities were taken as clusters in the case Dire dawa administrative council. Initially we have collected the number of professionals from different sources through and identified 125 professionals in the 3 areas (71 from East Hararghe zone, 26 in Harari region, and 28 Dire dawa city administration). Based on this number we have calculated the required number of sample size using single proportion formula (95% confidence interval, 50% proportion, 5% margin of error) and we got a sample size of 95.

Based on the assumption of homogeneity among clusters (districts and sub cities) of each area, we have selected clusters using simple random sampling technique. The number of subjects selected were proportional among the 3 selected areas. Higher number of professionals were identified in East Haraghe zone. Thus, greater number of clusters (13 out of 22 districts) were selected from East Haraghe zone, followed by Dire Dawa city administrative council (8 out of 13 sub-cities) and Harari region (6 out of 9 districts). All professionals who were engaged in EH service provision in the selected clusters were included. From the initial assessment, we have assumed the selected clusters were sufficient enough to provide 95 participants. However, we were able to acquire only 83 individuals (41 from East Haraghe, 23 from Dire Dawa city council administration, and 19 from Harari region) from included clusters. For the qualitative study, professionals with recognized experience were selected using a purposive sampling method and the interview was continued until the information got saturated which amassed 24 participants. Some of the participants partook in both the quantitative and qualitative data inquire.

#### *Data collection*

Data collection tools (questionnaires and in-depth interview guide) were developed based on different sources. The nationally harmonized Environmental health undergraduate program curriculum, Ethiopian hygiene and environmental health program, Center for Disease Control (CDC's) Environmental Public Health Performance Standards<sup>31</sup> were used to develop the tools. Dependent variables were measured using item questions in each category which later formed the composite score. Composite scores were used to provide a quantitative measure of the dependent variables. The type item questions were organized in the form of 5 priority scaling (1=None, 2=Minimal, 3=Moderate, 4=Significant, and 5=Optimal). The questions were verified and modified through senior professionals' comments and pretests. The quantitative data was collected using a self-administered questionnaire and the investigators were responsible for coordinating the assessment. For the qualitative data, a trained data collector was employed to conduct the in-depth interviews. Moreover, 1 assistant interviewer was assigned to handle tape recording and note-taking activities during each interview. After each interview, the investigators transcribed the tape recordings.

#### *Data quality assurance*

To minimize bias and ensure quality, experienced, and trained data enumerators were employed, and a pretest of data collection tools was conducted. The investigators checked the completed questionnaires in a daily basis to maintain its accuracy, completeness, clarity, and consistency. Any error related to clarity, ambiguity, incompleteness, or misunderstanding was solved on the following day before beginning data collection. To make

the subjects respond freely, the data collection process was conducted privately.

#### *Data analysis*

The collected quantitative data were coded and entered into EPIDATA software and later checked for the consistency of data entry. Data were cleaned accordingly and exported to STATA version 14 for further analysis. The frequency distribution of dependent and independent variables was computed. Responses of quantitative variables (identification of environmental problems, perception about having the appropriate knowledge and skill for environmental health services, introduction of innovative solutions to environmental health problems) were recategorized into binary variables "Yes" and "No") as required for the appropriate analysis. The sum of item questions was calculated and the mean score below significant and, significant and above was used as a cut-off point to categorize professionals' level of engagement as "No" and "Yes" respectively. Level of job satisfaction was also measured with item questions and later classified into a binary category as "Good" and "Poor." Bivariate and multivariate logistic regression analysis were performed to ascertain the association between dependent and independent variables. After identifying potential predictor variables in bivariate analyses, we have conducted multivariable analysis to identify the explanatory variables. We have calculated the odds ratio (OR) and a 95% confidence interval (CI) for each analysis. For all statistical significance tests, the cut of value was set at  $P < .05$ .

The qualitative data was analyzed using thematic analysis approach whereby 2 members of the research team (YTD and BND) independently read transcripts, identified themes and coded the data. Later all authors reviewed coded themes and discussed any inconsistencies in coding to refine the code structure. Finally, all data were re-coded using the final, revised code structure and a framework was developed to highlight key emerging themes representing different aspects of environmental health services. The major themes are presented in the result section with the related quantitative findings. All the qualitative data analysis process was performed manually.

#### *Variables*

Environmental health services and professionals level of engagement related to: identification of environmental problems, regular environmental health activities, involvement of professionals' in policies, standards, and guidelines development and training, perception about having the appropriate knowledge and skill for environmental health services, professionals involvement in introducing innovative solutions to environmental health problems, and level of job satisfaction were dependent variables. Meanwhile, Socio-demographic factors (Sex, Age, Year of Experience in Environmental Health

Service), Level of education, Work experience, Level of support and emphasis given to environmental health services, Type of profession, Types of institutions, and delivery system were independent variables.

### Operational definitions

*Environmental health services* are the variables of this study which were comprised different services, namely: services regarding environmental problem identification, services regarding to regular/routine activities, services related to implementation of environmental health policies, standards and planning, environmental health knowledge, skills, innovation, solutions, and research. Each service was measured with several item questions which had 5 response options (None, minimal, moderate, significant, and optimal). Definitions for the response options are described as follows:

*None*: 0% or absolutely no activity; *Minimal*: greater than zero but not more than the 25% of the activity described within the question is met within the EH system or program; *Moderate*: greater than 25%, but not more than 50% of the activity described within the question is met within the EH system or program; *Significant*: greater than 50% but not more than 75% of the activity described within the question is met within the EH system or program; *Optimal*: greater than 75% of the activity described within the question is met within the EH system or program.

*Good job satisfaction*: It means the worker is satisfied to the extent that the individual will not leave the job for other types of jobs and wants to continue in the current job.

*Fair job satisfaction*: It means the worker is satisfied to the extent that the individual will not leave the job for other types of jobs but wants a change with current arrangements and work environment.

*Poor job satisfaction*: The individual reached on a decision to leave the job for other type of jobs and doesn't want to continue with the current career.

*Good support and emphasis*: Higher officials are very supportive to the extent that they are showing their motive toward environmental health services and provide full support and necessary budget for environmental health activities.

*Fair support and emphasis*: Higher officials are supportive to the extent that they are showing their motive toward environmental health activities but little support in the process of acquiring environmental health budget and service delivery.

*Poor support and emphasis*: Higher officials are not supportive to the extent that they are showing no motive toward environmental health activities and no support in the process of providing budgets for environmental health services.

*Health services*: A wide array of services that affect health, including those for physical and mental health.

*Environmental health officers*: Individuals who have at least Diploma or Bachelor degree titled as "Bachelor of science or diploma in Environmental health" from a recognized college or University which adopted a nationally harmonized curriculum for Environmental health professionals and with a license from FDRE Ministry of Health.

*Other professionals*: Any professional engaged in EH service provision other than Environmental health officers.

### Ethical considerations

Ethical approval was obtained from Haramaya University, College of Health and Medical Science Institutional Health Research Ethics Review Committee (IHRERC). An official communication was made with the concerned institutions. During data collection, the purpose of the study was explained, and written consent was obtained from each participant. Confidentiality and privacy of participants were kept throughout the research process. All respondents were encouraged to participate in the study while at the same time they were informed that they had the right to leave participation at any time during the data collection process.

### Result

The study included all institutions which were known to provide environmental health services. The response rate was 86.8 % and the majority (63.9%) of the respondents were male (86.1%) and from the health sector. Disease prevention and health promotion was the major (61.1%) type of environmental health service and 68.1% of participants were environmental health officers by profession (Table 1).

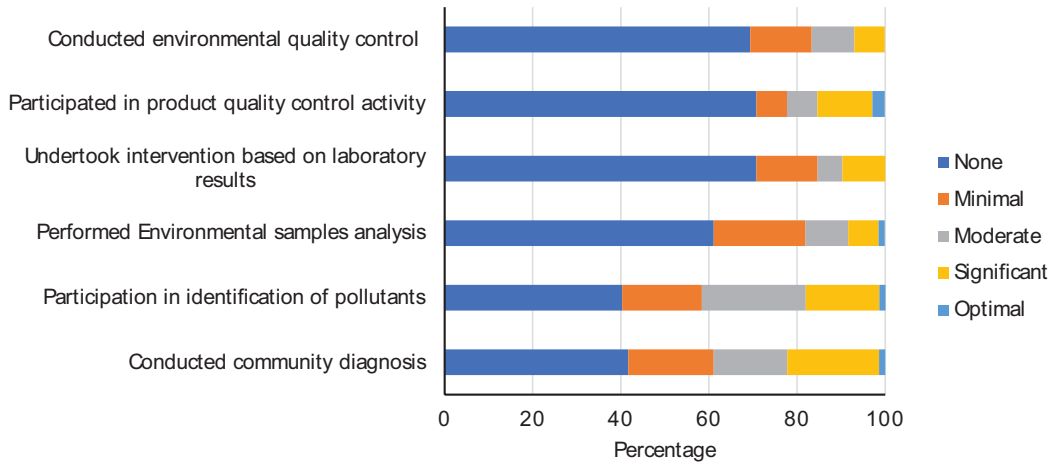
Majority (65.3%) of the respondents reported to have an average annual plan achievement related to environmental health services. The rest 19.4% and 15.3% reported high and low level of annual plan achievement, respectively. Participants in the qualitative inquire also responded that environmental health services were below the expected level. One participant said:

*"The service is compromised to the extent that activity plans were not available in place for the work I am assigned and mostly I am engaged in services other than environmental health."*

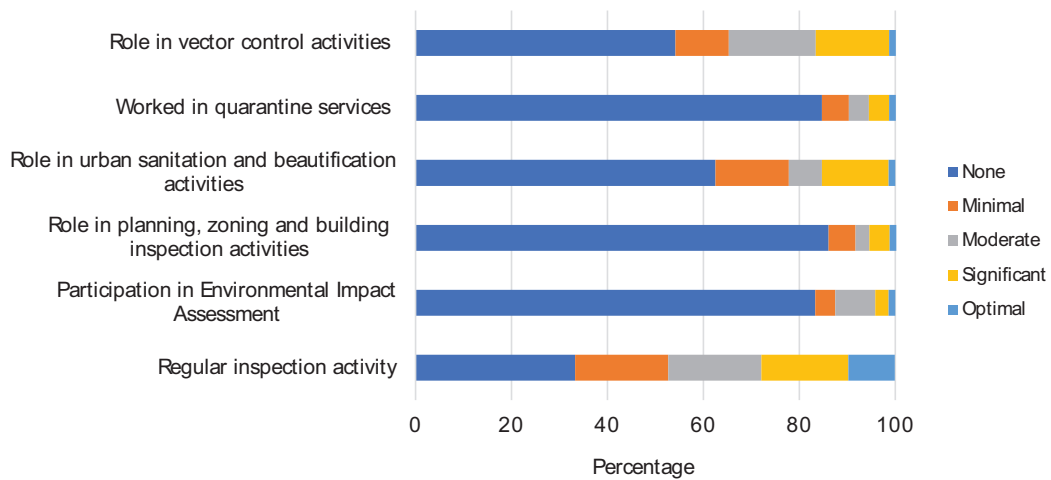
Issues to the extent of the service were also related to job description. Another participant responded that:

*"Job descriptions for the services was unavailable for most of the professionals in different sectors and problems related with EH services provision was getting worsened from time to time."*

The level of professionals' engagement in environmental problems identification is presented in Figure 1. About 41.7% and 40.3% of them were not engaged in any community diagnosis or



**Figure 1.** Professionals' level of engagement in environmental health services related to environmental problems identification in Eastern Ethiopia, 2014.



**Figure 2.** Professionals level of engagement in environmental health services regarding regular activities in Eastern Ethiopia, 2014.

pollutant identification activities, respectively. Moreover, 61.1% of the workers never performed any environmental sample analysis. In addition, 70.8% of participants didn't have an opportunity to conduct any intervention based on laboratory results.

Professionals' level of engagement related to routine/regular activities is presented in Figure 2. Around 33.3% of them stated inspection as not a regular activity. Furthermore, more than 50% of participants have never been involved in environmental impact assessment, quarantine, town sanitation, and vector control activities.

Involvement of environmental health professionals in national and regional planning and development of environmental health policies, standards, and guidelines was assessed as well. Only 15.3% said they have participated in development of regional environmental health policies and 20.8% of them had an opportunity to participate minimally in national and regional environmental health services planning. The rest (63.9%) never had a role and opportunity to participate in the planning or development of environmental health service policies, standards, and guidelines.

It is not only lack of opportunity to participate in development of standards, guidelines, and policies but also some of the

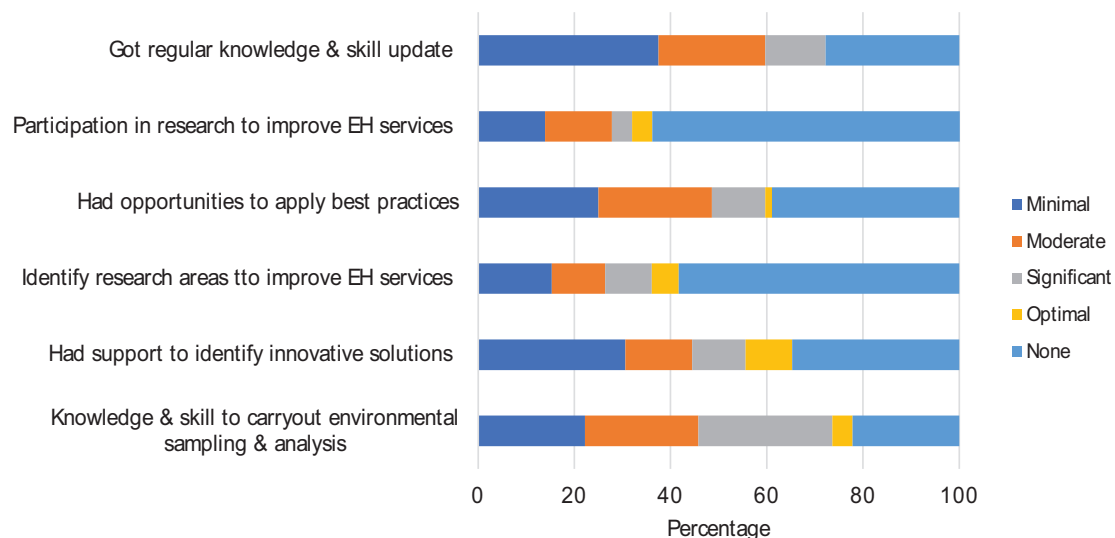
respondents admitted that they did not recognize the available policies and regulations in relation to their job. A participant who was working in the solid waste management sector responded:

*"I did not remember or know the available policies and regulations related to environmental health activities."*

Conversely, participants working in the disease prevention and health promotion sector claimed that they have been using the available regulations. However, almost all participants believed that the implementation of available policies and regulations was so poor and unrecognizable. An individual who was engaged in the health sector described as:

*"Ministry of health has policies and regulations related to environmental health services, but the implementation focused on curative services rather than preventive activities such as environmental health."*

Respondents who never had an opportunity for any form of leadership and skill development trainings accounted 47.2% of the total. The rest 33.3%, 15.3%, and 4.2% got minimal, moderate and significant opportunities for leadership and skill



**Figure 3.** Perceptions of professionals about environmental health related knowledge and involvement in introducing innovative solutions in Eastern Ethiopia, 2014.

development trainings respectively. About 22.2% and 27.8% of respondents perceived for not having knowledge and skill for environmental health services, and never had regular skill and knowledge update respectively. More than two-third of the respondents didn't participate in research activities and another 58.3% of them lacked support to identify areas that needs additional research to improve EH services (Figure 3).

Regarding the level of support and emphasis given to environmental health services, only 41.7% reported to have a fair or good level of support. The rest (59.3%) reported, poor level of support and emphasis. The qualitative findings revealed that theoretically the government has shown its support for the service through introducing environmental health services and preventive health policy. However, they have questioned implementation of the policy at regional and local level. Concerning the resources required for the service, all professionals working in disease prevention and control sector responded that budget was not allocated for environmental health services. An Environmental health officer working in a district health bureau said:

*"Prevention health policy is only in theory as the system was designed based on the curative service. . . it is impossible to perform environmental health services in such system and it is almost a forgotten service. . . every budget is related to curative services and we never had a specific budget for environmental health services."*

Professionals in the health sector also declared that the budget allocated in their institute was directly to the curative service and a budget for environmental health services is either unavailable or limited. A respondent working as a head of environmental health activities described the struggle as:

*"Environmental health services are considered as extracurricular activities and any support is on the will of institute directors and head of programs. . . You are supposed to perform bulky services*

*without budget, trainings and appropriate professionals suitable for the service. . . Even if you perform certain activities after averting all these obstacles, there is no recognition for the professionals providing the service."*

On the contrary, professionals working outside the health sector got better support and the service delivery system was comfortable to perform environmental health services. An individual working in a non-governmental organization as a coordinator of water and sanitation program replied as:

*"Despite some constraints, we are exerting a great effort with the available capacity to accomplish services and if some of the problems get solved, I am sure there will be a better service."*

While workers in the health sector felt the system made it difficult to provide environmental health services. An environmental health officer working in disease prevention and health promotion unit of a regional health bureau added:

*"In the new business process reengineering of our institution, environmental health department was totally neglected and wasn't considered in the main departments of the bureau. . . it was annexed with supporting units such as finance and human resource."*

Correspondingly, 58.3% the professionals responded a poor level of satisfaction with their current job in EH service provision. The remaining 41.7% responded good level of job satisfaction. Although most of them reported poor level of job satisfaction, they still believe they have bigger contribution compared to other professionals in their respective sectors. A participant working in a water, sanitation and hygiene program told:

*"I know my contribution and I am proud about it. . . when I do something, I know it is not only for the present, but it will pay back in the future and will make me smile later in my career."*

**Table 1.** Characteristics of professionals involved in environmental health services in different sectors in eastern Ethiopia, 2014.

CHARACTERISTICS	NUMBER (UN-WEIGHTED)	% (WEIGHTED)
Agency department or program		
Health Bureau	26	36.1
Health Center	20	27.8
Environmental Protection Agency	7	9.7
FMHACA	6	8.3
Sanitation and Beautification Agency	5	6.9
Others	8	11.2
Sex		
Male	62	86.1
Female	10	13.9
Age group		
18-24	8	11.1
25-34	49	68.1
35-44	9	12.5
45-54	6	8.3
Year of experience in Environmental Health Service		
0-5	35	48.6
6-10	24	33.3
11-20	8	11.1
21+	5	7.0
Profession		
Environmental Health Science	49	68.1
Environmental Science	6	8.3
Public Health Officers	5	7.0
Agriculture related field	4	5.5
Food Technology	2	2.8
Others	6	8.3
Level of education		
College Diploma	7	9.7
Bachelor's Degree	57	79.2
Master's Degree	8	11.1
Type of service involved in		
Disease Prevention and health promotion	44	61.1
Environmental Protection	21	29.2
Water Supply and Sewerage	3	4.2
Solid Waste Management	4	5.5



**Table 2.** Multivariable logistic regression analysis of determinants of the level of job satisfaction and introducing innovative solutions to EH problems.

CATEGORY		LEVEL OF JOB SATISFACTION				INTRODUCING INNOVATIVE SOLUTIONS TO EH PROBLEMS			
		GOOD	POOR	COR (95%CI)	AOR (95%CI)	YES	NO	COR (95%CI)	AOR (95%CI)
Profession	EHOs	13	36	1.00		11	38	6.4 (2.2-19.3)	3.4 (1.1-12.2)
	Others	17	6	7.8 (2.5-24.2)	4.5 (1.9-9.62)	15	8	1.00	
Institutions	Health Institutions	17	35	1.00		14	38	1.00	
	Other Institutions	13	7	3.8 (1.3-11.3)	6.4 (1.6-14.7)	12	8	4.1 (1.4-12.1)	3.1 (1.6-9.3)
Level of support	Good or fair	26	26	4.0 (1.2-13.6)	5.9 (1.9-17.6)	20	29	1.00	
	Poor	4	16	1.00		6	17	1.95 (0.66-5.8)	5.6 (2.2-11.9)

Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio; EHO, environmental health officers.

### Determinants of Environmental Health Services Performance and Level of Job Satisfaction

Bivariate and multivariate logistic regression analysis were performed and significant variables from the bivariate analysis were fitted in multivariable analysis. In the bivariate analysis, educational level, profession, the level of support and emphasis given to EH services, and type of institutions were significantly associated ( $P < .05$  at 95% CI) with 4 outcome variable namely, identification of environmental problems, perception about having the appropriate knowledge and skill for EH service, introducing an innovative solution to EH problems and level of job satisfaction. However, in the multivariable analysis profession, the type of institution and, the level of support and emphasis offered to EH services were statistically significant ( $P < .05$  at 95% CI) with the outcome variables-introducing innovative solutions to EH problems and level of job satisfaction (Table 2).

Accordingly, being an Environmental health officer was significantly associated with higher odds of introducing innovative solutions to EH problems compared to other professionals (AOR = 3.4, 95%CI: 1.1-12.2). Similarly, having a good or fair level of support and emphasis offered to EH services was significantly associated with higher odds of introducing innovative solutions to EH problems compared to poor level of support and emphasis (AOR = 5.6, 95%CI: 2.2-11.9). Moreover, professionals working outside health institutions were 3.1 times more likely to introduce innovative solutions to EH problems (AOR = 3.1, 95% CI: 1.6-9.3).

The final model from the multiple logistic regression also showed the level of support and emphasis given to EH services, the type of institutions, and profession were statistically significant ( $P < .05$ ) with the level of job satisfaction. The likelihood of a good level of job satisfaction was 6.4 times higher (AOR = 6.4, 95%CI: 1.6-14.7) among professionals working in other institutions compared to workers in health institutions. Level of job satisfaction was also found to be statistically associated with the level of support and emphasis given to EH

services. The odds of having a good level of job satisfaction was 5.9 times (AOR = 5.9, 95%CI: 1.9-17.61) times higher with good or fair level of support & emphasis given to EH service in comparison with those who had poor level of support and emphasis from their organization. Compared to Environmental health officers, the odds of having good or fair level of job satisfaction was 4.5 times higher among other professionals (AOR = 4.5, 95%CI: 1.9-9.62).

Meanwhile, only the profession and educational level determines the outcome of the 2 variables: identifying environmental problems and perception of professionals about having the appropriate knowledge and skill for EH service (Table 3). Environmental health officers were linked to higher odds of identifying Environmental problems (AOR = 4.1, 95%CI: 1.3-7.6). Furthermore, professionals who had a Master's degree were 3.1 times more likely to be involved with identifying environmental health problems compared to those who had diploma and Bachelor degree (AOR = 3.1, 95% CI: 0.9-5.9). Meanwhile, the odds of perception about having the appropriate knowledge and skill for EH service was 3.3 times higher (AOR = 3.3, 95%CI: 1.3-7.2) among Environmental health officers compared to other professionals. Moreover, having Master's degree was associated with higher odds of perceiving about having the appropriate knowledge and skill for EH service (AOR = 2.9, 95%CI: 0.8-12.3) compared to professionals who had a diploma or Bachelor degree educational qualification.

### Discussion

Environmental health services are those services which implement environmental health policies through monitoring and control activities.<sup>32,33</sup> Despite a wide scope of environmental health services in Ethiopia, the service delivery system and level of professionals' engagement were not studied well. The current study included all institutions which were known to provide environmental health services and it revealed that disease prevention and health promotion as major (61.1%) type of

**Table 3.** Multivariable logistic regression analysis of determinants of involvement in environmental problems identification and perception about having the appropriate knowledge and skills for EH service.

CATEGORY	IDENTIFICATION OF ENVIRONMENTAL PROBLEMS				PERCEPTION ABOUT HAVING THE APPROPRIATE KNOWLEDGE AND SKILL FOR EH SERVICE			
	YES	NO	COR (95%CI)	AOR (95%CI)	YES	NO	COR (95%CI)	AOR (95%CI)
	Dip. and Bachelor level	12	52	1.00		25	39	1.00
Master's degree	6	2	13.4 (2.3-32.2)	3.1 (0.9-5.9)	7	1	10.6 (1.2-29.6)	2.9 (0.8-12.3)
Profession	15	34	2.9 (1.2-12.1)	4.1 (1.3-7.6)	26	23	3.2 (1.1-9.4)	3.3 (1.3-7.2)
Others	3	20	1.00		6	17		

COR= Crude odds ratio.  
AOR= Adjusted odds ratio.  
Dip. and Bachelor = diploma and bachelor's degree.

environmental health service. Professionals' level of engagement and service delivery achievement for environmental health activities were found to be average and below average. Majority of respondents believed to have the appropriate knowledge and skill for environmental health service. Meanwhile, professionals' level of job satisfaction was reported to be low. These findings are similar with previous studies conducted in other countries.<sup>2,11,32</sup>

Environmental health practitioners are responsible in providing environmental health services in Ethiopia.<sup>12</sup> Previous studies of environmental health services and environmental health practitioners underscore the fact that there is a broad variety of perceptions of environmental health, the administration of environmental health services and the selection of professionals involved in providing such services.<sup>34,35</sup> In our study, we found professionals involved in environmental health services come to practice with an array of educational backgrounds. Given the complex and diverse nature of environmental health services, multidisciplinary professionals maybe appointed in different sectors.<sup>7,36</sup> Although an array of professionals involved in environmental health services, graduates of accredited environmental health programs are deemed the industry standard.<sup>11,19,37,38</sup> However, the absence of clear legislations, credentials, and qualifications required for environmental health services instigated a gap to prioritize an appropriate profession for the service.<sup>7,9</sup> Moreover, the limited number of environmental health officers created a hole for other professionals to grab the opportunity and occupy the job.<sup>19</sup> The engagement of individuals with diverse educational and credentialing requirements results in a poorly defined profession and deterred the services delivered.<sup>11</sup> The findings in our study were also indicated in other studies which revealed recruitment of unqualified individuals to fill the gap through lowering qualifications and/or competencies required for environmental health jobs.<sup>32,34</sup>

There was also a disparity in the level of professionals' engagement in different environmental health services. Most of the respondents were engaged in disease prevention and health promotion activities. It is not a surprise as major environmental health services in Ethiopia are under the Ministry of Health.<sup>9,12,18,26</sup> Moreover, the health policy of Ethiopia states disease prevention as a priority and MOH hires environmental health officers as front line workers to implement the policy.<sup>9,12,30,39</sup> Despite the policy and high level of professional engagement, the level of support given to environmental health workers in the health sector was the lowest compared to other sectors. Although, the MOH declares prevention as a priority, in practice environmental health services were treated badly with resource allocation, staffing and emphasis given.<sup>19,37</sup> The situation resulted in a high turnover of environmental health workers who learn needed skills on the job and moved into NGOs, industries, and other sectors. The extent of environmental health services in different sectors were also compromised and the annual plan achievements were average and

below the expected level. Activities were designed to protect the local communities from any environmental hazards through structured core functions of environmental health services.<sup>9,30,40</sup> Thus, a low-level achievement in 1 service will impact other services directly or indirectly. The low level of performance could be attributed to leadership, financial, personal or institutional reasons. Environmental health services require complex investigations, routine inspections, equipment and resources.<sup>11,41</sup> However, inconsistent and unsustainable financial and administrative support impend the service.<sup>42</sup> Lack of understanding the contribution, value and benefit of environmental health services to the wider public health caused budget cuts and failures in annual plans.<sup>3,42,43</sup> Biased and poor understanding of the costs of environmental health services delivery hinders progress toward an effective provision of services.<sup>41</sup>

In addition, addressing the rapidly emerging EH problems require updated knowledge and skills of professionals.<sup>11</sup> Remarks related to the need for increased professional development and training was made. The finding of this study revealed that professionals with Master's degree were 13.4 times more likely to identify environmental problems compared to their counter parts (AOR = 13.4 with 95% CI: 0.9–5.9). Findings from similar studies and better performance of professionals with higher level of education and profession (particularly EHOs) were supporting the need for training and development programs.<sup>44</sup> Furthermore, the figures which indicated the lack of environmental sample analysis and absence of intervention based on laboratory results showed services were delivered without empirical evidence. Any decision related to environmental health services has political, economic or social implications.<sup>45,46</sup> With the emergence of environmental pollutants with unknown characteristics, scientifically sound evidence is necessary for such decisions.<sup>8,47</sup> However, as the findings indicated, the environmental health service is too far from such evidence and requires further work.

The participation level of EH workers in planning and development of national, regional or local policies also cause to question the system. The low level of participation could be the result of many participants included in the study were mainly working at a local jurisdiction. However, the planning and development of policies, standards, and guidelines should involve appropriate professionals and stakeholders from all level.<sup>7</sup> Otherwise, the implementation of such policies, standards, and guidelines will not be effective.<sup>36</sup> The qualitative findings indicated the extent to which EH workers are unaware of the available standards and guidelines for environmental health services.

The findings of this study also showed low level of job satisfaction among professionals involved in environmental health services. The findings revealed profession, type of institution, and level of support and emphasis for environmental health services as factors determining level of job satisfaction. Studies showed numerous variables as contributors to low level of job satisfaction.<sup>44</sup> The degree of job satisfaction was

directly linked to the way the position is seen and respected by government officials, their colleagues, and within the broader community.<sup>37,48</sup> Literature showed that individuals' perceived organizational support is associated with level of job satisfaction.<sup>49</sup> If the staff feel sidelined and had no contribution to their organizations' they will develop a low level of satisfaction in their current job.<sup>12,27,50–52</sup> Underutilization of environmental health officers skills, which is a recurrent problem, also resulted in a low morale and job satisfaction.<sup>2,32</sup>

The study indicated the gaps in service delivery systems, level of engagement in environmental health services and professionals job satisfaction. A limited spectrum of technical and enforcement procedures, which become synonymous with the practice of environmental health also resulted dissatisfaction among professionals. This pattern has been detrimental to the wider concept of environmental health practice and resulting in both displeasure among current environmental health officers and young prospective graduates.

### Limitations of the Study

The limitation for the quantitative data could be the number of professionals obtained that weakens the appropriate statistical analysis. However, to fill the gap in having credible information, the qualitative findings has provided supportive evidence. The absence of any such type of research in the country or in Africa makes it difficult to compare the results.

### Conclusion

On the basis of both the quantitative and qualitative results of this study, it can be concluded that the environmental health service rendered by the practitioners has been dented, as many of the services have not been provided accordingly. The study indicated the gaps in the service delivery systems. Lack of required resources and support, lack of knowledge and skill trainings, loose inter-sectoral coordination and alignment, inappropriate service delivery system, and lack of professionals' commitment were among the key contributing factors to the quality of the service observed. There is also an overall need to standardize EH professional credentials and educational standards to produce qualified labor that can deliver environmental health services. The Ethiopian government, particularly the federal Ministry of Health, FMHACA, sanitation and beautification agency, environmental protection agency and other concerned bodies should give focus on environmental health services by allocating the necessary resources, providing the support, exerting capacity building efforts, restructure the framework for EH service delivery and facilitate co-operation among different sectors. There is also a need to produce more effective environmental health work force (such as EHOs) with a specific practice that can accurately deliver environmental health services. On the other hand, professionals should strive to provide the expected level service quality by keeping work ethics and exerting the maximum commitment.

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## Author Contributions

Conceptualization: YTD, BND, and AS. Methodology: YTD, BND and AS. Data collection: YTD, BND, and AS. Formal analysis: YTD, BND and AS. Writing—original draft manuscript: YTD and BND. All authors read and agreed on the manuscript.

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