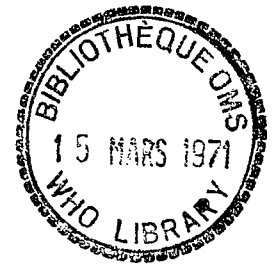




WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTÉ



TEACHING EXERCISE - FIELD INVESTIGATION OF A SMALLPOX CASE

SYLLABUS FOR THE DISCUSSION LEADERS

This teaching exercise has been designed for the classroom instruction of Surveillance Officers responsible for the investigation of smallpox cases and for containment activities.

The experience to date in training such officers by the presentation of lectures in the classroom has proved generally disappointing. On the other hand, when it has been possible to train Surveillance Officers in the field while dealing with actual problems, the results have been far more gratifying. While this latter approach is preferred, such is often not possible. Hence, this teaching exercise was designed in an effort to bring to the classroom, in as realistic a manner as possible, the circumstances and problems of an outbreak. While the various pictures of patients which are included are not actually required to conduct the seminar, they are included to assist in "bringing the outbreak into the classroom". The findings which emerge in the course of the exercise are not from a single outbreak but are a composite of features seen in outbreaks in many different countries.

The exercise emphasizes the importance of tracing the source of the infection and the need to initiate containment measures at each stage of the investigation. The exercise consists of eight separate sections. Each section should normally require from 30 to 60 minutes discussion, the earlier sections requiring more time than the later sections. It is intended that the students initially receive Section I of the exercise, a map of the area where the outbreak took place and a work sheet to record for themselves information pertaining to each case as the outbreak unravels. Section I describes the initial steps in the investigation. When it has been discussed, Section II is distributed and should be read aloud. Section II describes the subsequent series of actions taken by the Surveillance Officer and so on through the eight sections of the exercise until the outbreak is finally unravelled.

Prior to the use of this exercise, the epidemiological characteristics of smallpox should be discussed as well as the general principles of case investigation and containment activities. As a basis for presentation and discussion of this material, two documents are of particular value: (1) Smallpox Surveillance in the Strategy of Global Eradication (CD/WP/70.46) and (2) 'Surveillance-Containment Operations, Principles and Operational Techniques'. (WHO Document SE/69.1).

The differential diagnosis of smallpox, including the characteristics of those conditions most likely to be confused with it should also be presented. The WHO Handbook for Smallpox Eradication provides salient information. Illustrative material is included in the WHO slide series - A Guide to the Clinical Diagnosis of Smallpox.

Practical conduct of the exercise

1. The primary objective of a seminar such as this is to obtain the maximum possible participation of all in the group. After reading aloud the introductory statement for a particular section, the group leader should plan to introduce various discussion topics as briefly as possible, e.g. "What do you believe the Surveillance Officer should do next?" or "Should he vaccinate anyone at this time or should he do something else?". If the first of the seminar group to respond, provides what is perhaps the best possible answer, it is well to give no indication of this but to ask if there are others with a different view. Ideally, the group itself, through discussion and argument arrives at a logical solution which the group leader may briefly summarize before moving to the next point in discussion.

In many instances, there is no "correct" solution but, rather, several alternative possibilities, certain of which would be better under some circumstances and some under other circumstances. These should be summarized as such by the group leader.

2. Each of the sections (except Section I) is specifically designed so that the most important point to be discussed is "If you were the Surveillance Officer, what would you do next?". This question is composed of two parts: "What, if anything, can you do to trace further the chain of transmission?" "What should you do at this point in regard to containment of the outbreak?". It is noted that at the end of several sections of the problem, it might be logical to conclude that no further tracing of the source of infection is possible. It should also be noted that if this were concluded, important active foci of infection would be missed. This should be brought out in discussion. If the students are not made aware of the total number of sections in the exercise, discussion may be more lively as to whether or not further tracing of the infection is possible.

3. In Section II, the forms for recording of cases are first used. A sample copy, completed through the conclusion of Section II, should be distributed and time should be taken during this segment of the seminar to ensure that all participants fully understand how this sheet is filled in.

4. A summary sheet which will permit the outbreak to be summarized briefly should be distributed at the end of Section VIII.

A number of topics for discussion are suggested for each section. These represent suggestions only. These may be discussed in any order; they may be introduced in other ways; and, of course, other topics may be raised and discussed.

SECTIONS OF THE PROBLEM

AND

TIME OF DISTRIBUTION

<u>Section of problem to be distributed</u>	<u>Figure or graph No.</u>	<u>Smallpox case pictures</u>
I	1	Yes
II	2,3	Yes
III		No
IV		No
V		Yes
VI		Yes
VII		No
VIII	4,5	Yes

Section I

What do you think of the vaccinator's conclusion about Efta Aye's illness?

- Can a person develop smallpox who has been vaccinated only 6 months before?

Note that the vaccinator has not determined whether the child was vaccinated for smallpox or some other disease. He has made no effort to determine whether the vaccination, if a smallpox vaccination, was successful by examining for a scar.

However, if a person has been successfully vaccinated before exposure, it would be most unusual for him to develop smallpox within the next 6 months and, in fact, rather unlikely within the next 3 to 5 years.

- If there is an outbreak of chickenpox in the area, is it not reasonable to assume that this also is a case of chickenpox?

Note that the vaccinator has not examined any other persons but has simply accepted the mother's word that there are cases of chickenpox in the area. The other cases, about which she is speaking, might be smallpox. The seasonal increase in cases of chickenpox normally overlaps with that of smallpox. Thus, it is not unusual for the two diseases to occur together. The occurrence of a chickenpox outbreak does not make the diagnosis easier but rather may complicate the problem of diagnosis.

- What could the vaccinator do to be more certain of the diagnosis?

Should he obtain scabs for laboratory diagnosis?

Even if scabs are obtained and sent to the laboratory, the results would not be available for one to three weeks or more. In the meantime, containment measures must be undertaken as one should immediately undertake containment measures for every suspect case. The laboratory thus is not of help in reaching a decision as to what should be done in a situation such as this. Laboratory diagnosis is of importance when a large area is smallpox-free or almost smallpox-free. Specimens are then obtained from each outbreak to verify each suspect case so as to document precisely the situation in respect to smallpox.

In any outbreak, whether in well-vaccinated or poorly vaccinated areas, we know that 80 per cent. to 90 per cent. of all cases can be readily diagnosed by examination.

- What are the characteristics which help to differentiate smallpox from chickenpox?

1. Centrifugal distribution of rash
2. The similar stage of development of all lesions on the face, arm or leg
3. The occurrence of fever and malaise 2 to 4 days before onset of rash
4. The appearance of pocks on the palms and soles
5. The persistence of many scabs on the body for two to three weeks or longer

- If this case is atypical and difficult to diagnose, how can the vaccinator make the diagnosis?

Obviously, the individual acquired the disease from someone else. Thus a search for the source of infection and for other cases in the area would be important. It would be anticipated that most other cases found would be reasonably typical and easy to diagnose.

To assist in the diagnosis, the patient might be vaccinated. If, at the end of seven days, he has a major reaction, the disease is not smallpox. Note, however, that, if there is no major reaction, the opposite does not hold true, i.e. a positive diagnosis of smallpox cannot be made. Failure to develop a major reaction may mean that he has a high level of immunity as a result of previous vaccination or infection or that the vaccine or vaccination technique was poor.

- Assuming that the vaccinator was correct - that the illness is chickenpox - should he perform any vaccinations?

As the vaccinator has taken the time to travel to this village in which there is a village chief who is concerned about illness among his people, it would be sensible for the vaccinator to vaccinate the population by house-to-house visit. There are several reasons for this:

1. If he was in error in his diagnosis, possible further spread would be minimized by strengthening the barrier of immune persons
2. The presence of cases which might be smallpox almost invariably provides motivation on the part of the people to obtain vaccination
3. By visiting and vaccinating the people in response to a report from a village leader (such as in this case), health authorities may strengthen their relationship with civil authorities and the people as a whole, so that should cases be suspected subsequently, they would be reported promptly

- How long might it take for him to vaccinate the people in this village?

Experience has shown that a village of this size should be able to be vaccinated in the course of one day.

- Is this an effective way to conduct a surveillance operation?

Note that the vaccinator has waited 9 days after the report was received to visit the village. If one is to stop the spread of smallpox, investigation must be conducted promptly. Every day's delay decreases the possibility of interrupting transmission. Investigation should begin immediately and certainly no later than 24 hours after receiving the report.

The vaccinator was obviously poorly trained or not trained at all in surveillance procedures or how to diagnose smallpox. Experience has clearly shown that vaccinators alone cannot be expected to accurately confirm the diagnosis of smallpox and to undertake fully effective containment measures. Although all vaccinators should be strongly encouraged to report all suspect cases and immediately to undertake some containment measures, a much more highly trained individual is required to confirm the diagnosis, to trace the source of infection and to ensure that appropriate containment measures are undertaken at each infected focus. Depending on the number of cases of smallpox and geographical factors, experience has shown that one well-trained Surveillance Officer can deal readily with all suspected cases in a population of 1 to 5 million persons or more.

Section II

- What should the Surveillance Officer carry with him when he goes to undertake an investigation?

1. Vaccine and diluent - he should carry not less than three vials of vaccine and diluent for each day he may be away from his headquarters. Using the bifurcated needle, he can vaccinate at least 100 persons with each vial or 300 persons in all. If he can sometimes obtain assistance from local staff or if he is accompanied by vaccinators, he will wish to take more vaccine than this. Note that the vaccine may be carried in an ordinary box without refrigeration. A thermos is not required. However, the vaccine should be protected at all times from direct sunlight.
2. Bifurcated needles - he should have a quantity of needles equivalent to the maximum number of vaccinations he expects to perform, plus a reserve supply. If he has a sufficiently large number of needles, he will not need to stop and boil the used needles in the middle of the day. Thus, if he carries three vials of vaccine, he should have at least 300 needles plus 50 to 100 needles as a reserve supply in case some of the needles fall on the ground before use, etc.
3. Container for needles - he should carry a container which would permit him to boil the needles if necessary. In many areas, plastic containers are used in which the needles may be carried to the field and which are resistant to heat such that they may be dropped into a kettle of boiling water.
4. A file or other device for opening the vaccine vial - this is usually included in the box containing vaccine but the Surveillance Officer should check to be sure.
5. Forms to record the number of vaccinations performed - Fig. 2 is an example of such a form. If he uses a form such as this, it is possible to determine where people live who were absent at the time of first visit. He may return later in the evening or early the following morning to vaccinate them or he may assign the task to a trustworthy vaccinator.
6. Forms to record the epidemiological information - Fig. 3 is an example of such a form. This form serves to assist in recording the data in an orderly manner and in tracing the source of infection. (The form as partially filled out should be discussed fully before proceeding with the Section.)
7. Pens or pencils
8. Container to collect scabs or pus - specimen collection containers are usually not required. However, in states/provinces or countries where smallpox is no longer considered to be endemic or where transmission has virtually stopped, it is necessary to carry containers for specimens. A clear glass vial (not a used vaccine container) can be used to collect scabs. Pustular or vesicular fluid may be collected in capillary tubes or smeared on a glass slide with the aid of a scalpel. The slides or capillary tubes are then sealed in a clean screw-cap glass vial.

Should one record the date of onset of the fever or the rash?

It is best to record the date of onset of the rash. There are two reasons for this. The date of appearance for rash is usually much more accurately remembered and is actually the more important date because individuals do not transmit infection until the very first

lesions appear. It is not unusual for children particularly to experience a number of different febrile infections during the course of a year. If such an infection occurs just before the child develops smallpox, the mother may report that the child had a fever which lasted, for example, for two weeks before he developed a rash. If this is recorded as the date of onset, a serious error may be made in trying to trace the chain of infection for it is quite possible that the child was not exposed to smallpox until one or two days after the fever first developed.

What should the Surveillance Officer do next to trace the source of infection?

Two courses of action are possible and both should be pursued.

1. A house-by-house search of the village for additional cases. In visiting house-by-house, additional cases may be detected. At the same time, the villagers may be vaccinated. In doing this, the Surveillance Officer should, if possible, be accompanied by the village leader or his representative as this will facilitate co-operation of the villagers. Epidemiological studies of smallpox reveal that smallpox spreads primarily as a result of face-to-face contact in houses. Cases thus occur most frequently in adjacent or nearby compounds as a result of friends visiting each other. In a village of this size, every house may be readily visited. In a large town or city, dwellings closest to the infected house should be visited in an attempt to reach from 200 to 500 persons. At each house, the Surveillance Officer should ask if those present know of any cases of smallpox. This may provide further information regarding nearby villages or areas which might be infected or possible hidden cases in other houses.

In his house-by-house search for cases, vaccination of all persons should be performed.

2. He should further question the parents of Efta and Carlo Aye regarding visits made to other areas as well as visitors to the household who may have been ill with rash.

Should the Surveillance Officer insist that the patients go to the hospital?

It is noted that he has already vaccinated the persons in both families. Isolation of the patients at a hospital may be possible in some instances but in most areas this is not possible. In many instances, villagers fear the hospital and will hide patients to avoid hospitalization. In general, home isolation, to the extent possible, is the only alternative and often it is the best. As noted, the Surveillance Officer should instruct the parents to keep the sick children in the house until all scabs have come off. He should warn them not to admit visitors to the house. While cooperation may not be optimal in many instances, thorough vaccination throughout the village will normally prevent further spread.

In vaccinating those in the village, should he vaccinate individuals

- with a good vaccination scar?
- who are sick?
- who were vaccinated 3 months ago?

The answer to all questions should be 'yes'. Vaccination takes but a very few seconds. If the individual is already highly immune, no reaction will occur. If not, he will get a revaccination response and be better protected. In brief, a very strong barrier of immunity is the objective - no chances should be taken that someone requiring vaccination is missed.

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Should Nona Dee and Jojo Dee be vaccinated - after all, they have smallpox

They should be vaccinated. If an error in diagnosis has been made and one or both have chickenpox, they will be protected. If they have smallpox, they will have no response. Some physicians in the past have thought it was dangerous to give a "vaccine infection" to persons experiencing smallpox infection. This is definitely not so.

Was Jojo Dee infected by his mother?

Note that only 6 days elapsed between the onset of infection in Nona Dee and Jojo Dee. The usual incubation period of smallpox is 10 to 14 days although it may be as short as 7 days or as long as 17 days. We may assume that Nona and Jojo Dee were both infected by Efta Aye.

How long should it take the Surveillance Officer to visit all the houses in this village?

Experience in various parts of the world has shown that a village of this size may be readily covered in one working day.

What is the proper age for beginning vaccination?

As noted by various studies in India, Singapore, Taiwan and elsewhere, children can be safely vaccinated with good results from the time of birth. This is recommended by the WHO Expert Committee and by several national advisory committees in endemic countries. Formerly, authorities recommended that vaccination be delayed until 3 months or even 6 months of age, principally because poor results were obtained in vaccinating very young infants. With the potent vaccines available today, even new-born infants can be vaccinated effectively. If Carlo Aye had been vaccinated when the mother wished, he would not have developed smallpox.

Section III

What more can the Surveillance Officer do to trace the chain of transmission?

A disinterested or unimaginative Surveillance Officer might go no further at this point but, as we shall see, by quitting at this point, additional active foci of smallpox would be missed. There are a number of different steps which could now be taken by the Surveillance Officer to trace the chain of transmission.

- He might try to locate all patients hospitalized between 7 and 18 October. The probable incompleteness of hospital records and addresses of patients and the large number which would need to be seen would make this a difficult task undoubtedly requiring many days of work.
- He might undertake a house-by-house search of Camal City and the surrounding area to try to find cases. This, too, is possible but would require many people and many days of work.
- He might inspect all patients in the hospital to see if any had residual marks of smallpox. This could be readily done but it is likely that the case was one who was not properly diagnosed. By this time, the patient has probably been discharged.
- A more direct approach would be based on the assumption that the missed smallpox case was not properly diagnosed. The patient might have been diagnosed as chickenpox or perhaps he died of haemorrhagic smallpox with a very atypical rash. It is known that those who experience fatal smallpox are much more likely to spread the disease to others than are those with non-fatal and, particularly, modified atypical illness. The Surveillance Officer thus might inquire about deaths during the period of 7-18 October and also about patients with chickenpox.

What can the Surveillance Officer do, at this time, to contain the spread of infection?

Although the hospitalized smallpox patient has not yet been identified, the patients and staff of the hospital obviously should be vaccinated and a regimen established whereby all who are admitted are vaccinated on admission. This should be established policy in all endemic countries.

Hospitals throughout the world have been shown to serve as dangerous centres for the propagation of smallpox. For example, very seriously ill patients with haemorrhagic smallpox are often admitted to regular medical wards. These patients excrete large amounts of virus and frequently infect many others with whom they are in contact. Repeatedly, it has been reported that children with "smallpox" have been hospitalized only to return home and shortly after experience a "relapse". In fact, however, investigation inevitably reveals that the child's first illness (chickenpox) was misdiagnosed and that he contracted smallpox in the hospital.

The hospital is especially dangerous for another reason. Usually, smallpox spreads comparatively slowly through a community, only, after some time, moving from one part of the community to another. In the hospital, persons from many different communities are brought together. If smallpox spreads in the hospital, many new foci may quickly develop in many different areas as the patients are discharged during the incubation period. The hospital then is one of the most dangerous centres for smallpox transmission and should always be dealt with as a priority matter.

Who should be vaccinated in the hospital?

New born babies?

Persons with cholera?

Pregnant women?

Patients with chickenpox?

Patients with smallpox?

All should be vaccinated. The risk of smallpox is so great compared to the risk of complications that all these groups should be vaccinated. Both patients with diagnosed chickenpox and smallpox should be vaccinated to protect against possible errors in diagnosis. The only ones who might be omitted are those with cancer of the blood system (i.e. leukemia, lymphoma) and those receiving large doses of steroids or special cancer drugs. In addition, those patients expected to die within one or two days might be omitted for practical reasons as their death so soon after vaccination might be erroneously attributed to vaccination.

Section IV

Did the pregnant woman have haemorrhagic smallpox or haemorrhagic fever due to some other cause?

At this point, it is impossible to know. It is almost certain, however, that Efta Aye got smallpox while in the hospital. Ana Bo is the only patient whose illness is suspicious. Careful investigation of this case would, therefore, seem desirable.

What more can the Surveillance Officer do to trace the chain of infection?

There are two possible approaches which might assist in confirming the diagnosis and determining where the family came from. While the village chief might not know much about the family, those who lived near the family might have more information. Additionally, if there was spread of infection in the village, there may be cases among neighbours of the afflicted family.

As the village is small, a house-by-house search can be quickly done.

What more can be done to contain the spread of infection?

As the Surveillance Officer is moving from house to house to determine if there are additional cases in the village, vaccination of all residents at this time would be a logical step.

If the Sanitarian locates all 14 persons who were in the hospital ward at the same time as Ana Bo, and determines that none have smallpox, can we assume that no additional persons were infected in the hospital?

Definitely not. Many studies have shown that when smallpox is introduced into a hospital, the infection spreads to staff, to patients and to visitors. To identify all persons who might have had contact with Ana Bo would be virtually impossible. By contacting patients who had shared the same ward and were therefore more intensively exposed for a longer time, one might identify some additional foci. The fact that so many persons may be exposed to an unsuspected smallpox patient in the hospital; the fact that they may leave the hospital and go to so many different areas many miles from the hospital; and the fact that many of those who have been exposed cannot be traced - all these factors make the hospital one of the most difficult problem areas in the entire surveillance programme.

Section V

The Fay family denies contact with the Bo family. Where did they get smallpox?

Note that the first case in the family is Limo Fay, a 6 year old boy. In the first place, the history provided by the mother, that her 6 year old son had no contact with the Bo family must be assumed to be rather doubtful. It is further noted that both families were from Gavon City. That they would have no contact with each other in a village of only 90 persons is unlikely. Taking these facts into consideration and noting the date of onset of the first case, one concludes that most likely Limo Fay was infected by Ana Bo and that Ana Bo's case was indeed smallpox.

What additional steps can the Surveillance Officer take to trace the chain of transmission?

There are several arguments for doing nothing more at this point:

Gavon City is outside the Surveillance Officer's area of jurisdiction.

Ana Bo presumably acquired her infection there in early October - almost two months ago.

No information is available as to where in Gavon City the Bo family lived.

Such a case would be difficult to trace in a city so large.

Nevertheless, the Health Officer in Gavon City must be notified as soon as possible. It is possible, for example, that no smallpox cases have been detected in Gavon City for many months and this case provides the first indication that there are cases. The Gavon City Health Officer should be notified by telephone or cable and, at the same time, the provincial and national authorities should be informed to assure overall coordination of efforts.

What might the Health Officer in Gavon City do on receipt of information?

If there are known foci of infection in the City and its slum areas, he may take no special action, assuming only that Ana Bo was infected in one of these foci. On the other hand, if it has been many months since any cases have been detected in the City he might alert all health personnel and possibly other civil authorities that there is believed to be a focus of infection and ask them to report immediately any suspect cases. News media might be used to alert the populace more generally. Finally, hospitals might be checked and special vaccination teams despatched to vaccinate and search through slum areas.

If you were the Health Officer in Gavon City, would you take any special measures in regard to routine vaccination and surveillance of cases in slum areas?

Note that the Bo family came from a slum area. Slum areas in cities are normally where migrants congregate, many of whom come from rural areas where immunity levels are low. They live in crowded conditions. This provides an ideal opportunity for the continued transmission of smallpox. In one study in Pakistan, it was found that over half of all cases in rural areas could be traced ultimately to areas such as this in large cities.

In slum areas, there is normally a large turnover in population. After three months, as many as one-third or more may be new residents. Routine vaccination programmes which are effective elsewhere in the city or country are often not very effective in these areas.

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Such persons rarely visit health centres. Special teams which visit such areas every few months and vaccinate both early in the morning and very late at night have been found to be effective. By vaccination, they serve to diminish transmission of smallpox through reducing the number of susceptibles. Such teams may also detect cases so that containment measures may be instituted.

Can we now assume that all cases have been detected in the Camal City area which are associated with this outbreak?

Obviously we cannot. As noted earlier, one or more additional foci may have originated from the hospital. Additionally, it is possible that one or more persons from other villages may have visited those who are ill and carried the disease back to their own village.

What can be done to detect such additional foci?

If there are other infected villages, one might guess that those which are nearest to the villages with smallpox would be the ones most likely to get infected. There are eight villages south of Camal City which are not very far from those known to be infected.

How might the Surveillance Officer determine if they are infected?

A house-by-house search of all villages would be ideal but this would take many days. However, in the course of one day, he should be able to visit each village and enquire of the village leader as well as any health personnel and perhaps school teachers and school children to determine if they know of any cases of smallpox in these villages. At the same time, he could inform them that there is smallpox in the area and that the health authorities in Camal City should be immediately informed if they learn of any possible cases. This would serve to strengthen the surveillance network in an area where smallpox is known to be present.

Section VI

Are the cases in Volta village perhaps "sporadic" cases in an endemic area? Could these cases have been infected by wind currents blowing smallpox viruses from other villages? How could they possibly have become infected?

It is important to emphasize that there is no such entity as a "sporadic" case of smallpox. If an individual has smallpox, he has been in close contact 7 to 17 days before with someone else who has had a smallpox rash. The chain of transmission is continuous. Exceptionally, laundry workers have become infected from washing linen taken directly from the bed of a smallpox patient and thus have become infected although they have not had face to face contact. In endemic countries, this happens very rarely.

On two occasions only has it been shown that smallpox virus has infected persons after having been carried by air currents for some distance. On both occasions, the infection was carried by air within a single closed building in a very dry atmosphere. Smallpox infection has never been shown to be carried by air from one building to another, for example. Infection in this case was obviously not carried by air from an infected village.

On some occasions, it is not possible to trace the chain of transmission of some smallpox cases. The patients may deliberately provide false information or they may have forgotten that they have travelled to another area, or they may have been in contact with an infected person but considered the person to have had some other disease.

In tracing the chain of transmission, many persons may have to be queried in order to obtain an accurate history. In this case, one would guess that these cases were related in some way to cases in the other villages. Information should be sought from other villagers.

What should the Surveillance Officer do at this point?

A house-by-house search for cases is necessary. All persons, as before, should be vaccinated. In the course of his visits, however, he should seek information from others as to recent trips made by the Lal family. Elvis probably introduced the infection into the family and thus his movements are of particular concern. It is noted that Elvis became ill on 5 November. If the Surveillance Officer counts back 7 to 17 days, it is apparent that he is particularly concerned about Elvis' activities during the period 19 to 29 October.

Section VII

Should the Surveillance Officer assume that the Lal family was infected in Como Village in spite of the fact that the mother denies knowing anyone who was sick with smallpox?

If possible, one should identify specifically, for each case, the person and circumstances under which smallpox was acquired. Sometimes, however, this is not possible. It is evident that the mother in the Lal family either does not recall recent events very clearly or she may be deliberately withholding information for various social or other reasons. As the Surveillance Officer has been able to confirm that Elvis Lal was, in fact, in Como Village at a time when persons were acutely ill with smallpox, it is reasonable to assume that Elvis was infected there. Further efforts to identify specifically the exact date and place of contact would not seem necessary in this instance.

How many of these cases should be officially notified to Provincial and National authorities - after all, only 2 were notified by the village head?

All cases must be notified including the case Ana Bo, for example. The purpose of reporting is to reflect as accurately as possible the status of smallpox in an area and in the country as a whole. The more accurate and complete is the information pertaining to smallpox, the more effective are the steps which can be taken to interrupt transmission. Smallpox is not just a local problem. It is a national, a regional and an international problem. Resources must constantly be shifted to permit the maximum effort in the most heavily afflicted areas. This can be accomplished only by having as full a knowledge as possible of the smallpox problem.

Should these cases be reported according to the week of onset of illness or according to the week they were discovered?

Accepted practice is to report all of these cases according to the week they were detected. Reported in this manner, it is recognized that the data do not accurately reflect the epidemiological situation. However, if all cases throughout a country were reported according to week of onset of illness, constant revisions and corrections of previous week's reports would be required. The book-keeping problem would be very difficult and the chances for error in recording would be very great indeed. In morbidity reporting, the accepted practice is to record cases by week of detection. Special analyses and studies may be made separately, based on reports submitted by the Surveillance Officers, to determine exact seasonal trends, etc.

Regular summaries of reports of smallpox from throughout the country should be distributed by national authorities. The Medical Officer and the Surveillance Officer at Camal City, for example, should check these to be sure that cases which they have reported have been accurately recorded.

Is there anything further that the Surveillance Officer should do?

Obviously, a brief summary report should be prepared which will be discussed after Section VIII.

It is most important that the Surveillance Officer plan to return to the infected village to determine if any further cases have occurred. He should visit every two weeks until 6 weeks after the last case has occurred. The visits may be comparatively brief and may involve only discussion with the village chief and the affected families to determine if any other cases are known. If there are migrants in the area or if other cases are

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found, he should undertake, as before, house-by-house visits to inspect for cases and to vaccinate. Only by this means can he be reasonably certain that transmission in the particular area is indeed interrupted.

A revisit to the hospital should also be planned on a regular basis to be sure that the policies agreed upon are being followed. On such a visit, he personally should check patients who have been admitted to be certain that all are vaccinated. This is particularly important for, as noted before, the hospital may well represent the most dangerous site in the entire area for the continued transmission of smallpox.

Section VIII

What further should the Surveillance Officer do at this point?

1. He should plan repeat visits at two-week intervals until 6 weeks have elapsed since the last case.
2. He should ensure that the additional case is properly registered and reported to provincial and national authorities.
3. Repeat visits to the hospital at regular intervals would be a good plan. Hospitals throughout the world are renowned for setting up special programmes (such as vaccination of all patients on admission) only to abandon these policies after weeks or months as a new director takes charge or lower echelon staff forget.

If Koko Lal had been vaccinated on the day he returned to the village, would he still have developed smallpox?

After primary vaccination at least 10 to 12 days must pass before the individual develops full immunity. If he has already been exposed to smallpox, the vaccination may not prevent infection but it may cause it to be milder. Following vaccination, even though many years have elapsed since primary vaccination, immunity develops much more rapidly and good protection is present within 7 days. This further emphasizes the importance of assuring that everyone has received a successful primary vaccination.

Preparation of a summary form:

In every well-established surveillance programme, data regarding outbreaks and cases are systematically registered and compiled. Most programmes have found it convenient to record each outbreak by Province and by consecutive number for reference and tabulation. In many programmes, this entire group of cases would be considered a single outbreak although involving several villages. Others have preferred to regard each epidemiologically related group of cases in each village as a separate outbreak. Either system may work perfectly satisfactorily.

By using the field work sheet and the 'Summary of Investigation' form, information regarding the entire outbreak may be easily summarized. Emphasis should be placed on the minimum number of records consistent with adequate documentation as it is obvious that a Surveillance Officer does little to interrupt smallpox transmission while seated behind a desk in the office. As a practical guideline, a Surveillance Officer should spend no less than 15 full days every month in the field. If there are no cases to investigate, he should establish a regular schedule of visits to health centres, hospitals, etc., to enquire about smallpox and to emphasize the need for prompt reporting.