WEEKLY EPIDEMIOLOGICAL REPORT

A publication of the Epidemiology Unit
Ministry of Health

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Investigating an Outbreak (Part II)

This is the second in a series of two articles on investigation of Outbreaks. First article described how to identify Outbreaks, the necessity of investigating possible Outbreaks, Preparations for field work, Establishing the Existence of an Outbreak, Verifying the Diagnosis, Establishing a Case Definition, Identifying and Counting Cases

Step 5: Performing Descriptive Epidemiology

When data is collected, outbreak can be characterized by time, place and person. It may be necessary to perform this step several times during the course of an outbreak. This is a critical step, as it gives some information as to what information is reliable and informative (such as if many cases report the same unusual exposure) and learn what may not be as reliable (for example, many missing or "don't know" responses to a particular question). It provides a comprehensive description of an outbreak by portraying its trend over time, its geographic extent (place) and the populations (persons) affected by the disease. What is known about the disease (usual source, mode of transmission, risk factors and populations affected, etc.) can be used to develop a causal hypothesis.

Time

Traditionally, we depict the time course of an epidemic by drawing a histogram of the number of cases by their date of onset. This graph, called an epidemic curve or epi curve for short, gives a simple visual display of the outbreak's magnitude and time trend.

An epidemic curve provides a great deal of information about an epidemic. It can provide information about the present position in the time course of the epidemic and what the future course might be. Second, if the disease is identified and the incubation period is known, probable time period of exposure can be estimated and can develop a questionnaire focusing on that time period. An epidemic curve can help to draw inferences about the epidemic pattern-whether it is point source, continuous common source or propagated etc.

Place

Assessment of an outbreak by place not only provides information on the geographic extent of a problem, but may also demonstrate clusters or patterns that provide important aetiologic clues. A spot map is a simple and useful technique for illustrating where cases live, work or may have been exposed. On a spot map of a community, clusters or patterns may reflect water supplies, wind currents or proximity to a restaurant or grocery.

In studying an outbreak of surgical wound infections in a hospital, we might plot cases by operating room, recovery room and ward room to look for clustering. We can even use maps to plot recreational opportunities. If the size of the population varies between the areas that are being compared, a spot map which shows numbers of cases can be misleading. In such an instance, it is better to show area specific attack rates with an area map.

Person

Characterizing an outbreak by person is how we determine what populations are at risk for the disease. We usually define such populations by host characteristics (age, race, sex or medical status etc) or by exposures (occupation, leisure activities, use of medications, tobacco, drugs etc). Both of these influence susceptibility to disease and opportunities for exposure.

Summarizing by Time, Place and Person

After characterizing an outbreak by time, place and person, it is useful to summarize what is known.

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Step 6: Developing Hypotheses

Hypotheses should address the source of the agent, the mode (and vehicle or vector) of transmission and the exposures that caused the disease. Hypotheses should be testable ones too.

What is known about the disease can be utilized to generate a hypothesis and another useful way to generate a hypothesis is to talk to a few of the case-patients. The questions should be open-ended and wide-ranging, not necessarily confined to the known sources and vehicles. In some difficult investigations where there were only few clues as to what caused the disease, investigators have convened a meeting of several case-patients to search for common exposures. In addition, investigators have sometimes found it useful to visit the homes of case-patients and look through their refrigerators and shelves for clues.

Another useful thing is to talk to the local staff who know the people in the community and their practices and they often have hypotheses based on their knowledge.

Step 7: Evaluating Hypotheses

Evaluation of the credibility of the hypotheses developed should be done either by comparing the hypotheses with the established facts or by using analytical epidemiology to quantify relationships and explore the role of chance.

The first method (i.e. comparing the hypotheses with the established facts) can be used when the clinical, laboratory, environmental and/or epidemiological evidence so obviously support the hypotheses.

In many other settings, however, the circumstances are not so straightforward. In those instances, analytical epidemiology should be used to test the hypotheses. The key feature of analytical epidemiology is a comparison group. Quantification of relationships between exposures and disease and testing hypotheses about causal relationships can be done when comparison groups are used. Both cohort and case-control studies can be used in analytical studies. Testing of the Statistical significance of the hypotheses can also be done in both types of studies.

Step 8: Refining Hypotheses and Executing Additional Studies

Epidemiological studies

Sometimes, it may not be possible to arrive at a definitive conclusion. This is particularly true if the hypotheses were not well founded at the outset. Then, it is necessary to reconsider the hypotheses. This is the time to convene a meeting of the case-patients to look for common links and to visit their homes to look at the products on their shelves. Consider new vehicles or modes of transmission.

Even when the analytical study identifies an association between an exposure and disease, often it is necessary to refine the hypothesis. It is necessary to obtain more specific exposure histories for this purpose. This might require more specific control groups.

Finally, an outbreak may provide an "experiment of nature," which would be unethical for medical personnel to set up deliberately, but which we can learn from when it occurs naturally. Some of the questions which remain unanswered up to now can be answered using the newly acquired knowledge, such as its modes of transmission, characteristics of the agent, host factors etc. For example, an outbreak of mumps in a highly immunized population may be an opportunity to study vaccine efficacy and duration of protection.

Laboratory and environmental studies

While epidemiology can implicate vehicles and guide appropriate public health action, laboratory evidence can be more conclusive regarding the causative agent.

Environmental studies are equally important in some settings. They are often helpful in explaining why an outbreak occurred. A camera can be used to photograph working conditions or environmental conditions. Bringing back material for analysis in the laboratory would also be helpful.

Step 9: Implementing Control and Preventive Measures

In most outbreak investigations, primary goal will be control and prevention. Although we are discussing them as Step 9, it is necessary to implement control measures as soon as possible. It is possible to implement control measures early if the source of an outbreak is known. In general, control measures are targeted at the weak link or links in the chain of infection. It is possible to aim control measures at the specific agent, source or reservoir. In other situations, control measures can be directed at interrupting transmission, exposure or at reducing the susceptibility of the host (e.g. immunization, chemoprophylaxis etc).

Step 10: Communicating Findings

The final task in an investigation is to communicate findings. This communication usually takes two forms: (1) an oral briefing for local authorities and (2) a written report.

The oral briefing should be attended by the local health authorities and persons responsible for implementing control and preventive measures. It is necessary to present findings in clear and convincing fashion with appropriate and justifiable recommendations for action. This is an opportunity to describe what was done, what was found and what should be done about it. Findings should be presented in an objective manner and it is necessary to defend conclusions and recommendations.

A written report should be provided in the scientific format (i.e. introduction, background, methods, results, discussion and recommendations). By formally presenting recommendations, the report provides a blueprint for action. It also serves as a record of performance and a document for potential legal issues. It also serves as a reference if the health department encounters a similar situation in the future. Finally, a published report serves the broader purpose of contributing to the knowledge base of epidemiology and public health.

***Source*-Principles of Epidemiology-available from**

www.ciphi.ca/hamilton/Content/documents/principles.pdf

Table 1: Vaccine-preventable Diseases & AFP

23rd – 29th 2012 (26thWeek)

Disease	No. of Cases by Province									Number of cases during current week in 2012	Number of cases during same week in 2011	Total number of cases to date in 2012	Total number of cases to date in 2011	Difference between the number of cases to date in 2012 & 2011
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	01	00	00	00	00	01	00	00	00	02	02	44	48	+ 08.3 %
Diphtheria	00	00	00	00	00	00	00	00	00	-	-	-	-	-
Measles	00	00	00	00	00	00	00	00	00	00	03	23	77	- 70.1 %
Tetanus	00	00	00	00	00	00	00	00	00	00	00	05	12	- 58.3 %
Whooping Cough	00	00	00	00	00	00	00	00	00	00	02	34	19	+ 78.9 %
Tuberculosis	37	17	05	00	20	16	06	07	22	130	293	4353	4453	- 02.2 %

Table 2: Newly Introduced Notifiable Disease

23rd – 29th 2012 (26thWeek)

Disease	No. of Cases by Province									Number of cases during current week in 2012	Number of cases during same week in 2011	Total number of cases to date in 2012	Total number of cases to date in 2011	Difference between the number of cases to date in 2012 & 2011
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	00	00	00	00	00	01	02	00	04	07	45	2205	2483	- 11.2 %
Meningitis	00	00	00	01 JF=01	00	01 KR=01	00	00	02 RP=2	04	14	280	463	- 39.5 %
Mumps	00	00	00	00	04	00	04	01	05	14	54	2148	1361	+ 57.8 %
Leishmaniasis	00	00	00	01 VU=01	00	01 KR=1	00	00	00	02	19	314	367	- 13.3 %

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

DPDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna, **KN**: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam, **AP**: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps.

Special Surveillance: Acute Flaccid Paralysis.

Leishmaniasis is notifiable only after the General Circular No: 02/102/2008 issued on 23 September 2008.

Dengue Prevention and Control Health Messages

Reduce, Reuse or Recycle the plastic and polythene collected in your home and help to minimize dengue mosquito breeding.

Table 4: Selected notifiable diseases reported by Medical Officers of Health

23rd – 29th 2012 (26thWeek)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Returns Received
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	91	3431	0	51	0	5	1	89	1	25	1	67	0	2	2	29	0	2	**08**
Gampaha	42	2261	0	34	0	5	0	33	0	13	0	81	0	6	1	102	0	0	**07**
Kalutara	0	881	0	35	0	2	0	17	0	3	0	97	0	2	0	11	0	1	**00**
Kandy	0	750	0	40	0	1	0	11	0	12	0	28	0	65	0	16	0	0	**04**
Matale	1	193	0	39	0	4	0	7	0	4	0	20	0	2	0	10	0	0	**08**
Nuwara	0	125	0	64	0	1	0	17	0	1	0	14	0	31	0	9	0	1	**00**
Galle	0	455	0	36	0	3	0	6	0	10	0	59	0	21	0	1	0	0	**00**
Hambantota	0	216	0	18	0	1	0	2	0	10	0	28	0	22	0	5	0	0	**00**
Matara	0	580	0	30	0	4	0	9	0	16	0	64	0	36	0	48	0	0	**00**
Jaffna	0	202	0	85	0	6	1	177	0	27	0	2	0	236	0	4	0	0	**17**
Kilinochchi	0	20	0	6	0	1	0	18	0	39	0	4	0	26	0	4	0	1	**25**
Mannar	0	73	0	11	0	2	0	13	0	13	0	15	0	35	0	1	0	0	**00**
Vavuniya	1	31	2	9	0	19	0	6	0	5	0	15	0	0	0	1	0	0	**75**
Mullaitivu	0	8	0	9	0	1	0	4	0	1	0	2	0	5	0	0	0	0	**00**
Batticaloa	2	559	4	86	0	2	0	14	0	30	0	5	0	0	2	6	0	3	**50**
Ampara	0	58	0	44	0	0	0	3	0	6	0	17	0	0	0	2	0	0	**14**
Trincomalee	0	90	0	80	0	1	0	15	0	2	0	32	0	5	0	2	0	0	**33**
Kurunegala	24	663	1	56	0	6	1	48	0	24	0	79	0	17	2	49	0	2	**35**
Puttalam	0	356	0	23	0	4	0	5	0	1	0	20	0	9	0	1	0	0	**00**
Anuradhapu	1	176	1	30	0	1	0	4	0	3	1	51	0	18	0	37	0	1	**32**
Polonnaruw	1	99	0	19	0	0	0	1	0	0	0	23	0	2	1	27	0	1	**29**
Badulla	0	88	0	33	0	2	0	16	0	1	0	17	0	24	0	20	0	0	**00**
Monaragala	1	95	0	36	0	4	0	10	0	4	0	47	0	42	0	104	0	1	**18**
Ratnapura	43	934	2	95	0	23	0	30	0	5	2	130	0	19	0	50	0	1	**17**
Kegalle	46	1011	1	30	0	8	0	15	0	9	1	72	0	31	3	272	0	0	**45**
Kalmune	1	132	1	84	0	1	0	5	0	27	0	2	0	0	0	6	0	1	**08**
SRI LANKA	**254**	**13487**	**12**	**1083**	**00**	**107**	**03**	**575**	**01**	**291**	**05**	**991**	**00**	**656**	**11**	**817**	**00**	**15**	**15**

Source: Weekly Returns of Communicable Diseases WRCD).
***Dengue Fever / DHF** refers to Dengue Fever / Dengue Haemorrhagic Fever.
****Timely** refers to returns received on or before 29thJune, 2012 Total number of reporting units 329. Number of reporting units data provided for the current week: 49
A = Cases reported during the current week. **B** = Cumulative cases for the year.

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