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MAINTENANCE OF SMALLPOX VACCINATION THROUGH
MULTI-PURPOSE HEALTH WORKERS
AND DUAL SYSTEM

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for South-East Asia

After the attack phase of any smallpox eradication programme has ended, the aim of smallpox vaccination activities is to keep the immunization status of the population at a satisfactory level to prevent the spread of the disease when introduced. We can presume that during a successful attack phase 90% or more of the population should be given either primary vaccination or revaccination so that afterwards the health services are obliged only to cover newborns with primary vaccinations during their first year of life and to offer revaccinations to the total population every 3-5 years. If the vaccine used during the attack phase is of satisfactory potency and sufficient population coverage is achieved, such a procedure would seem to have a sound basis from both theoretical and practical points of view.

During the attack phase of a smallpox eradication project, usually uni-purpose smallpox workers are employed. Their task, irrespective of the level at which they are engaged (whether national, provincial or district), is exclusively smallpox eradication. This smallpox staff often has a good deal of autonomy within the existing frame of the health services in regard to personnel policies, financial matters and management of supplies including vaccine, equipment and transport. This strong and semi-independent organization is undoubtedly needed if the attack phase is to achieve its goal. The successful campaign, however, followed by a decrease in the number of smallpox cases and with smallpox-free status in sight, is often combined with decrease of interest for smallpox problems from the side of government authorities, the general public and the health services themselves. At this point the question may arise whether the existing smallpox eradication organization is not too large or too expensive to carry on with this uni-purpose activity only. Consequently two approaches are usually adopted. Either the smallpox staff is engaged for discharging other duties not connected with smallpox control and is gradually integrated into the existing health services, or the preventive part of smallpox activities is transferred to other sectors of the health services. As a result of either approach, the position of a uni-purpose smallpox worker gradually disappears and the smallpox organization is absorbed by health centres, policlinics and sections for communicable diseases control of health departments.

In this way the system of a multi-purpose health worker was introduced during 1966-67 in some of the Indian States, and we had opportunity to observe recently this type of organization in Kerala and Mysore. The unit, to which the multi-purpose health workers (called basic health workers) are attached in these two States, is a primary health centre, which is responsible for curative and preventive health services within a bloc (a part of a district) with a population ranging between 70 000 and 150 000.

The staff of a primary health centre varies between 25 to 50 persons including 1 or 2 doctors and 5 to 12 basic health workers. In theory, a basic health worker should serve a population of about 10 000, but this ratio is not reached in practice and usually lies between 1 : 12 000 and 1 : 15 000.

The majority of the basic health workers were employed in the past in health programmes like malaria eradication, yaws control and smallpox. They received an in-service training of several weeks' duration during which they were acquainted with basic problems and their solutions of their future fields activity consisting of:

- (a) malaria surveillance
- (b) smallpox vaccination
- (c) health education
- (d) family planning motivation
- (e) collection of data of vital statistics for health services

The area of the bloc is divided into parts equalling the number of basic health workers employed, who have to visit every household once a month to perform the above-mentioned duties. A basic health worker spends about 20 to 25 days in the field and if we assume that the population under his care is 12 000 and that each household comprises 6 persons on an average the number of households to be visited each day is about 80 to 100. If we presume further that of his 8 working hours a day two are spent for travel purposes, no more than few minutes' time would be left for each household. In practice indeed the target of 80-100 or more household per working day is difficult to achieve. Therefore, the households are visited less often than once a month, or the basic health worker contacts the village leader, school teacher or other village officials and collects the information available about newborns, new arrivals (new-comers), sick persons etc and makes household visits on a selective basis. Of course such an approach needs a reliable source of information, close co-operation with the villagers and a good deal of authority commanded by the basic health worker himself. Then only the work carried out by the basic health worker would be reasonably effective. Therefore, smallpox vaccinations are performed during his tours at collection points rather than through house-to-house visits. Primary vaccinations are offered to newborns and to persons not vaccinated in the past and revaccinations are given to persons, who are willing to accept it. Assuming that the population of the area under the care of a basic health worker is 12 000, the yearly number of primary vaccinations to be given to newborns (accepting 40 per thousand, birth rate) is 480 and the number of revaccinations (1/3rd of the population) is 4 000 giving a total of 4 480 vaccinations per year. Accepting a real figure of 200 working days per year, the daily performance of a basic health worker should be at least 22 vaccinations, a target which we found was not at all attained in the field. From the records and reports available in several primary health centres visited it was found that the number of total vaccinations performed by the basic health workers varied during 1968 and 1969 between 2 and 14 vaccinations per working day. For recording of vaccinations performed the family register is used, which, because of its complicity, presents many disadvantages. Basic health workers report the vaccinations to primary health centres every month.

In some primary health centres the take-rates are estimated on a routine basis either by the basic health workers themselves during the field visits that follow or by health inspectors supervising their activities.

The supervision of basic health workers in the field of smallpox vaccinations lies in the hands of a health inspector employed at the level of primary health centre. This is a single post with the result the ratio of supervisor to vaccinators varies greatly (from 1:5 to 1:15), depending upon the number of basic health workers. The health inspector is responsible for programming of vaccinations, supply, storage and distribution of smallpox vaccine, collection of data from basic health workers and preparation of monthly vaccination reports for the district level.

Observations made in the field indicate that in regard to smallpox vaccination activities of basic health workers, the system may be workable if:

- (a) the higher output of vaccination per working day is attainable in practice. For the average population of 12 000 served by a basic health worker, the necessary daily performance should be 20-25 vaccinations per day. It seems that such a higher performance could be accomplished if more attention to programming and supervision were paid. In this regard increase in the number of supervisory staff to get a better ratio of 1 supervisor per 4 to 5 basic health workers might be beneficial.
- (b) the basic health worker is well trained and interested in his job with a sense of responsibility.
- (c) he is equipped with transport facilities (bicycle) which would enable him to reduce his travel time.
- (d) he is getting the necessary guidance and encouragement from the medical officers of the primary health centre, and has sufficient personal authority to influence local leaders and village officials to enlist their co-operation and support.
- (e) even though in some areas, depending upon the local circumstances an increase in the number of basic health workers might be necessary with a view to bringing down the size of the population served by them, it would appear more important to effect some improvement in their present quality of work.

In contrast to the above role played by the multi-purpose workers, the so called 'dual system', introduced in Indonesia about 40 years ago, has two distinguishing features:

1. The smallpox vaccination staff remains a separate body regardless of the phase of the smallpox eradication programme; and
2. The primary and revaccinations are performed by the vaccinators on separate tours within the same area.

It would be necessary to briefly explain the administrative division of Indonesia to have an understanding how this dual system works. The country is divided into provinces consisting of regencies, which in turn, are divided into subdistricts. The average population of a subdistrict varies between 40 000 and 80 000. For the execution of the vaccination programme within a subdistrict one vaccinator is responsible, whose sole task is smallpox vaccination. This subdistrict vaccinator is supervised from the regency level by a senior supervisor acting under the guidance of a regency medical and health officer. Time unit for the programming of both primary vaccinations and revaccinations is a quarter of a year. A vaccinator during the first eight weeks of each quarter visits all villages in his subdistrict to perform primary vaccinations of newborns only. For this purpose the subdistrict is divided into 8 zones and the population of each zone is to be covered in one week (Diagram 1). Therefore, during one year four tours for primary vaccinations are performed by subdistrict vaccinator. Assuming that the population of a subdistrict is 60 000, the number of new borns could be estimated at 2 400 per year at a birth rate of 40 per 1000. If there are 5 working days in a week, the total number of working days per quarter for primary vaccinations, i.e. 8 weeks is 40 and the number of primary vaccinations to be performed would be 600. The daily output works out to 15 primary vaccinations. The remaining 5 weeks of the quarter are devoted to revaccinations. During this round the vaccinator visits 1/12 of the area of his subdistrict covering with revaccinations all the population except newborns. In this way during one year 1/3 of the subdistrict population is revaccinated (Diagram 2). On the same basis as above, over a period of 20 weeks in a year 20 000 persons in a subdistrict would be revaccinated at the rate of 200 revaccinations per working day.

The vaccinations are at present recorded on tally sheets and reported to the regency level once a month.

This system has a great traditional support in Indonesia and its routine and systematic execution in the past was the basis of the smallpox-free status, which the country achieved in the thirties. Following the launching of the smallpox eradication programme again in 1968, this system has been reintroduced with some modifications. These modifications based upon discussions and recommendations of seminars held during the preparatory phase of the programme comprise three basic points:

(1) Primary vaccinations performed during the first eight weeks of each quarter are offered not only to newborns but also to all persons regardless of their age, who have not been successfully vaccinated previously.

(2) Repeated primary vaccinations are given during the subsequent quarter to children and adults in case vaccinations performed during the previous quarter had proved ineffective. This procedure implies the introduction of a systematic take-rate inspection during repeated visits for primary vaccinations.

(3) It is now possible for the local health authorities to decide whether to shorten or extend the period devoted to primary vaccinations or revaccinations in each quarter depending upon local needs and circumstances in relation to the actual epidemiological situation obtaining in a subdistrict.

As the backlog of unvaccinated children and adults in some areas of the country proved to be high, in accordance with 1 and 2 above, the target for primary vaccinations performed during 8 weeks tour of each quarter has increased recently.

In practice, a subdistrict vaccinator has a fixed quarterly plan for primary vaccinations as he will be visiting repeatedly the same village each quarter. This plan is submitted to village officials within a particular subdistrict, so that they know well in advance about the timing of the vaccinator's visit to the village concerned.

For revaccinations a plan for four quarters of the year is prepared, and as above, the village leaders are kept informed of the vaccinator's visit.

The dual system has proved satisfactorily workable in the past and has worked efficiently during all phases of the smallpox eradication campaign. The system is advantageous in that a well organized machinery is persisting, which can be easily run and supervised in a uniform manner. As for Java, because of its high population density, the high figure of population for one vaccinator was not a handicap. However, the following precautions would be necessary for the success of this system:

(1) Proper programming of vaccination tours and advance notice to villages to be visited. Because the plans are fixed and repeat visits are made to villages, it is not difficult to achieve this.

(2) Close co-operation of the health services at the regency level with local bodies and village officials to gain their full understanding and support for the smallpox vaccination programme and to elicit their response.

(3) Reliable vaccinator staff with the necessary sense of their responsibilities, equipped with transport facilities (bicycle) to cut the travel time to the minimum and to visit particular villages without delays, which have a deteriorating effect on the public response.

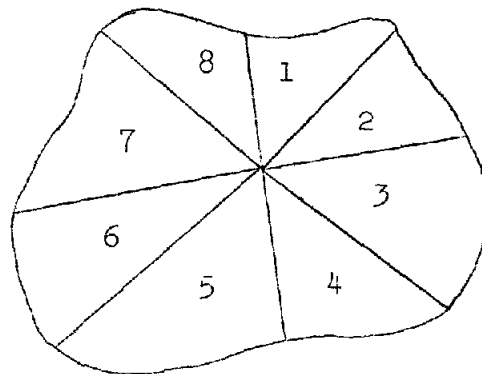
The dual system (like any other unipurpose system), seems to have distinct advantages from an organizational point of view. The system presents an uniform body concerned with a single activity, which can be planned and executed in a precise manner with clearcut duties and responsibilities and well defined lines of supervision. However, the ratio of 1 vaccinator to 50 000 or more of population is high, in densely populated areas with good communication facilities as in Java this did not prove to be a handicap. The

economy in the use of vaccine when the bifurcated needle technique is applied, is good during revaccination tour. During the primary vaccination round of visit the way to economize the use of the vaccine remains in backlog fighting and in repeated primary vaccinations of failures. After an attack phase, when the satisfactory vaccination coverage of a population is reached, the smallpox vaccinators may be given the additional task of performing vaccinations against other infectious diseases. In this regard the BCG vaccination should be taken into account. This approach might be applied to create a post of a vaccinator, responsible for the whole immunization programme. This has a disadvantage in that if a vaccinator's post is vacant, there is no one to do the task.

The system of a multipurpose health workers has on the other hand an advantage of integration of smallpox control with the existing health services, which are responsible at the health centre level for curative and preventive work. The general trend for integration is obviously a correct approach for the future development of health services. The main points represent however two questions: how many fields should be covered by a multipurpose health worker and how to exercise a proper supervision over them. There is observed in many countries that the more these duties are divergent and cover different fields, the more proper programming and supervision becomes difficult. At present in the two Indian States, referred to above, the basic health worker is active in his area in several important but distantly related field of health. This situation together with inadequate supervision implies, that a basic health worker may spend more time on problems he is personally interested in, or may tackle those problems only, in which an exact measure of his factual performance is difficult to apply.

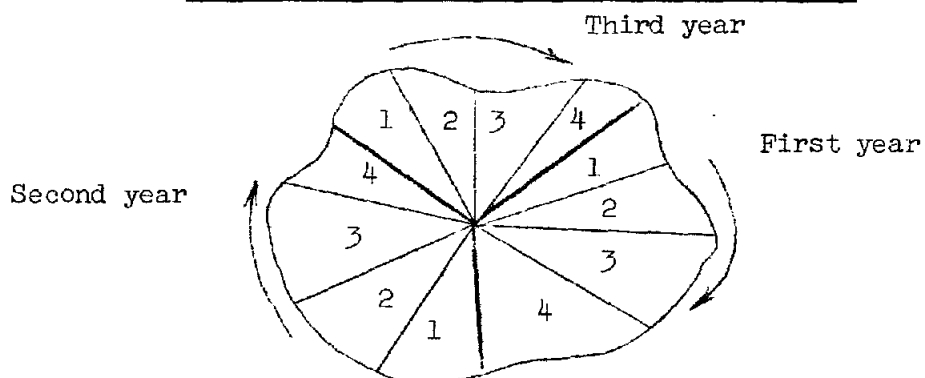
It seems that there is little doubt, that the use of multipurpose health workers for smallpox vaccinations needs further study with a subsequent assessment to establish under particular circumstances:

- the most proper set of their duties in field,
- and the best ways for programming of their multipurpose activities, concurrent supervision and assessment.

DIAGRAM 1Division of subdistrict for primary vaccinations

Weeks of each
quarter of a year

Eight zones of the subdistrict are visited during the first eight weeks of each quarter to perform primary vaccinations of newborns and persons not successfully vaccinated in the past. The whole subdistrict is visited four times every year for this purpose.

DIAGRAM 2Division of subdistrict for revaccinations

During 5 weeks of each quarter $1/12$ of the area of a subdistrict is visited for revaccination of the total population. During one year $1/3$ of the population of a subdistrict is covered. The vaccinator returns to perform revaccinations in the same area every third year.