RM
204

MALARIA CONTROL DEMONSTRATIONS.

A PRELIMINARY STATEMENT OF RESULTS OF DEMONSTRATION STUDIES, CONDUCTED BY THE UNITED STATES PUBLIC HEALTH SERVICE IN COOPERATION WITH THE INTERNATIONAL HEALTH BOARD.

The object of the demonstration studies in malaria control conducted in 1916 by the United States Public Health Service in Cooperation with the International Health Board, has been to determine more definitely the relative values of the several methods of malaria control, with especial reference to conditions in the United States, and, to establish their practical application.

As provided for in the tentative plan of procedure prepared by the late Surgeon R. H. von Ezdorf, USPHS, under whose direction the studies were begun, a division of the problem was made with reference to the "units" to be protected, and the measures to be employed; first, a "Town" or community unit, wherein anti-mosquito measures would be used, and second, a "Rural" unit, in which each house or family would receive individual consideration, and be protected through the use of screens,or quinine in prophylactic doses, supplemented by the intensive treatment of parasite,carriers,upon detection by microscopic examination of the blood.

Two localities were selected for the institution of these studies, both in southeastern Arkansas, in a section in which malaria is widely prevalent and of a high grade of severity. In both units, preliminary operations included thorough survey and mapping of the region, census of population influenced by operations. and establishment of the endemic malaria index by history and by blood examination.

TOWN UNIT, CROSSETT, ARKANSAS. DIRECTION, Field Director H. A. Taylor.

The town of Crossett is located in Ashley County, 12 miles north of the Louisiana line, at an elevatioj of 161 feet. It was built by the Crossett Lumber Company, 16 years ago for the purpose of milling the rich pine lumber of the section. The twon covers an area measuring about 1 mile by ½ mile, and is symmetrically laid out. Common water supply is universal throughout the town, and about half is equipped with sewage system.

Topographically, the country in the vicinity of Crossett is fairly flat, though undulating gently. The soil has been classed as "Richland Silt Loam," is of a fairly compact texture, and is moderately pervious. The water courses of the region consist of a number of small streams or "branches", draining, in the major, towards the east, south, and west.

Thempopulation of Crossett, as established in the sanitary census, totals 2029 persons. The following table presents a summary of tabulated census data and history index of malarial endemicity :--

CENSUS DATA .

Total Population,.....2029.

White Population,.....1139,... or ... 56.1%

Colored Population,..... 890,... or ... 43.9%

Total Number of Families,..... 463.

Total Number of Houses,..... 474.

Total Number Unoccupied Houses,..... 11.

Percentage of Houses Occupied,..... 97.6%

Average Length of Occupancy,..... 3½ years.

Average Number of Occupants per House,. 4.3 persons.

HISTORY INDEX OF MALARIA.

		Give Positive Histories of Malaria.	Index.
Total Population,	2029	503.	24.79%
White Population,	1139	254	22.30%
Colored Population,	890	249.	27.9%

The Parasite Index:- The endemic index as determined by blood examinations in Crossett was, at the beginning of operations, 9.43%. The following table exhibits a summarization of findings:-

PARASITE INDEX, MAY, 1916

	Number Examined.	Positive.	Index.
White.	336.	39	11.60%
Colored.	248.	18.	7.25%
Total,	604.	57.	9.43%

Examination of material collected for the purpose of determining the winter index, and incidentally, the change if any, following antimalarial operations, has been begun, but is as yet incomplete.

Control Operations:- In this unit, malaria control has been obtained through the exclusive use of measures directed against mosquito propagation. This has been accomplished through the training and regrading of natural streams as to secure rapid offflow, and concentration of water in bottoms, filling of borrow pits, digging of drainage ditches for the permanent removal of standing waters, and, finally, through the systematic application of oil and larvacidal substances by automatic drips and hand spraying. Artificial containers have been rendered unfit for mosquito breeding through the use of larvacidal agents, and where possible, abolition.

The following summary illustrates the extent of operations:-

Old Streams Cleared,..... 9,344 lineal yards.

New Ditch Installed,..... 3,177 " " .

Street Ditch Cleared,..... 4,844 " " .

TOTAL,.....17,365 " " .

Timber Cleared,(Second Growth,etc., Removed on Both Sides Streams)...429,626 sq.ft.

Amount of Oil Used,..... 1,353 gallons.

Area of Pond Treated,..... 1¼ acres.

Fire Barrels Controlled,..... 311.

The maintenance of the work, after installation, consisted of a second removal of accumulated vegetation, and of debris deposited after storms, etc.

It has been found that ditches of narrow cross-section cut in the type of soil found in this region, held their shape well, and were resistant to "scouring". Periodic examinations of all ditches were made throughout the active season, in connection with maintenance operations, and for especial purposes. The total yardage of ditch recleaned as a matter of maintenance was 8261 lineal yards.

Results;- The immediate results of the foregoing operations were first made apparent in an almost total eradication of mosquitoes of all varieties, and, from the beginning of May, by a progressive diminution in the incidence of malaria. In previous years, the daily calls made by thephysicians of the Lumber Company were numerous, totalling 2502 in 1915, a monthly average of 208.33. Chart #1 represents the monthly distribution of calls made for malaria in 1915, and 1916; this chart is plotted from data reported at the end of each month from the Crossett Hospital, and is an accurate index as to the amount of malaria receiving professional attention. Chart #2 represents the monthly distribution of cases of malaria in 1916, with subdivision into color and sex groups. No data are available for pases of previous years whereby comparative compilations could be made.

****

RURAL UNIT, VICINITY OF LAKE VILLAGE, ARKANSAS,

DIRECTION, Field Director T. D. Haas.

The studies undertaken in connection with the control of malaria under rural conditions, have been instituted on a number of plantations in the immediate vicinity of Lake Village, Chicot County, Arkansas, and have consisted of the use of quinine in prophylactic doses, the application of screens, and the sterilization, as far as possible, of parasite carriers by intensive quinine treatment. Throughout the eastern half of Chicot County, conditions are especially favorable for malaria, and the disease prevails to a high degree; pernicious forms and Hemoglobinuric Fevers, while not so common as in former years, are not infrequent.

The region is for the most part flat in contour, is subject to overflow, and is characterized by numerous swamps, bayous, small streams, and other water collections that provide an abundance of facilities for Anopheles propagation. Housing conditions, especially those of colored tenants, are very poor.

A summary illustrating the extent of operations, and presenting the history index of malaria in the groups under control, is given in the following table of data taken in connectionwith the sanitary census:-

CENSUS DATA.

Number of Plantations Studied,..... 10.

Number of Families,.....106.

Number of Houses,.....103.

Average Number of Rooms per House,..... 3.1

Average Length of Occupancy of Houses,..... 3.1 years.

Average Number of Occupants per House,..... 4.2 persons.

HISTORY INDEX OF MALARIA.

		Giving Positive History of Malaria.	History Index.
Total Population,	440	274.	62.3%
White population,	91	60.	6590%
Colored Population,	349	214.	61.3%

SPLEEN INDEX.

The spleen index, as taken in connection with census and original survey was taken by examination of all individuals in the controlled groups under the age of 16 years. It is of interest in connection with the other indices for purposes of comparison:-

	Number Examined.	Positive.	Index.
White	31	2	6.45%
Colored	110	2	1.8 %
Total	141	4	2.8 %

PARASITE INDEX, MAY, 1916.

	Number Examined.	Positive.	Parasite Index.
White,	79	11	13.92%
Colored,	360	60	16.66%
Total,	439	71	16.17%

Control Operations:- In this unit, malaria control has been obtained through the administration of quinine and screening. A subdivision of the total houses under control was made into several groups, and in each of these, certain standard measures were applied. Depending on their condition, the 103 homes included in this series of studies were, after preliminary survey, divided into three groups as follows:

Group A. Protection through the use of well applied screens. Such houses were selected for this group as permitted of the use of screens within economiclimits.

Group B. Protection through the issuance of quinine for prophylactic use. This group comprised such dwellings as were not considered screenable, because of defects in construction, disrepair, or undue estimated cost.

Group C. Protection through the combined use of screens and prophylactic quinine during the first half of the season.

In the three groups, parasite carriers were given intensive quinine treatment, upon discovery through microscopic esamination of the blood. A summary of the three groups follows:-

Group A:-Screen control,	32 houses.	150 persons.
Group B. Quinine Prophylaxis,	68 "	267 "
Group C. Screens and quinine,	6 "	23 "
TOTAL,....	106	440 "

(Note: Group C was merged into group A on August 1, 1916, the use of quinine being discontinued).

Screening: The use of screens as a malaria control measure has been studied during this series of demonstrations, by screening 32 houses and closely following the results. The material used for this work was Number 16 Galvanized Iron wire cloth, directly applied, in most cases, over windows, and to

door frames, built to fit in each case; chimneys were controlled by the use of "caps" of screen cloth held in place by frames.

The average costs of screening are summarized as follows:-

Materials.	
Screen Wire,	$2.48
Lumber, etc.,	2.81
Door Sets, Fittings,	.61
Nails, Screws,	.20
	6.10
Labor,	8.11
TOTAL,....	$14.21

Prophylactic Use of Quinine: For the prevention of malaria, quinine was issued to all individuals in Group B with instructions in its use. For adults, 5 grain capsules were dispensed, to be taken on two successive days in each week, preferably Saturday and Sunday, in two doses of 5 grains each, morning and evening, making a total of 20 grs. per week; for children, 3 grain capsules were used, and the emulsion of quinine in chocolate.

Quinine for Sterilization: Quinine was issued to all individuals in whom parasite were found, for purposes of sterilization; adults were given 10 grains daily, in two doses, for 30 consecutive days; no blood examinations were made upon completion of the course, determination of the diminution of carriers being provided for in a repitition of the entire parasite index at the end of the season. Examination of this material has been begun but is as yet but partially completed.

Negative Control: A control group of 17 houses and 119 peopleh has been studied throughout the season, to further determine the efficacy of the measures applied in the two control groups. A parasite index was taken in this group and it has been included in the same inspections as have been made in the groups controlled.

Results:- The results of the operations conducted in the rural unit are not as this time possible of concise statement. Despite a high incidence of malaria throught this section, very little illness has occurred on the units under control, and practically no losses of time have occurred through malaria. It has been noted that screening materials have been well taken care of, especially

by negroes, and that the issuance of quinine for prophylactic use has been productive of apparently good results.

R. K. Stevens.

Assistant Surgeon, USPHS.