



**Centers for Disease Control and Prevention
Epidemiology Program Office
Case Studies in Applied Epidemiology
No. 891-903**

Paralytic Illness in Ababo

Student's Guide

Learning Objectives

After completing this case study, the participant should be able to:

- Define incidence, prevalence, and case-fatality rate;
- Define surveillance and identify the key features of a surveillance system;
- List the types of information that should be collected on a surveillance case report form;
- List the factors that can account for a change in the reported incidence of a disease;
- Define sensitivity of a surveillance system, and the effect of different case definitions on sensitivity.

This case study was originally developed by Nancy Binkin (EIS '80) in 1989. The current version was revised and edited by Richard Dicker with input from EIS Summer Course instructors and students over the years



**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service**



PART I

It is the early 1990s. The World Health Organization is planning a program for the global eradication of polio by the year 2000. Likura, a fictitious nation in south-central Africa, may become one of the countries selected to test the effectiveness of WHO's polio eradication strategies. Unfortunately, little is known about polio in Likura. The Minister of Health therefore assigned the task of assessing the polio situation to a Ministry worker who has recently

returned from an epidemiology course in Atlanta, and who is about to become the District Health Officer in the Ababo District. The Ababo District is a relatively poor, rural district with a single hospital and several health centers. The Ababo District has attempted to conduct surveillance on polio cases and deaths over the past five years. The hospital, health centers, and all health workers are supposed to report such cases to the District Health Officer.

Question 1: What is **incidence**?

One measure of the polio situation in a community is the prevalence of lameness in

children, since lameness is a common sequela of polio.

Question 2: What is **prevalence**?

Question 3a: What data might you use (or collect) to determine the **incidence** of polio in the population?

Question 3b: What data might you use (or collect) to determine the **prevalence** of the sequelae of polio (lameness) in the population?

Question 4: What are the key elements included in the definition of public health surveillance?

Question 5: What is the difference between **active** and **passive** surveillance systems? Is the Ababo surveillance system for polio passive or active?

PART II

To characterize the incidence of polio over time, the new District Health Officer tabulated the routinely collected surveillance records for the past five years. In Ababo, the operational surveillance case definition for polio is acute onset of flaccid paralysis plus fever. The data are shown in Table 1.

The most recent census was conducted in 1986, when the population of the Ababo District was determined to be 360,000 persons. The population in Ababo is assumed to be growing at a constant rate of 3.8% per year.

Table 1. Polio Morbidity and Mortality, Ababo District, 1986-1990

Year	#New Cases	# Deaths	Midyear Population	Incidence Rate Per 100,000	Mortality Rate Per 100,000	Case-fatality Rate (%)
1986	54	5	360,000			
1987	56	7				
1988	50	6				
1989	68	8				
1990	74	10				

Question 6a: What is a case-fatality rate? What does it measure?

Question 6b: Complete Table 1 by calculating the annual midyear population estimates, polio incidence rates, disease-specific mortality rates, and case-fatality rates for each of the past five years.

Question 7: Plot the trends in incidence rates, mortality rates, and case-fatality rates. Interpret these data.

The District Health Officer is concerned that the number of reported cases seems low. He is concerned that **sensitivity** may be one of

several weaknesses of the polio surveillance system.

Question 8a: Define **sensitivity**. If the sensitivity of the system is indeed low, can these data still be used to describe the trends?

Question 8b: In addition to sensitivity, what other attributes of a surveillance system should you evaluate in determining whether the system is meeting its objectives?

Question 9: What might account for the increase in the number of new cases observed during the two most recent years?

To characterize the population that has come down with polio in Ababo, the District Health Officer went to the hospital to review the charts of all children admitted with polio during the past two years. To his surprise, he found more

cases with a discharge diagnosis of polio from the hospital in 1989 and 1990 than were reported from the whole district during the same years.

Question 10: How might you explain the discrepancy between the hospital cases and reported cases?

Recall that, in Ababo, the working surveillance case definition for polio was acute onset of flaccid paralysis plus fever. In reviewing the records, the Health Officer found that the data on signs and symptoms of children given the diagnosis of polio were not uniformly recorded.

On most charts it was noted that the child had fever and acute onset of flaccid paralysis. On about 1/3 of the charts, however, there was no notation of fever but only the acute onset of paralysis.

Question 11: What is the effect of including the children without fever status recorded on the chart in your case definition?

Returning to the office, the District Health Officer learns that the disease report forms have run

out. He sees this as an opportunity to design a new disease report form.

Question 12: What types of information would you ask for on the new polio report form?

The hospital review identified a total of 150 cases of polio. Characteristics of the cases are provided in the following tables.

Table 2. Seasonal Distribution of Polio, Ababo District Hospital, 1989 and 1990

<u>Month</u>	<u>1989</u>	<u>1990</u>	<u>Month</u>	<u>1989</u>	<u>1990</u>
January	5	7	July	2	3
February	19	16	August	0	2
March	4	8	September	1	1
April	9	13	October	2	1
May	4	8	November	4	4
June	4	5	December	7	5

Question 13: Describe the seasonal occurrence of polio in Ababo. (Note that Ababo is in the Southern Hemisphere.)

Table 3. Age Distribution of Polio Cases, Ababo District Hospital, 1989 and 1990

<u>Age (in years)</u>	<u>Number</u>	<u>Age (in years)</u>	<u>Number</u>
<1	34	5	2
1	50	6	3
2	25	7	2
3	27	8	0
4	7		

Question 14: Determine the median and mean age of cases.

Table 4. Sex and Ethnic Distribution of Polio Cases, Ababo District Hospital, 1989 and 1990

	Sex		
	Male	Female	
Zanu	73	53	126
Hanzu	12	2	14
Other	8	2	10
	93	57	150

Question 15: What is the ratio of male to female cases?

Question 16: Review the ethnic distribution of cases. Can you conclude, based on these results, that being a member of the Zanu tribe is a risk factor for polio? Why or why not?

To gather information on polio prevalence, vaccine coverage, and risk factors for polio, the District Health Officer conducted a survey of

children in the district. Lameness was used as a surrogate for polio. The prevalence of lameness by vaccination status is shown in Table 5.

Table 5. Lameness by Vaccination Status among Children 12-23 Months of Age, Ababo District, 1991

Polio Vaccine		Lame	Normal	Total
		\$1 dose	1	
	0 doses	9	667	676
		10	909	919

Question 17a: What is the prevalence of polio (lameness) among vaccinated (1 dose) children?

Question 17b: What is the prevalence of polio (lameness) among the unvaccinated children?

Question 17c: What is the vaccine coverage (at least one dose) in this population?

Question 17d: Interpret these data.

The District Health Officer plans to review the polio surveillance data each month. Knowing that part of a good surveillance system involves

disseminating the information to "those who need to know," the District Health Officer begins to compile a list.

Question 18: To whom should surveillance information be disseminated? How might you disseminate this information?

A few months after the hospital chart review was completed, the medical officer on the hospital pediatric service called the District Health

Officer. She has seen 12 and 34 cases in the months of January and February of 1991, respectively.

Question 19a: What is the expected number of cases for January and February?

Question 19b: In your opinion, is Ababo experiencing an epidemic of polio?

A meeting was held to discuss the situation. The results of the vaccine coverage survey

were reviewed, and the authorities decided to launch an intensive polio vaccination campaign.

EPILOGUE

In 1988, the World Health Assembly launched a global initiative to eradicate polio by the end of the year 2000. This initiative was not without controversy. Some public health officials argued that polio, a potentially fatal or crippling disease, could be eradicated, so it should. In the long run, eradication would save billions of dollars. Others felt that the money and energy that would be expended in eradicating polio, a disease already of low prevalence in most countries, could be better spent on comprehensive public health interventions rather than a single disease, and that the eradication effort might divert time, attention, and resources from other programs.

From the inception of the Global Polio Eradication Initiative in 1988 to the end of 2002, the number of cases has fallen by over 99%, from an estimated more than 350 000 cases in 1988 to 1919 reported cases in 2002 (as of 16 April 2003). In the same time period, the number of polio-infected countries was reduced from 125 to 7. Polio is now found only in parts of Africa and south Asia. Meanwhile, polio surveillance is thought to have improved, with rates of detected acute flaccid paralysis (AFP) rising from 1.6 to 1.9 per 100,000 children <15 years of age between 2001 and 2002.

REFERENCES

1. CDC. *Principles of Epidemiology, 2nd ed.* Atlanta: CDC, 1992.
2. PAHO. *Polio Eradication Field Guide, 2nd ed.* Washington, DC, PAHO, 1994.
3. WHO. *Poliomyelitis* (Fact Sheet no. 114). Geneva: WHO, April 2003.