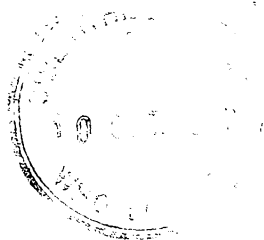


a 62456

15 September 1962

ORIGINAL: ENGLISH

Supplement to WHO/Mal/359



CONTENTS

	<u>Page</u>
1. Malaria Surveillance in the United States of America, 1961	2
2. Malaria as a Zoonosis	6
3. Total Coverage Difficulties in Spraying Operations	8

1. MALARIA SURVEILLANCE IN THE UNITED STATES OF AMERICA, 1961

In a previous supplement¹ an extract of Malaria Surveillance, Annual Summary 1960, issued by the Communicable Disease Center of the United States Public Health Service was made. Permission has been obtained from Dr Donald T. Quick, Chief, Malaria Surveillance Unit, Communicable Disease Center, Atlanta, Georgia, United States of America, to quote from the 1961 Annual Summary.

Introduction

For the fourth consecutive year, 1958-1961, the incidence of reported malaria in the United States was less than 100 cases. In 1961 reports on 85 cases were received by the Surveillance Section, Epidemiology Branch, Communicable Disease Center. An analysis of case reports submitted by State Health Departments and the armed forces is presented in this annual summary.

A case was considered "confirmed" on the basis of a positive blood smear as determined by the State Health Department Laboratory or other approved facility. A "presumptive" diagnosis refers to cases in which clinical and epidemiological evidence suggested malaria but confirmation by blood film was lacking.

A total of 85 cases of malaria were reported in the United States in 1961. Seventy two cases were considered as "confirmed" and 13 were classified as "presumptive". Analysis of the 85 cases reveals 78 to be of foreign origin (imported); five were presumably acquired recently in the United States, three of them probably being true indigenous cases (though one of these may be a relapse) and two induced cases, and two are thought to represent recrudescences of prior illnesses (relapses). The 78 imported cases occurred among 33 civilians and 45 military personnel. Seven of these infections were diagnosed in visitors to the United States. One death was reported as directly attributable to malaria.

Plasmodium vivax was the most common parasite encountered, occurring in 60 cases (70% of the total). Plasmodium falciparum accounted for 11 cases, including the one fatality and Plasmodium malariae for three. The species was not determined in 11 cases.

¹ Supplement to WHO/Mal/324, 15 December 1961

The morbidity curve of malaria over the past four years approaches a straight line and reflects disease acquired almost exclusively beyond the borders of the United States. Ever-increasing travel both to and from this country to endemic areas may maintain the morbidity curve at its present level, with minor fluctuations depending on the progress of eradication throughout the world.

Origin of Cases

The chart shows the countries of origin of the imported cases reported. Cases originated in at least 21 countries. In nine cases exact origin was uncertain. South Korea still accounts for the majority of cases among military personnel, 36 infections being directly linked with exposure in South Korea.

Of the seven cases reported to the Surveillance Section in 1961 originating in the country, five case histories are discussed. The sixth and seventh cases, both infections caused by P. vivax, appear to reflect recrudescences of previous infections (relapses).

Case No. 1. The District of Columbia reported that a 23-year old drug addict was hospitalized in January 1961 with severe chills and accompanying fever. Blood-smear examination was positive for P. malariae. Improvement followed the use of primaquine and chloroquine therapy. The patient had not received any blood transfusions and had never travelled beyond the borders of the United States. Use of a "community" syringe for injection of heroin was admitted and the infection therefore is presumed to be due to this syringe with transfer of parasites from another infected but unidentified addict. [This can be classified as an induced case. Ed.]

Case No. 2. In April 1961 a 43-year old female was admitted to a hospital in Los Angeles for surgical correction of mitral and tricuspid stenosis. The operation was successful and she was discharged home in May. However, later in the summer she developed an illness reported as sub-acute bacterial endocarditis. She was admitted to a hospital in San Juan in August, where, for unspecified reasons, she received a series of blood transfusions. Subsequent to one of these transfusions she developed chills and fever (recurrent every 72 hours). Examination of blood smears at St Vincent's Hospital in Los Angeles revealed P. malariae. Transmission through blood transfusion may have occurred in this case which may be considered as induced.

Case No. 3. The State of New Mexico reports a case in a 31-year old female in May 1961. The blood smear showed P. vivax on examination. The patient, eight months pregnant at the time of the onset of her illness, experienced chills and fever for about one week prior to hospitalization. There was no history of previous illness resembling malaria and no blood transfusions had been received. The patient had not been overseas. From an epidemiological standpoint the source of infection in this case is unclear. The patient's husband is believed to have had malaria when in Venezuela in 1948. He subsequently returned to Venezuela in 1950 and again in 1956. His current medical status was not reported. A further complication is noted. One week approximately before the onset of the patient's illness a friend, "who had had a severe case of malaria during World War II", visited the home. Follow-up on this individual is still in process at the time of this report.

Case No. 4. During July 1961, the Oregon State Board of Health reported a case of malaria in a resident of Portland. The patient became ill on 5 July 1961, with chills and fever. Blood-smear examination revealed P. malariae. There was no history of previous illness, blood transfusions or overseas travel. The patient, just prior to her illness, had spent three days in California (visiting Sacramento, Lake Tahoe and Clear Lake, 24-26 June). Epidemiological surveys in Oregon and California, by the respective State Health Departments, failed to reveal a source of infection. In Oregon, areas known to harbour anopheline mosquitos and therefore suspect were free of this species of mosquito at the time of surveying. In California, two indigenous cases of malaria had occurred in 1958 in one of the areas through which the patient had travelled in June 1961; however, no connexion could be made as no recent or recrudescent cases are presently known in this area.

Of the four cases presented, two have been classified as indigenous in the absence of obvious overseas exposure. In two cases, numbers 1 and 2, the source of infection is presumed to be a contaminated syringe and a contaminated blood transfusion respectively, and these are classified as induced. In both these cases, the individuals transferring the malaria parasite have not been identified. Case number 4 appears to be truly a primary indigenous case, implying that the infection was contracted as a result of contact with infected mosquitos in the States of California or Oregon. However, the knowledge¹ that P. malariae is liable to persist

¹ Tigano, F. (1961) Study of transfusion malaria, Arch. ital. Sci. med. trop. 42(6), 299-314

silently for many years in an infected individual makes it possible that the patient described in case number 4 may have been infected many years previously and was last summer suffering a recrudescence of disease. Case number 3 is reported as indigenous, although several important questions relating to source of infection are still under investigation.

A fifth case referred to as presumably indigenous was reported by the State of Michigan. The patient is a 79-year old male whose blood smear was positive for P. vivax. He has never travelled outside the United States, but has had a history of recurrent fever beginning in 1946. His whole family was said to have had malaria in the 1890's while living in Virginia. A son-in-law apparently had malaria in the service in 1943. There was trouble in evaluating this case, especially as the peripheral blood smear from which the diagnosis was made was not forwarded to the Communicable Disease Center and requests for additional smears were not acknowledged. The patient also received a four times daily dose of Aralin for three months at the time of reporting. It is preferred to call this case a recrudescence of old primary infection (relapse) rather than a new indigenous case.

Summary

Eighty-five cases of malaria were reported to the Communicable Disease Center in 1961. This number, comparable with the totals for the previous three years, probably reflects a base-line morbidity for this disease in the United States.

Although relegated to the category of "notifiable disease of low frequency", malaria remains a major health problem in many parts of the world. The increasing contact with such areas, both military and civilian, implies a continuing exposure of American citizens and this fact alone is sufficient reason for continued surveillance.

Of the 85 cases reported, 72 were confirmed and 13 were presumptive. Seventy eight cases were of foreign origin (from at least 21 countries), and seven were classified as acquired within the country. One death was reported. Forty-four of the 77 imported cases were among military personnel, and 33 among civilians (seven of whom were visitors to the United States).

Of the seven cases acquired in the United States, two were considered to be indigenous cases, blood transfusion and drug addition are presumed to be the respective vehicles for infection in two cases and three other cases appeared to represent recrudescence (relapses).

Plasmodium vivax occurred in 60 cases; Plasmodium falciparum in 11 and Plasmodium malariae in three. The remainder (11 cases) were not identified with respect to type of parasite.

[This report, which has been produced annually for several years, is of particular interest as it is the only one of its kind from a country where malaria has been eradicated. It gives an opportunity to study the type of reports and information which may be expected and requested from areas in the maintenance period. Ed.]

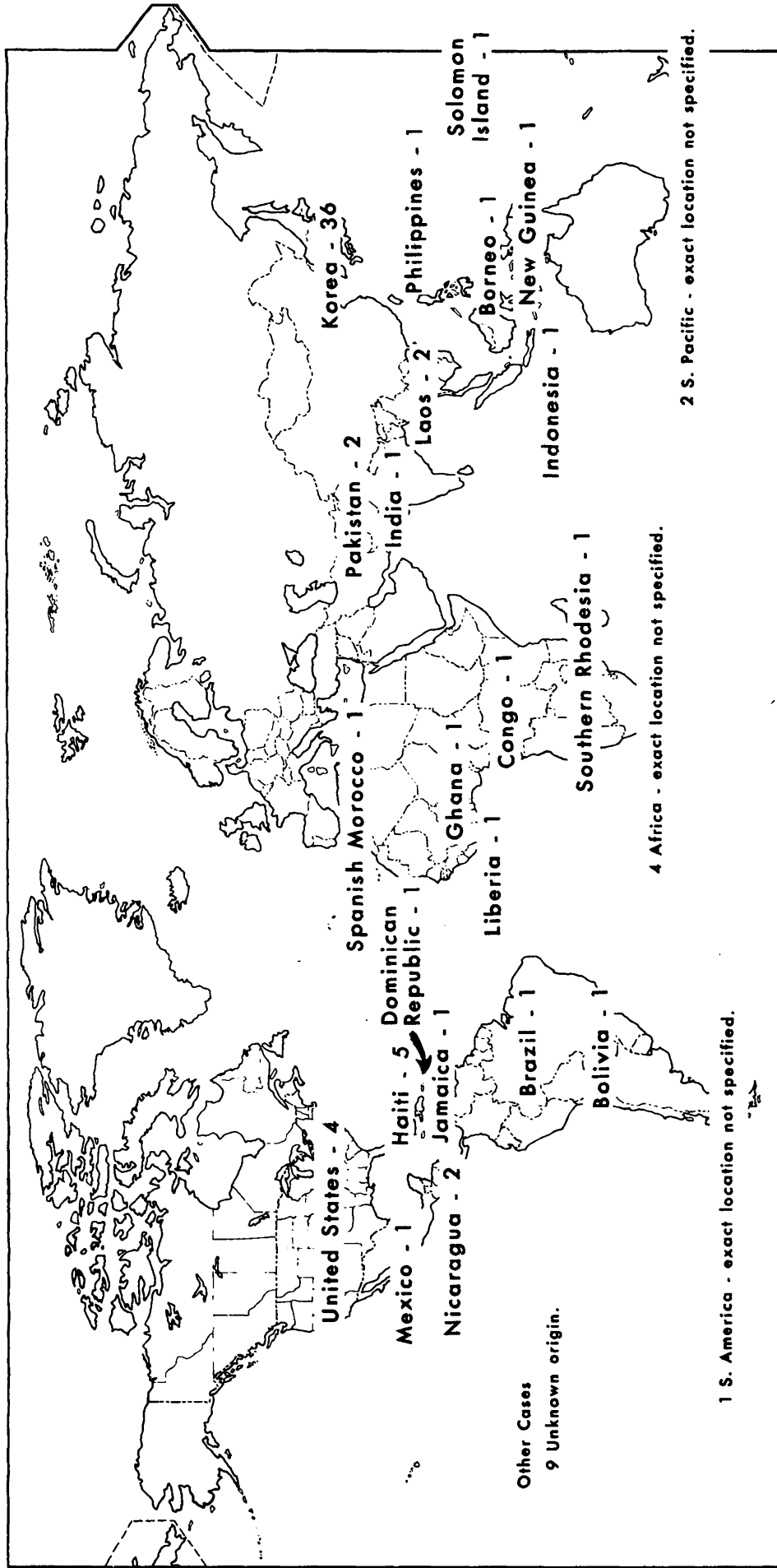
2. MALARIA AS A ZOONOSIS

The following note is based on a paper by Dr Don E. Eyles & Dr R. H. Wharton of the Institute of Medical Research, Kuala Lumpur, Federation of Malaya, which was presented to the fifth Antimalaria Co-ordination Board at Phnom Penh, Cambodia, in December 1961.

For a number of years it has been known that some simian malaria parasites can infect man. Blood-induced infections were first reported in 1932 with Plasmodium knowlesi and there are subsequent reports of infection by Plasmodium inui, Plasmodium schwetzi and other plasmodium species. In 1960 accidental mosquito-induced infection with Plasmodium cynomolgi bastianellii was reported from the United States of America. This was the first report of its kind.

Following this fortuitous occurrence a series of experiments were carried out in America with volunteers, and it was conclusively demonstrated that P. cynomolgi bastianellii would infect most men and produce clinical symptoms; it appeared that adaptation to the human host by this plasmodium does occur. It was also found that other strains of P. cynomolgi could infect man. Later it was demonstrated that simian malaria could be transmitted from man to man by means of the bite of anopheline mosquitos as well as by infected blood.

COUNTRIES OF ORIGIN OF MALARIA CASES REPORTED 1961



It therefore became established that, experimentally at least, malaria could be considered as potentially a zoonotic infection and it was felt imperative to study the problem in the field. The United States Public Health Service and the Institute of Medical Research of the Federation of Malaria initiated a co-operative project for field investigation in August 1960.

This investigation has five principal objects:

1. Studies to determine the species present and prevalence of malarias in the monkeys and apes of south-east Asia are being made, working initially in Malaya and adjacent countries, but anticipating later the extension of the work throughout the oriental range of these monkeys and apes. This work is progressing well and has resulted in many new findings including at least one distinct new species. Selected strains of malaria are being sent to laboratories in the United States where they will be used in experiments with human volunteers.
2. Vectors of the simian infections are investigated to determine if they also transmit malaria of man. In six instances it has been demonstrated that sporozoites in wild-caught Anopheles hackeri are infective to monkeys. Inoculations of sporozoites from 10 wild-caught A. maculatus, 27 A. umbrosus and two A. letifer did not produce infection in monkeys.

The results of this study have an additional practical application for the interpretation of the results of mosquito dissections in the field. There is some possibility that some vectors of human malaria are also vectors of simian malaria, thus making interpretation difficult. Already from observations it appears that A. umbrosus is not a vector of human malaria, as in several experiments sporozoites did not give rise to infection in man. There is also evidence that these infections of mosquitos are not of simian malaria, but must be from some as yet unidentified source.

3. Other studies of the epidemiology of simian malaria include investigations of the habits of the Malayan Anopheles to determine the frequency with which they are attracted to monkeys on the ground and in the canopy and to man on the ground. This is to determine if any ecological barriers exist which would block cross-transmission from monkey to man. Studies are also being carried out on the prevalence of malaria in monkeys from an ecological point of view; this information is related to the entomological data and to information on the malaria of man in the same habitat.

4. Tests of the susceptibility of the Malayan Anopheles to simian malaras are being made concurrently with the field studies. Great variations in susceptibility are being discovered, and possibly some mosquitos may be eliminated from field consideration as a result of those findings. It is interesting that the most susceptible mosquitos found are also vectors of human malaria (A. sundaicus and A. maculatus). Unfortunately, it has not yet been possible to test adequately A. balabacensis and other members of the leucosphyrus group. It is hoped in the future to make parallel studies with human malaria, as it is believed the information on this subject is inadequate.

5. Attempts are being made to determine if infections transmissible to monkeys exist in man in Malaya. To this end, blood from people who live in close association with monkeys is passed into uninfected rhesus monkeys, and these observed for infection. So far no positive results have been obtained.

Pending positive evidence that malaria infection in man may possibly be acquired from monkeys, it is considered that concern over this possibility is unwarranted.

3. TOTAL COVERAGE DIFFICULTIES IN SPRAYING OPERATIONS

At the Technical Conference on Malaria held at Teheran in May 1962, Dr A. B. Paltrinieri, Senior WHO Malaria Adviser, East Pakistan, dealt with the difficulties encountered in East Pakistan in maintaining total coverage due to factors related to physical environment or human customs and habits.

1. Related to physical environment

The territory in East Pakistan covered by the 1961 spraying operations is situated in the hyperendemic area. The importance of achieving a total coverage does not need to be emphasized. The spraying activities undertaken in 1961 practically reached this objective; according to the records, only 0.19% of the existing houses were left unsprayed.

The causes of failure are dealt with separately in two main paragraphs: first, houses not sprayed, secondly houses partially or improperly sprayed.

(a) Houses not sprayed

These include houses found closed, or unsprayed because of refusal of the owner, or simply missed.

The closed houses were routinely revisited many times during the spraying campaign, and again after its completion. They consisted mainly of shops, or of public utility buildings.

The cases of refusal reported numbered only 22 out of a total of 83 787 houses: it is evident that this did not constitute, during our first year, a serious problem. (In some cases the obstacle was not presented by private houses; but by religious buildings. This, in our area, applies exclusively to Hindu temples. Nowhere was opposition met in spraying mosques.)

The houses missed, which obviously are not reported in the final spraying report, are, according to our estimation, few. It can, however, be conceived that some houses, missed during the geographical reconnaissance operations, were consequently left unsprayed during the spraying campaign. No report mentions cases where houses missed by geographical reconnaissance were discovered during subsequent operations. Only one example of failure was reported recently from Dinajpur town, where an entire block of houses was found not numbered or mapped. This, it must be pointed out, happened in the largest town of the zone, and the error was found and corrected during the geographical reconnaissance phase. It must be kept in mind, however, that the problem of houses missed by the geographical reconnaissance operations will remain a threat to the achievement of total coverage, particularly in localities where houses are widely scattered in semi-jungle areas. This eventuality has been considered and a modification in geographical reconnaissance techniques already implemented this year will partially obviate it. The measurement of sample houses, which was in the past performed by the surveying team, will now be conducted, after the completion of geographical reconnaissance operations in a given area, by supervisors. They will be instructed to check the completeness of the work conducted by the surveying team in the selected "moja" before starting the measurement; this, in addition to their routine supervision.

New Houses: The increase in the number of houses has been found to be proportionate to the increase of population. This means that every year 23 houses are added to every existing thousand. This has not constituted a problem up to the present.

A minor problem is caused in some villages by the existence of stores, in particular those for the storage of rice, with an opening too small to permit a proper spraying of the interior. Their importance as resting places has, however, still to be demonstrated. Similarly the bamboo covers of bullock carts are usually left unsprayed when not found lying on verandas or near the houses. The same applies to the boats, which are, however, rare in the areas under operation.

(b) House partially sprayed

The average size of a room in North Bengal is 9 ft x 12 ft x 9 ft (3 x 4 x 3 m); there are variations, but on the whole this standard size is amazingly constant in the entire area. The furniture usually consists of one cot, two or three trunks or cases, two shelves, several small articles hanging from the ceiling or from the walls, baskets, cooking utensils, racks, etc. It is sometimes difficult to remove, or even to displace, all these articles which cause a considerable hindrance to the free movements of the spraymen: this can result in improper coverage of walls, corners and ceilings. Moreover the furniture itself cannot be properly sprayed. Another problem is caused by the existence in many houses of double ceilings. These are represented by a more or less complete partition of bamboo mats laid horizontally at a height of three to four metres. Apart from the height of the roof in these cases, the spraymen cannot effect proper spraying of the upper surface through the small opening usually located in a corner of the room. This applies also when the partition is only partial. In other cases no double ceiling exists in human habitations, but the roofs or walls are higher than four metres; and sometimes the double ceiling itself is above this limit. A high percentage of houses are surrounded on two or three sides by open verandas, which are usually wider in front of the house. During the hot season the dwellers, particularly those of mud houses, sleep in front of the entrance. This frontal veranda is at present being sprayed: not so the lateral wings or the eaves. The entomological findings do not indicate evidence of vectors resting on these surfaces, but further investigations are being conducted in order to ascertain definitely whether these surfaces need be sprayed.

The storage of agricultural products inside the houses is also a hindrance to the achievement of full coverage. This applies in particular to jute stocks, that are often stored for many months after the harvest. These goods are sprayed, but naturally when some are sold they leave an unsprayed surface on the remainder. Huge baskets usually containing rice or other cereals are very often found in corners or along the walls of rooms. They can be displaced only when empty, thus the part hidden by them and the contiguous surface of walls cannot be sprayed properly. Difficulties are expected to be encountered next year in the tobacco growing zones; there the leaves are hung for drying and stocked, when dried, in houses and cowsheds. Besides the technical problem of spraying the wall and ceiling surfaces in these cases, objections will probably be raised against the contamination of crops by the insecticide.

2. Related to human factors

It must not be forgotten that the sprayman is essentially responsible for the success or failure of a spraying campaign. Of course the habits and customs of the householder, or protected human being, can influence the efficacy of an otherwise perfect coverage.

On the sprayman's side, the causes for failure can be laid to

- (a) improper technique, or
- (b) carelessness.

The performance of a sprayman is not of uniform standard: some of them are excellent, some mediocre, and some inefficient or inaccurate. The majority of them work only when under strict supervision - as soon as this is relaxed they become negligent. This applies also to their squad leaders and other supervisory personnel. It is a chain reaction, the first spark very often coming from the top. The spraying campaign is conducted here during the hottest period of the year and relaxation in supervision is too often proportionate to the level of the thermometer. This subject will not be further developed here - it applies certainly to the majority of malaria eradication projects.

On the side of the householder, the factors influencing the achievement of total coverage can be broadly classified as related to personal behaviour or to family or community habits.

Outdoor sleeping is common both in villages and in towns (in a considerable number of cases mosquito nets are used) and some sort of protection is afforded by the spraying of house verandas. But often villagers travel at dusk or dawn, or during the entire night, in unprotected carts or boats.

Physical modifications to the sprayed surfaces include repairs, replastering, and whitewashing. The repairing of houses, both of mud and of bamboo, occurs to a certain extent during the entire year. The major repairs are, however, generally effected before the starting of the monsoon season; they coincide, therefore, with the spraying operation period. The part of the house that is commonly repaired or renewed during this season is the roof, which is, in general, completely replaced every three or four years. However, repairs may also be carried out on walls, particularly after cyclones or the severe north-western storms. The replastering of houses does not take place at a fixed date: in the jute growing areas it is usually conducted immediately after the monsoon, in the sugar cane areas a little later, when the cane has been sold. As a general rule it is done before the spraying season. There are exceptions to this rule: cases have been found of houses replastered after spraying, due to festivities, marriages, births, or financial reasons. In a few cases, and this applies particularly to Hindu houses, all surfaces were purposely washed and replastered after the spraying. This was also detected in some governmental or para-governmental buildings (rest houses, bungalows) where the DDT was cleaned away at the earliest occasion. Whitewashing is not generally practised. The exceptions are the "pakka" houses and even in these it is not a frequent occurrence.

More numerous and newer problems will afflict the programme in the future, when other kinds of environment will be encountered or when the enthusiasm or tolerance of the population towards the programme will have subsided. On the other hand, some of the problems enumerated above will find their practical solution with the acquisition of experience and with a better organized and more effective Health Education section. With progress of operations the programme will shortly reach the areas where the endemicity of malaria is low. Here the danger will lie in an excessive relaxation on the part of the executive and supervisory staff. The vector species being a poor one, and its density being low, the temptation of reaching only a safe percentage in coverage will be very strong. A word of warning or alarm is still premature, but it is never too early for planning prophylactic measures against the possibility.