



WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTÉ

INTER-REGIONAL SEMINAR ON SURVEILLANCE
AND ASSESSMENT IN SMALLPOX ERADICATION

New Delhi, 30 November - 5 December 1970

INDEXED

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English only

TEACHING EXERCISE - FIELD INVESTIGATION

PROBLEM FOR STUDENTS

Section I

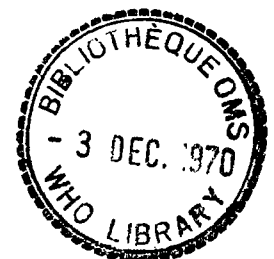
On Thursday afternoon, 3 November, the chief of Bala village (population 150) reported to the Medical Officer in Camal City (population 15 000) that one of the village children had a fever with a rash. He thought the child might have smallpox. The Medical Officer asked a vaccinator to investigate.

The vaccinator visited the village on Saturday, 12 November. He found that a 10-year-old girl (F.A.) had become sick about two weeks before. After a few days of fever, a rash appeared on her face, legs and arms, with a few lesions on her trunk. Her mother said she had been vaccinated 6 months ago.

The child looked well and had no fever although there were still scabs on her face, arms and chest. The mother said there were a number of cases of chickenpox in the village. Some had occurred among playmates of the patient. Considering this, as well as the fact that the child had been vaccinated recently, the vaccinator concluded that she probably had chickenpox.

None of the other 6 members of the family was sick except for the patient's 2-month-old brother (C.A.) who had a fever. The vaccinator examined the child to determine if a rash was present but found none.

He returned to the District Health Office and reported to the Medical Officer that there were chickenpox cases in Bala village but no evidence of smallpox.



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Section II

Nine days later, on 21 November, the chief of the village sent another message to the Health Officer. It said that another child in the family had a rash and was very sick.

The Medical Officer sent the Surveillance Officer, a Senior Health Inspector, to the village. He departed immediately. The very sick child, C.A., the 2-month-old brother of F.H., was found to have an extensive rash. It was pustular and heaviest on the face, arms and legs although there were a number of lesions on the chest and back. The rash was typical for smallpox. The mother said that the child had become sick about 11 November and had developed a rash after 2 or 3 days of illness. The mother said he had not been vaccinated as the vaccinator had told her that children should not be vaccinated until they were at least 3 months of age.

The Surveillance Officer examined all the other family members and vaccinated them. Among those examined was the 10-year-old girl F.A. whose scabs had almost all come off (onset, 30 October). The Surveillance Officer looked for a vaccination scar but found none. He asked the mother about other smallpox cases whom F.A. might have been in contact with. The mother knew of none. He asked the mother if she knew of any other persons who had been sick during the last month. She said that there was a lot of chickenpox in the village and her sister had been ill and had some sort of rash. He instructed the mother, as well as the village chief, that the children were to remain in the house until all scabs had fallen off and that no visitors should be allowed to enter the house.

The Surveillance Officer went to the sister's house which was located in the village. The sister, N.D., a 42-year-old woman, had a few scabs on her face, arms and legs. A vaccination scar was present on her arm. She said she had been vaccinated when she was a child and had been revaccinated 4 or 5 years before. She had developed a rash about 10 days previously (11 November). Prior to her illness she said she had frequently visited her sister's house. She knew of no other families in the village with smallpox. However, her one-year-old son (J.D.) had developed a fever one week before; vesicles had appeared three days later and could now be seen on his face. He had never been vaccinated. The Surveillance Officer examined the child, confirmed what she had said, vaccinated all members of the household, and instructed her about the need for isolation.

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Section III

With the village chief, the Surveillance Officer went house-by-house inspecting all persons and vaccinating everyone without regard to when the person had last been vaccinated. A total of 120 of the 150 residents were vaccinated. No other cases of smallpox were found and none of the residents knew of any other cases in neighbouring villages.

On the basis of the history and dates of onset of the different cases, he concluded that F.A. must have introduced smallpox into the village. He returned to the house of family A and asked the mother where F.A. had been during the 2 weeks before she got sick with smallpox. The mother reported that F.A. had been hospitalized because of measles in Camal City and had returned home only a week or so before she became sick again. Except for being in the hospital she had not been outside the village and they had had no visitors.

The Surveillance Officer arranged for a vaccinator to remain in the village overnight in order to vaccinate the 30 residents who had been missed. He then returned to Camal City.

On the morning of 22 November, he visited the 100-bed hospital and confirmed that F.A. had been hospitalized there between 7 and 18 October. However, the hospital director said that they had admitted no cases of smallpox for more than a year. The Surveillance Officer examined the available hospital records for the previous 3 months but could find no record of a patient with smallpox having been admitted to the Hospital.

He then talked to two other doctors and several nurses but none could recall any cases of smallpox in the hospital.

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Section IV

The Surveillance Officer asked if any patients with chickenpox had been admitted to the Hospital since early October. He was told that there had been none. He then asked if any patients had died during the time that F.A. was in the hospital. After considerable investigation and discussion, it was determined that 3 persons had died, one after being severely wounded in a fight, one very young infant with severe diarrhoea and a 20-year-old pregnant woman who had experienced an illness which the doctors had diagnosed as hemorrhagic fever. The pregnant woman (A.B.) had been admitted to the hospital on 16 October and she had died on 20 October. Her illness was said to have lasted about 6 days.

The Surveillance Officer reported his findings to the Medical Officer who immediately went to the hospital and persuaded the hospital director of the need to vaccinate all patients. The hospital director also agreed in the future, to vaccinate all patients admitted to the hospital and to revaccinate his staff every 3 years. The Surveillance Officer with assistance from the nurses, vaccinated all patients and staff - 175 persons in all. He next obtained the names of 14 persons who had been in the same ward at the same time as A.B. and sent a sanitarian to try to find these persons.

He learned that the pregnant woman (A.B.) who had died was from Como village, a village of 90 persons which was about 4 miles away.

On the following day, 23 November, he drove to the village. When he arrived, he talked to the village chief who said that the B. family had come to the village early in October but that the mother had died soon after they arrived and that the family had returned back to their home in another Province. He did not know where in the Province they had come from. He knew of no cases of smallpox in his village.

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Section V

The Surveillance Officer talked to the families which had lived near family B. They confirmed what the village chief had said. They knew of no cases of smallpox in their village. They were, however, able to provide the name of the city from which the family had come and to which they returned. The city, Gavon, has a population of about 500 000 persons. The family was very poor and was thought to have lived in a slum area.

The Surveillance Officer proceeded from house-to-house vaccinating all inhabitants and checking for recent cases of smallpox. In one house at the edge of the village, he found another family from the same city as family B. but who had lived in the village for almost a year. Two children, a boy (R.F.) 5 years old and a boy (B.F.) 3 years old were sick with fever and had pustules which were most dense on the face, arms and legs. They had both developed a rash 4 days before, i.e. about 19 November. A 2-year-old sister (T.F.) was covered with scabs in a distribution characteristic of smallpox and a 6-year-old brother (L.F.) showed depigmented areas, also in a distribution characteristic of smallpox. The sister had developed a rash about 8 November and the brother about two weeks before that (25 October). None had scars of vaccination. The family, however, denied having had any contact with family B.

By remaining in the village until late in the evening, the Inspector was able to vaccinate 198 of the 200 persons. Two adult males who had been working in a distant town for the past 10 days were missed.

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Section VI

On the following morning, 24 November, the Surveillance Officer informed the Medical Officer about the patient A.B. and the fact that she had probably acquired smallpox in Gavon City of the neighbouring province.

The Medical Officer arranged immediately to inform the health officer in Gavon City as well as the Smallpox Eradication Officer at Provincial level.

There were 8 other villages near the afflicted villages which ranged in size from 50 to 300 persons. The Surveillance Officer visited each of these and spoke with each village leader and the school teachers. He showed them pictures of smallpox patients and asked if they knew of any cases in the area. In 2 villages, he was told that there were children with skin rashes which might be smallpox. The patients were examined. One was found to have chickenpox and the second, a skin infection.

In Volta village (population 90), the seventh village which he visited, a school teacher told him of 2 cases which had recently occurred. He went to the house and examined the patients - one was an 8-year-old boy (M.L.) who had depigmented areas on the skin in a distribution characteristic of smallpox. He had become ill about 5 November. The second case was his 4-year-old sister (S.L.) who had become ill only 5 days before (about 19 November) and now had a vesicular rash which had been present for 2 days and was suggestive of early smallpox. Neither had vaccination scars. The mother said she knew of no other cases in the village and had no idea where M.L. could have become infected as she had not been out of the village for many months and they had had no visitors for a very long time.

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Section VII

The Surveillance Officer vaccinated all those living in the household. He then asked the women in neighbouring houses if they knew of any visitors to the L. family or if the L. family had made any trips to other villages during October. One of these neighbours reported that the L. family had visited Como village sometime in October. When this was repeated to the mother in the L. family, she recalled that this was so. In fact, they had spent a week in Como village in the last part of October but she denied knowing the families who had developed smallpox.

The Surveillance Officer proceeded from house-to-house and was able to vaccinate 85 persons. He found no additional cases of smallpox.

He returned to Camal City. On the following morning, the supervisor reported that he had been able to discover 12 of the 14 patients who were known to have been in the same ward of the hospital with A.B. All were in good health.

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Section VIII

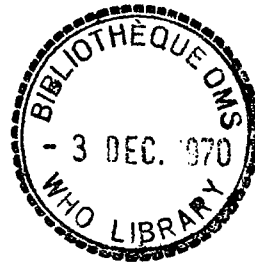
Two weeks later, on 6 December, the Surveillance Officer visited each of the afflicted villages to determine if additional cases might have occurred and to check vaccination takes. Over 95% of the unvaccinated pre-school children had vaccination takes. One additional case was found in family L. of Volta village. The father (K.L.) a 25-year-old carpenter, had become ill on 30 November with fever and backache. Two days later, he developed a rash over his face, arms and legs which was now becoming pustular. He had been vaccinated for the first time eight days before by the Surveillance Officer. A primary take was evident.

The village was again checked on a house-to-house basis to ensure that all persons had been vaccinated during his last visit and that all had either a scar of primary vaccination or a primary vaccination take. During the house-to-house visit, he found a family who had just moved into the village. They were vaccinated on the spot.

He then visited the hospital in Camal City and, with the director, examined all patients to be certain that all were being vaccinated on admission. Three patients were found who had not been vaccinated. They were promptly vaccinated and procedures were again checked to be certain that in the future, all patients would be vaccinated on admission to the hospital.



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TEACHING EXERCISE - FIELD INVESTIGATION

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 class-room, in as realistic a manner as possible, the circumstances and problems of an outbreak. While the various slides 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 15 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.

In the course of the discussions, various technical questions relevant to the programme may be introduced to ensure that the students clearly understand proper procedures in the storage and reconstitution of vaccine, vaccination techniques and the principal diagnostic features of smallpox.

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 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.

Section I

What do you think of the vaccinator's conclusion about F.A.'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.

- 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 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% to 90% 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 in a particular area, such as on the 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.

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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

The field investigation form should be used beginning with this Section to facilitate the orderly recording of data and the tracing of sources of infection. The form as partially filled out should first be distributed and discussed fully before general discussion of this Section.

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 F.A. and C.A. 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 co-operation 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.

Should N.D. and J.D. 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 J.D. infected by his mother?

Note that only 6 days elapsed between the onset of infection in N.D. and J.D. 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 N.D. and J.D. were both infected by F.A.

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 C.A. 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 hemorrhagic 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 hemorrhagic 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

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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 hemorrhagic smallpox or hemorrhagic fever due to some other cause?

At this point, it is impossible to know. It is almost certain, however, that F.A. got smallpox while in the hospital. A.B. 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 to 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 on the hospital ward at the same time as A.B., 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 A.B. 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

Family F denies contact with family B. Where did they get smallpox?

Note that the first case in the family is L.F., a 9-year old boy. In the first place, the history provided by the mother, that her 9-year old son had no contact with family B 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 L.F. was infected by A.B. and that A.B.'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.

A.B. presumably acquired her infection there in September - at least two months ago.

No information is available as to where in Gavon City the B. 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 A.B. 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 family B came from a slum area. Slum areas in cities are normally where migrants congregate, many of whom came 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. 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 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 authority 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, such 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?

As before, 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 family L. M.L. probably introduced the infection into the family and thus M.L.'s movements are of particular concern. It is noted that M.L. became ill on 5 November. If he counts back 7 to 17 days, it is apparent that he is particularly concerned about M.L.'s activities during the period 19 to 29 October.

Section VII

Should the Surveillance Officer assume that family L. 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 family L. 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 M.L. was, in fact, in Como Village at a time when persons were acutely ill with smallpox, it is reasonable to assume that M.L. was infected there. Further efforts to identify specifically the exact date and place of contact would not seem necessary in this case.

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 A.B., 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 are 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 detecting. 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 villages 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 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.

Why did K.L. get smallpox - after all he was vaccinated 8 days before?

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.

If this investigation had been promptly carried out on the day it was first notified, i.e. on 3 November, how many cases would have been prevented?

If we assume all contacts were vaccinated on 3 November and that vaccination would not prevent cases for 12 days, we would conclude that all cases occurring on 15 November or after could have been prevented. Thus, in this outbreak, 5 of the 12 cases could have been prevented through prompt containment action.

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 'Resume 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

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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.

It is noted that nothing has been said about the mechanics of recording vaccinations in the course of his work. The attached sample containment vaccination tally form, however, has been found useful in this regard. Again, emphasis is placed on a minimum of written records in order to permit a maximum of field work. By recording vaccinations by household, the Surveillance Officer can readily identify where persons were missed and so be able to return to complete vaccination in the village or area of town concerned.

Teaching exercise - field investigation
Problem for students

I. RESUME OF INVESTIGATION

DATE NOTIFIED _____
 DATES OF INVESTIGATION _____

 DATE OF FIRST CASE _____
 DATE OF LAST CASE _____

STATE/PROVINCE _____
 INVESTIGATION NO. _____
 DISTRICT _____
 VILLAGE _____
 DATES OF INVESTIGATION _____
 SURVEILLANCE OFFICER _____

II. RESUME OF CASES

AGE CASES DEATHS VACCINATION SCAR PRESENT

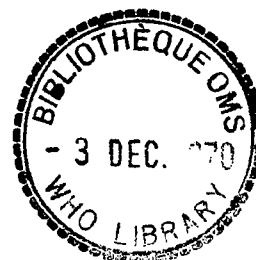
SEX

M F TOTAL YES NO ?

< 1						
1-4						
5-14						
15-44						
45 +						
?						
Total						

III. METHOD BY WHICH CASES WERE FOUND

ROUTINE NOTIFICATION NO. _____
 INVESTIGATION OF OTHER CASES _____
 OTHER _____
 TOTAL _____



IV. VACCINATION PERFORMED TO CONTROL OUTBREAK

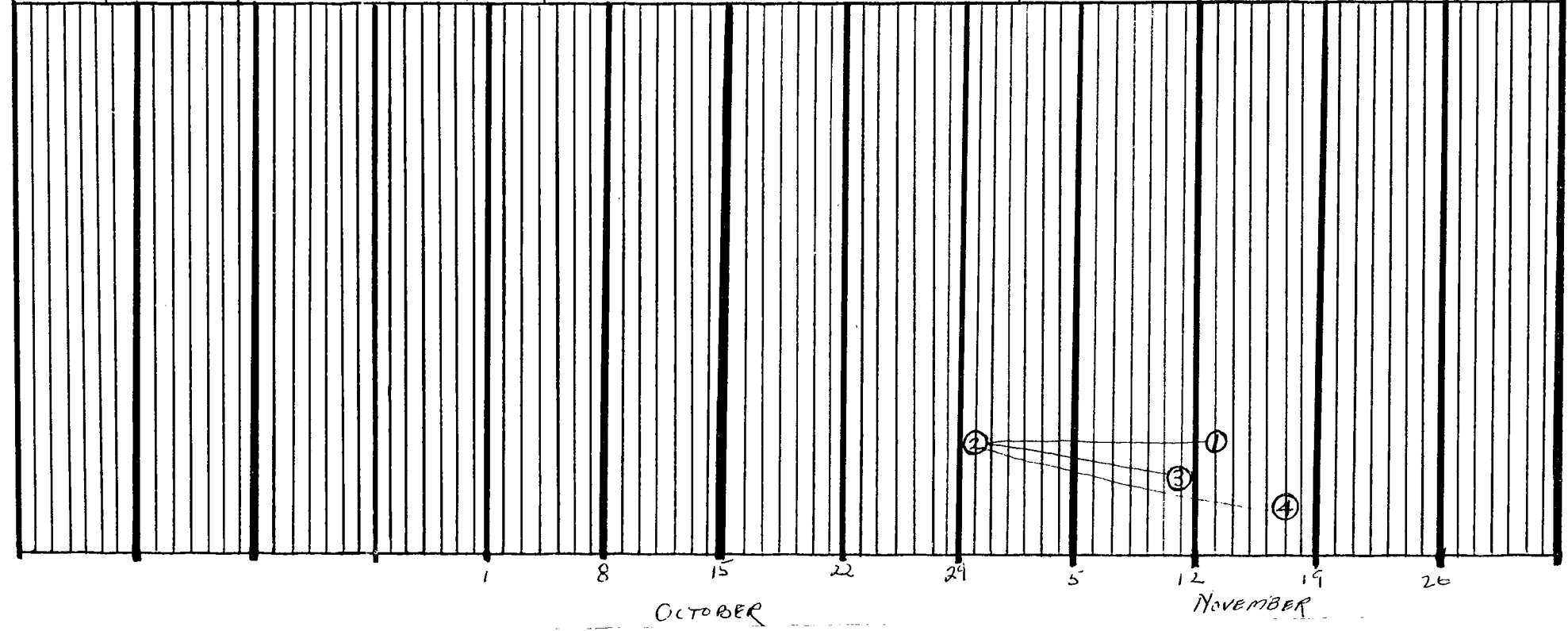
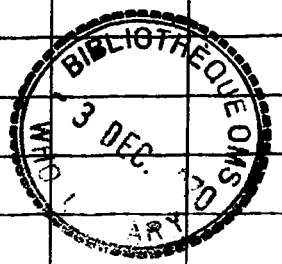
A. HOUSEHOLD MEMBERS AND CLOSE CONTACTS

NO. _____ NO. VACCINATED _____

B. VILLAGE OR SECTION OF TOWN NO. ENUMERATED NO. VACCINATED

Teaching exercise - field investigation
Problem for students

CASE NO.	NAME	VILLAGE	AGE	SEX	DATE OF ONSET OF RASH	VACC	SURVEILLANCE OFFICER _____		PROVINCE _____	
							DATES OF INVESTIGATION <u>Nov. 21</u>		DISTRICT _____	
1	C.A.	Como	2 1/2	M	13 Nov	No				
2	F.A.	Como	10	F	30 Oct	No				
3	N.D.	Como	42	F	11 Nov	YES				
4	J.D.	Como	1	M	17 Nov	No				



Teaching exercise - field investigation
Problem for students

MAP OF AREA

