ORIGINAL ARTICLE

The Statistical Literacy of Health Information System Workforces in Shiraz University of Medical Sciences, 2016

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Abstract

Background: Nowadays, the ability to understand and interpret statistical data is the basis for any decision in all societies. In the health system, people who play a role in the information system cycle could have a significant impact on decision makers in health organizations and communities. This study was conducted to investigate the statistical literacy of the HIS managers and workers as an educational need assessment in Shiraz University of Medical Sciences

Methods: In this cross-sectional study, statistical literacy of 89 statistics officials and statisticians working in Shiraz University of Medical Sciences and Health Services was investigated via a researcher-made questionnaire. The questionnaire was designed based on the basic scientific requirements of the study group and educational programs held during the past two years and inspiration from the two questionnaires developed by Watson (Watson, 2003) and Shield (Shield, 2002).

Results: The mean score of the respondents (19.7) was slightly higher than half (19) of the total score. 50% of the participants obtained a score of 19 and lower. Only 25% of the participants answered about two-thirds of the questions correctly. The statistical literacy of the participants about the measures of central tendency and using tables and charts was less than the areas of the probability and statistical inference.

Conclusion: The findings indicate the need for designing more effective in-service training sessions and workshops for HIS workers, paying more attention to the quality of the reported health statistical data, and employing HIS workers by the health system administrators.

Please cite this article as: Khosravi M, Karimi M, Bagherinezhad E. The Statistical Literacy of Health Information System Workforces in Shiraz University of Medical Sciences, 2016. J Health Sci Surveillance Sys. 2018;6(3):112-115.

Keywords: Statistic, Literacy, Health information system, Workforce

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Received: 12 April 2018
Revised: 14 May 2018
Accepted: 15 June 2018

Introduction

In today's society, understanding statistics is fundamental for any decision maker in every field.[1,2] Walls, in the early twentieth century, believed statistics were essential for efficient citizenship, like reading and writing.[3] Thinking about the results of decisions which are not based on statistics is very difficult. Because the data, probabilities and the chances are present in all areas of modern life, statistics is known as a popular and fundamental science.[4]

For many years, researchers have considered statistical literacy as an interdisciplinary science in many fields such as mathematics, statistics, education, psychology and linguistics.[5] Statistical literacy can be defined as knowing the meaning of the main terms of the statistics, understanding and applying the simple statistical signs and the ability to diagnose, interpret and present the data. A statistically

literate person should be able to read and interpret statistical data in news and public papers, and summarize and displaydata in tables and graphs.[6, 7] Wallman considered statistical literacy as the ability to understand and critically evaluate statistical reports in daily life.[1] Also, Trewin explained statistical literacy as the ability to understand, interpret and valuate the statistical information.[8] Knowledge of working with numbers including the interpretation of basic statistics, tables and graphs and summarizing statistical data are considered in the assessment of the communities' statistical literacy in Canada, America, and Australia.[9] Kimura, emphasizes interpreting, critically evaluating and making connections between statistical information in the statistical literacy assessment.[10]

Clear and reliable information is the basis for policy making, governance and implementation of policies, legislation, research, human resource development, health education, service delivery and financial investment in the health system at all levels. In fact, the health information system (HIS) provides necessary infrastructure for decision-making through multiple basic functions: data production, data collection, data analysis and inference, data sharing and data application. HIS collects data from peripheral units of the health system and other relevant organizations; processes and analyzes them; ensures their quality, relevance and being up to date: and converts them to information for decision making.[11]

Since HIS workers who play roles from data collection and interpretation to information production need data management skills for having effective communication with health system administrators and influencing their decisions. This study was conducted to investigate the statistical literacy of the HIS managers and workers as an educational needs assessment for in service empowerment courses and possibly university curriculum revision, if indicated, in Shiraz University of Medical Sciences. The results of this study can be used in planning in-service educational programs on the dimensions in which the participants had more weakness, so that we can improve their statistical literacy and make them professional statistics officials for more qualitative data processing and decision making.

Methods

This cross-sectional study was conducted after obtaining the approval of the Health System Research (HSR) committee of the deputy for administrating and financing of Shiraz University of Medical Sciences (code: 95-7664). All 93 HIS managers and workers in Shiraz University of Medical Sciences were requested to answer a researcher-designed questionnaire in order to assess their statistical literacy. The design of the questionnaire was informed by questionnaires of Watson[9] and Schield[12] and the items were based on the basic scientific requirements of the study group and educational programs held during the past two years. The questionnaire consisted of two parts. The first part asked about the participants' demographic information including gender, place of work, and years of work experience, degree, and field of study. In the second part, questions assessed the participants' statistical literacy in the areas of central tendency measures (mean, median, and mode) and their usage (three questions), designing and interpreting tables and statistical charts (four questions), chance and probability (three questions) and inference, and interpretation of statistical data (four questions). This part of questionnaire consisted five multiple choice questions, and nine open ended questions where the participants were asked to justify their answers to all the questions and each question was scored considering the participant's effort to provide logical responses and their justification power (between 0 to 3 points). Total possible score was 38. All questionnaires were anonymous and participants were assured of the confidentiality of their responses.

The content and face validity of the questionnaire was reviewed in a pilot study on 20 health experts employed at Shiraz University of Medical Sciences. It was revised and amended based on the results and feedbacks using expert opinions. In face validity, no question was omitted and only 2 questions were corrected. The minimum content validity ratio (CVR) and content validity index (CVI) for each question were calculated 0.9 and 0.85, respectively.

Based on the pilot study, a 40 minute time was assigned for the completion of the questionnaire. All of the questionnaires were distributed among the participants at a formal meeting and the participants asked to answer the questions if they were willing to do so.

The evaluation of the completed questionnaires was done in two steps; in the first step the completed questionnaires were evaluated and scored by two researchers independently. Then, two evaluators met to compare their scores to each question and determine a consensus if their findings differed; otherwise, their mean scores for each question were considered as the score of each individual to that question.

SPSS 16 was used for data entry, processing and analysis. Descriptive statistics, correlation coefficients, ANOVA and independent t-tests were used for the analysis of the data. The significance level was considered as 0.05.

Results

In total, 94% of the individuals participated in the study (83% female and 17% male). The mean±SD years of participants' work experience was 14.3±3.6. The

Table 1: Mean scores obtained by the participants for the studied areas

Area	Mean±SD)	1st Q*	2nd Q*	3rd Q*	Possible range
Chance and probability	4.96±1.84	3.5	5.0	6.5	0-8
Inference and interpretation of statistical data	5.97±1.73	5.0	6.0	7.0	0-9
Central tendency measures	3.00±1.64	2.0	3.0	4.0	0-9
Designing and interpreting tables and statistical charts	5.85±2.38	4.0	5.5	7.8	0-12
Total	19.75±5.23	16.0	19.0	23.5	0-38

*Quartile

Table 2: Comparison of the mean scores between demographic variables

Variable		N (%)	Mean±SD	P value
Sex	Male	15 (17.4)	22.27±6.59	0.055
	Female	71 (82.6)	19.41±4.81	
Working place	Central bureau	27 (36)	19.93±6.49	0.65
	Peripheral units	48 (64)	20.56±4.28	
Work experience in statistics field	<5 years	26 (34.2)	18.59±4.46	0.18
	5-10 years	22 (28.9)	19.64±4.32	
	10-20 years	22(28.9)	21.40±6.77	
	>20years	6 (7.9)	22.42±3.45	
Total work experience	<5 years	8 (9.6)	21.62±4.37	0.12
	5-10 years	17 (20.5)	19.7±4.11	
	10-20 years	46 (55.4)	19.02±5.68	
	>20years	12 (14.5)	22.79±4.68	
Academic study field	statistics	65 (74.7)	20.6±5.06	0.017
	others	22 (25.3)	17.54±5.18	
Educational degree	Diploma and ASc	14 (16.3)	19.10±3.58	0.17
	BSc	63 (73.3)	19.75±5.36	
	MSc and PhD	9 (10.5)	23±5.37	

majority of the participants (75%) were graduates of statistics and medical records fields; other participants were educated in other fields, but were employed in the statistics department of the university.

The mean±SD score of the respondents was 19.7±2.05, which was slightly higher than half of the total possible score. The median score of the participants was 19.00. Only 25% of the participants answered about two-thirds of the questions correctly. The participants' mean scores in the areas of chance and probability, and inference and interpretation of statistical data were slightly higher than half of the maximum possible scores, but in central tendency measures, and standards of designing and interpreting tables and statistical charts areas the mean scores were lower than half of the maximum possible scores. (Table 1).

Comparison of the participants' scores based on gender, place of work, work experience and education degree showed no significant differences between the groups, but the mean score of the graduates of statistics and medical records fields was significantly higher than those of other disciplines (P=0.017). Table 2 presents the participants' demographic information and the comparison of their scores in more detail.

Discussion

High quality health care data will provide the best practical evidence for planning and developing health care services.[13] Decision makers are the key clients for the statistical information and they may need support to be able to critically appraise information presented, analyze, and interpret data for evidence-based decision-making.[5] Thus, the personnel who work in HIS should have a good statistical literacy for a successful communication with them.

Since poor quality data collection, monitoring and feedback systems are important challenges in health promotion programs and may lead to their failure to reach their goals([14]). Several educational programs have been designed and implemented in many health organizations including Shiraz University of Medical Sciences in order to increase the statistical literacy in all fields of organization for scholars, students, statistics workers, health professionals, and decision makers.

The purpose of the present study was to assess the knowledge and skills of the statistics managers, workers, and the Staff of environmental units in Shiraz University of Medical Sciences based on their basic requirements and educational programs held during the past two years.

Based on the findings, overall statistical knowledge and skill of participants are assessed at a medium level. Howevr, contrary to expectations, the participants scores were the lowest at application and interpretation of the central tendency measures

(Mean, median and mode) area which are the most widely used measures in HIS. These findings were consistent with those of Javadi et al. in 2012,[15] in Shiraz University of Medical Sciences, which indicate that the participants' mean score was lower than the medium level. Of course, it should be noted that in their study the participants were all of health workers at all areas of health system, while the personnel working at statistics field are expected to be at higher levels of statistical literacy. Despite the findings of the study conducted by Javadi et al. in 2012,[15] the only significant difference in statistical literacy scores of the participants in the present study was seen in the study field groups.

The most important strengths of this study were participating almost all (94%) of Shiraz University of Medical Sciences HIS workforce in the study; although designing the questionnaires in this way was difficult, it prompted the participants to answer the questions and at first glance they found it as a general questionnaire, not only a scientific one. In addition, the respondents could not answer it by just searching the Internet or memorizing a text; instead, they should have statistics knowledge and also practically understand it to justify their answers to all the questions. However, the cross-sectional method which was used in this study and limiting the participants to Shiraz University of Medical Sciences workforce may limit the generalizability of the findings.

Conclusion

The lack of a significant difference in the scores between different demographic groups, especially years of working experience with the exception of study field groups, may indicate lack of efficiency and efficacy of in-service training sessions and workshops which have been held for HIS workers over the past few years, insufficient attention of the health system administrators to the quality of the health statistical data which have been collected, analyzed, interpreted and reported, and the importance of paying attention to the study field in selection and employing HIS workers. If the organizations practically pay more attention to data quality and plan to educate their statistics workers to find their right positions in health information system, they can improve efficiency.

Acknowledgment

This study would have not been possible without the support of Health System Research (HSR) committee of Deputy for administration and financial support of Shiraz University of Medical Sciences.

Conflict of Interest: None declared.

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