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NOTES ON SOME PRACTICAL PROBLEMS
IN SURVEILLANCE

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INTRODUCTION:

The main purpose of these short notes is to discuss some practical problems that have arisen and arise constantly in projects where surveillance operations are being introduced or have been under way for some time. It seems, however, appropriate to begin with a brief statement of the general objectives of surveillance and the definition of some terms used:

"Surveillance is that part of a malaria eradication project designed to discover evidence of any continuation of transmission, to establish its nature and causes, to eliminate residual foci, to prevent or cure such residual or imported malaria infections in man as would delay the ending of transmission or threaten its resumption in a given area, and, finally, to substantiate the fact that eradication has been achieved." (Seventh Report of the Expert Committee on Malaria - Wld. Hlth Org. techn. Rep. Series, 1959, 162, 7).

The principal objectives of surveillance are therefore:

- (a) To find cases using all possible means suitable to local conditions.
- (b) To investigate the cases found in order to establish where, when and how the infection was probably contracted.

- (c) To classify, accordingly, these cases as indigenous, imported, sporadic, induced or introduced.
- (d) To institute and supervise radical treatment in all cases found.
- (e) To institute emergency measures in localities where renewed transmission was found (e.g. focal residual spraying).

The main techniques used in surveillance operations are: passive case detection, active case detection and epidemiological investigation of cases (the latter will often include entomological investigations). The basic processes are the active and passive detection of cases which will be more fully discussed further below:

Some Practical Problems

These will be discussed under the following headings:

1. ACTIVE OR PASSIVE DETECTION?
2. SURVEILLANCE - WHEN SHOULD IT BE INSTITUTED AND WHEN NOT?
3. HOW TO JUDGE THE STABILITY OF CONSOLIDATION IN AN AREA UNDER SURVEILLANCE.
4. HOW TO ASSURE RADICAL TREATMENT OF CASES FOUND.
5. THE MICROSCOPIST'S BURDEN.

1. Active or passive detection

It is a common experience that these two procedures in surveillance are confronted in antithesis so that it would appear that one has to make a choice as to which of the two to adopt in a certain project. As a consequence malariologists are split into two groups, one favouring in general the use of active detection and the other the use of passive detection. The advantages and disadvantages of either system can be briefly summarised as follows:

Passive detection:

Assuming a good co-operation of the notifying agents (doctors, rural health dispensaries, voluntary collaborators), this system has the advantage of a continuous day to day vigilance on the situation at the level of a locality. Another obvious advantage is the lower cost of this system since most if not all of the notifying agents are not paid specially for this service so that the cost of a surveillance system entirely based on passive detection consists chiefly of the cost of supervision and the microscopic examination of blood slides.

Another important benefit of establishing a system of passive detection during the consolidation phase is that this will help considerably in the maintenance phase when the activities of a special malaria eradication service will have ceased and the necessary vigilance rests entirely on notification and passive detection.

The disadvantages of this system lie in the fact that supervision of such agencies not directly employed can never be as strict as the supervision of ME personnel employed for active surveillance and that its efficiency depends not only on the good will of the co-operating notification agents but also on the good will of the population, i.e. the use that is made by the population of the available notification posts.

The whole system therefore requires a good deal of public health education activity directed both towards the notification agents and the population as a whole.

Active detection

Correspondingly the advantages of active surveillance are the strict supervision of the personnel performing the house to house visits and the flexibility of the system in so far as it is possible to request such surveillance agents to take blood from special groups of people in addition to fever cases.

The greatest disadvantage of this procedure is obviously the high cost. An important aspect of this is that this expenditure will be demanded from a government at the end of the attack phase i.e. at a time when the impact of malaria morbidity on the general health of the population is already greatly diminished, when the Finance Department of a government envisages with gratification the near end of the expenditure connected with spraying operations both facts which influence adversely the willingness for further government expenditure.

The single-minded proponents of either system tend to exaggerate the advantages of their favourite system and the disadvantages of the other. It is our firm opinion that the best system is a combination of both systems in every project. It should be clear that in a country with practically non-existing rural health stations and a largely illiterate village population, the main system, at least in the beginning, will have to be a system of active surveillance, i.e. a system of house to house visits at stated intervals by employees of the malaria eradication service (surveillance agents). In general, however, one should not indulge in too much pessimism of the feasibility of at least a certain degree of passive surveillance even in such situations. It is a common experience that despondence in this subject is greatest vis-a-vis health stations and doctors in general who are often found to be less co-operative than uneducated voluntary collaborators. In fact, however, it is found that naturally malaria patients are most easily found in doctors' or public health

dispensaries and that if such institutions take the trouble to take slides from their patients they yield the highest percentage of positive findings. It should be impressed on governments that when the time has come for surveillance operations in the malaria eradication projects the utilization of at least the government rural dispensaries for this purpose is an essential requisite. It may be worthwhile to staff existing dispensaries a little more generously so as to obviate the excuse that overworked personnel have no time for taking blood slides and filling in notification slips. The little money spent on this should be compared with the outlay of money necessary for active surveillance visits in a locality that could easily be covered by such a dispensary.

A situation on the other extreme would be a country in which facilities for passive surveillance (e.g. a wide network of rural dispensaries and availability of well co-operating voluntary collaborators) would seem to make it possible to rely entirely on passive surveillance and no provisions whatever are therefore made for active surveillance. A realistic appraisal should be made from the very beginning of the extent to which the population is truly covered by the existing network of dispensaries and good voluntary collaborators. Account should be taken not only of the physical existence of notification posts each covering a reasonable geographical area and number of population but also of the extent to which the population makes use of these facilities or can be expected to make use of them. Every effort must be made to improve the facilities for passive detection but the loopholes that will unavoidably still be found at the end must be filled by a system of active surveillance. The rule of "total coverage" does not apply only to spraying operations but just as much to surveillance operations. Failure of total coverage in surveillance may have an even more disastrous effect on the course of the eradication programme than failures in total coverage in spraying operations. In Central and South American projects great stress has been laid from the very beginning on the organization of passive detection through great efforts in the field of health education. While on the whole these efforts have been quite successful it has now been realized that in most projects more personnel is required in order to supplement this system by some active detection.

2. Surveillance - when should it be instituted and when not?

It would be a truism to state that surveillance must operate when spraying is withdrawn. The problem is that surveillance operations must begin well ahead of the time when spraying is withdrawn because they cannot be built up and instituted within a day or a week, and in order to obtain the evaluation data for a decision as to when spraying can be withdrawn it is necessary to conduct procedures of malaria detection. We use here the term "malaria detection" (it is the basic part of surveillance) as opposed to the method of evaluation by malarionetric surveys, the latter being sufficient in the pre-eradication survey and the first one or two years of the attack phase only. Experience has shown

that evaluation by malarimetric sample surveys becomes too insensitive by the time that parasite rates have dropped to a figure of around 3%. This may sometimes be the case already in the second and certainly in the third year of the attack phase (if successful) and at this point malaria detection, passive and active, should take over. At this time total coverage of the population is not yet essential as the population is still protected by residual spraying. If infant parasite rates have not yet dropped to zero, infant blood surveys must be continued until this status is reached. When infant parasites have reached the zero level and malaria detection seems to indicate also a great reduction in the residual parasite reservoir, malaria detection must be extended to cover the whole population, while spraying is still continued. At the same time the epidemiological investigation of every case found becomes absolutely vital. When the results of these malaria detection activities on a total coverage basis show that the total malaria incidence has reached a level of less than 0.5 per thousand per population per year (i.e. number of infections found during one year multiplied by 1,000 divided by number of population) and the epidemiological investigations have shown the absence of indigenous cases, spraying may be withdrawn and malaria detection operations then become malaria surveillance operations *sensu stricto*. This implies not only the principle of total coverage - which is already to be employed before - but also completeness of radical treatment given to all cases found (this is not absolutely essential before the withdrawal of spraying, though desirable). If spraying is withdrawn (or conversely stated surveillance used as the only eradication measure) before this point is reached, there has been and will be trouble in areas in the "consolidation phase" for two reasons:

- (a) An incidence above 0.5 per thousand per year usually indicates not only a still high level of residual parasite reservoir, but also some residual transmission.
- (b) Even assuming that it is attempted to handle such situation without spraying by rapid case detection and rapid institution of radical treatment of all cases found, this would throw such a burden on the surveillance personnel that this operation would become far more costly than the continuation of residual spraying for another year.

Another important point has to be taken into consideration before withdrawing spraying from a given area. It has happened more than once that when spraying was withdrawn from an area in which malaria incidence had reached a satisfactorily low level (as defined above) widespread transmission was renewed after a short while because of large scale to and fro migrations of people between this area and neighbouring districts in which transmission had not yet been interrupted. This sociological factor has therefore to be studied well before the withdrawal of spraying and it might often be wiser to continue spraying in a "satisfactory" district until large enough areas in the neighbourhood have reached the same status.

3. How to judge the stability of consolidation in an area under surveillance

It should be clear from the foregoing that the situation in an area after the withdrawal of spraying (consolidation phase) under full surveillance is not satisfactory if it does not comply at least with the requirements outlined for the decision of withdrawal of spraying, i.e. an annual incidence of less than 0.5 per thousand population. Now it is not sufficient to await the compilation of results of surveillance at the end of the year but data resulting from surveillance operations must be evaluated at least month by month. The situation should be judged not only by the number of cases found but also on the results of investigations carried out showing whether among these cases indigenous cases had occurred. The epidemiological investigation of every case found is an essential condition of surveillance operations. A few occasional indigenous cases may be tolerated if they are confined to well circumscribed small foci in which immediate action (foci spraying, mass treatment etc.) has remedied the situation as definitely proved by continuous close observation of such a focus. In general the situation in an area in the consolidation phase should show a steady improvement leading towards the situation expected in the maintenance phase. In the maintenance phase it is required that not only no local transmission should have taken place for the past three years but also that the residual parasite reservoir (i.e. any malaria infections found through surveillance) has reached practically zero level (only the occurrence of a few odd imported and even less sporadic cases being permissible). If a trend towards this situation fails to materialise during the consolidation phase, the position may have to be drastically reviewed and possibly spraying be reinstated in some areas.

4. How to assure radical treatment of cases found

It cannot be stressed often enough that the purpose of surveillance is not only to obtain evaluation data (malaria detection) but that based on the findings through malaria detection activities, the epidemiological investigation and the radical treatment of cases found is absolutely essential. The radical treatment of P. vivax and P. malariae infections consists of a protracted course of drug administration, the most generally adopted course being three days of treatment with four amino-quinolines and two weeks' treatment by daily doses of Primaquine. In many projects it has been found that the practice was to give to the patient the total amount of drugs needed for fourteen to eighteen days at the time of the first visit after the finding of his positive blood slide to give the patient careful instructions as to how to take the various drugs and to rely on his compliance with these instructions without further checking. We are convinced that such a procedure will rarely result in the patient taking any drugs for more than two or three days. We consider it necessary that the patient should be revisited during the period of treatment at

least every two or three days, that is to say five or six times in the case of P. vivax or P. malariae infections. This load of visits should be carefully calculated in advance so as to employ the number of surveillance agents required not only for the basic house visits but also for the following visits for radical treatment. Here again the co-operation of any existing rural medical facilities (as mentioned in the discussion on passive surveillance) should be used to the utmost in order to reduce the workload of the surveillance agents. It is essential to explain to the patient the need of the protracted radical treatment beyond the alleviation of the first symptoms for his own benefit so that he will co-operate willingly. Not only should the radical treatment of cases be ensured in the first instance but these persons should be revisited and their blood re-examined at regular intervals for a period of six to twelve months at least. In this connection the necessity of keeping a case card register in every district from the end of the attack phase onwards should be mentioned.

5. The microscopist's burden

While the devising of the best suited system of surveillance in a given project requires a good deal of epidemiological knowledge and thinking as well as organizational talent, the taking, staining and examining of blood slides would seem to be, in comparison, a simple, straightforward matter. Reality has shown, however, that in some projects, systems of surveillance have been well set up and the field personnel and supervisory personnel have worked very satisfactorily, yet the end results have been most disappointing since it was found that the microscopists available were not able to cope with the number of blood slides and thereby a huge backlog of unexamined slides had accumulated. Such a fact alone defeats completely the very object of surveillance. In many other projects microscopic examination of blood slides would have seemed satisfactory if judged by the number of slides examined and the minimal backlog. On further investigation, however, one would find that blood slides were badly taken, contaminated with dust, badly stained and incompetently examined and conclusions based on the results of such examinations would therefore be greatly decreased in value. In planning surveillance operations, a rough estimate must therefore be made from the very beginning of the load of blood slides expected for microscopic examination, and a sufficient number of microscopists trained well in time to cope with this work from its start. As a very rough guide it may be assumed that the number of slides to be examined per year in full surveillance operations (mainly fever cases, but also some additional checking surveys) will amount to a figure of about 10% of the population. The number of slides that could be examined daily by one microscopist may be calculated as forty to fifty under bad to medium conditions and up to sixty or seventy under very good conditions. "Good conditions" is here defined as a large laboratory where several microscopists work at the same time, where the staining can then be done most economically by a special employee and where

electric light, good water, chemicals and other laboratory conditions are available. Wherever good communications make it possible to concentrate the examination of blood slides in a few large laboratories this is therefore a recommended procedure. Communications (for sending blood slides and information) must, however, be good enough to ensure the arrival of blood slides in one direction and communication of results in the other direction within one to two days. Wherever such conditions do not pertain microscopic examination will have to be organized on the basis of single microscopists working in simple field laboratories or a corner of a malaria eradication sector office in the periphery. While in a large laboratory supervision is no problem, in the latter situation regular supervision of the isolated peripheral microscopist by an itinerant senior laboratory technician is absolutely essential.

The "microscopist's burden" is created not only by the large number of blood slides that have to be examined but also by the fact that in the conditions of the consolidation phase the vast majority of the slides are negative and the few positive slides are apt to have very low parasite densities. In order to facilitate the work of the microscopist in this situation, cleanliness of slides and blood smears and good staining are far more essential than in a situation of malarionetric sample surveys. To describe methods ensuring the taking of clean, good blood smears and good staining is beyond the scope of these notes. Some very basic and useful advice on these matters is given in a presentation of the technique of collection and examination of thick blood films, in WHO/Mal/232 of the World Health Organization. One of the most important and neglected points is the care to be taken to prevent the contamination of the blood smears by dust while drying. A simple tray for field use on which blood slides can be placed face downwards to allow drying in a flat position, yet protected from dust, is described and pictured in the publication referred to.