Evaluation of Influenza Sentinel Surveillance System, Saudi Arabia, 2017-2018. A Teaching Case-Study

Student's Guide

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Abstract

Influenza is a disease of global importance and concern. The World Health Organization (WHO) Global Influenza Strategy for 2019-2030 categorizes influenza as a global threat, where national prevention and control programs play a substantial role in achieving the strategy's goals. Strengthening Influenza surveillance activities is a core function of control and preparedness for future pandemics. The Kingdom of Saudi Arabia (KSA) is very much concerned with such epidemic-prone diseases, given the annual gathering of Muslims from all over the world for Hajj and Umra. In response, the Saudi Public Health authority established a National Influenza Surveillance System. Initial and periodic evaluation of such programs leads to improvement to their performance and quality.

This case-study aims to build capacity of trainees in the processes of public health surveillance evaluation and to develop essential trainee's competencies in surveillance programs evaluation. It is intended to inform Field Epidemiology Training Program (FETP) residents of the *know-hows* of being engaged in evaluation tasks, in particular evaluation of surveillance programs. The case study is designed for training novice field epidemiology trainees. The case study can be administered in 3-4 hours. Used as adjunct training material, the case study provides the trainees with competencies in evaluating public health surveillance programs at local or national levels including analysis and interpretation of data. It is also designed to improve their practice of teamwork concepts.

Keywords: Influenza, Evaluation, Public Health Surveillance, Saudi Arabia

How to Use the Case Study

General Instructions: This case study should be used as adjunct training material for novice epidemiology trainees to reinforce the concepts taught in prior lectures. The case study is ideally taught by a facilitator in groups of about 20 participants. Participants are to take turns reading the case study, usually a paragraph per student. The facilitator guides the discussion on possible responses to questions. The facilitator may make use of flip charts to illustrate certain points. Additional instructor's notes for facilitation are coupled with each question in the instructor's guide to aid facilitation.

Audience: This case study was developed for novice field epidemiology students. These participants are commonly health care workers working in the country departments of health whose background may be as medical doctors, nurses, environmental health officers or laboratory scientists who work in public health-related fields. Most have a health science or biology background.

Prerequisites: Before using this case study, participants should have received lectures on disease surveillance and evaluation of public health surveillance.

Materials needed: Flash drive, flip charts, markers, computers with MS Excel.

Level of Training and Associated Public Health Activity: Novice – Disease Surveillance and Evaluation of Public Health Surveillance.

Time required: 3-4 hours

Language: English

Goal of Case Study

To build capacity of trainees in the processes of public health surveillance evaluation and to develop essential trainee's competencies in surveillance programs evaluation.

Learning Objectives

At the conclusion of the teaching session, participants will be able to:

1. Discuss sentinel surveillance system, such as features, advantages, and disadvantages.
2. Describe the purpose and operation of sentinel surveillance for influenza.
3. Identify steps followed for evaluating surveillance systems.
4. Identify how to assess usefulness of a surveillance system.
5. Enumerate and define attributes for assessing surveillance system performance.
6. Develop a scoring system and calculate scores of system attributes.
7. Evaluate and interpret the results of evaluation process.
8. Draw a line graph, using MS-Excel to show disease (influenza) seasonality.
9. Outline the template for an evaluation report.

Introduction

The Kingdom of Saudi Arabia (KSA) occupies about four-fifths of the Arabian Peninsula with a land area of 2.15 million square kilometers of arid desert, lowland, and mountains. The country shares boundaries with eight countries (*Figure 1*) and is the heart of the Islamic world where it is occasionally referred to as "the Land of the Two Holy Mosques" since it hosts the two holiest Islamic places: Makkah and Al-Medina.

Figure 1: Map of Administrative Regions of the Kingdom of Saudi Arabia, Showing Cities with Influenza Surveillance Sites

The total estimated population of KSA in 2017 was 32.94 million people who, according to official Saudi figures, are mostly urbanized and young [1]. Since it is the largest oil exporter in the world, the Kingdom has the largest economy of the region. The climate is predominantly hot with regional variation. Administratively the Kingdom is divided into 13 regions (Emarah) and 20 health regions.

The Ministry of Health (MOH) runs public health services and manages factors influencing local health that include pilgrims coming from endemic countries during seasons of Hajj and Umra, environmental factors, the presence of non-immunized people, and frequent population movements to and from other countries. Infectious diseases prevention and control programs are implemented through units in each health region and supported by an efficient national surveillance system for communicable diseases. The surveillance system is implemented through two arms: general (integrated) surveillance for infectious diseases, and a number of disease-specific surveillance systems. The MOH introduced free influenza immunization as a response to the 2009 H1N1 pandemic, later on, the MOH recognized the importance of building a national influenza control program as a vertical program with a core unit and a surveillance unit.

Part 1: Story

Influenza is a very contagious viral disease that causes a range of clinical symptoms varying from a common cold to severe respiratory illness which sometimes could be fatal. Due to the significance of influenza, the World Health Organization (WHO) recommends the use of two terms as case definitions: Influenza Like Illness (ILI) and Severe Acute Respiratory Illness (SARI) [2]. In 2017, following other countries, the KSA joined the Eastern Mediterranean Flu Network (EMFLU), which is a regional platform for sharing epidemiological and virologic data on influenza in the WHO Eastern Mediterranean Region [3]. EMFLU provides direct data entry at the country level using a web-based interface. The platform also provides quantitative and qualitative data on trend, spread, intensity, and impact of influenza. The platform is intended to provide useful information for informed decision-making regarding influenza prevention and control strategies.

On February 3rd, 2019, the National Influenza Surveillance Program in Saudi Arabia (ISSA) requested from our FETP to conduct an evaluation of their program. The ISSA, which was launched in January of 2017, had entered its third year, and wanted to fulfil the WHO's recommendation that "*influenza surveillance systems should be evaluated periodically, starting 1 to 2 years after their implementation*" [2].

The FETP willingly accepted to carry out the request and formulated an evaluation team. You and some of your colleagues were nominated as members of this team and started by drafting the proposal for the evaluation.

Part 1 Questions

Question 1. Briefly state what the objectives of Influenza Surveillance System should be.

Question 2. To build an influenza surveillance system, you have the choice between using a population-based or a sentinel system. What do these terms mean? Which one will you choose and why?

Question 3. To evaluate such a surveillance system, what would be the steps or components of the evaluation process? Mention any the guidelines you are referring to.

Question 4. Based on the above-provided information, what might be the sources of data used to conduct the evaluation?

Part 2: Methods

Based on their approved proposal, the team started with identifying stakeholders, meeting with them, and collecting provisional information about how the program is organized and running. The system is based on collecting data from 50 purposely selected sites distributed all over the 20 health regions as was shown previously in the map of KSA (Figure 1). Each region has two hospital sites for SARI cases and one primary health center (PHC) for ILI cases. According to a pre-stated protocol, nasopharyngeal swaps are collected from a selected number of ILI and SARI cases and sent to specified laboratories for further testing. Reporting sites forward their weekly reports to the regional coordinator for monitoring and review in addition to adding virological results from laboratories. Regional coordinators then send the information to the national level for compilation and later entered into the EMFLU's website [3].

Nada, a member of the team, was assigned to draft a description of the surveillance system (ISSA) as part of the evaluation process. Available epidemiological data on influenza cases was retrieved from the EMFLU system into an MS-Excel spreadsheet (*Annex 1. File 1*). Your colleague Ahmed,

who is another team member, was assigned to list data variables from File 1 and carry out the necessary descriptive analysis. Further information on other aspects were identified and collected using a structured questionnaire from all staff members working in the system. The data was stored in another MS-Excel file (*Annex 2, File 2*). The team also collected copies of the periodical reports produced by the unit and reviewed them.

You were assigned to work with this data set.

Part 2 Questions

Question 5. The team started out by identifying stakeholders. Who are the stakeholders in this situation? What is the purpose and importance of meeting with them and engaging them at this very early stage?

Question 6. Laboratory specimens were taken from selected cases at each center. How can these cases be selected to minimize selection bias?

Question 7. Nada*,* who is working on describing the ISSA system, requested help. What items/headings should be included in her report?

Question 8. The dataset with Ahmed comprises the epidemiological data on cases (ILI and SARI). What variables do you expect to find for each category from ILI and SARI?

Part 3: Results

By mid-March, the evaluation team had worked on analysis of collected data. The first part of results regarding description of the system needed an organizational chart [4].

Part 3 Questions

Question 9. Using the description provided in the previous sections (Part 2), draw a simplified flow chart for the Saudi Influenza Surveillance System.

Ahmed generated the following tables and requested further improvement of his tables in order to simplify their descriptive interpretation. Below is *Table 1* which summarizes some characteristics

of the SARI cases extracted from EMFLU. *Table 2* shows the distribution of ILI cases by month [5].

Table 1: Characteristics of Reported SARI Cases, EMFLU, Saudi Arabia, 2017 - 2018

Characteristic	2017	2018	Total
Total number of cases	2,720	7,881	10,601
Age Group			
Less than 2 yrs	272	1,251	1,523
From 2 to 5 yrs	121	537	658
From 6 to 15 yrs	162	525	687
From 16 to 50 yrs	860	2,393	3,253
From 51 to 65 yrs	583	1,221	1,804
Greater than 65 yrs	722	1,954	2,676
Gender			
Female	1,263	3,376	4,639
Male	1,457	4,505	5,962
Season			
Quarter 1	492	2,023	2,515
Quarter 2	527	1,765	2,292
Quarter 3	485	1,346	1,831
Quarter 4	1,216	2,747	3,963

Table 2: Monthly Reported ILI cases, EMFLU, Saudi Arabia, 2017 - 2018

Month	2017	2018	Total
Jan	47	38	85
Feb	77	113	190
Mar	39	101	140
Apr	23	52	75
May	3	22	25
Jun	1	18	19
Jul	1	44	45
Aug	5	28	33

Sep	23	92	115
Oct	68	78	146
Nov	54	118	172
Dec	72	134	206
Total	**413**	**838**	**1251**

Question 10. Add necessary columns and/or calculations to *Table 1* and then describe the findings in a short paragraph.

Question 11. Choose a suitable chart to display and visualize the seasonality of cases and comment on your findings.

Out of the 10,601 enrolled SARI cases, 5,378 cases were verified as to meet the case definition of SARI (*An acute respiratory infection with: measured fever of ≥38 °C, cough with onset within the last 10 days, and a condition requiring hospitalization*). *Table 3* below summarizes the lab results among cases (diseased/not diseased) according to the verified case definition.

Table 3: Distribution of Cases according to Lab Results

Case Definition	Diseased	Not Diseased	Total
Test Positive	998	687	1,685
Test negative	4,280	4,388	8,668
No Results	100	148	248
Total	**5,378**	**5,223**	**10,601**

Question 12. How would you interpret these findings?

Part 4: Discussion

According to the evaluation plan, the team assessed the usefulness of the system by answering a set of questions regarding the ability of the system to achieve its objectives [5]. To assess the system's performance, a set of attributes were identified and studied. Both the epidemiological and the survey data sources were used in the evaluation.

Question 13. One data set was obtained from the staff working on the system using a questionnaire. List the categories of whom should be included in this survey.

Question 14. Provide some questions to answer for the assessment of the system's usefulness.

Question 15. List the attributes to be included for assessing the system's performance.

Question 16. Choose one attribute as an example and explain how you would measure it.

Part 5: Conclusion

On a scale of 1 to 5, most of the system's examined attributes recorded high scores. Completeness of Data, Simplicity, Stability, and Acceptability all scored a 4, while timeliness scored a 5. The system, based on the distribution of its selected sites, was representative of the country to a great extent. Nevertheless, what was alarming is that only 61% of doctors were clear about the SARI case definition. Intensive crash-training for health care workers was the main recommendation, in addition to matters related to completeness of data. On the 2nd of May 2019, the final evaluation report was submitted.

Question 17. Outline a template for such an evaluation report.

Question 18. What happens after the report is submitted? Is submitting the report considered the end of the mission?

Annexes

Annex 1: Epidemiological data (modified) of ILI & SARI cases, MS-Excel

Annex 2: Survey data on influenza surveillance attributes, MS-Excel

Annex 3: Influenza surveillance evaluation Survey questionnaire.

References

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Case Study Related Readings

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