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SOCIAL MEDICINE IN THE FIELD OF PEDIATRICS*

By

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INTRODUCTORY—WHAT IS OUR AIM IN CHILD-HEALTH?

Medicine, which functions to raise the level of health of the people, when applied in the service of society to create, preserve, promote and restore health assumes social characters and becomes 'Social Medicine. A very important and vulnerable component of any society in matters of health is children, especially children below five years of age. 38.5 per cent of the total population in Uttar Pradesh is formed by children below 15 years, the infant population (0—1 year) is 3.3 and pre-school population (children below 5 years) 13.3 per cent. In planning for the health of nearly 9.5 million pre-school children in this State, 86.4 per cent of whom are living in the rural areas, we need to bear in mind the wider and positive concept of health—a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. In other words, a child should enjoy at the same time physical well-being, mental well-being and social well-being. For a child to be healthy it is essential that he should not only have a healthy inheritance but should also be brought up in a healthy physical, biological and psycho-social environment. A child needs the love and security of the parents, and parents should have enough means to provide for the basic needs of the child, especially the nutritional needs. The parents should also have a reasonable level of health conscientiousness.

Social Medicine, with other child welfare agencies, can be of considerable help in developing the physical, mental and social well-being of the children. Paediatrics is largely preventive medicine, as has been stressed by Robinson (1959) in a recent address at a Conference of Paediatricians in India. It was through paediatrics that the science of nutrition was first applied to human welfare. Paediatrics was among the first of the clinical subjects to link itself to preventive medicine. It is time that it further enlarges its field, so that in association with social medicine it may build positive health for the children. A healthy child can only be developed in the home, and our activities have to provide domiciliary and follow-up services, with special stress on health education. Hospitals are essential for sick children, and relief from sickness being the first felt need of any community, needs to be given priority. But as our aim is to maintain health, and prevent disease, rather than cure, it is desirable that hospitals for sick children should adopt the philosophy of health centres to meet the needs of a health programme aiming at positive health. Once this is recognised, social medicine comes very close to paediatrics as both have the same aim. No paediatric service can be effective and complete without workers in the field of Social Medicine *viz.* Health Visitor, Public Health Nurse, Medical Social Worker and the Vaccinator.

Disease is due to the interaction between host, agent and environment. All these factors are important consideration in preventive paediatrics. A paediatrician while dealing with a disease has to bear in mind the natural history of a disease process and the five levels of prevention, *viz.* (1) health promotion; (2) specific protection; (3) early diagnosis and prompt treatment, when there is

*Read at the First U.P. State Paediatric Conference 1959 held at Lucknow on 21st and 22nd November, 1959.

demonstrable but early disease; (4) limitation of disability, when there is advanced or manifest disease; and (5) rehabilitation, to restore health and activity to normal as far as possible. Paediatrics in India has to take the five-fold responsibility of health promotion, immunisation, early recognition and prompt treatment, rehabilitation and social and clinical research in child health.

What Social Medicine Can Contribute to Paediatrics

To fulfill the concept of positive health, every child born should be considered as a potential community asset and hence need to be conserved, protected and developed. "As children go, so goes the Nation" is a well-known saying. Some of the important services for child health which need to be provided in a welfare State are:

(1) Maternity and child welfare services including facilities for immunisation through a health centre.
(2) A family planning advisory service, as size of the family influences morbidity and mortality among the children.
(3) A marriage counselling service for prevention of family failure, as this has a direct bearing on the child's mental and social development.
(4) Hospital beds for sick children.
(5) Health education and follow-up services.
(6) Child guidance clinics for problem children.
(7) Special services for physically and mentally handicapped children.
(8) Welfare services for providing, food supplements for mothers and children, and also parks, play centres, museums and libraries for children, and films for the proper emotional and physical development of children.

The Directive Principles of State Policy in the Constitution of India provide that the health of the children should receive special consideration. The Declaration of the Rights of the Child made thirty-five years ago at Geneva had said "the child that is hungry must be fed; the child that is sick must be nursed; the child that is physically or mentally handicapped must be helped; the maladjusted child must be re-educated; the orphan and the waif must be sheltered and succoured". Recently, the United Nations adopted the declaration of the rights of the child embodying ten principles considered essential for healthy development of children. It declared 'mankind owes to the child the best it has to give'.

Social action, an outcome of social experiment and social policies, may in the long run produce much better results than the opening of more hospitals which only provide emergency service and do not solve the basic problem *i.e.* the prevention of the circumstances in which the disease was produced. The importance of social action may be illustrated by a few examples. The massive social experiment on the eradication of malaria has considerably reduced the death rate and morbidity and mortality among children. Mass B.C.G. vaccination has shown how remarkably it has brought down deaths from tuberculous meningitis among vaccinated children. Protein deficiency is a common and a serious condition in the weaning period in the under-developed countries. Its advanced syndrome Kwashiorkor is not uncommon even in India where animal milk occupies a high place in the culture as an article of diet. We take great pains in treating this condition, and the treatment mainly rests on feeding with skimmed milk, but we give very little thought to ways and means of improving the nutrition of the children. No measure has played a greater part in improving the health of children in the the United Kingdom during the last 20 years than the distribution of a glass of milk and provision of a mid-day school meal.

In order to build an effective paediatric service it is necessary to ensure that maternal care is not separated from child care and that both are developed as an integrated service. There is hardly any group of population in which social medicine has made more contribution than that of mothers and children. This is reflected in the phenomenal fall in the infantile and maternal mortality rates and increase in the expectation of life at birth in the Western countries during the last three decades.

What is Our Problem?

The expectation of life at birth in India is less than 40 years, half of that in the Western countries. In Sweden in 1755-56, *i.e.* 200 years ago, the expectation of life at birth was 33 years for males and 35 years for female, which approximate to the average which we have at present. Throughout the world females have a longer span of life than males, except in India. In India, unlike the Western countries, the expectation of life at 5 years

exceeds that at birth by nearly 8 years due to the hazards of life in India which are heavy in early years. Forty-four per cent of the total deaths in India are those of children below five years of age and half of these deaths are of children under one year. In India the Infant Mortality Rate is over 100 per 1000 live births and Maternal Mortality rate 20 per cent 1000 registered births as against 17.0 and less than one respectively in Sweden. About two lakh of women die annually in India from the effects of child-birth, directly or indirectly, 35,000 are dying in Uttar Pradesh alone, and for every death from child-birth, twenty suffer from impaired health and lowered efficiency. India is passing through the stage of high birth and high death rates, birth rate and death rate being 40 and 27 respectively, which are more than double those of the Western countries.

There are very few institutions at present devoted to the care of the orphans and physically and mentally handicapped children. Rehabilitation of these children is important from three points: (1) to provide a substitute for the mother for the orphan child, (2) to give the physically or mentally handicapped child full or partial vocational independence, and (3) to give him independence in regard to his personal and social life, as in his efforts to do so he undergoes constant, continuous and severe emotional trauma.

Fields in Which Social Medicine Can Contribute to Paediatrics

We may now consider briefly the common fields in which Social Medicine and Paediatrics can undertake joint investigations and compare notes for determining problems connected with the health of the pre-school child and finding ways and means to solve them. In order to do that the first thing which we have to do is to change our outlook so that the community becomes our research, action and evaluation laboratory. Paediatrics must concern itself with the culture and problems of the community in which it serves and should place more stress on social and preventive paediatrics. The late Sir James Spence, the famous paediatrician, in his lecture "Disease in its local setting" stressed that in order to make progress in paediatrics it is necessary to see the disease in its local setting, or in its proper perspective *i.e.* "disease as it is occurring in a local community, disease seen against the background of local economic conditions, disease as it affects or as it is influenced by local conditions of life, that is, local culture". He further observed "I assume that aside from whatever institutions, such as hospitals, may be necessary for normal conditions, that is, for the treatment of disease which cannot be treated at home, the chief instrument for child welfare in modern society is, or should be, the mother, and the chief instrument for child development should be the family". His final definition was that "Paediatrics comes down to a study of all those processes which safeguard the welfare of the children, and particularly one which has been neglected to the present—the technique of motherhood".

It is needed that paediatrics adopts the concept of social medicine, *i.e.* it applies itself to the problems in the community to become an instrument of social policies.

With these suggestions I may be permitted to enumerate some of the problems in India which need the joint attention and collaboration of the departments of Paediatrics and Social Medicine.

1. *Studies of Growth and Development*

(1) Determination of average weight of a new born male and female infant.
(2) Collection of basic data on child growth and development during the pre-school age.
(3) What should be the criterion for prematurity in India? Is 2.5 k.gm., the recommended standard of minimum weight for prematurity, also applicable to India?
(4) What is the incidence of premature births and what are the causes connected with them?
(5) What is the incidence of still births and what are the causes connected with them?
(6) What is the place of play centres and parks in the physical and emotional development of children?
(7) A study on personality development among two groups of children, one group with mothers staying in the home and the other group with mothers working outside the home.
(8) The development of personality of child in two-generation (unitary) families and in several-generation (joint) families.
(9) Study on development of children in two groups, one in which children are over-protected and over-cared for and parents

are over-cautious and there is softness in regard to their rearing, and another group in which children are allowed necessary independence, and are made hardy.

2. *Nutritional Studies*

(10) The extent of malnutrition among pre-school children and causes connected with it, and how best to improve their nutrition within the economic means of the community.
(11) Studies on the acceptability and effectiveness of cheap food supplements *e.g.* skimmed milk, food yeast, multi-purpose food, soya bean and ground-nut preparations etc.
(12) Comparative study on bottle feeding as against breast feeding under Indian conditions.

3. *Cultural Studies*

(13) Studies on practices and customs connected with child-bearing and child-rearing in various classes of the society.
(14) Evaluation of methods of health education and various agencies involved in it, *i.e.* the general practitioner, the specialist, the Health Visitor, the Public Health Nurse and the Medical Social Worker.
(15) How the people use the maternity and child welfare services provided in the area and what type of other services are utilized by them and why?

4. *Studies in Infant and Maternal Mortality*

Infant Mortality Rate is one of the most sensitive indices of the level of living of a people. It can be taken as an index of the relative economic development of a country. Chandrashekhar (1959), the demographer, says "Infant mortality is a sensitive index of the total cultural *milieu* of a community or a country. It reflects the state of public health and hygiene, environmental sanitation, cultural *mores* about feeding and clothing, socio-economic development and the stage of the arts, and above all, the people's attitudes towards dignity and value of human life itself. No simple statistical index conveys so much so effectively as the infant mortality rate".

(16) What are the principal causes of morbidity disability (including accidents) and mortality in infants and pre-school children and what is their relation to the socio-economic and occupational factors; social classes; parity and size of the family; environmental factors; nutritional factors; customs, practices and values in regard to child-bearing and child-rearing in society; and the immunisation status of the children, etc.?
(17) What are the causes of high maternal mortality and how can maternal health be improved?

5. *Studies on Maternity and Child Care*

(18) What would be the most suitable and economic organisation for a comprehensive medical care programme for mothers and children (including family planning advisory services).
(19) What is the acceptance to immunisation programmes if facilities are provided: (1) in the hospitals, (2) in the health centres and (3) in the homes?
(20) How to bring about motivation for better health in the families and also to get them accept immunisation programmes against small-pox, tuberculosis, diphtheria, whooping cough and tetanus?
(21) How best to utilize the services of indigenous Dais in the rural areas? Is it possible to prohibit them from practising in urban areas or to license them after training them and taking an examination?
(22) What are the factors favouring childbirth in home or in institutions?
(23) What arrangements should be made for the care of orphan and illegitimate children with foster-parents or in social institutions?
(24) What arrangements are needed for the care and rehabilitation of physically and mentally handicapped children?

In the end let me suggest that a study may be planned and undertaken in which 1000 expectant mothers may be followed with their children up to the age of 5 years to collect data under Indian conditions on some of the problems suggested above. It would be desirable to allot to the students of Third and Fourth Years in the medical colleges of this State a family with an expectant mother in collaboration with the departments of Social and Preventive Medicine. This will help them to obtain better understanding of the relation of health and disease to the total life of the family ,and the means for maintaining normal

health. It will also enable them to appreciate the importance of socio-economic and emotional factors in the maintenance of health and the causation of disease. This project can be framed in such a way that some of the essential base-line data which we need to collect for this State can easily be got through the students and in about 5 years' time we will be able to collect information on about 1000 families with a growing child. This study of 1000 families in life will become a classical study in India like that of Sir James Spence's "A thousand families in Newcastle-upon-Tyne".

SUMMARY

1. In the building of positive health for children, paediatrics and social medicine should have a closer collaboration.
2. Present-day paediatric services are provided not only to treat the sick, but much more important, to prevent disease and children remain healthy and happy.
3. The need for social action in child health is stressed.
4. To build effective paediatric services it is important that maternal and child care should be developed as an integrated service.
5. Attention is drawn to the problems of child health in India.
6. Importance of field studies in paediatrics is stressed and a number of studies have been indicated in which social medicine and paediatrics can undertake joint investigation.
7. It is suggested that study should be made in 1000 families with expectant mothers for a period of five years in which the medical students may be involved, so that they may also benefit from studies of a family with a growing child. From the data so collected valuable statistical information would emerge.

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BACTERIOLOGICAL INVESTIGATION OF AN OUTBREAK OF FOOD POISONING DUE TO SALMONELLA NEW-PORT IN CALCUTTA

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INTRODUCTION

The importance of bacterial food-poisoning as clinical entity has not been fully recognised in India; because most of the gastro-intestinal infections are classed under diarrhoea and dysentery due to the paucity of proper laboratory investigations. One may suspect food-poisoning whenever there is violent sickness with diarrhoea, abdominal pain etc. but such cases are not generally reported by the general practitioners in our country as they can cure cases of food-poisoning usually within 24-36 hours with the help of modern drugs, only serious cases are admitted to the hospital. Thus, numerous cases of food-poisoning escape detection and do not come for any laboratory diagnosis.

On the other hand, in technically advanced countries like Great Britain, information regarding food-poisoning is now much improved because of the investigations and bacteriological work of Public Health Laboratory service. During 1956, when the Registrar-General reported receipts of 10,985 cases of food-poisoning (although Public Health Laboratory services analysed about 18,500 cases), 44 fatal cases were reported to the laboratory service. Of these, 22 were due to *Salm. typhimurium*, 13 to other types of Salmonella, 2 were due to Cl. welchii, 5 to Staphylo aureus and 2 to undiscovered causes.

Hence, it will not be improper to assume that had there been complete bacteriological services available in India, we would have been in a better position to provide data regarding bacterial food-poisoning in our country. Without such investigations, it would be unwise to say that the problem does not exist in this country.

The steady increase in the number of recorded cases of food-poisoning in the Western countries due to the Salmonella group of infection has become a potential source of danger to other countries, specially when the preserved food (which may be infected) is imported by such countries. Thus, an investigation under Medical Research Council (S.R.S. No. 260, 1947) into the bacteriology of imported dried eggs showed the presence of Salmonella organisms in 9.9 per cent of the samples and altogether 33 different strains of Salmonella were distinguished. Though the importance of some of the members of causative organisms for food-poisoning was realised as early as 1888 and 1898, yet the systematic study of the other members of Salmonella group was done only recently.

Savage (1956) in Great Britain divided the Salmonella group of organisms into two broad classes viz.,

(*i*) *Endogenous*—those which are common in that country and the sources of infection (or reservoirs) of these organisms are found inside the country e.g., *S. typhimurium, S. enteritidis, S. thompson, S. newport, S. dublin, S. cholerae-suis, S. bovis morbificans, S. derby, S. stanley.*

(*ii*) *Exogenous*—those which are recently isolated in that country after 1940 and are supposed to be introduced in Great Britain from other countries. These organisms are *S. anatum, S. montivedeo, S. oranienburg, S. bareilly, S. minnesota, S. give, S. tennessee.*

The report of the Medical Research Council (1947) stated that imported egg powder from U.S.A. resulted in four outbreaks of food-poisoning in Great Britain due to the introduction of such strains as *S. oranienburg, S. montivedeo, S. tennessee* and *S. sundasvall.*

Salmonella outbreaks, through food depend on the mode of preparation of the food. The commonest vehicles in Great Britain are meat, milk, synthetic cream and eggs. Imported egg powders are now available in India, but the frequency of food-poisoning from these sources is rather difficult to ascertain, because unless the infected egg powder is used for custard, cream filling or some similar dishes, the infection fails to occur and does not come to the notice of the health authorities. As the Salmonella organisms are killed by heat, the type of dishes like fried eggs etc. are less dangerous than the types of dishes containing custard, cream filling etc. It is high time that we should be careful about the imported egg powders which carry Salmonella as we have very recently come across an outbreak of food-poisoning in the Marine Engineering Hostel, Calcutta, where after bacteriological investigation, *S. newport* has been isolated—a type of Salmonella hitherto unknown in India as causative agent of food-poisoning. The imported custard powder has been incriminated on the basis of epidemiological investigations Bhattacharjee *et al.* (1959) as the vehicle of food-poisoning in that outbreak. Similar outbreaks in India deserve thorough investigation so that we would be in a better position to recognise newer types of Salmonellas which may be introduced in our country through the imported egg powders. The results of bacteriological investigation carried out in connection with the above outbreak are reported in this paper.

Material & Method

On 21st July 1958, cases of food-poisoning occurred with symptoms of diarrhoea, vomiting, fever, headache, body ache and abdominal pain in the Marine Engineering Hostel, Calcutta. All the cases recovered, the average period of sickness being 3 days. Some cases were admitted to hospitals. Altogether 16 samples of stool and 9 samples of blood could be collected for examination. The stool samples of all the 15 members of the staff working in the kitchen were also obtained for examination to detect if any carrier is responsible for the spread of infection through some

common food. All the available food articles, as also the containers e.g. empty tin cans etc. were bacteriologically examined.

Examination of Stool

Each sample was (1) plated directly on S. S. Agar media and incubated at 37°C for 24 hours; (2) a loopful of stool was placed in the tetrathionate broth for enrichment. After incubation at 37°C for 24 hours, S. S. Agar plate was inoculated.

The lactose fermenters were overlooked and non-lactose fermenters were further studied. The rate of isolation from direct plating and after enrichment in tetrathionate broth has been tabulated in Table I.

Table—I

Serial No.	Tetrathionate Broth Culture		S.S. Agar Plate from Tetrathionate Broth		S. S. Agar Direct Plating		Remarks
	24 hours	48 hours	24 hours	48 hours	24 hours	48 hours	
1	Turbidity		n.l.f.* colony.		n.l.f. colony.		
2					n.l.f. colony.		No growth in S.S. agar from T. broth.
3		Turbidity	n.l.f.		,,	n.l.f.	
4	,,		,,				
5	,,		,,		l.f.		n.l.f. after enrichment.
6	,,		,,		n.l.f.		
7	,,		,,		l.f.		n.l.f. after enrichment.
8	,,		,,		n.l.f.		
9	—	,,	,,	—	l.f.		,,
10	—	—	—	—	,,		
11	—	—	—	—	,,		
12	Turbidity		n.l.f.				
13	,,		,,		l.f.		,,
14	,,		,,		n.l.f.		
15	,,		,,		l.f.		,,
16	,,		,,			n.l.f.	
Staff:							
17		Turbidity	,,			,,	
18	—	,,	,,			,,	
19	—	,,	,,		n.l.f.		Formed pigment in the media.
20	—	,,	,,		,,		
21	—	,,	,,			n.l.f.	
22	—	,,	,,			n.l.f.	
23	—	,,	,,		n.l.f.		
24		,,	,,		,,		
25	Turbidity		,,		,,		
26	—	—	—		l.f.		
27	—	—	—		l.f.		
28	—	—	l.f.		l.f.		
29	—	Turbidity	l.f.		n.l.f.		

* Non-lactose fermenter.

For further study of the organisms the colony characters, morphology, motility, staining character and sugar fermentation reaction with lactose, sucrose, glucose, maltose, arabinose and inosite were noted. The results are tabulated in Table II.

Table—II

Acute cases	Motility	Lactose	Sucroses	Glucose	Maltose	Mannite	Xylose	Inosite	Arabinose
1	+	—	—	AG	AG	AG	AG	—	AG
2	+	—	—	AG	AG	AG	AG	—	AG
3	+	—	—	AG	AG	AG	AG	—	AG
4	+	—	—	AG	AG	AG	AG	—	AG
5	+	—	—	AG	AG	AG	AG	—	AG
6	+	—	—	AG	AG	AG	AG	—	AG
7	+	—	—	AG	AG	AG	AG	—	AG
8	+	—	—	AG	AG	AG	AG	—	AG
9	+	—	—	AG	—	—	AG	—	—
10 }	+		Lactose fermenting colonies.						
11 }									
12	+	—	—	AG	AG	AG	AG	—	AG
13	+	—	—	AG	AG	AG	AG	—	AG
14	+	—	—	AG	AG	AG	AG	—	AG
15	+	—	—	AG	AG	AG	AG	—	AG
16	+	—	—	AG	—	—	—	—	—
Staff									
17	+	—	AG	AG	AG	AG	—	—	AG
18	+	—	—	—	—	—	—	—	—
19	+	—	—	—	—	—	—	—	—
20	+	—	AG	AG	AG	AG	AG	—	AG
21	+	—	—	AG	AG	AG	AG	—	AG
22	+	—	—	AG	AG	AG	AG	—	—
23	+	—	—	AG	AG	AG	AG	—	AG
24	+	—	—	AG	AG	AG	AG	—	AG
25	+	—	—	AG	AG	AG	AG	—	AG
25	+	—	—	AG	AG	AG	AG	—	AG
26 }	+		Lactose fermenter colonies						
27 }									
28 }									
29	+	—	AG	AG	AG	AG	AG	—	AG

The serological reactions with group and type specific sera were then carried out, the results of which are tabulated in Table III.

EXAMINATION OF BLOOD

9 samples of blood were obtained from the

Table—III

Testing organism against Diagnostic Sera.

Serial	Poly valent Salmonella "H" Serum	Poly valent Salmonella "O" Serum	New port "H" Serum	S. New port "O" Serum
1	+	+	+	+
2	+	+	+	+
3	+	+	+	+
4	+	+	+	+
5	+	+	+	+
6	+	+	+	+
7	+	+	+	+
8	+	+	+	+
9	—	—	—	—
12	+	+	+	+
13	+	+	+	+
14	+	+	+	+
15	+	+	+	+
16	—	—	—	—
17	+	+	—	—
18	—	—	—	—
19	—	—	—	—
20	—	—	—	—
21	+	+	—	—
22	+	+	—	—
23	+	+	—	—
24	+	+	—	—
25	+	+	+	+
29	—	—	—	—

patients who were admitted in the hospital, but no stool sample was available for examination. Each serum was tested with all the organisms isolated from the stool of other patients. The results are tabulated in Table IV.

As the blood samples were obtained after full recovery of the patients, it was not necessary to culture them. Paired blood samples of all the patients were not available, and hence a comparative study of the rise of antibody titre could not be made.

Table—IV

Organisms isolated from sample No.	Sera a	Sera b	Sera c	Sera d	Sera e	Sera f	Sera g	Sera h	Sera i
1	+	+	+	+	+	+	+	+	+
2	+	+	+	+	+	+	+	+	+
3	+	+	+	+	+	+	+	+	+
4	+	+	+	+	+	+	+	+	+
5	+	+	+	+	+	+	+	+	+
6	+	+	+	+	+	+	+	+	+
7	+	+	+	+	+	+	+	+	+
8	+	+	+	+	+	+	+	+	+
9	—	—	—	—	—	—	—	—	—
12	+	+	+	+	+	+	+	+	+
13	+	+	+	+	+	+	+	+	+
14	+	+	+	+	+	+	+	+	+
15	+	+	+	+	+	+	+	+	+
16	—	—	—	—	—	—	—	—	—
17	—	—	—	—	—	—	—	—	—
18	—	—	—	—	—	—	—	—	—
19	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—	—	—
21	—	—	—	—	—	—	—	—	—
22	—	—	—	—	—	—	—	—	—
23	—	—	—	—	—	—	—	—	—
24	—	—	—	—	—	—	—	—	—
25	+	+	+	+	+	+	+	+	+
29	—	—	—	—	—	—	—	—	—

(+) = Agglutination.

EXAMINATION OF FOOD & FOOD CONTAINERS

All left over food and also washings from food containers were inoculated into the different media as follows: (1) Direct plating to S. S. agar media, (2) Enrichment in tetrathionate broth followed by plating in S. S. agar, (3) Blood agar, (4) Cooked meat media for anaerobic culture. The results are tabulated in Table V.

Table—V

Food and containers	Isolated organisms	
	Aerobic culture	Anaerobic culture
1. Custard powder	Chromogenic	—
2. Cream	-do-	—
3. Bari curry	-do-	—
4. Sag—dal	-do-	—
5. Empty pine apple tin cans	spore bearing bacilli	—

COMMENTS

For the purpose of isolation of organism from stool, enrichment by tetrathionate broth was definitely found to be helpful from the bacteriological point of view. From Table I, it will be evident that 5 samples showed non-lactose fermenter only after enrichment. The sera of all the 9 cases from whom only blood samples were available, agglutinated readily with the common isolated organism later identified as *S. newport*. Blood samples of other subjects were not available for examination. The present study therefore reveals that food-poisoning may occur in India from an exogenous type of Salmonella infection as was found in the present outbreak where *S. newport* was responsible for the food-poisoning. Though in this outbreak the vehicle of infection remained undiscovered because of the non-availability of the most of the suspected items of food for bacteriological examination, yet an epidemiological grounds as reported by Bhattacharjee et al (1959), a particular type of food made from the imported custard powder was found to be responsible for infection as the symptoms of poisoning were confined to those who took that particular food. No pathogenic organisms could, however, be detected in the other samples of food consumed by them and in the containers on both aerobic and anaerobic cultivation. The food sample actually responsible for the infection was not available for bacteriological examination. During our routine bacteriological examination of stool samples of the members of the staff only one gave positive result. This person could neither give any history of his illness, nor the follow up of this case was possible for us.

As regards the bacteriological procedure, tetrathionate broth was found to be more effective than S. S. Agar (freshly prepared) media. The reason for this may be that former medium contains enrichment which is helpful for isolation of Salmonella group of organisms in the sub-acute state of infection, but in the acute stage of infection, organisms could be isolated from the stool by S. S. Agar medium.

As regards the bio-chemical tests the isolated organism did not ferment lactose, sucrose and inosite, while rest of the sugars were fermented with the production of acid and gas. Incidentally, we found *S. enteritidis* and *S. newport* as biochemically identical. Later, other bio-chemical tests were employed with following results. Salicin — negative, H_2S — positive, Indol — positive, Dulcite — positive, Adonite — negative, Sorbitol — negative. Thus, the serological test was found to be more reliable for laboratory diagnosis of Salmonellosis. The organism was identified by using Polyvalent 'O' and 'H' sera against Salmonella, followed by 'O' and specific 'H' sera against *S. newport*. A need is therefore felt for establishment of a Salmonella reference laboratory in India which would be very useful for proper diagnosis of food-poisoning outbreaks in this country.

In India the incidence and prevalence of Salmonellosis in man has been studied by Hayes and Freeman (1945) reporting chiefly the following serotypes of Salmonella, viz. *S. typhi, S. paratyphi A, B and C, S. enteritidis, S. typhimurium, S. dublin, S. anatum, S. virchow, S. cholerae-suis* etc. With the exception of *S. typhi* and paratyphi A, B and C, the rest were all responsible for severe or moderate incidence of food-poisoning.

Recently Ganguly (1958) reported various Salmonella serotypes of human origin, isolated and identified during the period of '1950-57' at Poona from sources in and outside Poona. Organisms isolated are: *S. anatum, S. banana, S. bovis-morbificans, S. bareilly, S. cubana, S. Chester, S. enteritidis, S. london, S. morehead, S. orion, S. para typhi C, S. reading, S. typhi-murium, S. virchow, S. weltevreden,* but no *S. newport* was isolated in his series of cases. As regards Salmonellosis in animal sources, work was carried out in India by Shirlaw (1935), Rao (1946). Salmonellas are found in a very wide variety of animals and birds with some evidence of host selection. Uptil now 32 types of Salmonella from different sources have been isolated and identified in this country, including *S. newport*, but this organism has been reported by Khera and Dhanda (1958) from buffalo and cow calves only. In England and U.S.A., apart from the human sources, *S. newport* has been isolated from rats by Khalil (1938), from chicken and turkey by Edward (1959) and from imported spray/dried egg powder from U.S.A. (M.R.C. 1947).

CONCLUSION

This is the first time that *S. newport* has been found to be the causative organism of bacterial food-poisoning in human cases in India.

Our thanks are due to Shri Jnan Majumder for his technical assistance.

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INFECTIOUS HEPATITIS IN THE GOMOH RAILWAY COLONY (BIHAR), 1959

By

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An epidemic of jaundice was reported from the Gomoh Railway Colonies (Bihar) by the Railway authorities between January and May, 1959. An investigation of this outbreak was undertaken by the authors under the auspices of the Epidemiological and Virological Unit of the Institute at the instance of the Director General of Health Services Government of India. The results are reported in this Communication.

AREA AND POPULATION INVOLVED

The Gomoh Railway colony is situated on either side of the Railway line passing through the Gomoh station in District of Dhanbad, Bihar. The Railway Station is a junction of the Eastern and South-Eastern Railways. The area is 0.85 sq. mile or 529.45 acres. The colony is surrounded by villages on all sides except the north which is covered by a range of hills continuous with the well-known hill of Parshnath. There are 12 residential sectors follows: (1) B.N.R. Colony, (2) Sickline colony, (3) Pahartoli colony, (4) B. type colony, (5) Anglo-Indian Colony, (6) Central Colony, (7) Loco Colony, (8) Sainik Colony, (9) Durgapara Colony, (10) West Central Colony, (11) Jungle Kothi Colony, and (12) Sweepers Colony (see map).

The total population of the colony was 11,064, consisting of the railway employees and their family members. There were 4,034 employees of which the largest majority was living in these colonies and a few in the village around. The total population of Gomoh including that of the villages (6,314) was 17,378.

GENERAL PHYSIOLOGY

The soil is rocky and the country is arid and wears a barren look. The altitude of Gomoh is 744 ft. above the sea level. There is hardly any agricultural enterprise although the average rainfall is 45 inches. The average maximum and minimum temperature are 112° and 20° F respectively. The maximum humidity is 85 per cent and the minimum 15 per cent.

There are three distinct seasons, the summer, the rains, and the winter covering about 9 months, the rest of the period being evanescent and tending to merge with the nearest

season. The rainfall records for the last five years were as follows: 1954—39″; 1955—31″, 1955—60″; 1957—39.66″ and 1958—53.9″ average—44.64″.

CONDITIONS OF SANITATION IN THE AREA

Sources of water supply

Several kinds of sources are utilised for the supply of water in the Gomoh Railway Colonies:

(A) *Filtered Water*

About a mile from the station towards the North-West an embankment has been placed across a channel at Chowrapatty to collect upland surface water. This area is not, however protected and hence subjected to pollution by men and animals. From here the water is directed to the lower Chowrapatti to a tank from which it is pumped to the filtration station fitted with rapid sand filter. The water filtered after coagulation with alum-ferri is treated with chlorine from a chloronome (Paterson & Co.) before supply. The chlorine contents is supposed to be maintained at 0. parts per million at the source, which gets reduced to 0.3 parts per million at midway and to 0.1 part per million at the furthest supply point.

The rate of filtration is 5,000 gallons per hour. Out of the total output of 1,20,000 gallons per day 1,05,000 gallons are supplied through taps distributed throughout the colonies and the rest is used for washing the filter beds and also accounts for the loss due to wastage, loss of head etc. The average supply is only 10-11 gallons per head per day and being also intermittently opened for a short duration (half hour in the morning and half hour in the evening) it is very much deficient for all practical purposes and the people are forced to procure water from other available sources which are obviously contaminated.

Another important point noted in this connection is that according to the report of the Chief Medical Officer dated 24th October, 1958, the water from the filtration plant was being supplied without chlorination for a pretty long time. It was, however, resumed sometime before the present investigation on or about March, 1959.

It may also the mentioned here that in the Loco shed of the Railway there is no reservoir of water for drinking purposes, and the Sickline Colony is supplied with unfiltered taps and wells.

(*B*) *Unfiltered water*

From the upper Chowrapatti bund, unfiltered water is supplied through another main to the overhead tanks at Loco shed to supplement the water from Gomoh Nullah and to the Railway Colonies for domestic use including water for the gardens. This was an additional supply to meet the shortage. The capacity of supply per hour is 15,000 gallons. In most of the colonies the unfiltered water taps are provided along with the filtered taps. Naturally any requirement of water including drinking, after the filtered water tap is turned off is met by the unfiltered and unchlorinated water.

This supply was withdrawn from the Sickline Colony on suspicion that this unfiltered water supply was probably responsible for the spread of infection. The investigating party was informed that this unfiltered water supply would also be withdrawn from other colonies.

(C) *Wells*

In addition to the above there were 41 fully or partly covered masonry wells fitted with pulleys, in the Railway Colonies. Their depths varied from 30 to 52 ft. and the water columns in them from 8 to 15 ft. according to season. Only two of them dry up in summer. In the rest, water is available at all seasons. It may be stated here that inspite of the pulleys and parapet the people disregard the instructions and use individual buckets and thus pollutes the wells. The authorities were, recently chlorimating these wells regularly with bleaching powder.

(D) *Gomoh Nullah*

Gomoh nullah is a slender stream coming down the hills. It dries up in summer. Water from the loco-tank (see map) as well as the waste water from the town is allowed to flow down here. It has the capacity to hold about 120 lakh gallons of water. From this source water is pumped up to the overhead reservoirs which also receives some unfiltered water from Chowrapatti to supply water for the engine tenders for generation of steam, as well as to hydrants in the yard for carriage washing and fire-fighting. This water after settling in the overhead tanks gets settled and when supplied to the engines looks sparkling and resilient and tastes well enough to give the drinker of it a false notion of safety.

It may, however, be added that this nullah is subject to excreta pollution by the

DR. No.- S/201.

MAP OF GOMOH RAILWAY COLONY

SHOWING INFECTIVE HEPATITIS CASES.

1959.

NOT TO SCALE.

N
W E
S

UPPER CHOWRAPATTI CAP: 700 LAKHS GALL.

CHOWRAPATTI VILLAGE

RANGE OF HILLS

VILLAGE KANADIANALIAS MARKOCHO

VILLAGE BISHNUPUR

VILLAGE KANADIN

VILLAGE BISANPUR

RLY. BOUNDARY

BR. NO. 72

CAP: 260 LAKHS GALL.

CHOWRAPATTI

BR. NO. 71.

SUB-STATION

PUMP HOUSE

PUMP HOUSE

VILLAGE CHOWRAPATTI

VILLAGE BISHNUPUR

JUNGLE KOTI COLONY

'B' TYPE COLONY

RLY.

RIAL COLONY

WEST C E

BOUNDARY.

PAHAR TALI COLONY

DURGA PARA COLONY

CENTRAL COLONY

E OF STAN BUILDING

GROUND TANK 130 LKS. GALLS.

RLY. BOUNDARY.

H W H

TOWARDS ADRA

TOWARDS BARKAHANA

B.N.R. COLONY

BOUNDARY WALL

LOCO SHED

GOMOH NALA CAP: 120 LAKHS GALL. DAM

L C C COLONY

SICK LINE COLONY

VILLAGE BISHNUPUR.

VILLAGE GOMOH.

ANGLO INDIAN COLONY

CHURCH ROAD.

VILLAGE GOMOH

SAINIK COLONY

SWEEPER'S COLONY

LOCO BAZAR

VILLAGE GOMOH

VILLAGE KHESMI

VILL. JITPUR.

ALTITUDE ..... 774·00 M.S.L.

AREA OF GOMOH RLY. COLONY } 0·85 Sq. MILE

INDEX.—

INFECTIVE HAPATITES CASES = ●

people using it for ablution purposes after defaecating nearby.

(E) *Loco tanks and its use*

The Loco tank is a ground reservoir of the capacity of 130 lakh gallons, meant specially to supply the water for engine tenders, hydrants for fire-fighting and carriage washing. Water from this tank is led to the Gomoh nullah described above and is pumped up to an overhead reservoir from which the distribution is made as mentioned above. This Loco tank is also subjected to human and animal pollution from bathing and ablutions etc.

The distributions of different kinds of water supplies and types of latrines provided in different railway colonies are given in Table I.

Table—I

Distribution of types of water supply and latrines in different colonies

Name of the colonies	Approx. population	No. of quarters	Description of quarters	No. of taps	Open for	No. of wells	No. and types public of latrine
Sickline	905	181	2 rms— 54 Units. 1 rms—137 ,,	18 unfiltered water tap. No filtered water tap	Now discontinued	6 (6 ft.) masonry	8 seated septic tank and 43 aqua privies.
Anglo-Indian	110	22	4 rms— 1 ,, 3 ,, — 10 ,, 2 ,, — 6 ,, 1 ,, — 5 ,,	All quarters provided with filtered water taps	½ hr. morning and ½ hr. evening	6 (6′ diam) masonry	4 seated service latrine
R.P.F. Barrack (Sainik colony)	140	19	20 rms— 3 ,, 1 rms— 16 ,, (family type)	9 filtered water taps	-do-	Nil	4 seated septic tank latrine.
Loco	1485	297	1 rms—267 ,, 2 rms— 30 ,,	55 filtered tap	-do-	4 partly covered 1-6′ drain-1 3-7′ ,, 3	3 service latrine with 20 seats.
Central East	1105	221	1 rms—177 ,, 2 rms— 40 ,, 3 rms— 4 ,,	59 filtered taps	-do-	4 masonry 1-7′ diam. 1-8′ ,, 2-6′ ,,	3 service latrine 12 seated.
Central West	355	71	1 rms— 3 ,, 2 rms— 58 ,, 3 rms— 8 ,, 4 rms— 2 ,,	17 f.w. taps inside taps.	-do-	11 partly covered 7-6′ diam. 4-7′ ,,	Private latrines.
Durgapara	820	164	1 rms—101 ,, 2 rms— 63 ,,	33 f.w. taps	-do-	4 partly covered 1-4′ diam. 1-5′ ,, 1-8′ ,, 1-10′ ,,	8 seated septic and 2 service latrines with 12 seats
B type	325	65	All 2 roomed	All provided with inside taps	-do-	1	Private latrine
Jungle-Kothi	45	9	Office Bunglow-1 2 rms— 2 units 2 rms— 2 ,,	6 f. w. taps	-do-	2	-do-
Pahartali	495	99	1 rms— 45 ,, 2 rms— 54 ,,	15 f.w. taps	-do-	2	-do-
Sweeper's	180	36	1 rms— 19 ,, 2 rms— 17 ,,	7 f.w. taps	-do-	Nil	5 seated septic tank
B.N.R.	100	20	2 rms— 12 ,, 2 rms— 8 ,,	No tap water	—	1 5′ diam.	No latrine

From the data given in Table I it is apparent that the water supply was very insufficient, particularly because the supply was not only intermittent but the duration of supply was for only one hour in the whole day. Necessarily the people had to use other sources. Towards the latter part of this outbreak water sources were suspected and since then all the wells were being treated weekly with bleaching powder and daily from 10.3.59 onwards.

(F) *Water supply in the affected villages*

The only source of drinking water in the village is the well, distributed sparingly in the villages.

Disposal of Night Soil

The Railway colonies are provided with three types of latrines namely,

(1) Bucket type service latrine.

(2) Septic tank type, and

(3) Aqua privy—a simplified type of septic digestion latrine—Their distribution in different colonies is given in Table I. In addition to the above latrines the following places are also supplied with latrines as specified against each of them.

1.	Third Class Waiting Hall	...	16	seated	septic tank	
2.	Watchman para ...	...	8	,,	,, ,,	
3.	West side up platform	...	6	,,	,, ,,	
4.	East side up platform	...	6	,,	,, ,,	
5.	South running room ...	...	4	,,	,, ,,	
6.	West running room ...	...	4	,,	,, ,,	
7.	G. R. P. Barrack ...	...	3	,,	,, ,,	
8.	East running room ...	...	3	,,	,, ,,	
9.	Loco shed ...	...	2	,,	,, ,,	+ 4 seated service type
10.	Loco Formeman's new office	...		,,	,, ,,	
11.	East cabin ...	...		,,	,, ,,	
12.	West cabin ...	...	2	,,	,, ,,	
13.	A. E. N's office ...	...	2	,,	,, ,,	
14.	Railway hospital ...	...	1	,,	,, ,,	
15.	Old I.O.W's office ...	...	2	,,	service latrine	
16.	Indian Institute ...	...	1	,,	,, ,,	
17.	Primary School ...	...	1	,,	,, ,,	

There are 285 service latrines in the quarters of Class III staff. These are cleaned by private sweepers employed by the employees on monthly payment and the arrangement is not at all satisfactory. It will also be seen that several places are not provided with any latrine at all. This absence of latrine, as well as its shortage compels a large number of people to defaecate in the field and open drains and channels nearby. Some people are, however, habituated to use the fields and would not use the latrines even when these are provided for them. The villages around have, however, no latrine and all of them use the open fields or bushes around.

From the service type of latrines night soil is carried to one trenching ground on the west side of the railway line. It is a small place without any boundary wall or fencing and the place is not at all an isolated one. The inspection of this ground revealed that the method of disposal needed a lot of improvement.

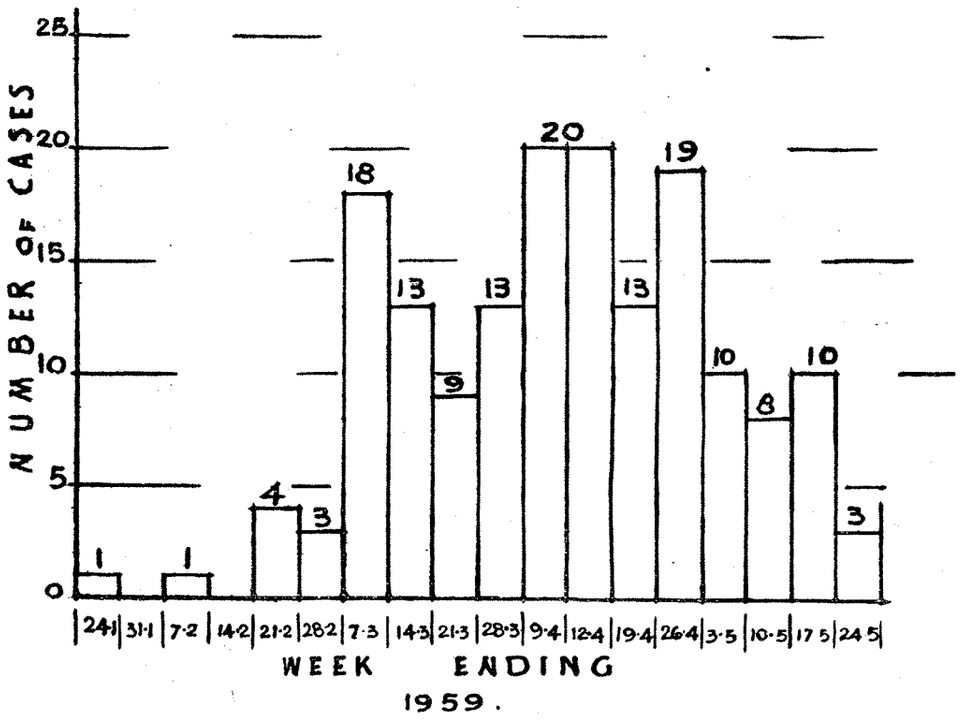
Disposal of Refuse

There are two dumping grounds close to the quarters for the disposal of refuse. Here night soil from the latrines which are not serviced under the railway supervision is also dumped causing nuisance and fly breeding.

General Cleanliness and Insects

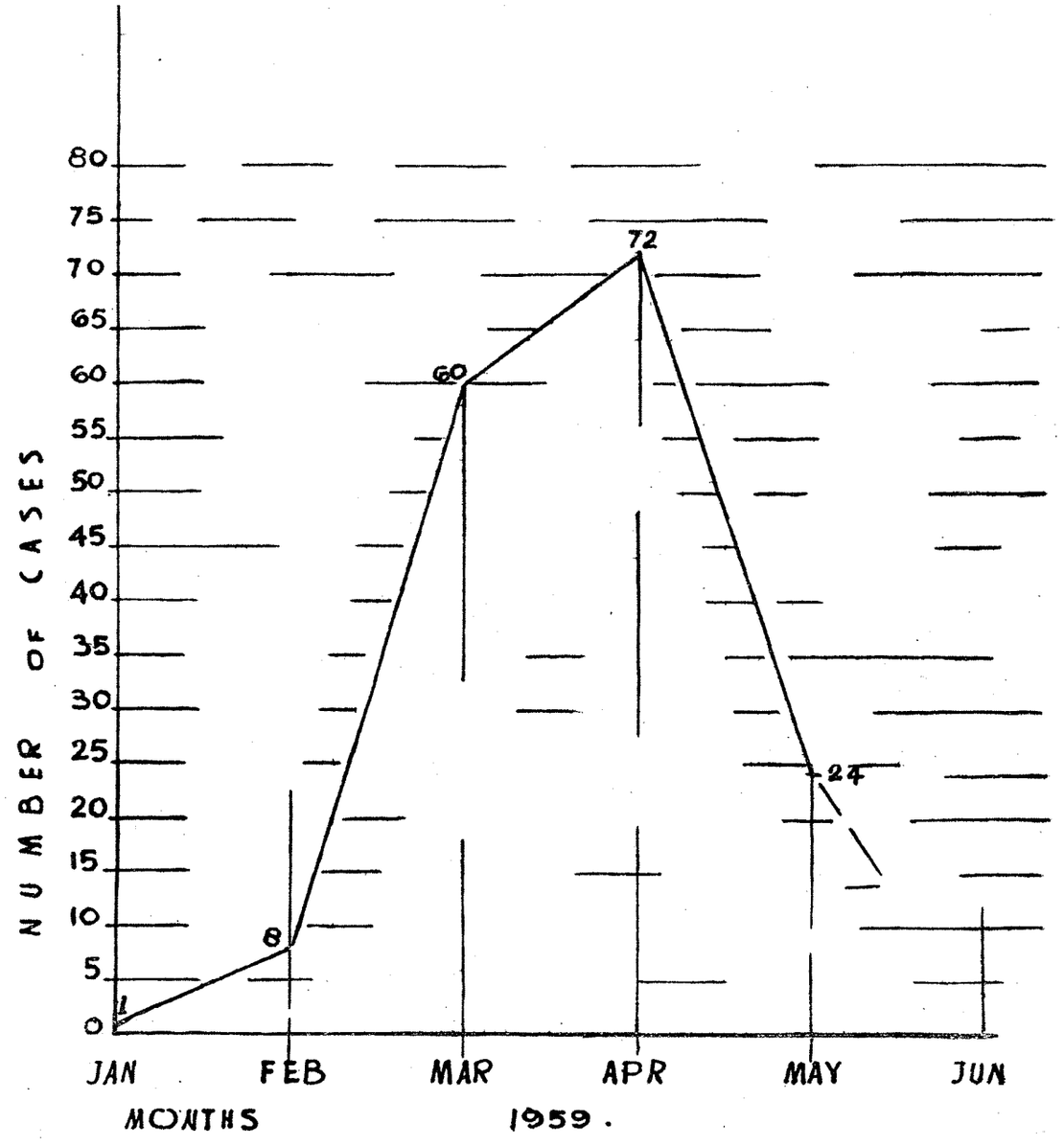
The colonies are moderately clean except for the dumping grounds mentioned above. These were not conspicuously plentiful at the time of investigation due probably to the use of insecticides but mosquitoes were complained of. This was expected as there were some pools of stagnant water around.

WEEKLY CHRONOLOGICAL ORDER CASES OF INFECTIVE HEPATITIS IN GOMOH RAILWAY COLONIES DURING THE PERIOD BETWEEN 18th JANUARY TO 24th MAY, 1959.



MONTHLY DISTRIBUTION OF INFECTIVE HEPATITIS CASES IN GOMOH RAILWAY COLONIES, 1959.

(FROM JANUARY 18 TO MAY 24)



History of Infectious Hepatitis in the area

Only sporadic cases of what is clinically considered as infectious hepatitis have been known to occur in Gomoh from time to time since 1947, although the railway dispensary records are non-contributory in this respect. It was, however, confirmed that in 1947 a person named S. M. Waliullah, son of S. M. Abdullah, a lawyer, resident of Loco Bazar, a place just adjacent to the Railway Colony was affected with infectious hepatitis, as diagnosed by a local physician. This patient recovered. The next authoritative record was one of Parameshwar Prasad, a fireman in the railway who suffered from the disease in April 1957. His wife also contracted the disease and died at Gaya where she had gone for treatment. Parameshwar Prasad, however, escaped this time although some of his neighbours either suffered or had been suffering at the time of investigation.

Duration of epidemic and chronological order of cases

The first case was Sri S. R. Sarkar, Hindu male aged 28 years, employed as a second fireman in the Loco Department of the Railway reported sick on or about the 22nd January 1959. He was a resident of one of the railway colonies called the 'Sick Colony' which derived its name from its location near a shed where the sick locomotives were shunted and kept.

It started with malaise followed by fever, body-ache and gastric discomfort and soon after by jaundice which was detected on the date mentioned above. The last case seen by the investigating party being on the 24th May 1959, the total duration of the epidemic, so far as the present investigation is concerned was about 19 weeks from January 22 to May 24, 1959. There were altogether 165 cases, a few relapses but no death.

Incidence rate

The actual incidence rates cannot be ascertained as there should have been many cases without jaundice and remained undetected. Considering the jaundice cases only 144 cases occurred among the 3,021 railway workers the prevalent rate being 4.77 per cent. The rate in the affected families was 36.7 per cent (113 cases in 308 members). In the railway colonies there were 101 cases among 11,064 population and in the villages 64 cases among the 6,314 population, the respective prevalent rates being 0.91 and 1.0 per cent. It works out to be 0.95 per cent for the total population of Gomoh.

The chronological order of cases is given in the Chart I. The first three cases occurred at an interval of two weeks from each other and thereafter the cases started occurring every week, reaching the peak in April and declining towards the end of May. The distribution of incidences by months is given in Table II and by weeks and months in Chart II.

Table—II

Distribution of cases by months

Months	June	Feb.	March.	April.	May.	Total
No of cases	1	8	60	72	24	165

From the above distribution of cases it appears that the source or the sources were active mostly during the months of January, February and March and their effectiveness declined with the change of climate towards summer.

Clinical Characteristics

The usual history given by the patients was as follows: The onset was abrupt with fever, headache, anorexia, a sensation of gastric distress, nausea more frequently than actual vomiting and a creeping weakness, with the cessation of fever in about four or five days, an icteric tinge of the conjunctivae was noted soon spreading over the body, unaccompanied by pruritis. A high coloured urine with or without bile salts and pigments was the usual feature. A summary of the clinically findings of 11 cases admitted to the Dhanbad Railway Hospital between February and May 1959 is given in Appendix I.

Leucopaenia was generally observed with relative lymphocytosis, continuing even up to the convalescent stage. For instance examination of blood from 65 convalescent patients yielded the following results (Table III). Liver

Table—III

Results of differential counts of 65 samples of blood from convalescent patients.

Polymorphs	%	Lymphocytes	%	Monocytes	Eosinophils
—50% — 1	1.5	20—25% — 1	1.5	1% — 5 cases	Upto 3% —10
50—60% —13	20.0	25—30% —11	19.0	2% — 2 cases	4—5% —25
60—70% —38	58.5	30—40% —38	58.5		6—10% —10
70—80% —13	20.0	40% and above —15	23.0		10% — 2
65		65			

and spleen were a little enlarged. Cervical lymphademitis was not a marked feature. The course was prolonged extending over a period of about three weeks followed by gradual recovery. Relapses were uncommon inspite of the early release of patients from hospital or early resumption of duties, some times even before the clearance of Jaundice. One case, Lakhan Gope H. M. 22, resumed duty on 23-3-59 and reported sick again on 1-4-59. There were two other cases, L. Tikky H. M. 35 driver and C. G. Singh H. M. 28 of Loco Colony who gave history of previous attack in 1949. The patient who were mostly railway workers were sent back to duty at this stage but relapses were few. Urine samples were examined from 95 convalescent patients. Only one had albumin and two bile salts and pigment. The rest were normal.

Clinical condition of the patients

The clinical conditions of the 110 patients contacted at the time of investigation were as follows:

Clinical condition	Still under treatment	Convalescent	Cured	Total
Mild	11	89	6	106
Moderate	3	1	—	4
Severe	—	—	—	—
	14	90	6	110

Apparently the cases were generally mild and there was no serious case nor death.

Distribution of cases

Although almost all the cases were railway employees except a few secondary cases, they were not invariably residents of the railway colonies, sixty-four out of 165 known cases i.e., 38.8 per cent residing in the neighbouring villages. The distribution of cases is given in Table IV.

Table—IV

Geographical distribution of infectious cases in Gomoh

Railway colonies	No. of cases	Village	No. of cases	Village	No. of cases
1. Sickline colony ..	55	Khesmi	13	Chowrapatti ..	1
2. Loco colony	17	Jitpur	4	Puranabazar ..	11
3. R. R. F. Barrack ..	5	Laxmipore	2	Locobazar ..	11
4. Durgapara colony ..	6	Dahiari	6	Chaila	1
5. B. type colony ..	2	Baradih	1	Chitro	2
6. Central colony ..	12	Vendra	2	Karkutta	3
7. Gangman colony ..	3	Hariharpur	2	Kurama	1
8. Pahartali	1	Ghanghusa	3	Topchanchi ..	1
	101				64

It will be seen from Table IV that the total number of cases was 101 in the colonies and 64 outside. Among the railway colonies the maximum incidence was in the Sick line colony followed by the Loco and the Central colony. Durgapara colony R. P. F. Barrack came next in order. Among the villages and areas outside the colonies the most affected areas were the village Khesmi and the Locobazar and the Puranabazar which are adjacent to the colonies. Among the other villages Dahiari and Jitpur had 6 and 4 cases respectively. The rest had between 1 and 3 cases. But all these cases were either workers in the railway or their contacts.

The cases actually started in the Sick line colony and from the records it appears that the largest number of cases (55) occurred there. The intensity next fell on the Loco and the Central colonies. This local distribution naturally raises the question of some common factors being involved. Without going into the details it may be stated at this point that the majority of cases reported here occurred among the running staff handling the locomotives, and these are the colonies where they were mainly residing.

As it was of interest to see if the number of cases had any relationship with the population densities of the colonies, their distribution against the corresponding number of clinically diagnosed infectious hepatitis cases is given in Table V.

Table—V

Distribution of Infectious Hepatitis cases according to population of the colonies

Colonies	Population	No. of cases clinically detected	%
Sickline ..	905	55	6.1
Loco ..	1485	17	1.1
Central ..	1105	12	1.1
Durgapara ..	820	6	0.73
R. P. F. Barrack	140	5	3.6
Gangman colony	?	3	..
B. Type ..	325	2	0.6
Pahartali ..	495	1	0.2
Anglo-Indian Colony ..	110	0	0.0

From the data given in Table V there is apparently no correlation between the number of cases and the number of people in the colonies. Besides secondary cases were uncommon.

Chronological order of reporting of first case and duration of the outbreak in the colonies and villages

The chronological order of reporting of first case and the duration of outbreak in colonies and the villages are given in Table VI.

Table—VI

Chronological order of reporting of first case and duration of outbreak in the colonies and villages

Colony or Village	First case reported on	Last case reported on	Duration of outbreak in weeks	Total cases
Sickline colony	22.1.59	15.5.59	16	55
R. P. F. Barrack	2.2.59	30.4.59	12.5	5
Durgapara colony	17.2.59	26.3.59	5.3	6
Durgapara village	18.2.59	12.5.59	12.0	6
Dahiari village	18.2.59	13.5.59	12.0	3
Locobazar	25.2.59	14.5.59	11.0	11
B. Type colony	2.3.59	16.5.59	10.75	2
Loco colony	4.3.59	13.5.59	10.0	17
Central colony	5.3.59	8.5.59	9.0	12
Puranabazar	7.3.59	19.5.59	10.5	11
Jitpur village	7.3.59	1.5.59	8.0	4
Khesmi village	16.3.59	12.5.59	8.0	13
Topchanchi village	19.3.59	..	..	1
Gangman colony	22.3.59	1.4.59	7.0	3
Chowrapatti	22.3.59	..	..	1
Hariharpur village	26.3.59	10.5.59	6.5	2
Vandra village	3.4.59	9.5.59	7.0	2
Chaila village	7.4.59	..	..	1
Chitro village	16.4.59	27.4.59	1.5	2
Karkutla village	20.4.59	9.5.59	2.75	3
Pahartoli colony	26.4.59	..	..	1
Laxmipur village	26.4.59	29.4.59	4.5	2
Kurama village	30.4.59	..	..	1
Baradih village	24.5.59	..	..	1

The cases started initially in the Sick line colony in the last week of January 1959 and the number of cases as well as the duration of the outbreak were maximum there. Chronologically R. P. F. Barrack, Durgapara colony, Dahiari and Ghonghusa villages, Loco-bazar and so on showed cases in succession. Loco colony which had the second highest number of cases (17) was not affected until the 1st week of March. In actual facts the infection occurred about 2-4 weeks previous to the reporting of the first case. Although Dahiari and Ghonghusa were the two villages which had reported cases in February, most of the villages were affected in March, April and May. The chronological order of reporting of cases in the different colonies does not therefore indicate any ordered extension of infection by contiguity or otherwise. There is, however, some relationship with the number of cases and the duration of outbreak in any locality.

Age and sex distribution

The age and sex distribution of the Infectious Hepatitis patients are given in Table VII.

Table—VII

Distribution of infectious hepatitis patients according to age and sex

Sex	−1	−5	−15	−25	−35	−45	−50	50+	Total
Male	0	0	5	28	75	29	10	5	152
Female	0	0	3	3	4	1	0	2	13
	0	0	8	31	79	30	10	7	165

Among the sufferers only 13 were females, and the rest males. As will be seen later that of these 13, as many as 11 were secondary cases having history of close contact with known patients. Only two, one aged 51 years and the other 27 years, both housewives, had no history of direct contact.

Considering the age distribution particularly of the male patients almost the whole group were adults between the age 15 to 55 years. The five male children that suffered were all secondary cases with history of close contacts with known patients. This age distribution is significant. As all of them were railway employees* the possibility of the sources being somewhere in the railway plant is indicated. This leads to the next question *i.e.*, the occupation of the patients.

Religion

Of the 165 patients 147 were Hindus, 15 Muslims and 3 Christians. Although the relative distribution of these religious groups in the population is not known, it appears that religion did not have any specific influence on the incidence of the disease.

Occupation of the patients

The distribution of occupation among the patients arranged according to the frequency of incidence is given in Table VIII.

Table—VIII

Various occupations of the Infectious Hepatitis patients at Gomoh

	Nature of occupation	No. of patients
1.	Fireman	37
2.	Labourer	19
3.	Shuntman	11
4.	Oiler	11
5.	Fitter	9
6.	At home*	7
7.	Khalasi	11
8.	Housewife**	6
9.	Railway protection force	5
10.	Gangman	5
11.	Driver	5
12.	Train Examiner	4
13.	Wheelgaager	4
14.	At school*	4
15.	Blacksmith	3
16.	Guard	2
17.	Asstt. St. Master	2
18.	Welder	2
19.	Ass. Yard Foreman	2
20.	Leverman	2
21.	Painter	1
22.	Packer	1
23.	Runner	1
24.	Signaller	1
25.	Turner	1
26.	Tool-keeper	1
27.	Callman	1
28.	Carpenter	1
29.	Cart driver	1
30.	Chowkidar	1
31.	Cleaner	1
32.	Clerk	1
33.	Cook	1
34.	Villager	1

* At home and at school were all secondary cases.
** Housewife—4 out of 6 were secondary cases.

From the nature of the occupation of the patients it is further established that the workers of Class IV grade or low income group especially dealing with locomotives were the principal victims. A higher incidence was noted among the firemen, labourer, shuntmen, oiler, khalasi, fitter, gangmen and driver etc. in the order mentioned. Among the Class III staff there were 2 guards, 2 assistant station masters, 4 train examiners, 2 assistant yard foremen, 5 drivers, 9 fitters, 3 blacksmiths, 2 welders, 1 carpenter and 1 painter and one clerk, 32 in all or about 20 per cent. As far as could be ascertained these workers were exposed to the same conditions as the Class IV workers and the source of infection was likely the same.

Family size and number of cases

Family size was recorded for 102 families with Infectious Hepatitis cases. There were only 113 cases in these families. These included 2 cases each in families with 2, 8, 9 and 10 members, 3 cases in a family of 4 members and 5 cases in a 25 men barrack. The rest of the families (95) with sizes varying between 1 and 17, had only single cases. The results are given in Table IX. Apparently there is no relationship between the family size and the number of cases. It is to be noted that as many as 60 families were single member families.

Table—IX

Infectious hepatitis cases according to family size

No. of cases	Size of the family													Tot. No. fam.	Total No. of cases
	1	2	4	5	6	7	8	9	10	13	14	17	125		
1	60	13	4	3	1	7	4	—	—	1	1	1	—	95	95
2	—	2		—		—	1	1	1	—		—	—	5	10
3	—	—	1	—	—	—				—	—	—	—	1	3
5	—	—	—	—	—	—	—	—	—	—	—	—	1	1	5
Tot. No. of families	60	15	5	3	1	7	5	1	1	1	1	1	1	102	
Tot. N. of cases	60	17	7	3	1	7	6	2	2	1	1	1	5	113	113

History of contacts

Sixteen cases gave history of prior contact with known cases. On close scrutiny of the dates of onset of symptoms it was found that except 5 children and one housewife (mother) the rest were actually primary cases having occurred shortly after the case with whom the supposed contact had taken place. In another instance only the mother of a railway worker engaged as oiler, had the disease 19 days earlier than him? Since the secondary cases were so few and far between there was as much possibility of imbibing infection from the railway source as from his own mother. It could not, however, be ascertained how his mother got the infection.

History in recent inoculation

The history of recent inoculation was available for only 21 i.e. about 19 per cent of the 110 patients investigated. They had revaccination against small-pox within six months of their attack. History of no other inoculation could be elicited.

Food habits of patients:

Out of 165 known patients 110 were contacted for examination and interrogation. Their food habits were as follows:

	Meals at			
	Home	Out side	Part at home and part outside	Total
No. of paient	6	3	101	110
%	5.5	2.7	91.8	100

The majority of patients was either running staff or working in the loco-shed and as high as 91.8 per cent were completed to have their food partly at home and partly outside at different places. Among them only 3 were partaking food exclusively outside, but no common place for partaking of food could be elicited. Besides, infection took place continuously for about 4 months. Although the transmission of infection through food is doubtful it has to be considered along with the history of exposure of food to flies as given below.

Food exposed to flies

	Exposure to flies		
	Yes	No.	Total
No. of patients ..	101	9	110

Only 9 out of 110 patients stated that care was taken to protect their foods from flies. In other cases these were obviously exposed to flies. On the other hand, the open latrines being situated in the quarters or near about more cases were expected in the families if flies were mainly responsible but this was not the case. Nevertheless, under the circumstances stated above, it must be admitted that the possibility of flies contaminating food existed during this outbreak.

Sources of milk consumed by patients

Although there is very remote chance of milk being a vehicle of infection as milk is invariably used after boiling, and its consumption among the grown-up adults which provided the majority of the patients, is generally low except with tea, an enquiry was made of the sources of their milk supply, if any. The results are given below:

Source of milk supply of patients

No. of patients not consuming Milk.	Patients consuming milk from			Total
	Market	Home	Total	
84	22	4	26	110

It will be seen that only 25 per cent of the patients consumed milk from different sources and there was no supply of pasteurised milk or any other common sources.

Other sources of food

There are hawkers and unlicensed vendors selling prepared foods and snacks inside the colonies and around workshops, loco-shed etc. Sometimes they even creep inside the platform, if unnoticed. But this is a system usually going on there. It is difficult to assess their actual role in this present outbreak by this short investigation but those who partake of such foods have been found to indulge in using the water available nearby irrespective of their qualities.

Sources of water used by the patients

The usual sources of water used by the patients are given below:

Nature of sources

Open well	Filtered and Unfiltered water taps	Filtered, unfiltered taps and open wells	Total
No. of patients using 41	4	65	110

It will be seen that 41 or 37.3 per cent used exclusively open wells for drinking and domestic purposes. Since they consumed water from different wells the possibility of multiple infection of wells cannot generally be expected. Only 4 patients gave history of not using water other than from the filtered and unfiltered water taps. This number is insignificant as these sources were being used by thousands of other residents in the colonies. Secondly, on close scrutiny it was found that these 4 patients were Sainika (Railway Protection Force) who used to work in various places on duties and had food and drinks sometimes outside their barrack. *Prima facie* both filtered and unfiltered water supplies of the Railway colony do not seem to bear any relationship with this outbreak of infectious hepatitis. Sixty-five patients or 59 per cent gave history of using all the three types of sources but in view of the remarks made above no significance can really be attached to it so far as the transmission of infection is concerned (cf. Delhi outbreak. Explosive type). It was therefore of interest to find out if they had indulged in some unusual but common

source of water supply or any other drink. The results of this enquiry are given below:

Unusual sources of water supply used by patients

No history of unusual source	Loco tender	Engine tender	Railway water	Total
60	5	36	9	110

Only 50 out of 110 patients could remember about using some unusual sources of water supply. By Railway water they meant any source of water supply in the railway colony. On further scrutiny it is found that these nine persons were living in the village and were using well water but when they came for duty in the railway workshop or colony they had to drink water from the available source nearby and they could not discern about the quality or source of water. Taking these 9 also in the category of those who have unusual drinks there were 50 patients (45.5 per cent) who could give history of drinking water from the loco or engine tenders which received water from the Gomoh nullah or any other source connected or unconnected with it.

The corresponding usual sources of those who used these unusual sources are given below. (Table X).

or 30% of those who were using open wells in addition gave history of using the Gomoh Nullah water supplied to the tenders.

Sanitary condition in relation to the patients

The general sanitary condition of the colonies and the villages have already been described. The methods of disposal of night soil among the patients investigated were as follows:

Methods of disposal of night soil

Open field	Service latrine	Aqua-privy septic tank	Not known	Total
23	49	35	3	110

Only 35 patients or 32.7% had the privilege of safe disposal of night soil whereas in case of 72 or 67.3% of patients the disposal was unsatisfactory. The methods of disposal of refuse were also very unsatisfactory as will be seen from the data given below:

Methods of disposal of refuse

Indis-criminate throwing	Dumping	Otherwise unsatis-factory	Not known	Total
23	72	9	6	110

Table—X

Unusal sources af water supply versus the usual sources

Nature	Usual sources	Unusual sources				
		Loco tender	Engine tender	Railway water	Total	%
	No. using					
Open well	41	2	16	9	27	66.0
Filtd. unfiltd. taps	4	3	0	0	3	75.0
Filtd. unfiltd. taps and open wells	65	—	20	0	20	30.0
	110	5	36	9	50	45.5

It will be seen that 66 per cent of those who were using open well water for drinking had used the Gomoh Nullah water through the loco and engine tenders or other channels of supply. Similarly 3 out of the 4 patients who used filtered and unfiltered water taps and 20

From the above data it appears that there was plenty of scope for fly-breeding but it is difficult to say how far the flies could play the part in the transmission of infection but the secondary or multiple cases in the families were not common.

Discussion

The following points emerge out of this investigation for discussion.

(1) The nature of the disease.

(2) The extent and characteristic of the epidemic.

(3) The sources of infection and the possible mode of spread.

(4) Methods of control and prevention.

(5) Future plans.

(1) *The nature of the disease*

The disease was considered to be one of Infectious Hepatitis and the diagnosis was made purely on the basis of clinical signs and symptoms. No biopsy or laboratory test was done except examination of urine and total and differential count of blood. Twenty-eight samples of patients' sera were sent to the Virus Laboratory Centre, Poona, for any test that may be carried out there. A typical onset with fever, headache, anorexia, high coloured urine, tender liver, nausea, gastric distress, followed 4 or 5 days after by the appearance of jaundice, bile salts and pigments in the urine, leucopaenia with relative lymphocytosis and recovery within 3 to 6 weeks etc., led to the diagnosis of Infectious Hepatitis. The investigation also revealed that such cases were prevalent in the area in a sporadic manner since 1947.

(2) *Extent and characteristics of the epidemic*

The records of 165 cases who had jaundice could only be collected but it must be admitted that there were perhaps a large number of non-icteric as well as non-clinical cases which remained undetected. The duration of epidemic was more than four months from January to May 1959; that is, much more prolonged than the sharp, short but extensive epidemic of Delhi in 1955-56. It appears that the infection was mostly operative during the winter months and it gradually were out with the advent of the summer. In the temperate zone the disease appears more prevalent in the autumn and winter.

This epidemic had also other peculiarities. It was specially confined to men and age groups between 15 to 55 years. Usually the highest rate for morbidity are in the age group from 5 to 9 and 10 to 14 regardless of geographical location, but the mortality rates tends to rise with increasing age, the females during the reproductive age period being particularly susceptible. In this outbreak a few women and children who were affected generally belonged to the families of Infectious Hepatitis cases. Secondly, almost invariably they were railway workers, either the running staff or workers and labourer connected with the loco shed and the movement and repair of railway engines, irrespective of their residence in the railway colonies or neighbouring villages. The only indigenous villager who was involved was a carter engaged in moving the railway goods. Amongst the railway workers the largest number of victims were from the Class IV staff, particularly the firemen. Among the colonies the most affected were the Sickline, the Loco Colony and the Loco-bazar, whereas some colonies like the Anglo-Indian, Jungle Kothi, B Type and Parhati colonies were either not affected at all or had only one or two stray cases.

The disease was mostly mild in character with a few cases turning out moderately severe, but there was no death.

(3) *The Source of Infection and the Possible Methods of spread*

The infection was present locally, as sporadic cases of Infectious Hepatitis were reported from time to time in Gomoh, at least since 1947. It thus appears that some of these cases were acting as reservoirs of infection. Even so, the question arises whether these cases acted as the direct source or through some temporarily contaminated source. Unfortunately complete knowledge of the natural mode of spread of this disease is not known because of the lack of an experimental host other than man. However, the following modes of spread have been suggested by different workers from time to time namely; (i) Contact infection, (ii) Food-borne, (iii) Water-borne, (iv) Droplet infection from nasopharynx to nasopharynx. But the majority have stressed on the faecal-oral route as the most important mode of spread.

In regard to (i) there was very few contact infection as secondary cases were few and far between. Taking into consideration of the minimum incubation period of 15 days only 7 contact cases could be taken as secondary cases. On the same ground the question of (iv) *i.e.* droplet infection playing any part in this outbreak may also be eliminated. Absence

of inoculation history in the immediate past other than small-pox revaccination in 21 patients, also eliminate the possibility of acting as an exciting factor in this outbreak. Thus we are left out with two important modes of spread *i.e.* through food and through water. These may now be given more through consideration.

In regard to the food infection a large majority of the affected persons were having part of their food outside their homes. Besides no particular precaution was being taken for protection from flies. But no common source of food was elicited which could be incriminated for the infection to be effective for a period of about four months. Milk supply and foods sold by the hawkers and vendors were not found to play any definite role. The sanitation was not entirely satisfactory and there were open latrines as well as indiscriminate dumping of refuse and sometimes excreta. Transmission of infection through flies was thus existent although towards the latter half of the epidemic period insecticides were used for destroying flies, and these were actually reduced also. But the occurrence of cases among certain age, sex, and occupational groups, their distribution in certain colonies only and the duration of the epidemic etc., all go against the possibility of food infection playing anything but a minor role only, in this outbreak.

In regard to the water-borne infection there were three different types of water supply in the area namely; (i) filtered, (ii) unfiltered and (iii) open masonry wells. In addition to these there was a tank called Loco-tank (ground reservoir) for supplying water for the Loco shed, railway engines and for carriage washing and fire-fighting. The filtered water was obtained from an impounded upland surface collection and was filtered through a rapid sand filter and released into main pipes for distribution. According to the Chief Medical Officer's report the chloronome was not working during the earlier part of the epidemic and no chlorination could be done.

The rate of supply of filtered water was only 5000 gallons per hour and the duration being for one hour in the whole day, not more than 100,000 gallons was being supplied through this system *i.e.* less than 10 gallons per head. To supplement the deficiency water from the same reservoir was supplied through a separate pipe system simultaneously to different colonies. In addition, the people were supplementing their water supply from the masonry wells which were as many as 41 distributed throughout the colonies. The villagers were using only well waters.

From the analysis of the data regarding the sources of water used by the patients it is seen that 37.4 per cent had used well water exclusively from different wells and only 4 patients used filtered and unfiltered water taps and 59 per cent all the three types. As has been already discussed earlier none of these sources could be considered important from the point of view of acting as a temporary source or as the vehicle of the infection. In regard to the question of chlorination, it was resumed in the earlier part of March in the filtration plant and the wells were also being treated with bleaching powder. But since according to the previous experience in Delhi and elsewhere it was found to be ineffective for destroying the I.H. Virus, it was immaterial whether the water was filtered or unfiltered, chlorinated or unchlorinated. In fact the unfiltered water was never chlorinated.

However, 50 out of 110 patients gave direct or indirect history of drinking water from the loco or the engine tanks to which they were usually habituated out of shere necessity in the absence of supply of a better quality of water in the loco shed and the yard. This, therefore, seems to be the only common but unusual source that the patients had used for drinking purposes, and had probably acted as the temporary source of infection.

Even according to this hypothesis the question still remains whether the infection was carried by the unfiltered water from Chowrapatti or the water from the Gomoh Nulla from both of which the overhead tanks at the loco-shed received its supply.

Both the unfiltered and the filtered water supply have already been exonerated from the position of incriminated vehicles of transmission in this outbreak. Out of the exclusive users of these filtered and unfiltered water taps only 4 were affected by the infection. Thus the reasonable conclusion is that the Gomoh Nullah might be responsible for this outbreak. This Nullah as well as the Loco-tank from which the water is drawn into it for the overhead tank at the loco-shed are both subjected to frequent faecal contamination of human and animal origin. Although it is difficult to adduce direct proof of this hypothesis, no source other than this can be incriminated from the analysis of the data so far collected in connection with this epidemic.

(4) *Methods of control and prevention*

(a) *Immediate methods of control:* The following principles of control measures were formulated at the time of investigation on the basis of a tentative conclusion that the water from Gomoh Nullah and Loco-tank might be responsible for this outbreak.

Since contact is the commonest form of transmission particularly through the faecal—oral route, attention should be directed towards its interruption by taking the general precautions and measures usually applied against entire infections, namely;

(i) Isolation of patients in the early stage,
(ii) Personal cleanliness,
(iii) Safe disposal of excreta,
(iv) Prevention of contamination of food, water, milk supplies, directly or by hands of infected persons, fly abatement and screening of kitchens and latrines.

The stools generally remains infectious for 3 weeks from the onset of illness.

The epidemiological investigation of this particular outbreak has led to the suggestion that contamination of the water supply from the Gomoh Nullah and Loco tank is responsible for this outbreak special precaution is to be taken to see that this water is not used for human consumption at all. Chlorination procedures as adopted should be continued for purification of water but in the light of present knowledge it cannot be assumed that chlorination will be effective in the prevention of Infectious Hepatitis. Superchlorination followed by dechlorination might be tried. It would also be wiser to ask the people to boil their drinking water whichever may be the source of supply at least during the epidemic period.

In regard to the patients they need not be removed to the hospital if suitable precautions can be taken at home and unless his clinical condition warrants it. Quarantine is not recommended for contacts except some careful watch for the suggestive symptoms.

Since inoculation measures may initiate the infection and disease special care should be taken in the sterilization of all instruments which have been used for collection of blood or injection of these patients.

Specific measures

Normal human gumma globulin given intramuscularly in doses of 0.1 ml per pound of body weight prevent hepatitis even up to 6 days after exposure. It can give protection for several months though not warranted by such passive immunisation. This may be used for protection of family contacts, and in outbreaks in institutions and closed communities. For this purpose, the families of the patients and the workers in the Loco shed may be considered as suitable subjects for administration of gumma globulin."

(2) *Methods of prevention*

It is difficult to devise measures of prevention because of the lack of specific serological tests, susceptible laboratory animals and knowledge about the length of time the individuals carry virus. Recently a battery of laboratory tests have been described to detect the derangement of liver function in hepatitis and the appearance of bilirubin in the blood and urine. These tests are: Serum transaminase test, thymol turbidity test, thymol flocculation test, colloidal gold test, zince sulphate and ammonium, sulphate flocculation test etc. Besides, the needle biopsy of liver may be done. But these tests require the help of a good laboratory.

Another difficulty is the resistance of the Infectious Hepatitis virus to physical and chemical agents, with the result that disinfection or sterilization of blood plasma or water supplies has not been successful. But ultraviolet radiation may be helpful for sterilizing the plasma or serum for injection.

Unlike other infectious diseases no vaccine is available for mass immunisation.

Special efforts should therefore be made to imprive sanitary and hygienic practices in the community with the object of reducing fly breeding, faecal contamination of food and water supplies etc. Education of the public about the nature of disease and its mode of spread and individual precaution to be taken to reduce opportunities for exposure should be attempted.

(5) *Future plans*

(i) In addition to the improvement of general sanitation, water reservoir should be strictly guarded against any possible contamination.

(ii) Sufficient chlorinated filtered water should be supplied to the railway colonies, if possible, without interruption.

(iii) Unfiltered water supply should be discontinued, except for fire fighting and locomotives.

(iv) Sufficient safe water for drinking purposes should be provided at the loco-shed and workshops as well as in the yard and the use of unfiltered water for drinking water should be strictly forbidden and even made punishable, if detected.

(v) The running staff should carry, and if necessary, should be supplied with, water bottles (canvas bags) containing safe water and arrangements should be made to replenish their supply at all railway stations.

(vi) All latrines provided in the colony should be sanitary in type and adequate in number. The disposal of night soil, if required should be done by the colony sanitary authorities by a standard method and no individual or private arrangement should be allowed.

(vii) Laboratory facilities in the hospitals should be augmented for quick diagnosis of infectious diseases.

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APPENDIX—I

Strength of the staff in various Departments of Gomoh Railway Centre shown classwise (1959)

Serial No.	Departmental heads	Personnel under them		Total
		Class III.	Class IV	
1.	Carriage Fore-man	129	314	443
2.	Station Master	113	279	392
3.	Loco Fore-man	591	658	1249
4.	Electric Chargeman	20	20	40
5.	Assistant Surgeon	10	98	108
6.	O. C. Rly. Protective Force	28	132	160
7.	Grainshop Manager	9	16	25
8.	Assistant Engineer	8	9	17
9.	Inspector of works	24	52	76
10.	Perm. weight Inspector	13	412	425
11.	Head Master, Rly. School	4	2	6
12.	Govt. Rly. Police	4	18	22
13.	Asstt. Maint. Insp. (Sigl)	15	43	59
	Total:	968	2053	3021

APPENDIX—II

Clinical findings of 11 *cases of Infectious Hepatitis admitted to the Railway Hospital, Dhanbad after the appearance of Jaundice (data supplied by Dr. A. Ghosh, A. M. O., Dhanbad)*

Name, age and sex, religion	Employed as	Date of on set	Prodromal symptoms	Clinical features	Laboratory findings			
					T.C. and D.C.	Hb & ESR	Urine	Stool
1. Chandra Bhusan, F.M.24	Sainik (Gomoh)	2.2.59	Gastro -intestinal disturbance	General condition—fair, P/R—92/16 T—98° F. Liver—1 fing.—tender Jaundice +, B P—108/80 mm of Hg. Heart, lungs, spleen—NAD	8500 P-70% L-27% M-0% E-3%	Hb-70% ESR-5mm Ist hr.	High Col Alb.. sugar & bile—Nil.	Pale Yollow OPC—Nil
2. G. Runda Ch. M. 34	Driver (Running staff, Pathordi)	26.3.59	Weakness, constipation and high coloured urine	G.C.—fair, P/R-74/18, T.—90° F. Jaundice +, Liver—enlarged and tender, Lung—few rales, Heart, spleen—NAD. BP—110/70 mm Hg.	10,000 P-80% L-20%	Hb-70% ESR-10 mm Ist hr.	-do-	-do-
3. R.P. Banerjee, H.M. 20	Second Fireman (Running staff —Barkakhana)	4.4.59	Discomfort upper abdomen and constipation.	G.C.—Fair, P/R-60/20. T—98° F, Jaundice —++, Liver—enlarged and finger and firm. Heart, Lungs, spleen NAD. BP—120/80 mm Hg.	9000 P-70% L-28% M-0% E-20%	Hb-70% ESR-8mm in Ist hr.	High col. and Alb. sug nil, Bile salt+ pigment ++	-do-
4. Ramsurat Singh H.M. 18	Cleaner —running staff (Pathardih)	10.4.59	Weakness, lassitude and nausia	G.C.—Fair, P/R—72/18, T—98.4°F Jaundice +, Liver—1 finger, tender spleen, heart, heart, lungs NAD B.P.—112/-30 mm Hg.	7800 P-70% L-20% M-2% E-10%	Hb-75% ESR-3mm Ist hr.	High col. Alb-sugar Bile-nil	-do-
5. Babu Lal H.M. 25	Second fireman (running staff Katrasgarh)	15.4.59	Not marked	G.C.—Fair, P/R—70/18, T—98°F Jaundice +, Liver enlarged and tender Ht., lungs, spleen—NAD BP-115/70 mm Hg.	6000 P-62% L-28% M-3% E-7%	Hb-80% ESR 5mm Ist hr.	High col. Alb. and sugar-nil, Bile and pigs+	-do-
6. Tasth Nath H.M., 13.	Fireman -running staff (Barkakhana)	10.4.59	Body ache temp. and cough.	G.C.—poor. P/R-120/24. T. 102°F Jaundice ++, Liver and spleen—enlarged and tender, Lungs—rales and ronchi. B.P.—110/75 mm Hg.	8000 P-38% L-20% E-2% M.P.-nil	Hb-60% ESR-45 mm Ist hr.	High colour Bile salts + Pig ++	Pale Yellow OPC—Nil

APPENDIX—II (contd.)

Name, age and sez, religion	Employed as	Date of on set	Prodromal symptoms	Clinical features	Laboratory findings			
					T.C. and D.C.	HB & ESR	Urine	Stool
7. Jharimia MM 45	B. M. Khalasi (Gomoh)	22.4.59	Anorexia and general weakness.	G.C.—fair. P/R-70/18, T—98° F. Jaundice +, Liver—2 finger, tender, Ht. lungs and spleen—NAD	6000 P-69% L-30% E-1%	Hb-70% ESR-20mm Ist. hr.	High colour Alb. sugar and Bile-Nil	-do-
8. Fasi Ahmed MM 30	2nd fireman-running staff (New Matkuria colony-Dhanbad)	9.5.59	Constipation, anorexia and vomiting.	G.C.—fair, P/R-68/18, T—98° F Jaundice ++, Liver—2 fingers and tender, Ht. Lungs and spoeen —NAD. B.P.—110/70 mm Hg.	6400 P-68% L-30% E-2%	Hb-70% ESR-15 mm Ist hr.	High colour Alb. and sugar —nil, Bile salt and Pig+	-do-
9. R.D. Sharma H.M. 28.	2nd fireman-running staff (Gomoh)	9.5.59	Constipation anorexia andvomitting	G.C.—fair, P/R-70/18, T—98° F Jaundice +, Liver 2 finger Ht. Lungs and spleen—NAD B.P.—120/80 mm. Hg.	6800 P-65% L-22% M-1% E-2%	Hb-70% ESR-40 mm Ist hr.	High colour Alb. sugar and Bile—Nil	-do-
10. Dal Bahadur B.M. 27.	2nd fireman running staff (Dhanbad)	9.5.59	Alternate constipation and diarrhoea	G.C.—fair. P/R-72/18, T—98° F Anaemia, Jaundice +, Liver— 1¼ fing. Spleen—2 finer tender. Ht. , Lungs—NAD, B.P.—120/80mm Hg.	9000 P-72% L-24% E-2 %	Hb-50% ESR-30 mm Ist hr.	High colour Alb. sugar and Bile—+.	Yellow solid formed. Hookworm ++.
11. A.K. Mukherji H.M. 26.	Blocksignal Inspector. running staff (Dhanbad)	16.5.59	Anaemia and constip.	C.G.—fair. P/R-72/18, T—97.4°F. Jaundice ++, Liver —1 finger. Ht., lungs, spleen —NAD. B.P.—125/80 mm. Hg.	6000 P-60% L-32% M-2% E-6%	Hb-65% ESR-25 mm Ist hr.	High colour Alb., sugar —Nil Bile+	Yellow OPO-Nil.

SMALL-POX IN PONDICHERRY STATE

(1905-1957)

By

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&

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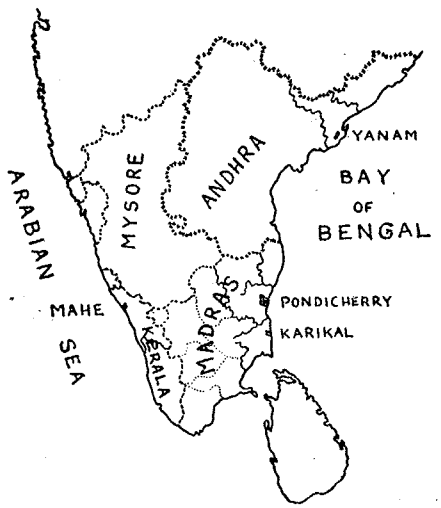
INTRODUCTION

The State of Pondicherry consists of 4 settlements (Map 1) covering an area of 186 square miles with a population of 3.17 lakhs (1948). The Pondicherry settlement is on the east coast of India about 100 miles to the south of Madras spreading over 112 square miles and interspersed by a number of enclaves and consists of 97 villages with a total population of 2.22 lakhs. A hundred miles down further south on the coast lies the Karaikal settlement with a comparatively more compact area of 62 square miles and consisting of 64 villages with a population of 70,541. Up north 500 miles from Madras is the small settlement of Yanam with 4 villages covering an area of approximately 8 square miles with a population of 5,853. Far away on the west coast, 100 miles south of Mangalore, lies the Mahe settlement consisting of 6 villages covering an area of 4 square miles with a population of 18,293 people. The only towns in the state are Pondicherry with a population of 60,000 and Karaikal with a population of 23,000.



The object of this paper is (1) to consolidate and bring on record in English language all the available past data about small-pox in the State. (2) to describe the epidemiological features of the disease in these settlements. (3) to review the control measures adopted. Little information is available about the ravages of the disease in this area before 1905. The official health report of French establishment in India was prepared in 1913. The disease must have been prevalent before as in the rest of the country.

Registration of Births: It is extremely important to have complete records of birth, small-pox deaths in various age groups and number of vaccination, revaccination performed etc. for taking effective control measures. In French settlements the population is divided into two categories namely "Renonsant" and "Sujet". The former are those who have renounced their Indian citizenship and become citizens of France. According to ch. II articles 55-56 of the French civil code, all births of children of Renonsant should be registered in the respective Maries within three days of the birth of the child and in case of Sujet it is 10 days in municipal areas and 1 year in rural areas. After the births have been registered in the various Maries the medical officer of the nearest dispensary is informed by the Mayor of registered births for carrying out compulsory primary vaccination for which there is no additional staff and is carried out by the compounder of the hospital. At the end of each month a return of primary vaccinations carried out by the dispensary concerned is sent to the Director of Medical Services. The Mayor of the commune does not send any report of births to the Director of Medical Services, and there is no machinery either for checking up of the registration of births. For deaths the medical officer of the dispensary sends the monthly return of total deaths and deaths from epidemic diseases. There is no classification of deaths by diseases

and age groups. One can only know about the total deaths from all causes and due to epidemic diseases.

Prevalence: (1905-1957 for Pondicherry and 1913-1953 for other establishments).

During the period under observation 33,402 deaths from small-pox were registered in the French establishments, giving an annual average of 650 deaths and 6.7 per cent of all deaths were due to small-pox. A striking feature is the variability of the diseases incidence as shown in the range of mortality rate per mille in Table I.

Apparently these waves have been occurring due to accumulation of susceptible persons in sufficient numbers, which were responsible for the lowering of herd immunity. New births, accumulation of persons who neither had the disease nor are vaccinated, and also loss of immunity acquired by vaccination are the other possible factors.

Secular Trend: It is difficult to predict the long term periodicity for the different establishments because of the paucity of the data over longer periods.

A steady decline was observed uptill 1938 for Pondicherry and Karaikal followed by an upward trend from 1949, for Mahe and Yanam

Table—I

Deaths from Small Pox in Various Establishments in Pondicherry State

Establishment.	Population. (1948 Census)	Average No. of death due to smallpox.	Mean smallpox death rate per 1000 population.	Percentage of deaths due to smallpox.	Range of mortality rate per mille.
Pondicherry ..	2,22,566	571 (1905-57)	0.8	2.4 (1955-57)	0.0 to 18.6
Karaikal	70,541	81 (1913-53)	0.03	1.4 (1935-53)	0.01 to 17.88
Mahe	18,293	8 (1913-53)	0.13	0.5 (1939-53)	0.05 to 7.40
Yanam	5,853	4 (1913-53)	0.14	0.6 (1939-53)	0.17 to 7.27

PERIODICITY

Short term periodicity which is a feature in all incompletely immunised countries is also the feature in French establishments. Cyclic exacerbation of small-pox have occurred regularly at 4 to 6 years interval in Bengal (Chatterjee 1959) and 4 to 8 years in Uttar Pradesh (Lal 1958). During the period of 53 years (except for the years for which there is no record in various establishments), nine clear epidemic peaks have occurred in Pondicherry and Karaikal and seven in Mahe and Yanam. The interval between the peaks ranged from 2-7 years but maximum frequencies were from 3-4 years (Table II).

Table—II

Interval between epidemic peaks.	*Frequency*			
	Pondicherry	Karaikal	Mahe	Yanam
2 Years	—	2	3	1
3 ,,	4	2	1	3
4 ,,	2	2	2	2
5 ,,	1	1	1	—
6 ,,	1	1	—	—
7 ,,	—	—	—	1
8 ,,	—	—	—	—
10 ,, and above	1	1	—	—

the decline starting from 1929 and 1928 respectively followed by a rise in 1942 and 1940 (Fig. 1, 2, 3, 4 and Table III). It is apparent

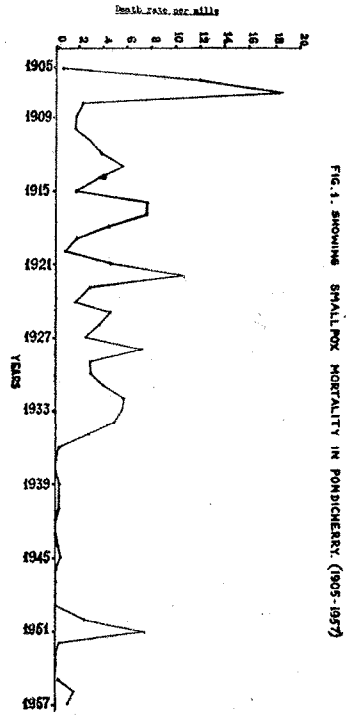


FIG. 1. SHOWING SMALLPOX MORTALITY IN PONDICHERRY. (1905-1957)

FIG. 1

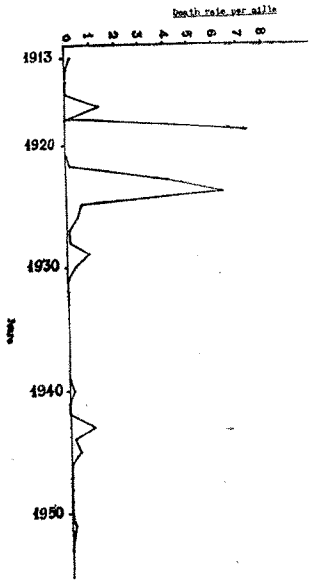


FIG. 2. SHOWING SMALL-POX MORTALITY IN MAHE (1913-1950)

FIG. 2

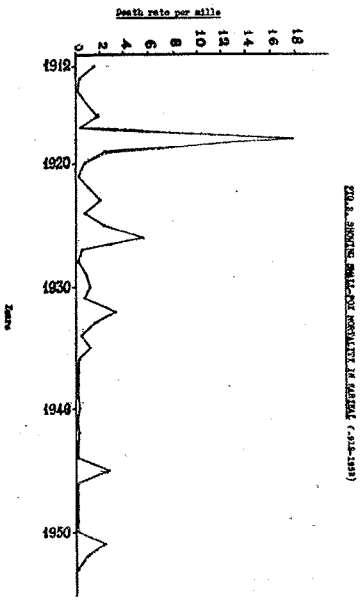


FIG. 3. SHOWING SMALL-POX MORTALITY IN KARAIKAL (1912-1950)

FIG. 3

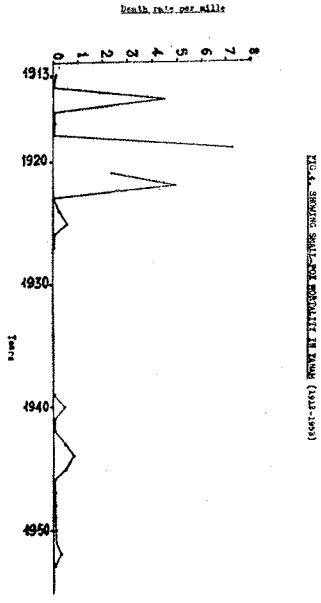


FIG. 4. SHOWING SMALL-POX MORTALITY IN YANAM (1913-1950)

FIG. 4

Table—III

Death Rates per mille due to Small Pox in Pondicherry State

Year	Death Rates per mille				Remarks
	Pondicherry	Karaikal	Mahe	Yanam	
1905	0.65	No.	Data	Available	
1906	11.83	,,	,,	,,	
1907	18.67	..	..	..	
1908	2.15	..	..	..	
1909	1.59	..	..	..	
1910	1.24	..	..	..	
1911	2.79	..	..	..	
1912	3.75	1.37	No Data	Available	
1913	5.59	0.16	0.19	0.00	
1914	3.58	0.07	0.00	0.00	
1915	1.71	0.77	0.00	4.54	
1916	7.53	1.93	0.00	0.00	
1917	7.74	4.12	1.39	0.00	
1918	4.38	17.88	0.00	0.00	
1919	1.51	2.37	7.40	7.27	
1920	0.82	0.50	not recorded	not recorded	
1921	4.32	0.21	0.00	2.37	
1922	10.69	1.04	0.18	4.91	
1923	2.78	2.05	4.17	0.00	
1924	1.38	0.64	6.39	0.19	
1925	4.46	2.26	0.52	0.58	
1926	3.67	5.56	0.34	0.00	
1927	2.48	0.44	0.08	0.00	
1928	7.24	0.08	0.08	no data available	
1929	2.89	0.89	0.99	-do-	
1930	2.86	0.94	0.32	-do-	
1931	3.99	0.67	0.00	-do-	
1932	5.57	3.32	0.00	-do-	
1933	5.56	1.37	0.00	-do-	
1934	4.85	0.28	no data available	-do-	
1935	2.81	1.33	-do-	-do-	
1936	0.11	0.02	-do-	-do-	
1937	0·00	0.02	-do-	-do-	
1938	0.00	0.02	-do-	-do-	
1939	0.13	0.02	0.00	0.00	
1940	0.08	0.05	0.14	0.35	
1941	0.01	0.00	0.00	0.00	
1942	0.00	0.00	0.00	0.00	
1943	0.01	0.00	1.05	0.35	
1944	0.32	0.12	0.13	0.69	
1945	0.30	2.86	0.30	0.52	
1946	0.05	0.19	0.00	0.00	
1947	0.00	0.00	0.00	0.00	
1948	0.00	0.01	0.00	0.00	
1949	0.00	0.01	0.00	0.00	
1950	2.34	0.01	0.00	0.00	
1951	7.45	2.47	0.09	0.00	
1952	0.09	0.87	0.05	0.17	
1953	0.00	0.00	0.00	0.00	
1954	no data.	..	..	..	
1955	0.11	..	..	..	
1956	1.72	..	..	..	
1957	1.07	..	..	..	

that the severe epidemics of previous years are not observed now. The quinquennial averages are given in Table IV.

Table—IV

QUINQUENNIAL AVERAGE DEATH RATES DUE TO SMALL POX IN FRENCH ESTABLISHMENTS

Period	Pondicherry	Karaikal	Mahe	Yanam
1909—1913	3.01	no data	no data	no data
1914—1918	4.99	4.98	0.03	0.89
1919—1923	4.03	1.23	2.35	3.62
1924—1928	3.85	1.79	1.45	0.19
1929—1933	4.18	1.44	0.26	no data
1934—1938	1.55	0.33	no data	no data
1939—1943	0.05	0.01	0.26	0.14
1944—1948	0.13	0.63	0.08	0.24
1949—1953	1.97	0.68	0.03	0.03

DISTRIBUTION

Rural and Urban: The rural area suffers more than the urban. The mortality records for the year 1957 show that there were 243 deaths due to small-pox in rural area as compared to 20 in urban area. The classification of deaths by age and urban and rural distribution has started only from 1957.

Age incidence: In 1957, of the total deaths from small-pox 28.7 per cent occurred within one year of age and 33.9 per cent between 1-10 years of age, that is 62.6 per cent among under ten and 37.4 per cent above that. So the children under ten constitutes the major vulnerable group in these establishments. No records of mortality are available according to sex.

Seasonal: Balwing Latham (1890) pointed out the connection between occurrence of small-pox to intense dryness of the ground and Rogers (1926 and 1948) to the absolute humidity. The disease is prevalent throughout the year in all establishments without much monthly variation. The climatic factors for various establishments were studied in relation to small-pox.

PONDICHERRY, KARAIKAL & YANAM

These three establishments are situated on the eastern coast and they have a similar climate with little variation. The hottest months are May-June, and January is the coolest. The main rainy season is from October-December from north-east monsoon, but Yanam being higher in the north also gets its rain in July-August from south-west monsoon. The average annual rainfall for Pondicherry, Karaikal and Yanam are 40.8, 45.22 and 54.42 inches respectively. The small pox season in Yanam is at its peak in December declines in February and is highly prevalent from March to May. In Pondicherry and Karaikal the incidence increases in January and attains its peak in March-April (Fig. 5, 6, 7 & 8).

Mahe: This settlement is situated on the west coast. Hottest months are March to May and coolest in January. The rainy season is from June to August from south-west monsoon and its annual rainfall is 129 inches. The small-pox is at its peak in March and there is a small rise in June, July during rainy season with rise in humidity.

The correlation coefficients of small-pox with climate factors in Pondicherry settlement were calculated and are given below:

Correlation Coefficients of Small Pox Mortality with Climatic factors in Pondicherry Establishments

rMT — − 0.03566
rMH — + 0.15689 } Lag 0
rMR — − 0.58691

rMT — − 0.47638
rMH — + 0.26765 } Lag 1
rMR — − 0.50286

rMT — − 0.69816
rMH — + 0.38822 } Lag 2
rMR — − 0.18557

rMT — Correlation coefficient between mortality due to small pox and temperature.
rMH — Correlation coefficient between mortality and humidity
rMR — Correlation between mortality and rainfall.
Lag 0 — no month lag.
Lag 1 — 1 month lag etc.

Humidity has got a positive effect on small-pox incidence and it is maximum for 2 month

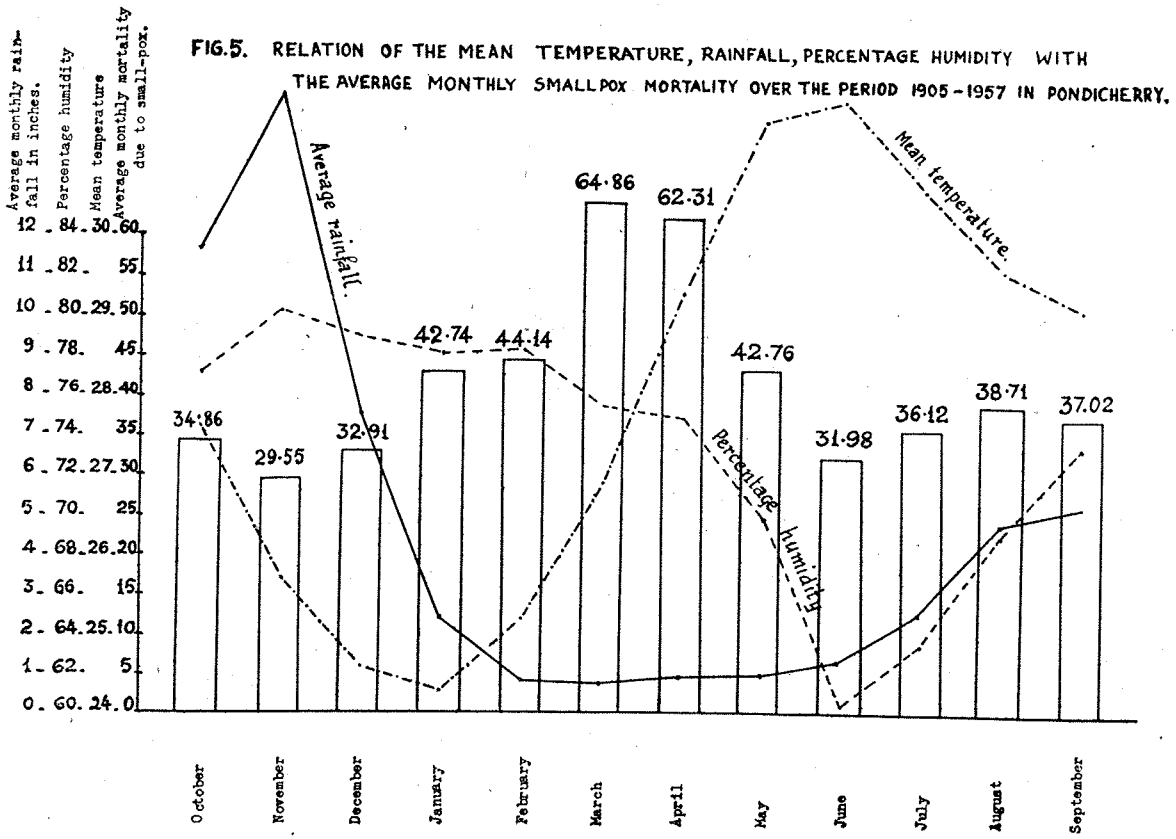


FIG. 6. *Small-pox death rate, average rainfall and temperature in Karikal*

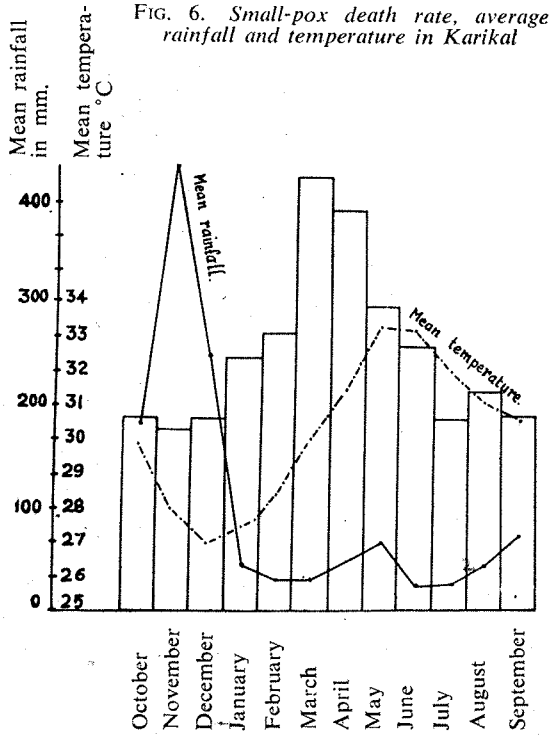


FIG. 7. *Small-pox death rate, average rainfall and temperature in Mahe.*

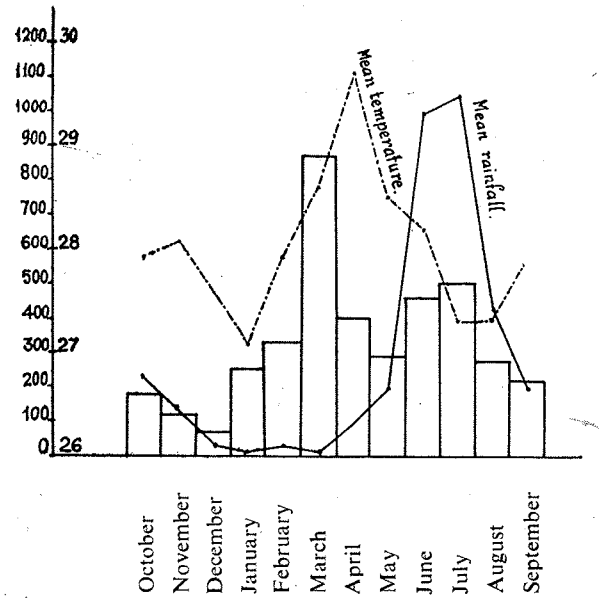
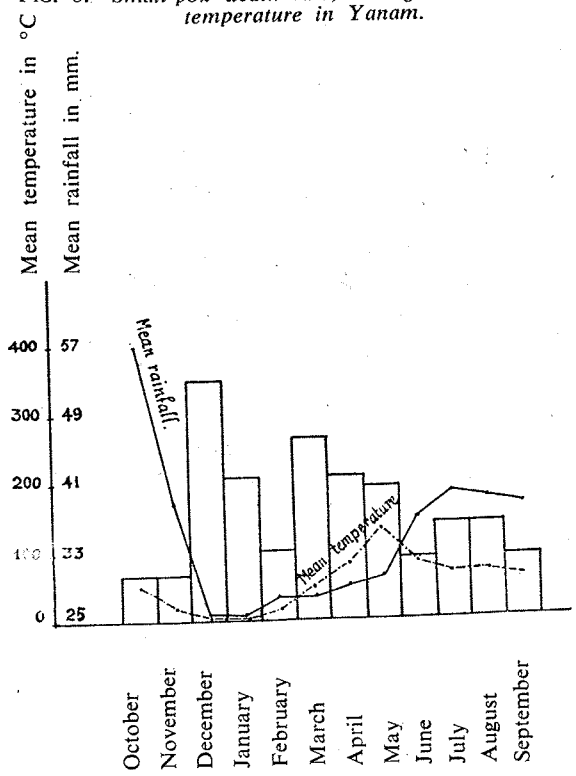


FIG. 8. *Small-pox death rate, average rainfall and temperature in Yanam.*



lag. Temperature has got no positive effect on small-pox incidence. Rainfall has significant negative effect for no month lag and this effect tends to decrease as the number of months in lag increases.

Partial correlation coefficients in Pondicherry establishment: The partial correlation coefficients were studied for further detailed analysis. The letters M, T, H and R respectively stand for mortality due to small-pox, temperature, humidity and rainfall. The values are as follows:

Zero order

rMT	—	− 0.0357	rTH	—	− 0.8604
rMH.	—	+ 0.1569	rTH	—	− 0.3363
rMR	—	− 0.5869	rHR	—	+ 0.4602

First order

rMT.H	—	+ 0.1974	rMR.H	—	− 0.7517
rMT.R	—	− 0.3056	rMR.T	—	− 0.6364
rMH.T	—	+ 0.2478	rTR.H	—	+ 0.1318
rMH.R	—	+ 0.5939	rHR.T	—	+ 0.3559

Second order

rMT.HR	—	+ 0.4534
rMH.TR	—	+ 0.6580
rMR.HT	—	− 0.8002

(i) The value rMR.HT = −0.8002 shows that rainfall has practically no correlation with small-pox when humidity and temperature are constant, whilst the coefficient rMH.TR = + 0.6580 indicates that humidity apart from temperature and rainfall has a significant association.

(ii) Humidity has a fairly high positive association with small-pox, rainfall markedly affecting the degree of correlation e.g.

rMH	—	+ 0.15689
rMH.R	—	+ 0.5939
rMH.T	—	+ 0.2478
rMH.TR	—	+ 0.6580

(iii) Increase in rainfall is associated with a reduction in the incidence of small-pox as this factor gives a high negative correlation in every case, e.g.

rMR	—	− 0.5869
rMR.H	—	− 0.7517
rMR.T	—	− 0.6364
rMR.HT	—	− 0.8002

VACCINATION

Effective control of small-pox depends on vaccination: In France, law of February 1902 requires vaccination in the 1st year of life and revaccination during the 11th and 21st years of life. This was not applicable to the French establishments in India.

Vaccination act of November 1906: Under this act Primary vaccination was made compulsory by the French all over the Pondicherry State. Revaccination is not compulsory. A valid certificate of vaccination against small-pox is a pre-requisite for school admission.

Epidemic disease act: Under this act the Governor has the power to order compulsory vaccination for all and this power is used during epidemics.

During the period 1946-1957 for which the data for vaccination are available are shown in Table V. The records of successful and

Table—V

Births and Primary Vaccinations performed

Years.	Total births	deaths in age group under 2 years	No. of primary vaccinations performed.	No. of re-vaccinations
1946	11,224	2,424	1,444	3,104
1947	10,542	2,794	1,358	1,782
1948	10,663	2,226	1,496	2,088
1949	11,958	1,846	1,592	2,614
1950	12,025	2,393	2,918	30,535
1951	11,466	2,910	2,458	21,223
1952	12,164	1,424	2,388	3,878
1953	11,243	1,209	2,037	2,062
1954	11,100	no data	no data	no data
1955	12,298	no data	1,825	5,849
1956	13,639	no data	6,033	61,552
1957	14,194	*3,365	1,981	12,566
	1,42,516	20,591	25,530	1,47,253

*deaths under 1 year only.

unsuccessful vaccination and according to age groups are not available to study the status of artificial immunity.

It is apparent from the table that only 18 per cent of the new born children have been vaccinated. This shows the insufficient enforcement of the provisions of the act due to certain reasons.

Organisation for control: There is an integration of both preventive and curative services from top to the peripheral level. The Director of Medical Services is responsible for the administration and organisation of vaccination. There is no separate Public Health field staff for rural areas.

There are no vaccinators and the vaccinations are performed by the compounders in hospitals only.

The lists of children born within last four months is sent by the Maries to the nearest rural dispensary every month. All infants included in the lists are vaccinated before the 9th month of age. It is apparent that the facilities for vaccination are not available to the rural public due to the absence of vaccinators and distance of the dispensary from the village. There is no checking also unless the parents bring their children again to the dispensary. The individual can register the birth within one year and get the child vaccinated within nine months. In urban areas there are vaccinators and facilities for vaccinations are available at the Bureau de Hygiene and houses. The lymph supply is from King Institute, Guindy, Madras and the storage, transport and method of vaccination is same as in other parts of India. During war time dry vaccine obtained from France was being utilised in rural areas. It had the added advantage of being potent for long periods at room temperature.

Suggestions

Vaccinators and Vaccination: There is a necessity for the employment of full time vaccinators in the rural areas which are not covered by Primary Health Centres (provided they are fully staffed). Taking the average birth rate in the area as 40 per 1,000 population and making due allowance for infant mortality, about 10,000 primary vaccinations and 120,000 revaccinations are required to be performed per year, making a total of 135,000 vaccinations.

If one vaccinator can perform 6,000 vaccinations per year, there is a necessity for about 22 vaccinators with three supervisors. Administratively the whole of Pondicherry state is divided into 16 communes and one vaccinator per commune with reserves and 2 supervisors at headquarters, fits in the administration nicely. Unless these vaccinators are situated within an easily negotiable distance from the residences of the people, they cannot be effective. They should be posted at commune headquarters and tour their areas to carry out vaccination. There are a large number of industrial establishments and a successful vaccination certificate should be a pre-requisite for employment in these organisations.

Registration of births: The period for registration in rural areas should be reduced to eight days instead of one year.

Checking of vital statistics: The Medical Officers, supervisor, vaccinator and vaccinators should have the power to check the completeness of the birth and death registers.

Vaccination Act: It should be amended, that the vaccination is completed within six months of the birth.

Infectious disease hospital: Urban areas should have I.D. hospitals for hospitalisation and isolation of infectious disease cases.

Health education: In addition to vaccination act there should be recourse to health education to overcome the social obstacles for accepting vaccination.

Summary

The epidemiology of small-pox in Pondicherry State (French settlements in India) for the period 1905-1957 has been studied.

(2) 6.7 per cent of total deaths are due to small-pox and the mortality rate is highest in Pondicherry settlement.

(3) Rural areas suffer more and 62% of small-pox deaths are in the age group under ten years.

(4) Small-pox shows a periodical increase at intervals of 4—6 years and the diseases is prevalent all the year round with peak months in March, December for Eastern coast settlements and March-July for western coast settlements.

(5) Humidity has got a positive effect on the incidence of disease in Pondicherry.

(6) Organisation and control of small-pox has been discussed with outlines of suggestions for improvement.

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PIECE-MEAL MASS VACCINATION DRIVE AGAINST SMALL-POX IN COMMUNITY DEVELOPMENT BLOCKS

By

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It is a queer coincidence that although vaccination against small-pox has been in existence for over a century, yet perfectly preventable small-pox epidemics not only continue to break out periodically, but also show an upward trend. It is due to the well recognised fact that the way vaccination against small-pox has been carried out during the last few decades by the vaccinators in an isolated manner, has not been satisfactory. One vaccinator required to cater to a population of roughly 60,000 persons and 150 villages, is grossly insufficient. The result is that many villages are not attended even once throughout the year, or possibly more. This failure is aggravated by the lack of health consciousness and apathy of the illiterate and ignorant masses.

With the appointment of Village Level Workers and vaccination duties also having been entrusted to them, some relief and better results were anticipated. But on account of greater stress having been laid on Agricultural production, vaccination duty by Village Level Workers is mostly being neglected or perfomed only rudimentarily. Even when compulsory vaccination is extended to the rural areas, much goodwill do not accrue because enforcing legislation is not easy. If we radically change the entire mode of vaccination and properly reorganise ourselves, better results can be obtained. For this purpose,, "Peace-meal Mass Vaccination Drives" have to be launched.

The district can be divided in Block and Non-Block areas for purpose of vaccination. Roughly 50% rural population has been covered by the NES/ID/Normalised Blocks in all the districts by now. Population of a block is approximately 66,000 and the number of villages is about 100.

Vaccination Staff in a Block

The following personnel, who are trained in the technique of small-pox vaccination, will be invariably available in a block.

Village Level Workers	...	10
Primary Health Centre:		
Sanitary Inspector	...	1
Health Visitor	...	1
Gram Sevikas ...	...	2
TOTAL	...	14

Let it be clarified at the outset that the above staff of a block will be utilised only for 6 days at a time after every 1½ months of vaccination season, for a total of about 30 days in the entire year.

In addition, the following staff from the District Health Organisation can also be made available:

*Epidemic Assistants (or Auxiliary Health Workers)	...	2
Circle Vaccinator	...	1
Assistant Superintendent of Vaccination ...	...	1
TOTAL	...	4

Thus, a total of 16—18 vaccinators will be available for utilisation in a block, at one time. In addition, the Midwives should accompany the party for contacting women-folk.

Completion of Birth Registers

Before the actual vaccination work starts in a particular block, the Block Development Officer and the Medical Officer I/C of a Primary Health Centre get the birth registers, of the villages to be taken up in a particular week, completed in advance with the help of the village Level Workers and Circle Vaccinator.

* They are graduates of indigenous system of medicine, employed by the State Epidemiology Department.

Actual Mode of Working

Total number of vaccinators will be divided in 2 batches of 8-9 persons, each under the supervision of an Epidemic Assistant. Association of one lady worker in each batch helps eliciting response from women and children of the village. The batch of vaccinators will be taken to the villages in Block Jeep/P.H. Van. Each batch will be able to cover 2-3 villages every day, working 5-6 hours a day. Working hours should be so arranged that the maximum number of villagers are available in their houses or villages at the time of visit. Whenever a village is visited, education will be imparted to the masses with a loud-speaker set, which is invariably available with the Block Development Officers. Loud-speaker set is mounted on the vehicles. This field work will last only for first five days of a week, in a block. On Saturday, statistics will be compiled and consolidated and handed over to the circle vaccinator, who will follow them in the ensuing three to four weeks till the next visit of the Vaccination Party.

Mass Vaccination work by the team will be concentrated in one block only for one week at a time. During this period, 25 villages in the block would have been visited. Thus, each block will have to spare its staff only for one week after every 5-6 weeks depending upon the number of blocks so far established in the district. For instance, say, 6 blocks numbered I, II, III, IV, V & VI, have so far been established in a district. Block staff of Block No. I will be utilised only for 1st, 7th, 13th, and 20th weeks in the entire vaccination season of 5 months from November 1 to March 31. In the 2nd week of vaccination season, the vaccination party will move to the next contiguous Block No. II, which will be visited during the 2nd, 8th, 14th and 21st, weeks, so on and so forth.

In this way, about 3,96,000 (66,000 × 6) population in block areas alone (approximately 50% of rural population of a district) will derive the benefit of saturated small-pox vaccination. Besides, work would also be progressing in non-block areas by the regular vaccination staff, who would cover another 10-20% of population. This will be enough to build up herd immunity in the district. In two years working, complete immunity can be build up in the entire district.

FLOW CHART SHOWING
ORGANISATION OF MASS SMALL-POX VACCINATION COMMPAIGN IN COMMUNITY DEVELOPMENT BLOCKS OF A DISTRICT
FROM NOVEMBER 1 TO MARCH 31.

No. of villages :—100. Approx. population :—66,000.

D.M.O.H.

A.M.O.H.

ASST. SUP. OF VACCINATION

BLOCK DEV. OFFICER

M.O. I/C PRIM. H. CEN.

Completes birth registers with the help of V.L.Ws. and Circle vaccinator in advance.

Block jeep/Distt. Amb. | Primary Health Centre Jeep

Publicity by loud-speaker mounted on above

BLOCK VACCINATORS.

Village level workers	.. ..	5	Village level workers	..	5
Sanitary Inspector	.. ..	1	Health Visitor	..	1
Gram Sevika	.. ..	1	Gram Sevika	..	1

DISTT. HEALTH STAFF.

Epidemic Assistants	.. ..	1	Epidemic Assistant	..	1
		8			8

helped by circle vacc. and midwives

Cover 2-3 villages/day (working 5 hrs./day)

cover 2-3 villages/day (working 5 hrs./day)

25 VILLAGES PER WEEK (working 5 days/week)

Saturday for compilation and consolidation.

Circle Vaccinator to follow results till next visit.

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PROVISION FOR HEALTH IN FIVE YEAR PLANS —RETROSPECT AND PROSPECT

Two five year plans are about to be over and we are at the threshold of the third. The Health survey and development committee (Bhore Committee) report of 1946 formed the first attempt to crystallise health problems of the country and in their recommendations it indicated the lines and directions in which the remedy was to be found. They suggested long term and short term programmes covering the various fields of activities and chalked out an organisation of health services to meet this end. Emphasis was laid on the development of Preventive Health Services, not merely conforming them to the control of Endemic and Epidemic diseases in the country but also expanding its scope, inter alia, to Environmental Sanitation and Hygiene, Mental Health, School Health, Family Planning, Nutrition and Health Education. An integrated Health service particularly in the rural areas was advocated and the plan of such service was clearly laid down. In order to provide personnel for these expanded services expansion of Professional Education both for medical as well as the para-medical personnel was particularly stressed. They even suggested action for manufacturing Drugs and Antibiotics to meet the need of the country and to make it gradually self-sufficient in these respects.

No funds were provided by the then Govt. of India to assist the provinces and very little action, if any, was taken to implement the Bhore Committee recommendations in the period between their emergence and the independence of the country.

With the dawn of Independence in August 1947 the responsibility developed on the Indians at the helm of affairs for formulation of plans and proposals to face the health problems of the country. The Planning Commission was set-up in March 1950 and after a year's labour the first five year plan saw the light of the day in April 1951 even though its implementation was delayed by another year or so. Rupees 131 crores were allotted for health out of the total of Rupees 2,356 crores provided in the first plan of National Development giving about 5.5% of the total plan provision. About 110 crores were actually spent and the shortfall of expenditure amounted to Rupees 21 crores or 16%. It was partly due to the delayed commencement of the implementation of the plan in almost all states and quite a good deal due to the fact that there was acute shortage of personnel—medical and para-medical and equipments needed for full implementation of the planned programme. Priorities were given to provision of water supply and sanitation, control of Malaria, integrated health care of the

rural areas, Health services to mothers and children, Education and training of health personnel. Health Education, Self sufficiency in drugs and equipments and Family Planning for population control. The sum provided for all these activities was to our mind, meagre and the time period, barely three years, was not enough either to reach the target or to make a definite impression on the problems particularly in need of the shortage of trained personnel and of equipments for sanitation. Even so some of the progressive States made a commendable start and achieved some progress though the bulk of the states had made very little advance beyond an initial start.

The Second Five Year Plan came into force in 1956. Rupees 267 crores were originally provided for Health out of a total outlay of Rs. 4,800 crores, thus maintaining the same 5.5%. Subsequently reduction in the total outlay were made, thus reducing the allocation on health prorata. Even so it is hoped that by the end of the Five year period the percentage of expenditure on health to the total outlay would not be reduced.

The Second Five Year Plan was in the sense a continuation of the process of development commenced in the First Plan but there was inevitably a shift of priorities with accent on some phases of National Development, particularly in Heavy Industries and Transport. In the sector of Health, it was the object of the Second Plan to continue the development process as commenced in the First Plan and at the same time give emphasis to provisions of adequate institutional services to serve as a base of organising health services, to provision of facilities for training of medical and other health peronnel, to control of mass diseases, to Family Planning and to Health Education.

The intention of the plan was to develop institutional services by providing more hospitals and increase number of beds on the one hand and on the other by establishing integrated medical and health care for the people in the rural areas through the Primary Health Centres and Health Units. To man those services it was felt that simultaneous training programmes for both medical and para-medical personnel should be developed with due attention to the number required on the basis of the accepted standard per cent of population. The gap that existed between the available strength of the personnel in the different categories and the need of the whole country was very large and hence this training programme and its quick implementation were strongly emphasised.

Control of communicable diseases particularly of the devastating disease of Malaria work in regard to which was commenced on a planned basis in the First Plan was to be continued to a successful end. In view of the utter inadequacy of the water supply in the rural areas as well as many urban areas and of the deplorable state of disposal of human wastes particularly in the villages the problems received careful attention and substantial provision in the allocated budget.

Family planning for which a provision of Rupees 4 crores was made in the Second Plan received great emphasis. 300 urban and 2,000 rural family planning

centres were provided for besides assistance to voluntary organisations and States for clinics and demographic research.

In a like manner, Health Education which forms the key-note of all modern health campaign received an allocation of Rupees 75 lakhs.

In reviewing the achievements in the Second Plan which terminates in March 1961, the tempo of work manifested except for a few items on the programme, compels us to fear that there would be inevitable shortfalls in the expenditure amounting to 15% or more. In the face of the fact that funds allocated were meagre as against the needs of country such shortfalls are all the more regrettable.

Except for increase in the number of Medical Colleges and bed in hospitals providing more qualified doctors there has been very feeble attempt made even during the Second Plan to train other categories of health personnel. The gap, wide as it was, between the available strength and the number needed for the country will still remain very large. This applies to Dentists, Pharmacists, Nurses, P. H. Nurses, Sanitary Inspectors, Health Visitors, and Midwives. In other words, the States have so far not paid much heed to the recommendations in regard to the training programme of the Bhore Committee repeated again in the First and Second Plans.

Fair progress has been made in the control of Malaria and the country will look forward fervently to the change-over into the Eradication programme if, in view of the fast developing resistance of the vector to the insecticides, the benefits of the control programme are to be conserved.

As for Environmental Hygiene some progress has been made in regard to supply of potable water to rural areas and improvement and additional supply to some urban areas. Even so, much remains to be done in this direction. As regards the programme for disposal of human wastes, particularly in the rural areas hardly any attempt has been made beyond working out the type of a suitable latrine. The insanitation prevailing for centuries in the rural areas still exists with its usual consequence of high incidence of intestinal diseases and deaths.

In some progressive States the work of providing integrated health service through the establishment of Health Centres in the rural areas in the First Plan brought a lot of hope to the people. But for reasons better known to the authorities the work has been held up and in the name of merging the work with the health services in the Community Development blocks, there have been poor speed and little progress. Family planning clinics have been established though their number is no where near the target. The progress has been poor and the value of such clinics, unless the work is so planned as to satisfy all aspects of the programme, will remain doubtful.

We purposely refer to just those few fields of activities planned in the Second Five Year period on which special stress was laid. In regard to other fields we reserve our observations for the future till the Second Plan is over and the full picture of quantitative achievements is out.

The Third Five Year Plan is due in April 1961. The Planning Commission and its advisers have been busy in formulating the proposals. But before doing so we assume that they have evaluated the achievements since the Bhore Committee made its recommendations and taken full account of what has been achieved of the planned projects in the two Five Year Plans just over.

We have not got a draft on the proposals for the third plan but from discussions at all level high and low, official and unofficial as reported in the press from time to time we understand that the total outlay in the Third Plan would amount to Rs. 10.200 crores and that the allocation on Health has been reduced from Rupees 700 crores to Rupees 300 crores. This gives an allocation on Health less than 3% of the total outlay as against 5.5 to 5.6% in the two past plans. We presume that the Third Plan is expected to accelerate the programmes in the two previous plans and reach the targets in those fields speedily within the Third Plan passed. Numerous problems, the immensity of each of which is well known still await solution. The country is looking forward to making vast strides inter alia, in the field of integrated health services through Health Centres in the Community Development Blocks, in training of health personnel, particularly in the para-medical categories, in the provision of water supply and sanitary disposal of human excerta through development of Environmental Hygiene in rural areas, in the field of nutrition and food adulteration, in the control of mass diseases with eradication of some such as Malaria, Smallpox, Cholera, and adequate control of T.B., Leprosy, Filariasis, etc., in health service to mother and children including school health, in family planning and population control, in mental health and degenerative diseases, in expansion of Laboratory services, and in research. With such a formidable task in front of us the meagre allocation of Rupees 300 crores is more than disappointing and discouraging. We would request the planners to reconsider the matter and provide for the original sum of Rupees 700 crores. If, however, the purse strings are maintained tight and rigid and the Third Plan on health has to be formulated on the basis of the reduced allocation, priorities in the Third Plan programme will have to be determined, with great consideration and care. In our opinion the following should receive priorities:—

1. Training programme of health personnel.
2. Environmental Hygiene—provisions of water supply and disposal of human excerta in rural areas on a subsidy basis. This is in view of 50 million cases of diseases of intestinal infection and 5 million deaths every year.
3. Emphasis of Integrated Health Service through Health Units.
4. Family Planning and Population Control.
5. School Health.

(6) Malaria Eradication Programme.

If social and economic development forms the main objective of the Five Year Plans, it is indeed a pity that we should fail to appreciate adequately that the human factors is fundamental to it and that the protection and promotion of health must undertake any programme to raise the standard of living.

WORLD HEALTH DAY

Malaria Eradication—a World Challenge

The seventh of April of every year has now been sufficiently known to the people of every country as the World Health Day, i.e., the anniversary day of the official enforcement of World Health Organisation's constitution. On this day a theme for observance is selected every year to be used by all national and local health authorities to focus public attention on some particular aspect of health, to interest the people about the health needs and to stimulate their co-operation in the health activities at all national and local levels. This is the tenth year in succession of the propagation of such a theme. This year the choice has very appropriately fallen upon "Malaria Eradication—A World Challenge." More so, for the country like India where malaria has wrought more danger and devastation in recent times than any other single illness and where the eradication programme has already been lanched and is making a rapid progress.

The discovery of DDT as an effective insecticide during the Second World War encouraged countries like India and Ceylon to undertake large scale rural control measures. With the advent of the World Health Organisation in 1948 control of malaria was given the priority No. 1 in public health schemes and beginning from 1949 a close collaboration was set up between it and various governments to establish demonstration and training projects from malaria control. Following this, some of the countries established malaria control activities with the generous help offered and the bilateral agreements executed by the Government of the United States of America through its operating Missions. While the progress achieved by the control procedure appeared somewhat phenomenal with the new weapon DDT, the question of probability of development of resistance on the part of some vector insects brought out a reorientation on the global policy on malaria and the W.H.O. emphasised on the need of switching on to ERADICATION to achieve the ultimate objective before the local vectors could develop any degree of tolerance to make the scheme ineffective.

The essential difference between the two programmes is one of strategy. In case of eradication the performance has to be total, speedy and efficient, rather than taking care of the main endemic sources and in piecemeal manner, and involves the question of permanent future security against the world scourge. Thus before the end of the period the human reservoir should be reduced to the vanishing point if not actually zero, so that no secondary case may arise to lead to an acute epidemic of malaria with the repetition of devastation and endemicity. If this is to be achieved the spraying work must be particularly efficient (attack phase) and arrangement should be made to map off any residual case of malaria, old or new, indegenous or imported through surveillance during the consolidation phase (withdrawal of spraying) and afterwards. This would cover a period of seven years but even after the interruption of local transmission, close watch should be maintained for a considerable period for any possible reappearance (as relapse cases may arise even upto 14 year or so) by the general rural health services.

The crux of the programme is that once accepted, the organisation and execution of it should be carried out with utmost efficiency and meticulous care, in no less a degree than that of a military strategy. Any laxity or delay in carrying out the planned programme may prove fatal in malaria eradication. Particular attention of the administrative wing of the government which is dealing with the problem, is, therefore, drawn to this point, and to the fact that the budgetary provision should be made for five-yearly period instead of yearly, to ensure the financial need.

Another important point which plays a decisive role in this strategy is the action taken in this regard by the neighbouring countries. The problem being global in nature all countries should adopt the same plan without any reservation, otherwise each one of them may turn out to be a dangerous menace to their neighbours. Here also, all credit and gratitude of the people are due to the World Health Organisation for establishing the Malaria Eradication Programme

for 500 million people in the South East Asian Countries *en block*. The economic gain in terms of wages only has been estimated to be about Rs. 60 to 65 crores a year, the total loss being about Rs. 500 crores due to the loss in vitality, output and efficiency. Against this the total cost of the programme for the next ten years has been calculated to be about Rs. 176 crores, i.e., 17.6 crores a year, a straight saving of Rs.42-48 crores on wages alone per year.

The third and equally important point is the need for an unfailing and intelligent co-operation of the people. Although to our great future and gain the people rendered their very willing co-operation in the control rather more liberally in the eradication programme if the success is to be guaranteed. The people may not be misled by the dramatic removal of malaria from the country and may not consider any further action as troublesome and wasteful. This tendency should be guarded by extending appropriate public information, health education and guidance to the people of all economic and controlled levels in our country.

When the final stage of eradication is reached malaria will almost have disappeared from among the largest majority of the people, with full reversion to the susceptible state. But it should be pointed out that the last stronghold of malaria, e.g., Africa would still remain untouched. It should, therefore, be the interest of every country to join hands to overthrow the large stronghold, for the continued presence in the heart of our planet of such a reservoir of infection would be highly dangerous at that time, in the face of the fact that malaria in that continent present complexities and difficulties that have not yet been overcome. Indeed, the world cannot claim to be free from malaria until the very last case has been detected and treated. If both parasite and mosquitoes exist anywhere they are bound to meet sooner or later and the consequence can be well-imagined.

The wanderers are another group who can create real difficulties. The seasonal labour and pilgrim migrations both intolerate and intercontinental movement of refugees constitute another problem in the programme of malaria eradication. Some of them may actually be the potential smugglers of the malaria parasite. We have to guard against them too.

The task is indeed stupendous and was once considered impossible. There are no doubt countless difficulties in the way of our achievement. Besides finance, shortage of field workers, technicians, research workers and administrative staff is still playing a decisive role in the programme, but all barriers and difficulties will vanish before the will and determination of the people.

CHANGING PHASES OF CONTROL OF TUBERCULOSIS IN INDIA

In the very early part of this century a rising trend was noticed in the incidence of Tuberculosis. This corresponded with the increasing tempo of movement of population from the rural to the urban areas in qest of education, business, employment, sight—seeing and of the development of industries with consequent increase of slums, squaller and over-crowding. Only a few years prior to this that the tubercle bacillus was discovered by Koch and little later the X-Ray Roentgen. Even so a great deal of social stigma was attached to the disease. It was considered by many as hereditary and was known as "Rajjakshma", i.e., King of wasting diseases. However, the discovery of causative germ and its infectious nature brought about the first fundamental change in the control programme by way of segregation and disinfection of sputum. In the absence of any specific drug the treatment remains mainly confined to the relief of symptoms and to the healing by rest, recreation, good food, change of climate (to the hills or sea side) and graduated exercise, etc. The discovery of Vitamins also urged the clinicians to use it extensively in addition to calcium and high protein diet.

Then come the innovation and popularisation of surgical treatment, particularly artificial pneumothorax, phrenic avulsion and later pneumoperitoneum, which brought greater hope of survival to the suffering patients.

Among the methods of segregation, hospital was considered better than home for obvious reasons and this led to the development of special tuberculosis hospitals and sanatorium. Hospitals were generally built away from the congested city or town areas and sanatoria at or near hill or sea side stations to ensure pure air, sunlight and enjoyable climate, and with arrangements for better food, rest, recreation, surgical procedure and graduated exercise, etc. While serious and late cases were admitted in the hospitals sanatoria were dealing with mild, early and moderate cases only the cost of treatment being most expensive and generally beyond the reach of the majority of the tuberculosis patients.

A partial remedy to this hight cost was found in the building and utilisation of cottages in association with the tuberculosis hospital where the patient could obtain his food and treatment from the hospital staff at a lesser cost than that of the sanatorium.

Now the question of rehabilitation of tuberculosis cases gradually becomes a very vexed and difficult problem. Thus the idea of Tuberculosis after-care colony, such as Sapworth in Great Britain, was mooted out, where the convalscents as well as the cured could be engaged in some suitable job to earn their own living and even could lead a well-con trolled family life. Such an Institution could not yet be established in our country. The specific drug still remaining undiscovered. The main emphasis was laid on the detection of early cases through the turberculosis dispensary or clinic system with facilities for laboratory and radiographic examinations. This helped in the detection of larger number of cases in the community some of whom were still in the earlier stages, but the number of beds in the hospitals and sanatoria fellfar short requirement and they were not within the reach of the majority of the patients. This led to the development of follow up of cases in their homes through the health visitors.

The other method of detecting case in the community general, industrial or otherwise, though not extensively used in this country was through the special survey. While all these procedures were making a good progress in detecting the tuberculosis cases among the communities, the problem of treatment and rehabilitation were also assuming unusual proportion. The position still further deteriorated recently with the increasing tempo of the growth of population, towns and industries and migration of unsalted labour population in connection with the development plans and of the refugees from the neighbouring countries. Even with all these India has not yet reached the hump of the curve from which many countries in the west started descending long ago.

However, the three important discoveries within the last two decades which have considerably influenced the newer outlook and

changes in the control of tuberculosis are the discovery of chemotherapeutic and antibiotic drugs like PAS, INH, Streptomycin, Viomycin, etc., the mass miniature flurophotography and the BCG Vaccine (recently popularised) for prophylactic purposes. Each one of these has contributed substantially in its own way towards a wider coverge in the control of tuberculosis. While immunity has still remained a controversial issue, prophylactic immunisation with BCG vaccine has been adopted on a mass scale under the National Tuberculosis Scheme in India. Although doubts about its practical efficacy have been openly expressed in some quarters, judicious use in appropriate fields will certainly have its value.

The latest design now being advocated by the experts in this country is the "Domiciliary Treatment" In an experimental trial for one year in Madras under controlled conditions among none-too unbiased group of patients, the domiciliary treatment has proved almost equally effeciaous as that of the hospital treatment. This has raised a fresh and greater hope for an easier and more economic control of tuberculosis in this country, but the question is would it be feasible for application of this measure on a country-wide basis, where the patient seeks the hospital treatment mainly on economic ground and would not even leave the hospital even after being declared cured and when the success of the scheme depends upon the complete co-operation and understanding between the people and the workers and when a slightly neglectful execution of the procedure may lead to the development of drug resistant bacilli which would be far worse than no treatment? Thus along with the brighter side it would be unwise to neglect the possible darker aspects also during planning.

All these and various other points have well discussed by Dr. P. K. Sen in his Presidential Address at the Sixteenth Tuberculosis and Chest Diseases' Workers' Conference held at Poona in January 1960. The various new suggestions that he has offered are worthy of serious consideration. The readers are, therefore, referred to his address which has been published in the 'Reports and Reviews' section of the issue of the journal.

REPORTS & REVIEWS

PRESIDENTIAL ADDRESS AT THE SIXTEENTH TUBERCULOSIS AND CHEST DISEASES WORKERS' CONFERENCE

DR. P. K. SEN,
Calcutta

Let me first express my gratitude and sincere thanks to the Chairman, the Members of the Executive Committee and the Standing Technical committee of the Tuberculosis Association of India, for kindly inviting me to preside over this Conference and to act as the Chairman of the Standing Technical Committee.

I am aware that it ill befits an unworthy person like me to step into the shoes of my illustrious forerunners. I only hope that you, in your kindness, will forgive me if I travel along the beaten track most of my time. This I do thinking that it may be gainful to repeat important things.

We meet here for the first time under a new name. At these Conferences, in the past, many papers were presented on chest diseases other than tuberculosis. We published such papers in our Journals and Proceedings. The change in name, therefore, only truthfully reflects the function and character of this Conference. This year's programme also shows this trend clearly by incorporating a panel discussion on non-tuberculous conditions. I welcome this change and hope that more contributions will be available on other subjects in coming years.

We are, at the moment, in a dangerous phase in regard to tuberculosis. The impact of industrialisation and of mass movement of population due to partition of the country has disturbed the barriers of village shelters mingling this ocean of humanity into one homogeneous mass. Tremendous efforts to make up past deficiencies and desire for better standard of living without parallel achievements are causing hardship both on the body and mind of our people. All these environmental and psychological causes make for greater inroads of tuberculosis in the country deeply indenting and increasing our problems. I do not see much chance of remission of all these stresses in the near future. Tuberculosis is, therefore, likely to spread its vicious tentacles far and wide and take heavy toll in human lives and sufferings if it remains unchecked at this vital period.

It is not that we do not know how to fight tuberculosis, nor have I any doubt about our ultimate victory, but, unfortunately our means are limited; so limited that every step we intend to take has to be modified in the light of our resources. Yet, with an epidemiological pattern like ours, it must be remembered that time is the essence of the problem to render heavy initial toll lighter. Keeping these in mind our Tuberculosis Control Programme will have to be so designed that it will ensure the greatest gain in the shortest time with minimum expenses.

In doing so, our present load of tuberculosis and achievements so far must be taken into account first and thereafter, in that light, our campaign should be designed and developed.

OUR LOAD

Infection—B.C.G. vaccination campaign in West Bengal till the end of 1958 showed in 13,37,366 tested persons, 21.4 per cent get infected by the age of 6 years and 32.7 per cent by the age of 14 years. I have no all-India figures in this respect. I do not expect those to be appreciably different.

Disease—Summarised findings of National Sample Survey (1955-1958) of 6 Zones on prevalence of pulmonary tuberculosis are as follows:

1. In cities, towns and accessible villages the rate of radiologically diagnosed cases of "active" and "probably active" tuberculosis varied from 13 to 25 per 1,000 population.
2. The rate of bacteriologically positive cases for 1,000 population varied from 2 to 8.
3. Prevalence rates in cities, towns and accessible villages were generally of the same order.

Assuming that this rate is roughly true for the whole of India, that the population of India is at present about 400 million, that 80 per cent of this population live in the villages of which four-fifths are in areas inaccessible to mass miniature x-ray van and that this rate for inaccessible villagers is half that of the others, the number of cases on such rough estimate will be as follows:

1. In cities, towns and accessible villages: 1.9 to 3.6 million.
2. In accessible villages: 1.7 to 3.2 million.

The total number of cases of pulmonary tuberculosis in the whole country will, therefore, be on a lower estimate 3.6 million, and on a higher estimate 6.8 million. Of these about one-third will be bacteriologically positive on testing a single sample of sputum.

Death—The rates are unknown and I prefer not to make any guess, though one-fifth of the morbidity rate may be accepted as this rate for rough calculation.

It may be correct to remember that this load is not static. From available information it may be justly assumed that the load will increase in the near future.

OUR ACHIEVEMENTS

1. *B.C.G. vaccination programme*—Till September 1959 a total of 135,223,784 persons were tuberculin tested and 47,387,334 were vaccinated.

2. *Clinics*—A total of 180 clinics have been established. Accepting a high estimate of about 2,000 cases in each clinic, the total number of cases domiciliarily treated is about 360,000.

3. *Private Practitioners*—In addition, a number of cases are treated by private practitioners. This

number may be even 4 or 5 times higher than that of the clinics totalling about 1,800,000 cases.

4. *Hospitals and Sanatoria*—There are about 25,000 beds. Assuming that all the beds remain filled, a total number of 25,000 patients are being treated in that way.

It may, therefore, be very roughly assumed that out of the 3.6 to 6.8 million cases, only about 2 million are known and are being treated in some way or other and the rest remain undiagnosed and untreated. This latter group, probably constitutes the greatest source of danger to the community and to themselves.

5. *After-care Colony and Rehabilitation Centres*—There are a few centres but their contributions, as yet, are so small that I need not expand on it.

These are our loads and achievements so far regarding pulmonary tuberculosis. We have adopted recognised methods of a control programme and I have nothing more to add. The important problem, however, is where to lay the stress and how best to utilise and control the measures in our present circumstances. I wish to present to you briefly some thoughts that crossed my mind in this regard.

B.C.G. Vaccination and Chemoprophylaxis

In a disease like tuberculosis no measure is comparable in effectiveness to those which improve the standard of living of the people and of sanitation. These are general measures for the uplift of the nation and I leave this matter for the proper quarters to consider. In the light of our epidemiology and in consideration of the existing facilities adoption of a specific preventive measure seems to me almost obligatory. Let us then consider the existing preventive measures and their suitability for mass use.

Case finding, segregation and treatment are all preventive measures as they eliminate the sources of infection. These are, generally, slow processes. On the other hand, any measure which can improve the resistance of the healthy population and can be much more quickly and widely employed should be regarded as a better method. B.C.G. vaccination and chemoprophylaxis belong to this group and I intend to compare the merits of these two only.

In the past there had been and also at present there are many earnest advocates for and antagonists of B.C.G. vaccination. It would not be fair to brush aside all the criticisms levelled against it. I personally feel that in some respects our evaluation had been based on very reasonable assumptions but not on actual proof. This is because our fundamental knowledge on allergy and immunity is still very poor and exact experimentation on an adequate scale is extremely difficult. Many other criticisms are, however, quite unfair. When I consider it from all angles from existing literature, I feel our current knowledge is such that we should accept this measure as safe and also effective in terms of partial protection against tuberculosis disease. I am, however, not yet bold enough to hazard any definite opinion on the quantitative estimation of the amount of protection it may confer. Theoretically, such a protection should be dependent on so many variable factors that only a general statement of this kind is possible at present. B.C.G. vaccination has the great advantage of being cheap and very large fields can be covered within a short period.

Chemoprophylaxis has its earnest advocates also but, as far as I know, no one amongst them is quite sure of the feasibility of its mass use in a country with our kind of epidemiology. It involves single drug administration (INH) over a long period in people who have no clinical or radiological evidence of disease. Proper acceptance of such a measure by the persons and control of such a procedure by the administrators, are, therefore, most difficult.

The most suitable time for chemoprophylaxis is immediately following primary infection. In practice, this optimum period can only be determined by serial tuberculin testing of an individual from infancy onwards. Obviously, in a country with high infection rate even in younger age periods, this is almost an impossible procedure. The measure may also be useful in the uninfected (chemoprevention) and in the infected (chemoprophylaxis) beyond this optimum period. It is, however, not yet quite settled which group should be preferred in a mass campaign or only certain specially exposed and susceptible groups should be included. Other problems like alteration of the immunological response, later development of disease by INH-resistant persistent bacilli and a host of other questions remain to be satisfactorily answered. The measure is, also, much more expensive.

There had been suggestions to employ both B.C.G. vaccination and chemoprophylaxis, preferably with INH-resistant B.C.G. strains. There is no evidence as yet suggestive enough that this will be advantageous.

From these considerations one cannot escape the conclusion that our adoption of the mass B.C.G. vaccination programme is a step in the right direction. We still have to complete our first round. One must remember that this programme, to be effective, must continuously include the newcomers by birth and should not be stopped till, probably, the infection and disease rates fall to a great extent. I would, therefore, suggest that:

1. All the staff necessary for this scheme after completion of the first round, be absorbed in a permanent cadre of the Health Services in the State.
2. A responsible officer of the status of an Assistant Director of Health Services should be in charge of tuberculosis control in each State.

I am of the opinion that medical personnel is not generally necessary for the routine vaccination programmes. This should be left to the technicians specially trained for the purpose. There had been suggestions in some quarters that this programme may be integrated with other vaccination programmes and the same vaccinators with a little more training may be employed for the purpose. I do not think it will be wise to do so now for many reasons.

It is essential that a mass service programme of this type should continually be checked and guided by research programmes. In addition to the usual checks for potency of the vaccine, conversion rates, extent of allergy produced and a few other studies undertaken by the Research Team, I suggest the following:

1. *Change in the record for age groupings*—Currently the age groups are recorded as 0—6 years, 7—14 years, 15—24 years, 25 years and above. It is likely that the soil conditions determine the amount and quality of protection and liability to disease later and these conditions are different in different stages of life. For investigations in these lines at a later date it may be worthwhile to record age periods in terms of the new-born (0—1 month),

infant (1 month—1 year), toddler (1—5 years), child (5—13 years), adolescent (13—19 years), adult (19—40 years), and old (40+ years).

2. *Tuberculin and Tuberculin test*—Inadequacy of tuberculin as a perfect specific antigen and difficulties in interpreting this test are becoming more and more apparent. All attempts should be made to develop a better antigen.

Also we depend on WHO for tuberculin. We should try to have our own. For all these our B.C.G. Laboratory should be adequately equipped.

We have not yet been able to define clearly what should constitute positive reaction. Further work in this line and a clear definition are urgent necessities.

3. *Studies on the result of vaccination*—Whatever might have been the findings in other countries, it is essential that we assess our own results in terms of protection and complications, as these may vary under many different conditions. I concede that studies in these regards to arrive at a definite conclusion may be very difficult. But in a situation like ours, attempts must be made. Groups of stationary and controlled population may be available in some areas like the Urban and Rural Health Centres of the All-India Institute of Hygiene and Public Health, Calcutta, some well controlled Community Development Blocks and also in some other places. Investigations of this nature can be planned and executed in such areas.

4. *Vaccination of the newborn and infants*—There is no doubt that vaccination of these groups at the maternity hospitals and at the Child Welfare Centres will help mass vaccination programme appreciably. The result, as determined by conversion only in Bombay and West Bengal seems encouraging. Complications were also not too many. This experience should lead us to study other samples.

5. *Oral vaccination and dry vaccine*—Use of oral vaccination and dry vaccine will also solve many field problems and will immensely help in quick coverage. Planned sample studies in all these should be started without delay.

6. *Keloid*—Post-vaccination keloid formation is fairly frequent—specially in some areas. You must agree that it is an ugly scar, specially for females. I have an impression that this is more frequent in persons who react to tuberculin more intensively after conversion. Investigation into this subject seems important to me.

7. *Chemoprophylaxis*—In the light of what has been said before, it seems justifiable to set up well planned and controlled studies in a few centres only for the specially exposed groups like home contacts. I do not like to go any further in this matter at the present stage of our knowledge.

Domiciliary Treatment

In our Third Plan period this service is likely to be very much highlighted. As stated before, even without proper case finding programme we have 3.6 to 6.8 million cases on our hands with only 25,000 hospital beds for segregation and treatment. Are we, therefore, accepting domiciliary treatment merely because there is extreme shortage of beds or as an apology for segregation and treatment or have we any valid reason to justify this step? This seems to be the burning question of the day for us.

A fair amount of information is already available to justify a statement that up to the end of drug treatment and for a short period thereafter patients treated at home fare almost as well as the hospital treated cases. This experience is not limited to our country only. In the East, Iwasaki of Japan and in the West, Griesbach of Germany recorded improvement by domiciliary treatment in 75 per cent and 79.87 per cent cases and by hospital treatment in 74.60 per cent and 85.00 per cent cases respectively. These figures may not show the exact situation as the definitions of the terminologies used are not exactly the same. It may be right to accept them as a rough estimate.

In this country, initial report of comparative study of one year's treatment of 82 home and 81 sanatorium patients by the Madras Chemotherapy Project is now available. Their conclusion in their own words is "that the results of domiciliary chemotherapy, as carried out in this study, approach sufficiently closely the results of sanatorium treatment to suggest that it is appropriate to treat the majority of patients at home." It was, also, very interesting to note that more serious sociological difficulties occurred in the sanatorium group. This finding is in line with my experience also. This is a very well planned and carefully executed investigation. Home visiting, control of drug administration, etc., or in other words whatever was felt necessary was done as well as money could buy.

It is good to know the result on such ideal conditions but such are certainly not the conditions which can be reproduced in our domiciliary country-wide service. It is, therefore, also essential and may be more profitable, to know the results of our usual domiciliary service. There had been a number of publications from a few of our prominent workers in this respect. Their findings also seem to show that the result of domiciliary treatment is not appreciably inferior to the result of the hospital treatment.

In a retrospective study from records, I reported the result of domiciliary treatment in 5,883 cases at the Domiciliary-Ambulatory Committee Meeting of the International Union Against Tuberculosis in July, 1958. I had also compared this result with that of 2,472 patients treated in hospitals and sanatoria in different parts of India modifying the terminologies used in the hospitals in such a way that the group results were comparable. Comparative results recorded in home and hospital groups were: improved and quiescent in 81.00 per cent and 87.49 per cent, worse in 4.40 per cent and 0.02 per cent cases respectively. Briefly, the result of treatment in the hospitals proved to be slightly better than domiciliary treatment but the difference was not significant enough.

The most interesting findings in the assessment of the influence of different factors were that neither the environmental conditions like bad housing and overcrowding, nor the standard of living in terms of diet, etc., nor the standard of supervision and not even the state of ambulation had any appreciable effect on the result provided the drugs were taken regularly. All that mattered was the antimicrobial therapy, and to some extent, the character of the lesion. It may be accepted that the main difference between hospital and domiciliary treatment is better control on the movements of the patients in the hospitals. As movement also did not have any appreciable effect when drugs were taken then there should be no great difference in the result of treatment between home and hospital cases under chemo-

therapy. If these findings reflect truth, it must then be conceded that the drugs alone can control the bacillary population and heal the disease to such an extent that no other factor can have any appreciable influence on the immediate result of the treatment. A phenomenon of this magnitude changes many of our previous concepts and must have the potentiality of revolutionising the anti-tuberculosis campaign in a country with our type of epidemiology and resources.

There is, therefore, justification for optimism with regard to domiciliary treatment. Extensive use of this service may fulfil our dream of early control of tuberculosis.

I should, however, like to voice a note of caution for the present. We have very little knowledge of what happens to the *home contacts* if we allow a patient to be treated at home, even accepting that majority of such sources of infection may get liquidated in 3 to 6 months' time. Last year, at the Jaipur Conference, I presented a study in this respect showing higher prevalence rate of the disease among such contacts than that found in the National Sample Survey and a general population survey of a part of the same area. But that was only for the domiciliary group. A fairly long-term comparative study between the domiciliary and hospital groups in different parts of the country and in different strata of the society is necessary to come to any conclusion.

Extensive studies on the frequency of *fallouts, types and causes of irregularities in self-administration of drugs, frequency of emergence of drug-resistant strains and long-term relapse rates* specially in relation to irregular drug taking, must be undertaken before we can more confidently launch this service programme in a nationwide scale. Besides, though we seem to feel that this treatment is almost equally effective as that in hospital when all the patients are taken together, we have not instituted any proper study to settle which categories of cases may be quite unsuitable for this service and should be treated in the hospital. It will help greatly in determining the priorities for hospital admission if we can arrive at some decision in this regard. The most suitable drug regimen for domiciliary service and average cost involved in treating each case at home and hospital should also be determined.

I have only mentioned a few among many problems that confront us. I do not think that any of these investigations are difficult or expensive in a retrospective and day-to-day study. All that is necessary is to organise co-operative investigations by several institutions noting the information on a common schedule under common terminologies with clear-cut definitions. This is an immediate and vital need. In an international study at the Committee on Domiciliary Treatment of the International Union Against Tuberculosis, it was very disquieting to see how often we use the same terminology in different meanings. Even the meaning of "domiciliary treatment" was found to be different with different countries and workers. I can think of no better and no more useful programmes of research than in these directions. If finance permits then, in addition, carefully planned further co-operative studies may be initiated.

In the light of current knowledge, control of drug-treatment seems most important and urgent for our campaign. A brochure on "Principles of the Control Programme of the Domiciliary Treatment of Pulmonary Tuberculosis" incorporating an introduction, methods of tests by pill counting, ferric chloride test for urine, etc., and main points in home visits, published by our Association will, to my mind, serve useful purpose. Besides, studies on simpler tests like incorporating a dye in the pill and testing its presence in urine and further investigations on INH test, should also be undertaken in some of our institutions.

I have only another point to make in this connection. Home visiting is, no doubt, an important method for proper control and guidance of domiciliary service. From whatever experience I have, it seems to me that the effectiveness of such visits as practised in some institutions does not seem to be satisfactory. The number of such Home Visitors also fall too short in relation to the number of cases. May I, therefore suggest that this effort should be concentrated on control of self-administration of drugs and segregational measures only and, if need be, other details of home visits may even be neglected. By this means we may be able to expand our services on an aspect which seems so important.

May I suggest that the Tuberculosis Association of India undertake to prepare such schedules through an expert committee without delay and seek assistance from the Indian Council of Medical Research and the Government of India for nationwide co-operative studies on the lines mentioned above.

Reorientation of Clinic System and Case Finding Programme

We know to-day that drugs act best in fresh lesions and an early case can be treated at home most successfully with minimum residual crippling. In contrast, it is our common experience that patients admitted to hospitals or visiting a clinic are, by and large, fairly or far advanced chronic ones. This increases demand on hospital beds, drug failure and relapsed cases and ultimately the total load. One should remember that every early case of today is a chronic one of tomorrow. Liquidation of one is the control of the other.

With our main stress on domiciliary treatment in coming years, it seems almost imperative that early case finding measures should also run hand in hand. Survey by mass miniature radiography is the recognised method for this purpose. To sieve out cases from the whole community is, however, very expensive. We must, therefore, screen only those groups where the yield is likely to be much higher. In this light, may I suggest that we should not spend time and money generally for community survey but should reserve the use of mass miniature radiography only for screening the home contacts, those who have any kind of previously known lung pathology, and/or relevant chest symptoms, general hospital admission cases, diabetes, those who are exposed to special hazards of tuberculosis, namely, workers in silica industry and groups where the incidence is known to be higher, as for example, the tribal races.

In the light of the foregoing statements and whatever experience I have about clinics, it seems to me that these two most important functions of early case finding and supervision of domiciliary treatment, specially that of self-administration of drugs, are not adequately practised and controlled. The intention of having clinics up to the district level at the end of the Second Plan period was not fulfilled. In the Third Plan period we have rightly stressed on clinic-based domiciliary treatment more than any

other measure and it is natural to expect that our greatest effort should be channelled in this line. I have, however, some misgivings which I like to share with you. A clinic which cannot adequate control administration of drugs may not only be wasteful for drugs but may become a dangerous source of partial and irregular treatment with all the attending evils of relapse, emergence of resistant strains and community danger following them. Besides, inadequate facilities for proper examinations may lead to misdiagnosis and wrong treatment.

Because of these reasons, I think, a bad clinic may even be worse than no clinic. To remedy this situation, to some extent, I have thought of another type of planning for the clinic system and I place this for your consideration. For cities and other crowded areas let us not try to build many clinics with a full complement of x-ray and laboratory equipment. Let there be one place governing a large area, call it a *Central Clinic,* something like our Teaching and Demonstration Centres without the arrangement for entertaining patients there except for consultations only. This clinic will be manned by a very experienced medical officer with an adequate number of medical assistants, ancillary staff and a statistician. It will house mobile mass miniature radiography sets, a good laboratory with facilities for culture and resistance tests, processing section for the x-ray films, store for drugs, etc., and a good office for records.

Such a Centre should have attached to it a number of *Sub-clinics* in suitable sites, specially in crowded areas, where a room, a trained local doctor and home visitors will be made available for a predetermined area for attending to emergencies and complications, drug control and door-to-door propaganda for early case finding in selected groups. Patients, contacts and others for chest examination will visit the sub-clinics only on scheduled days in a week as also the mobile x-ray set along with a doctor, a nurse and an x-ray technician, drugs, sputum collecting bottles, etc. In short, these sub-clinics will represent clinical and radiological field services only. Final diagnosis, decision on treatment, drug distribution, registration and records, etc., will be under the control of the Centre. By this way the building and equipping cost of many clinics may be cut down. It will also enable us to overcome many of the defects of ill-equipped clinics by proper standardisation of work and, in addition, will bring diagnostic and treatment aid near the homes of the patients. This, to my mind, will help in bringing more easily those categories of persons for check where the yield is greater. This is not an unknown method. The mode of working suggested is somewhat different. Time does not permit me to enter into the details of such working methods. I have, therefore, presented only an outline. If you consider this worthwhile, then the Tuberculosis Association should work out the details of this scheme and present this for the consideration of the Planning Commission. If this suggestion proves workable then it may have the added advantage of bringing within our range the possibility of tackling vast semi-rural and even accessible rural areas by spreading a network of such sub-clinics.

Hospital Treatment

It is obvious to all that the available bed capacity is extremely poor in relation to the number of cases. It will be nothing short of a miracle if we can provide adequate number of beds within a short time. We should not bank on that. Our main endeavour should be to utilise the existing beds to the most useful purpose and increase them gradually for special needs. How can we do so is the quest. As a general rule one might suggest that all open cases, specially in bad environmental and social conditions, representing great sources of infection, should be hospitalised for just as long as they are not converted to closed cases. With the help of drugs, the majority of the cases can be so converted within three to six months. Even accepting that the patient will go out of the hospital for domiciliary treatment when so discharged, the number of available beds will still fall far too short. I, therefore, think this general principle, though commendable, cannot yet be adopted. With decreasing load this principle should increasingly guide our hospital admission policy. Let us, therefore, take into account some specific claims to consider this policy.

The demand for beds for *major surgical interventions and major complications of an emergency nature* is very real and important. Accepting that only ten per cent of all cases need such help, the bed provision will still be insufficient.

I would like to mention another group whose segregation away from home is most essential. These are *incurable cases.* I had been privileged to be on the Board of West Bengal Government for screening the cases for admission into and discharge from the hospitals. Medical information along with social and environmental conditions of the patients are made available for the purpose. Among them, on a minimum estimate, about two per cent of cases can definitely be classed as incurable. Most of them are very bad sources of infection as crowding at home is such that there is no possibility of home segregation. More than that, almost all of them had irregular drug treatment over years, and are not suitable for any other treatment. It may be justifiably regarded that most of them are discharging drug resistant bacilli. Many thousand such cases were reviewed. In a recent investigation to determine the eligibility for aid in about six thousand tuberculous refugees, we have come across about the same percentage of such incurable cases. You can easily realise not only the fate of such persons but also what grave danger they constitute to the community by spreading drug-resistant strains.

To determine a policy for meeting such diverse demands on hospital beds the Tuberculosis Association of India should set up a committee to consider all aspects of this problem, and enunciate a principle for admission and discharge of patients in hospitals and request the States to adopt this principle in this matter. For some time I have been thinking on this baffling problem but do not seem to have come to any definite conclusion. I feel like giving the highest priority to these incurables for the greatest good of the community. These cases will not need any very specialised treatment but are likely to stay in bed till the end of their misery. It seems justifiable to utilise the greater part of our resources for hospitals in building cheaper types of institutions in the neighbourhood of crowded localities or wings at the existing institutions for this type of cases in our next plan period.

For the present, it may be a fair distribution if about two-thirds of the available beds are allotted for incurables and other types of cases and about one-third for major surgical intervention—specially for the group of 'good surgical risk' cases. As a general principle, no case where effective home

segregation is possible and who is suitable for domiciliary treatment should be admitted.

There is a danger that separate institutions for incurables may acquire the name of 'death houses' and even such cases may refuse to go there. This problem may, to some extent, be solved by constructing them, in the earlier phases, near big cities and appointing eminent specialists as Visiting Physicians and allowing some extra amenities if found necessary. These may lure them to such institutions. The plight of many such incurables is such that, I believe, such a scheme will not fail.

Hospitals are excellent fields for co-operative studies on drugs, typical and atypical bacilli and in many other respects. They are the only places for research in regard to surgery. Among many possible and valuable lines, may I suggest only two which seem to be important for evaluation and guidance of our services in this direction. They are:

(a) pilot studies on the fate of cases undergoing resectional surgery compared with comparable controls, and

(b) bacteriological and histopathological studies of resected tissues.

These studies may throw most valuable light on the selection of cases for surgery, causes of fallure of drug treatment and relapses under our conditions.

Aftercare Colony and Rehabilitation Centre

With advances in treatment and increasing knowledge on working capacity of tuberculous patients under chemotherapy, the need for an orthodox Aftercare Colony seems to be receding and the necessity for Rehabilitation Centres increasing. There could, however, be a good combination of both. The aim of treatment, however successful it may be from the medical point of view, will fail if the patient cannot be socially, mentally and economically re-established. Psychologically, the name Aftercare Colony does not appeal to me. It creates a colony of outcasts. Rehabilitation Centre, on the other hand, retains the persons in the midst of the society, makes them economically independent and gives them human dignity. It is, however, best to rehabilitate them in their former jobs, if the work is not hazardous. This is not easy because of social stigma and various other difficulties. May I suggest that the Tuberculosis Association of India take the onus of formulating criteria for rehabilitation, taking into account existing rules of the Central and some State Governments and thereafter urge the States and big enterprises to accept such a formula.

Along with the development of clinics and hospitals earnest attempt for establishing *work centres* should also be made. Grants may be asked for from the Refuge Rehabilitation Department for refugee patients. Another approach, to my mind, may prove a great success. Existing big industrial concerns in large cities may be induced to start departments for ex-tuberculous patients either at the factory or at the Aftercare Colony on guaranteed marketing of products. It may not at all be difficult to arrange for this guarantee by placing orders for certain kind of goods by the Central and State Governments, Corporations, Railways and others big buyers. Our Association should probe into such possibilities.

Special Problems

About two decades an enquiry by the Indian Research Fund Association, in which I had the opportunity to take part, showed that the infection and disease rates of pulmonary tuberculosis diminish gradually in groups of population consisting of jute factory workers, their relatives living in the neighbourhood of the factory, in the nearby villages and in distant villages. Disease rates in the factory workers and distant villages were 3.8 and 0.5 per cent respectively. A few other investigations at about the same period produced somewhat similar results. Thus, on a comparative study of these rates with those of the National Sample Survey, it is evident that in about 20 years the number of tuberculosis cases in the rural areas have increased about three times. It should be specially remembered that institution of anti-tuberculosis measures in rural areas is not only much more difficult than in the cities and industrial areas, but, that in this vast area tuberculosis is entering into a soil and yet well immunised and is, therefore, likely to spread quickly and take a very heavy toll. This is most disquieting and poses very difficult problems for us.

Our second most important problem is likely to be tuberculosis in the industry. We are marching ahead with widescale industrialisation. For such an enterprise labour has to be recruited mostly from the rural areas. Experience in other industrialised countries showed high incidence of tuberculosis in such recruits in the early years of their industrial lives. It is also common knowledge that such recruits return home when they are sick. With advancing industrialisation this number and consequently the sources of infection in the rural areas will increase. Because of these reasons the problem of rural tuberculosis in the near future will be graver still. Improved facilities for conveyance as it must follow in the wake of industrialisation will also add to the movement of the tuberculous in this direction.

To my mind, therefore, problems of tuberculosis in rural and industrial areas are closely interlinked. Effective control of movement and of tuberculosis in one will have beneficial repurcussion on the other. Industrial populations are groups in compact areas, better organised and better suited for anti-tuberculosis measures, I should, therefore, like to suggest the following measures to be adopted in all industrial areas with large labour population.

(a) Each such area should have a well equipped clinic with mass miniature radiography sets and a small barrack reserved for housing tuberculous patients.

Every new recruit and new entrants for the first 2 to 3 years should be tuberculin tested. Negative reactors to be BCG vaccinated. All positive reactors to be screened by miniature radiography. All detected cases of tuberculosis to be treated domiciliary free of all cost. Those who need to be housed to be accommodated in the reserved barrack. They should also be told that on recovery their cases for suitable employment will be considered.

(b) A few tuberculosis hospitals in the neighbourhood of very large and crowded industrial areas should be established for those who need institutional treatment among the domiciliary treated groups. Such hospital system can be gradually developed according to the financial resources.

A network of clinics in industrial areas with full facilities for domiciliary treatment should be an immediate need. The plan for clinic system mentioned before may be well suited for this purpose.

My firm conviction is that if we can ensure all these, the tuberculous recruits will not only be protected but will not go back home where they are not likely to have such facilities. With added possibility of getting a job after recovery, this movement of tuberculous persons homewards will be further restricted.

I am aware that the State Insurance Scheme and some industrialists are taking care of tuberculosis patients. They are, however, on an individual basis. I do not think such efforts can solve or even minimise to any appreciable extent this very important problem. I do further think a planned campaign as mentioned above is within the reach of our resources if the Health Insurance Scheme and the Government together harness their efforts in this direction. Achievement in this endeavour is likely to have far-reaching effect on our total load of tuberculosis.

Teaching and Training

In recent years there had been much talk on clinical and public health types of teaching and training as if they are two separate methods. I do not see how this can be. In an infectious disease the bias must be on the public health aspect. It depends largely on the teacher how he teaches. It should, however, be remembered that in a subject like tuberculosis public health measures cannot stand on their legs without clinical knowledge, specially when drug treatment has become such an important weapon for prevention of tuberculosis. It will be wise to integrate the teaching and training in such a way that the student can see the picture in all perspectives both for the individual and for the community.

Teaching of the undergraduates—I am of the opinion that medical colleges should have a "Chest Department" under a recognised specialist in chest diseases. This department should undertake diagnosis and treatment of all chest diseases. As domiciliary treatment has assumed such importance for tuberculosis by home visits. Nonpulmonary tuberculosis should be excluded from the domain of this department. I do not think there should be segregation of respiratory tuberculosis from other chest diseases. One must remember that all chest diseases may simulate very closely some stage of pulmonary tuberculosis and *vice versa*. Students must learn to differentiate them at one and the same place. With the advent of potent drugs it must be accepted that the main burden of treating pulmonary tuberculosis will rest with the general practitioners with guidance from the specialists. Undergraduate students must, therefore, have fairly good grounding in the principles of diagnosis and management of this very important disease. They should, however, be relieved from details.

Postgraduate teaching—Currently, there are two grades: diploma in tuberculous diseases and doctorates. The first type of courses and examinations should be designed for producing personnel for manning Tuberculosis Institutions and the second for developing them as teachers. This is not the place to discuss the various issues on this important subject. Both for the Diploma and Degree courses teaching of non-tuberculous respiratory diseases should be as essential as that of tuberculosis. Existing stress on nonpulmonary tuberculosis should be relaxed. For degree courses (doctorates) good general training in medicine may not be essential under certain conditions but it should be preferable. Recently, the Tuberculosis Association of India had made an attempt to standardise the Diploma Course in various universities. I do not know what had come of it.

National Training Centre—You may be aware that only recently such a Centre has been established in Bangalore. As far as I know the idea is to train the medical and para-medical personnel mainly in field service and community approach. I welcome the idea and wish the institution success and expect, in future years, important contributions from it. We are badly in need of personnel of this type, specially the ancillary ones.

My predecessor Dr. Sikand had discussed the problem of service conditions in relation to training and employment rather extensively last year. I agree with him in many things. I should, however, feel that it may be difficult to create a special cadre by the States for Tuberculosis Services only. It is undoubtedly fair to absorb such workers in the permanent cadres with opportunities to rise to the highest level in State Medical Service.

Training for general practitioners—I regard this matter as extremely important. It must be accepted that vast majority of cases are and will be in the hands of private practitioners. They are the keymen in the proper use and abuse of many of the control measures. I do not think our endeavour to disseminate recent information on drug regiment and on many other aspects had been adequate enough. Besides many more short courses on tuberculosis, I propose that the Association undertakes to print one-page brochures on information on tuberculosis and send them to all registered practitioners now and then. In addition, under the auspices of the Branches of the Indian Medical Association, as many meetings as possible should be organised.

Research

I know I have already taxed your patience to the limit. I seek your forbearance a little while more to say something which is very near to my heart. I have already placed before you a few lines on research in association with the service programmes. Such studies will expand and may even get altered in the course of the development of such programmes. These studies are, no doubt, most useful, to guide and to modify the working methods. My mind, however, travels more in another direction and I am not able to exclude the question of fundamental or so-called academic research. The more I think of tuberculosis the more I feel how ignorant we are. We do not know even the causes which determine infection and disease. Studies undertaken on such fundamental aspects may not seem to have any utilitarian value. Many past experiences, however, may justifiably lead us to cherish the hope that such researches do not only improve knowledge but may have the seed for bringing about revolutionary changes in practical fields.

It will be futile to try to mention specific studies here. This will mostly depend on the outlook of an individual. It is also true that widening knowledge in medicine and its dependence on many other science make it very hard, almost impossible, to carry out a plan of research individually. Facilities for co-operative studies must be created for the purpose. The Tuberculosis Association of India, have the credit of building very good clinics and hospitals in the past. Let their next contribution be a "Research Institute" to crown their past achievements and bring further glory in the future.

All along, for sheer necessity, I have depicted a gloomy picture in presenting our load. Looking forward, as we should always do, I have no feeling of despondency. Nobody can foretell what the future holds for us. But, I am almost sure that wisdom will guide our knowledge constantly and we shall achieve much even with out slender resources. Soon the pattern of our epidemiology will change making some of the expensive measures unnecessary. If the load bends our back today, tomorrow it will not, and our progress will be faster. Maybe, and it is most likely, that newer discoveries will place in our hands more potent weapons and make this magnificent fight much easier. I am sure that we are on the winning side of the battle but we must not relax. The horizon of Medicine is not bounded by national barriers, yet it is my earnest hope and desire that India does not merely become the recipient of the benefits of such great discoveries and newer methods of control but be one of the chief contributors. By that only she will earn undying gratitude of others who are groaning under similar load. Let us have faith in the future and work for it, remembering that if winter comes, the spriing cannot be far behind.

N.B.—A part of the address on non-tuberculous pulmonay diseases and non-pulmonary tuberculosis has been omitted—[ED.]

A REGIONAL SURVEY OF MYSORE STATE FOR PLANNING PURPOSES—A PILOT PROJECT BY THE INDIAN STATISTICAL INSTITUTE 1956-1958.

A. T. A. LEARMONTH

[*This note embodies the substance of the oral but not the visual material contained in a lecture given in slightly differing forms in Calcutta, Delhi, Benares, Bangalore, Hyderabad, Madras and Bombay by Dr. Learmonth shortly before his return to U.K. in September 1958 on completion of his Colombo Plan assignment with the Regional Survey Unit of the Indian Statistical Institute.*]

Objectives

From the very first conversation between Professor P. C. Mahalanobis and the writer, it was explicit that this pilot project was to be exploratory in nature, initially for one year, at the end of which period it was hoped to reach a decision whether or not to continue the work. Despite various delays it was in fact possible for the Director of the Indian Statistical Institute, to decide at the end of the first year that the Institute would have some form of team to carry on regional research; up to the present, however, broader questions remain to be decided concerning the nature of regional planning proper to be carried on in India. The second year of the project has been spent largely in recruiting staff and training them, or perhaps more important, in beginning to weld them into a team; naturally the work on Mysore has been carried a little farther also.

Implie in this exploratory approach was the hope that it might be clear whether regional survey and regional planning should be used all over India as part of the national planning programmes. Apart from the I.S.I's decision to carry on some basic research, the present situation is that some members of the Planning Commission are certainly impressed by the usefulness of the approach, but that the Commission as a body has not yet made any decision to carry out countrywide regional planning, and in particular has not decided whether to use any form of central assistance or encouragement to the States to induce them to carry out this type of research and planning, or whether simply to state that it is desirable that it should be carried out.

It was also anticipated from the first that from such a pilot project, especially one carried on as this one was initially by foreigners, there would emerge methods that would be useful later in regional planning rather than regional plans ready for execution; on the other hand some findings would possibly be directly useful and these would naturally be welcome.

A specific contribution hoped for as a result of the project was in methodology useful in carrying out one of the four main stated objectives of the Second Five-Year Plan—i.e. to secure the balanced development of all parts of the country. Indeed it is worth noting parenthetically that the other three objectives of the Plan may also be assisted by regional survey and regional plannin—to rebuild rural India, to lay the foundations of industrial progress and to secure to the greatest extent possible feasible opportunities for weaker and under-privileged sections of the people. Some objective measures of regional disparities have been used in the work so far, and more and better measures can doubtless be evolved by building on our experience. The use of even simple objective measurements of this kind may be a real contribution towards deciding priorities between schemes possibly being pressed by different political, local or sectional pressure groups.

Such objective measurement of regional disparities can of course be carried out within a particular branch of knowledge or let us say within a particular government department. A particular concern during the pilot project, however, has been to initiate or to encourage regionally co-ordinated thinking about problems and about planning developments which may assist in solving them. In the writer's limite d experience, it is not too strong to say that much of the work for the Five-Year Plans in the States of the Union is done by departmental estimates and targets. Co-ordination is done departmentally and then an overall co-ordination is done at an administrative level by the Development Commissioner or Planing Secretary of the State. State estimates and priorities between States are then adjusted by the Planning Commission in the light of the national Five-Year Plan. Some progress has been achieved in demonstrating the kind of contribution which may be expected from a scientific discipline adaptable to regional co-ordination.

Lastly it was explicit from the first that though the project was to apply geographical techniques in regional survey, it was to be inter-disciplinary in character. Initially the disciplines to be applied together to the problem were to be geography, economics and statistics. Considerable progress in wedding the techniques of geography and statistics at a simple level has been achieved, and more sophisticated results may be expected from the continuing team now operating at the Indian Statistical Institute in Calcutta. The liaison between geographers and economists has been less close so far, owing to chance factors of personnel available, I believe, rather than to any fundamental incompatibility between the two disciplines.

Limitations

Some of the limitations of the project are implicit in the discussion so far. A regional plan proper can only be worked out once it has been decided to go ahead with regional planning; to express the same statement conversely, it is impossible to produce an effective regional plan, at least for a large tract of country such as a State, at a quasi-academic level. Regional planning proper implies that implementation is in prospect, with appropriate resources, powers and sanctions available to the planning authority which could not possibly be available to an exploratory academic survey such as has been in the field during these two years.

A second serious limitation arose from various delays encountered, the most serious being in the arrival of skilled personnel, especially geographers, but only to a lesser extent we felt the lack of a good economist with a few years' experience as a full-time worker integrating his efforts fully with the work of the team. Six months elapsed before my wife and I were joined by other trained geographers and a further twelve months before men with both training and experience were released. These delays were not the fault of the Indian Statistical Institute, the Planning Commission or the Mysore Government. Even granting that good men are woefully scarce in universities and can ill be spared, however, it seems that a greater sense of urgency in securing and releasing men for essential planning research might be expected to permeate a country in the midst of its second great Five-Year Plan.

Method

Our method naturally had much in common with that used by any scientific discipline:—

(a) A review of the existing data, especially secondary sources such as existing reports and works of scholarship. For unavoidable reasons this part of the project fell far short of what would be desirable in a purely academic study.

(b) New processing, where justified, of existing data from existing primary sources such as government archives. This formed much the greatest part of our work; this was so partly because in the reorganization on 1st November 1956 Mysore State acquired Bombay, Hyderabad and Madras and the whole of Coorg. An effort was made to use the best techniques possible given the skill available, and some of these are referred to in the next paragraph.

(c) Completely new work was restricted to surveys, mainly sample surveys on a pilot scale, aimed at filling gaps in existing knowledge or at least finding methods useful in filling them.

(d) Analysis of the data involved in this project the regional analysis of all the data, old and new, using the man as a basic tool. It was found in practice that using the map as a serious tool of analysis, using simple indicators of disparity in regional socio-economic development, such as an index of over- or under-industrialisation compared with the State level, was greatly appreciated by many administrators and legislators.

(e) The synthesis at the end of the processing and analytical stages was in the form of a

regional synthesis, using the subjective techniques prevalent so far—*i.e.* using the judgment, skill and experience of the members of the team. Objective methods of regional synthesis may come, and they may well be evolved or improved in India.

(f) The conclusions to the whole work are mainly concerned with (i) planning measures of potential usefulness in Mysore State and (ii) how to make future work better.

Techniques

It is difficult to do more than to refer to some of the tools of analysis used in the project in a short, non-technical paper, and a more detailed exposition is therefore under preparation. But some groupings of the techniques is possible:—

(1) *Regional mapping of existing data*

(i) Many types of data from government sources lend themselves to mapping by choropleth or isopleth, *i.e.* maps showing different degrees of intensity say of population density by different types of shading by administrative units or by 'contour lines' respectively. Before deciding the shading for such a map, the frequency distribution of the values was studied by arranging them in descending order or by drawing a simple 'scatter diagram'. The shadings were selected with the statistical distribution in mind—for instance, care was taken not to divide a cluster in the values—and it was found that the geographical distribution in turn could be the better studied.

(ii) Simple indexes were used to compare the values say for a taluka with the State-level value for a particular set of data. For instance an index of concentration of industrial population was taken to be :—

$$\frac{\text{taluka industrial population}}{\text{State industrial population}} \Big/ \frac{\text{taluka total population.}}{\text{State total population}}$$

Thue a taluka with the State-level of industrial employment would have an index value of 1.0; 'over-industrialised' talukas would have values over 1.0; and 'under-industrialised' talukas might theoretically go down to zero. In mapping, a system of shading was chosen to bring out the under-industrialised areas as defined by this particular measure, using dots and pecked lines as contrasted with line shading for the areas with index number of 1.0 or over.

(iii) In studying trends our aim as often was to get as close to the different types of country as our data and time permitted, rather than to accept figures for large administrative units to such as Districts. For each taluka, for instance, graphs were drawn for birth and death rates, corrected as far as possible, for the period 1901-51, and placed on a map. Admitting the inaccuracy of the data, it was nevertheless postulated that regional groupings of types of graph might be significant and capable of correlation with causal factors by cartographic correlation with other distribution maps which might give evidence of causal relations, and perhaps later to be followed by statistical correlation. The grouping of the types of graph was done subjectively by inspection. Objective classification would of course be possible given more time or staff, but sophisticated techniques were sacrificed deliberately in order to take the data as close to the country as possible.

(iv) A number of maps were constructed in which two variables, such as mean incidence and also variability from year to year, of mortality from cholera were placed on the same map; the mean incidence was depicted by intensity of shading, the variability by direction of shading. In studying disease data, this technique is helpful in providing some sort of objective index of epidemic as contrasted with endemic areas. It has also proved interesting in relation to crop yields, revealing areas of, say, high and stable yields in contrast to areas of high but variable yields.

(v) A beginning was made with the technique of presenting regional patterns of balance or imbalance, possible differential imbalance, in multi-purpose development. This tool requires to be refined, but very simply the idea is to map say eight main items in community development on a map of community development blocks, or over the sites of the villages within a block, using a somewhat star-shaped graph on the analogy of the 'wind-rose' of weather maps. It is of course obviously unsatisfactory to mark off the eight convergent axes in absolute values of tons of fertiliser applied, compost pits dug, and so on. Sometimes it may be possible to relate the graph to, say, the all India level of development, sometimes to the desirable level in proportion to population or area, and sometimes to the norm of accomplishment. It has been successfully used in relation to the level of various urban services in 65

sample towns surveyed during an urban survey of the towns of Mysore State as a whole.

(2) *Mapping of data from existing sample surveys.*

(i) Expermental mapping was carried out using material from the National Sample Survey. Proportional symbols were placed over the site of the sample villages, say for consumer expenditure (proportional circles, divided to show proportions of food grown, food bought and other items), or for income or deficit for various livelihood classes in the villages. It was accepted that the sample design would not at all justify the use of the data in relation to individual villages, but it was hoped that regional groupings of villages might emerge which might be at least suggestive even though the findings purely by this approach could not be treated as significant. The results were tantalising in relation to Mysore State, for the clusters of sample villages separated by large tracts not sampled under the sample design appropriate to an all-India survey raise more questions than they solve. However, they provided almost the only source of information about socio-economic conditions. Mapping on an all-India basis-probably using isopleths or 'contours' rather than proportional symbols—would almost certainly be rewarding.

(ii) Some data were mapped from the United Nations and Government of India demographic survey in old Mysore State carried out about seven years ago. Certain of the Hollerith tabulations were kindly made available to us by Professor C. Chandrasekharan of the All-India Institute of Hygiene. The results were again tantalising in relation to the Mysore survey, although sometimes complementing other sources of information. The areal distribution patterns revealed were interesting in revealing significant regional differences within the categorial dictated by the sample design, in which the processed material is actually published. The questionnaires covered very widely the socio-economic, as well as the demographic conditions. It seems an inherent difficulty about routine statistical processing of such comprehensive surveys that some of the valuable data, e.g. on land tenure, are in fact unrelated to the main sample design which categorises the villages in the three groups of the sample design : first Malnad villages with malaria control; second, Malnad villages without malaria control; and third, Malnad villages.

(iii) The results of sample surveys of crop yields by crop-cutting experiments were kindly made available by the State Statistician, Government of Mysore. The sample design was aimed at District estimates of out-turn, and as such it is no doubt unexceptionable. It seemed a pity, however, not to try to take the data nearer the country in treating such a phenomenon, which clearly has ecological controls which cannot be studied by taking large and heterogeneous adminstrative units such as Districts. One series of maps represented the two sample plots per village by proportional semi-circles placed over the village sites. The result was very suggestive in revealing the low yields of staple foods obtained, say, in the coconut-growing area of the State. It is believed that mapping over a longer period might be useful in leading to a sample design of wider application than the present one. The date say for rice yields were also processed for several consecutive years together and a two-variable map of average yield along with variability of yield was produced. An interesting finding was that both ragi and rice yields showed some tendency to be moderate but stable in the cash-cropping area in the centre of old Mysore State, but were high but unreliable in the peripheral isolated areas with less cash-cropping.

(3) *New sample surveys*

(a) A pilot survey of villages within geographical sub-regions previously delimited from topographical maps was carried out. The questionnaire was a broad one intended to give experience, covering differential land-use in relation to soil and water conditions, idle and busy seasons, rural industry and the impact of community development and N.E.S. work.

(b) A sample survey of about a quarter of the towns of the new Mysore State was carried out under the direction of Dr. V. L. S. Prakasa Rao. The sample design was based on occupational structure as revealed in the 1951 census, on the size of population and on a relatively even areal scatter throughout the State. A separate survey of the Bangalore City-Region was carried out under the direction of Dr. R.L. Singh.

(c) A sample survey of about 20 per cent of the lorry operators was carried out as one approach to finding out the intensity of lorry transport along different roads, the type of goods carried, the capacity of the lorries filled,

and so on. It was only for traffic carried during one week in the cool season of 1957-58, so was only on a pilot scale. A dis-advantage from a geographical point of view is that while multiplying would give estimates for traffic flow in different types of road and even in different types of region, there is no means of telling, say, which specific market towns and which specific areas are completely lacking in lorry transport, although a little information is naturally obtainable from the preliminary information gathered before preparing the final list of operators to be visited.

(4) *Regional synthesis*

It is difficult to describe the construction of a regional synthesis by subjective methods in a brief summary. It is necessary to read regional surveys be experienced workers in full and to attempt the same task for oneself. As an example, however, a regional geographer's view of the county around Bangalore leads to certain planning recommendations with some of the regionally co-ordinated thinking referred to earlier. A typical landscape in this region would incude a bare or scrubby plateau or granitic hill, deforested, overgrazed and eroded; dry fields growing the ragi/jola/pulse and oil-seed mixture and groundnuts are dominant crops—also subject to accelerated soil erosion on relatively slight slopes of only 1° or so; commonly a tank storing more or less irrigation water according to the topography and of course the vicissitudes of the weather as well as the amount of engineering put into the dam; below the tank the paddy lands and sometimes some well-irrigated garden, using traditional or perhaps electrified liftings; and there may be some irrigated gardens for vegetables, etc. around the margins of the larger tanks. The rural scene cries out for a coordinated scheme of soil and water conservation allied to a suitable land-use programme and of course including adequate marketing facilities for the produce.

The overgrazed and eroded uplands needs a better vegetal cover and this can only be secured if stock are excluded or strictly controlled. Fuel, fodder and green manure can all be provided for as the vegetation is encouraged to build up, but the fodder will have to be cut for stall-feeding or fed by strictly controlled rotational grazing. Run-off may be systematically fed into the underground water-table in many circumstances—sometimes by putting it in through wells. The dry lands can be dealt with—given co-operation or better participation by the village as a whole, by well-tried methods of contour-bunding, perhaps supplemented by planting fodder-yeilding bushes on the bunds. Experiment is needed—it is always wise in these matters to proceed on the basis of ascertained facts—but it seems quite possible that the water-table may be so replenished that many small ineffic ient tanks may be abolished in favour of well-irrigation, so winning some useful lands. Such a programme would produce much more garden crops than are grown at present, and the findings on yields referred to earlier suggest that great care would be needed to ensure that yields of staple foods do not fall concurrently. Stall-feeding of cattle, by no means foreign to local farming practice, would need to be increased in revolutionary fashion, and there is almost an implication of widespread individual or communal culling of stock, and probably the banishing of useless scrub cattle to gosadans. There might well be a golden opportunity, never to recur, of encouraging a dairy industry really worthy of the high place held by the cow in the local culture—to the great improvement of nutrition especially among children, both locally and in adjacent towns. Concurrently draught cattle might become everywhere adequate in quantity and quality—in many places most are so ill-bred and ill-fed as to be almost unfit for the plou. There are revolutionary elements in this programme, and in particular it would be impossible without some form of cooperation, whether formal or by sheer acting together for the public good; yet much is evolutionary, related to present practice but viewing the needs of the community as a whole in relation to the particular environment.

The marketing element involves the considering together of town and country, of industry and agriculture, which is a basic element in the regional concept. In a well-electrified and also a relatively literate area such as this, there seems every possibility of encouraging dispersed industry in medium and even small towns. Again this would merely be an extension of current trends like the recent growth of quite seemly and well-designed small rayon factories in the small market centre of Dod Ballapur.

Such a dispersal of industry into small and medium-sized towns would probably act in some degree as a safety value to local population pressure in rural areas—one expresses this with a little caution because in many

towns of Mysore the urban labour force including the industrial workers are largely immigrant Tamilians or Telugu speakers rather than short-distance migrants from surrounding areas. Given careful planning, urban services could be improved, and municipal incomes increased so that public services can be adequate. The improved urban services would benefit both town dwellers and countryfolk-the penetration of the countryside by bus services is even now far advanced—and, most importantly, there would be a stimulus to agriculture within the town's market area concordant with the proposals made for rural development. There can be little doubt that increased demands for dairly produce and for vegetables would certainly follow increased urbanisation in South India, particularly if it is possible to secure a concurrent increase in standards of living.

From regional survey to regional planning

It is clear that for regional planning proper, a research and planning team must include technical men to a much greater degree than has been possible in the pilot project. Considerable periods of concentrated work along with an inter-disciplinary group of academicians is required, for instance from foresters, agriculturists and engineers including industrial engineers, not merely access to data and an occasional opinion which is all that overworked officials have been able to give us so far, even with the best will in the world. This step is essential in order that proposals shall be accompanied by quantitative estimates of costs, of yields, of short-term and long-term employment estimates and so on; without such hard, quantitative thinking, regional planning will never be worthy of the name.

Some of the deficiencies in the work so far will be remedied when an economist is available for full-time, integrated work. More sophisticated statistical participation will also be required. Our statistician has recently suggested that it may be necessary to experiment with a link between regional geography, regional econometrics and statistics, almost on the lines of regional planning by operational research. It may be necessary to construct a model of the variables chiefly contributing to a regional economy, perhaps taking only a few key measurements—regional per capita income may be useful assuming an evening upwards of disparities of income between different social groups. If this can be done, it should be possible to forecast the effects on regional per capita income of the regional developments proposed let us say for the Third Plan period. Indeed, logically this seems essential if regional planning is to become a reality, for without such a check regional disparities in prosperity may conceivably be accentuated instead of being remedied.

Some additional tools may be necessary, and some may be so expensive as to involve major policy decisions. For instance, an attempt has been made to compare the standard of work attained during the pilot project with that achieved by the resources survey carried out by a Colombo Plan team in Ceylon, based on complete cover of the island by aerial photographs. On the side of physical resources, the work there is at a much higher level and much more quantitative. The initial expense is heavy, and of course there is no magical quality about aerial survey—the photographs have to be followed up by particular specialists using it as a tool to speedier and more economical work; but once the initial expense is faced, there is a constant increment of saving by the avoidance of wasted effort on abortive projects and through speedier work, the carrying out of more economical and better-planned fieldwork within a frame of reference provided by the air photographs.

There remains the associated questions of machinery and manpower. The Planning Commission is clearly vitally concerned. But some of the technical problems may perhaps be handled by a research institute or institutes. The Indian Statistical Institute is perhaps one of the best places in the world in which interdisciplinary work on socio-economic date can be carried out, particularly if the operational research approach to regional planning should prove fruitful in India. If the survey of physical resources based on aerial photography is developed on a scale proportional to such a large country with such big problems—and disinterested observers from several temperate and tropical countries agree that India should build up her own survey—then there may need to be a closely associated and perhaps overlapping group from the appropriate government body or research institute. Meantime the small group in the Indian Statistical Institute will go on with experimental work and fundamental thinking so that there will be a basis for expansion when the country is ready for it.

In the States the problem will vary. Some will prefer to set up a research team within the State government, and it appears that the

Government of Mysore may do this. There are difficulties in carrying out medium-and long-term research within the civil service, for the demands of today and tomorrow may exert too much pressure, seniority rather than independent opinion may weight the shape of a particular report, and so on. But given safeguards, such as a really active group of outside consultants, this is a perfectly acceptable solution. Some States may be able to entrust the work to a university or research institute, and this is being done in Uttar Pradesh. Others again may prefer to engage in rather limited engagements with a research organisation, although ultimately the most comprehensive and long-term thinking will also be required. The shortage of skilled man-power probably dictates that all these approaches shall be used for some time. But the full fruit of regional planning will not be obtained unless there is reasonable comparability of data, and it will be necessary to develop and, I believe, to lay down a rational over-all pattern—to be supplemented according to particular needs in individual States. By that time the broader investigation of the 'macre-region' of southern India already will begun by the Indian Statistical Institute, may have yielded first results—small teams are at work in Kerala, Madras and Andhra and it is hoped that Dr. George Kuriyan may be able to supervise the final synthesis—and it should be possible to allot a proper place to this very broad type of investigation within the national plans. More intensive applications of skill and capital, perhaps dealing with regions straddling State boundaries, can also be reviewed, using the experience of the Damodar Valley Corporation, and a firm though flexible framework laid down for regional planning in India.

ANNOTATIONS

We welcome the publication of the Bulletin of the Pilot Health Project, Gandhigram, which is at our hands. All health workers, particularly those who are engaged or interested in rural health work will find the bulletin extremely useful. There are very few rural institutions in India which publish their own bulletin or have the facilities to do so at the present time.

Ganhigram, as it owes its name from Mahatma Gandhi was founded in 1947, the year of independence of India, by Dr. (Mrs.) Soundram Ramachandaran with the main object of working "for the reconstruction of the social order in our country along lines laid down by Mahatma Gandhi, i.e., the building of a classless and castless society of complete justice to the common name through wholly non-violent effort and with special emphasis upon the social and moral values of bodily and productive work." The main activities undertaken and carried out with zeal and enthusiasm, by this organisation during the past twelve years included the rural medical service. This area was selected for establishment of a Pilot Health project in 1959. Its objective is to determine the minimum health service required to be provided for the rural development areas and to develop essential experience needed for involving a model pattern of rural health services including both preventive and curative aspects which might be usefully applied in other development areas. The study is in collaboration with the Ford Foundation, the Indian Council of Medical Research and the Madras State Health and Medical department, Gandhigram. The scheme is to function approximately for a period of five years. The experimental basic frame work of health services is to be established and maintained in the delimited community development block at Athus. The over-all authority for health activities for the project is vested in a specially constituted Advisory Board, having Dr. (Mrs.) S. Ramachandran as its chairman and Dr. N. R. Ramakrishnan, Director of research and co-ordination, Pilot Health Project, Gandhigram as its Secretary-cum-Treasurer.

We wish the Project all success and will watch its progress with interest from time to time through the bulletin of the project.

NOTES & NEWS

BELATED SOVIET RECOGNITION OF DR. HAFFKINE

Dr. Valdimir Haffkine, the Russian-born bacteriologist who introduced scientific methods of fighting cholera and plague to India, received posthumous honour at Moscow on March 16, 1960, the centenary of his birth in a poor Jewish family on the black sea coast.

Dr. Haffkine owes his belated recognition as "an outstanding Russian scientist" to an improvement in Indo-Soviet relations. Completely ignored in Russia since he left Odessa over 60 years ago to do research at the Pasteur Institute and snubbed by Czarist officials when he offered to help fight a cholera epidemic in Russia, Dr. Haffkine was given a place among outstanding Russian scientists of the past at a meeting organised by the Society of Soviet-Indian Cultural relations. The meeting was attended by a representative of the Indian Embassy and members of the Haffkine's family.

DR. RAMAN ON ROLE OF FOUR VISUAL PIGMENTS IN RETINA

Dr. C. V. Raman, noted Indian physicist, said on 26-12-59 at Annamalainagar that the power of the eye to distinguish between the different colours was the result of the presence of four "visual pigments" in the retina.

The noble laureate, who was presiding over the annual session of the Indian Academy of Science identified these pigments as (i) Lutein, also known as Xanthophyll, (2) Haemoglobin, (3) Oxyhaemoglobin, and (4) Methaemoglobin.

The presence of lutien in the retina has long been known Dr. Raman said. The other three substances were pigments present in human blood and since the retina was richly nourished by blood vessels, they were justified in assuming that they were present in the retina.

Dr. Raman explained in his address the manner of their functioning by a comparison of their physical poperties with the known data of observation regarding the perception of colour. About the role of xanthophyll in colour vision Dr. Raman said: The absorption spectrum of lutein or xanthophyllis well-known. The substance is transparent at wave-lengths greater than 5300 A.O. (angatrems). The absorption beginning at that wave-length rises at first slowly and then every steeply and reaches a maximum about 4300 A.O. It then drops a little and rises again to be a second pronounced at maximum 4450 A.O. At still shorter wave-lengths it drops down quickly and become small but does not vanish even at end of the visible spectrum.

A survey of the facts known regarding the preception of colour reveals various features which can be specially connected with the sprectoscopic behaviour of lutein. The absorption by lutein covers the whole of the blue and violet regions of the spectrum. Since lutein is transparent to wave-length greater than 5200 A.O. it can play no part in the perception of colours at such wave-lengths. It is therefore, not surprising to find that in the chromaticity diagram, the pure spectral colours appear arranged on a straight line at all wave-lengths greater than 5300 A.O. while on the other hand the rest of the perimeter of the diagram exhibit a marked curvature. It is also highly significant that when the sensitivity for colour difference with change of wave-length is represented as a graph, it shows a pronounced maximum at 4900 A.O. precisely the wave-length at which the absorption by lutein exhibits the steepest rate of rise.

A second maximum of the sensitivity has also been observed at 4400 A.O which is also the wave-length at which the absorption —curve of lutein drops down very steeply as the wave-length is diminished. It is also significant that the colours in the blue which are found to be complementary to red, orange and yellow in the spectrum have precisely those wave-lengths at which lutein exhibits its highest absorptive power. Finally the high cromaticity coupled with feeble luminocity characteristics of the violet and of the spectrum, readily understood in terms of the rapid fall in the strength of light absorption by lutein beyond 400 A.O.

PROGRESS OF NATIONAL FILARIA CONTROL PROBLEM

About 43.75 lakhs have been covered by the mass therapy under the National Filaria Control Programme. Mass therapy has been in

progress under one or more units in all the states participating in the programme.

The present coverage in the states varies from 15.9 to 82.1 per cent, the full course having been given from 8.6 per cent to 60.4 per cent of the population in the various units. Reactions following therapy have varied in incidence and severity in the population treated. Public Health education through lectures, films strips and brochures has been lunched in some areas where wrong nations and false propaganda regarding mass therapy made it necessary.

A population over 22 millions has been covered by sample surveys carried out so far under the programme. Teams from the Malaria Institute of India were deputed to carry out surveys in Andaman and Nicobar Islands, Assam, Pondicherry, and the Laccadive Islands. A number of new filaria foci revealed by these surveys. It has also been found that bancroftian filariasis is not confined, hitherto believed, to urban areas only but is endemic in many rural parts also. These findings indicate that the problem for Filaria endemicity in India is far in excess of the original estimate that 25 millions people are exposed to the risk. According to the revised estimates the population at risk may exceed 40 million.

The National Filaria Control Programme came into operation in 1955 with the signing of the Indo-U.S. Agreement in March that year.

Under the programme, the Union Government makes available drugs, larvicides, vehicles and spraying equipment. The State Governments meet the operational costs.

To meet the requirements of the trained personnel to man the units in the participating States, which was one of the urgent needs for lunching a countrywide control programme, a branch of the Malaria Institute of India was opened at Ernakulam in Kerala in August 1955. Courses for Medical Officers as well as Inspectors are held periodically at the centre. So far 70 medical officers and 136 inspectors have been trained.

$18.5 MILLION BUDGET FOR W.H.O.

A working budget for $18,569,620 for the World Health Organisation (WHO) in 1961 has been recommended by the WHO Executive board. The budget will be submitted to the next World Health assembly which will meet in Geneva in May.

This figure represents an increase of about 10 per cent over the corresponding budget estimates for 1960, reflecting the worth of the organisation's activities, particularly in the eradication of communicable diseases, and in the field of medical research, environmental sanitations and education and training of the health personnel.

The budget also takes into account the fact that the Fourteenth World Health Assembly is likely to be held in New Delhi in 1961, and $24,240 to cover the organisation share of the additional expences of the holding the assembly away from WHO's Headquarters in Geneva.

VENEREAL DISEASES AMONG CHILDREN

An alarming increase in venereal disease in the U.S.A. particularly among the children teenagers—and parallel "significant" increase in Britain—has been reported by the three American Medical Organisations.

And they said that not even one-sixth of early infectious syphilis or one quarter of gonorrhoea in the U.S.A. was being discovered and treated. The report said that venereal disease among teenagers was being discovered at the rate of one case every 11 minutes and that in New York City last year the rate among the children between 10 to 14 had increased by 59.6 per cent and among those in the 15-19 age group by 78.3 per cent.

For the country as a whole, the 1959 increase of venereal disease among children between 10 to 14 was 14.3 per cent and for those between 15 to 19 it was up 11.4 per cent over 1958.

Among all age groups the number of cases of early infectious syphilis had risen from 6,661 in 1958 to 8,178 in 1959—an increase of 22.8 per cent.

The number of gonorrhoea cases rose from 220,191 in 1958 to 237,318 in 1959—a 7.8 per cent increase.

The figure was issued in a joint report of the American Social Health Association, the Association of the state and Territorial Health Officers and the American Venereal Disease Association.

47 MILLION INDIANS VACCINATED AGAINST T.B.

A report from U.N. Headquarters states that an allocation of $222,000 (about 11 lakhs)

will be recommended for continuation until the end of 1961 of India's anti-tuberculosis campaign, biggest such operation in the world.

By the end of last year, 139 million people had been tested for tuberculosis in India, and it was hoped to reach the target figure of 170 million people by the end of 1961.

In ten years some 47 million people, most of them under the age of 20 had been vaccinated against tuberculosis, they added.

During the Indian Government's third plan the goal is to test 30 million more people and vaccinate those whose reaction is negative.

CENTRAL GOVERNMENT'S GRANTS TO HOSPITALS

The Union Ministry of Health has sanctioned during the current financial year a sum of Rs. 8,00,000 to various institutions and hospitals engaged in research and treatment of cancer according to a press release.

The institutions and hospitals to which the grants have been made include Chittaranjan Cancer Hospital, Calcutta, Rs. 1,00,000; Kamala Nehru Hospital, Allahabad, Rs. 1,00,000; and Kailash Seva Sadan, Bombay, Rs. 50,000.

The provision in the second five year plan for giving financial assistance to state governments for the establishment of Cancer research institute is Rs. 35 lakhs.

MORE FAMILY PLANNING CENTRES IN THIRD PLAN

Dr. V. T. Krishnamachari, Deputy Chairman, Planning Commission said on March 19 at New Delhi that two thousand more family planning centres would be established during the Third Plan period bringing the total centres to 4,800 covering the entire country.

In his address at the five day Family planning Education seminar at Vijayan Bhawan, Dr. V. T. Krishnamachari said voluntary organisations of women would be set up to establish contact with families individually and in groups and promote family planning activities not in isolation but as part of programmes of community welfare. In the rural areas in which nearly 75 per cent of the people lived, progress would become possible only by family planning becoming an integral part of the comprehensive programme of community development.

ALARMING RISE IN PSYCHIATRIC CASE IN INDIA

In his presidential address at the Indian Psychiatric Society's annual meeting in Calcutta on 27-2-60 Colonel P. N. Bardhan referred to the alarming rise in psychiatric cases in India. Col. Bardhan could not be present and his speech was read at the meeting.

If 12 per cent to 18 per cent of admissions and out-patients in hospitals were wholly or partly psychiatric case, it was time that full chairs in the subject were created in most universities, he added.

Urging greater liaison between psychiatrists and general medical Practitioners he said that India was rapidly catching up with the western methods of life. Necessarily the psychiatric illness associated with these conditions would appear and some means must be found to deal with them. He regretted that the draft Medical Health Bill, which the Association had submitted to the Union Government in 1950, had received scant attention from the authorities.

Dr. K. R. Masani, who presided emphasised the preventive part of the society's work when they could scarcely think of making suitable arrangements for the cure of all the cases.

In the absence of the Mayor, Dr. J. M. Roy inaugurated the Conference. Dr. Nagendra Nath De, Chairman of the Reception Committee felt that if a survey was taken today, the number of psychiatric patients would be found to be about 3,500,000 in India. To cope with the situation there were only 15,000 beds in different hospitals. The demand for beds was fast increasing and the number of mentally ill patients seemed to have doubled during the past 20 years.

He said that like other diseases the earlier a mental case was tried the better. To impress this point on people there should be concerted propaganda through lectures, pamphlets and films.

The society's out-going president, Lt. Col. Kripal Singh urged members to establish contacts with persons practising in the medical fields. The number of trained psychiatrists in India was very limited and the society should make an effort to bring all of them within its fold as members.

HOPEFUL RESULTS OF MASS CAMPAIGN WITH LIVE POLIO VACCINE

Mass vaccination campaigns using live poliomyelitis vaccine given by mouth have demonstrated the safety and probable effectiveness of this new method, according to an article in the latest WHO chronicle (Vol. 14, No. 4, April 1960) published by the World Health Organisation.

For some years research workers have been trying to produce a poliovirus vaccine that would give maximum protection without untoward side effects. Several attenuated live vaccines have been developed to this end, by Sabim, Koprowaski and Cox, and by 1957 work was sufficiently advanced to permit the WHO Expert Committee on Poliomyelitis to recommend that large scale trials be undertaken. In the ensuing two years, limited trials of the live vaccine were carried out in family groups and children's homes in the U.S.A., Poland, Sweden and the U.S.S.R. The larger groups were vaccinated, 32,000 children in Mexico, about 150,000 in Czechoslovakia, and 200,000 in Singapore.

After a number of trials in both Moscow and Leningrad which produced strong evidence of the vaccine's harmlessness and efficacy the U.S.S.R. Ministry of Health authorised general use of the vaccine, and, by the end of May 1959, it had been administered to several million children in various republics of U.S.S.R.

Studies in these countries revealed information of great value in the assessment of live poliovirus vaccine. In the U.S.S.R. for example, not only was there good evidence that the vaccine caused no ill effects, but in certain republics, the incidence of poliomyelitis following its use was much lower than in the previous five years.

In Leopoldville, on the other hand, where the most susceptible population group, African children under 5, was vaccinated in 1957 as well as in some trials in Latin America, "wild" enteroviruses, often present in the intestines of the vaccinated persons in such areas, probably interfered with successful immunisation by the poliomyelitis vaccine virus.

The phenomenon of interference between viruses helps to create a paradoxical situation in poliomyelitis protection. In environments where hygiene is at its highest and overcrowding rare, the children are not naturally protected by subclinical infections caught when they are young and least likely to become paralysed. They therefore remain dangerously susceptible to virus.

On the other hand, in communities where hygiene is rudimentary and where children contract subclinical infections at an early age and are also carriers of other enteric viruses, these "wild" viruses may prevent effective antipoliomyelitis vaccination with the live vaccine.

The question of the interference of enteric viruses with the polioviruses, and of interference between the polioviruses themselves and how to overcome it, are among the subjects that still require wider study. What was clear from the Washington conference however, was that in trials of the live vaccine made so far, nothing had arisen to suggest that it was not harmless or to throw doubt on the effectiveness, once the organism had responded to it.

PROTEINS FROM GRASS

Pirie and other scientific workers have directed attention to reserves of protein available in grass and other chlorophyll-containing material normally consumed as animal foodstuffs, but potentially of use to man. The efficient production of good quality edible protein from such sources depends on the solution of various biochemical engineering problems which have been investigated by the Rothamasted group for some years. A recent report from British Glues and Chemicals, Ltd., reflects the increasing interest in leaf protein. The report states that 100 tons of fresh grass (of 80 per cent water content) yields about $2\frac{1}{4}$ tons of edible protein together with two important by-products—7 tons of fibre (suitable for the production of hardboard) and 0.6 tons of a chlorophyll syrup containing fat-soluble vitamins, pigments and steroids. The commercial development of this process will be watched with interest by all who are concerned in way with the nutritional problems of tropical and other areas, and it is to be hoped that the method can be introduced into those regions where additional supplies of supplementary protein are most needed.

ERADICATION OF LEPROSY

The Leprosy Advisory Committee, which concluded its session at New Delhi on April 20, 1960 under the chairmanship of Mr. D. P. Karmarkar, Union Minister of Health, has

recommended the establishment of more leprosy control units as well as integration of leprosy work with existing health services during the Third Five-Year Plan period.

The Committee noted that the allocation for the leprosy control scheme in the Third Plan was likely to be of the order of Rs. 7 crores, and laid down the outlines for its utilisation. It suggested that leprosy control work should be considered a part and parcel of the general routine work of existing medical and health services, the committee also suggested that voluntary organisations should be encouraged to undertake control work.

The Committee recommended that high priority should be given during the Third Plan for training of medical and para-medical personnel.

The Committee accepted the report of the Sub-committee on rehabilitation of leprosy patients. It also adopted the scheme of the Hind Kusth Nivaran Sangh for health education involving the preparation of pamphlets, film strips and other material for doctors, para-medical personnel and patients.

The Committee also reviewed the progress of the Leprosy Control Scheme and noted that 101 centres were functioning up to the end of December 1959.

Observers from the State Governments including the State leprosy officers placed before the committee certain difficulties experienced by them in running these units. The Committee examined these difficulties and made suggestions to resolve them.

FINDINGS OF NATIONAL TUBERCULOSIS SURVEY IN INDIA

The National Tuberculosis Survey has revealed that about 5 million of India's population is suffering from pulmonary tuberculosis. The number of infectious cases is about 1.5 million.

The statistics also indicate that the prevalence of tuberculosis is higher among higher age groups than among younger ones. The number of women affected by tuberculosis is in general less than of men. This difference is specially marked in the higher age groups.

The importance of socio-economic conditions and environmental factors has been emphasised by the finding that people living in kutcha houses were more prone to the disease than those living in pucca houses.

The report says that the difference, if any, in morbidity rates between towns, cities and villages are much smaller than was earlier expected. The incidence of tuberculosis in rural areas is generally lower than in cities and towns but the difference is not marked.

The survey was conducted by the Tuberculosis Sub-Committee of the Indian Council of Medical Research. Dr. P. V. Benjamin, Tuberculosis Adviser to the Government of India, was the Chairman of the Sub-Committee. The survey was started towards the end of 1955 and completed early in 1958.

The survey was limited to investigations in pulmonary tuberculosis, one of the most important forms from the epidemiological and public health points of view.

Various types of population in selected cities, towns and villages in the States of West Bengal, Bihar, Uttar Pradesh, Delhi, Punjab, Andhra Pradesh, Mysore, Madras, Bombay and Kerala were covered by the Survey. About 3,00,000 persons were examined in six cities, 30 towns and 151 villages.

The group included in the survey were chosen in accordance with statistical principles so that the findings might be of general application. Six institutions were entrusted with the survey work. These were: The tuberculosis centres in New Delhi, Patna, Hyderabad and Trivandrum, the All-India Institute of Hygiene & Public Health, Calcutta, and the U.M.T. Sanatorium, Madanapalli, Andhra Pradesh.

The entire population, excluding children under five years, in the areas selected for survey was objected to mass miniature x-ray examination and, those suspected, for further bacteriological tests.

HEALTH MINISTRY'S THIRD PLAN PROGRAMME

An almost total eradication programme against Malaria, less ambitious programmes to check other communicable diseases, an intensified family planning drive, a modest increase in public health services and what is described by health experts as a "grossly inadequate" project for protected water supply and sanitation are the main features of the Third Plan of the Union Ministry of Health.

About 15 Medical colleges are also expected to be established by the states with the help of the centres during the third plan.

Four new Ayurvedic colleges and about 100 additional Ayurvedic hospitals may also come into being under the programme for the development of indigenous medicine being prepared by the Ministry.

In the first plan, the amount given for the

health was Rs. 140 crores or 5.9 per cent of the total outlay and in the second Rs. 274 crores or 5.7 per cent. The amount earmarked for health in the third plan works out about 4.3 per cent of the total envisaged expenditure of Rs. 7,000 crores in the public sector.

Of the eleven heads under which allocations are understood to have been made, control of communicable diseases gets the largest share, namely, Rs. 92 crores. More than half of this amount, namely, Rs. 55 crores, is for Malaria control. Amounts budgeted for the prevention of other communicable diseases are Tuberculosis Rs. 12 crores, Leprosy Rs. 7 crores; smallpox Rs. 7 crores; Filaria Rs. 8 crores and other diseases Rs. 3 crores.

One twelfth of the total allocation, namely, Rs. 25 crores goes for family planning. Rs. 30 crores, will be utilised for the development of medical services, Rs. 17 crores for the development of medical education and research and Rs. 20 crores for organisation of primary health centres. Training programme will get Rs. 17 crores. Other allocations are development of indigenous system of medicine Rs. 5 crores. The Directors of the Health services Rs. 1 crore, Drugs control Rs. 2 crores and miscellaneous items Rs. 1 crore.

The original draft prepared by the third plan working group of Union Health Ministry had envisaged an expenditure of over Rs. 700 crores. The Directors of the Health services of two states were on the working group, as also two officials of the planning Commission and a representative of the Union Ministry of Community Development.

The Working group had pointed out to the Planning Commission during its discussions with that body that the Central Council of Health and recommended that not less than 10% of the total outlay in the third plan should be provided for health. The planning commission, however, could not agree even to half the amount it had asked for.

CANCER INCIDENCE AMONG SMOKERS

Smokers are at a greater risk than non-smokers of suffering from lung cancer, according to investigations carried out in India. These investigations also indicate that the risk increases with the number of cigarettes smoked.

The problem of lung cancer, it appears, is not of a big magnitude in the country. Of 36,505 patients who attended the Tata Memorial Hospital during 1941-56 only 521 (1.43 per cent) were suffering from lung cancer.

An investigation conducted by the Indian Cancer Research Centre in Bombay among 1,460 unselected patients admitted to the Tata Memorial Hospital during 1952-54 revealed that the habit of chewing was significantly associated with cancer of the mouth, of chewing and smoking with cancer of the back of the tongue and the upper part of the pharynx, and of smoking only with cancer of the upper part of the gullet and the adjoining portion of the pharynx. It was possible that cancer of the lung escaped detection and was diagnosed as some other disease of the lung or the adjacent organs.

According to an official press release, a recent survey of 34,000 healthy men above the age of 30 in Maharastra, Gujrat, Uttar Pradesh and Andhra Pradesh, showed a significant association of some pre-cancerous changes with smoking and chewing tobacco. Evidence supporting the cause and effect relationship between tobacco smoking and oral cancer has come from certain parts of eastern India where cancer of the palate was found among people smoking cigars (Chutta).

FIFTH INTERNATIONAL CONGRESS ON NUTRITION

Nutrition scientists from all over the world will participate in the fifth International Congress on Nutrition to be held in Washington, D.C., September 1-7-1960. A symposium on "World Food Needs and Food Resources" will be one of the main features of the scientific programme. The remainder of the programme will consist of seven half day panel discussions by invited participants, the Special sessions of ten minutes paper reporting *unpublished original research.* Major problem of Nutrition throughout the world will be reported and discussed during the meetings.

The Congress is being arranged under the auspices of the International Union of Nutritional Sciences, the American Institute of Nutrition, and the U.S. National Committee, International Union of Nutritional Sciences of the National Academy of Sciences—National Research Council.

ABSTRACTS

ANTIGENS OF V. CHOLERA—GHOSH, S. N. AND MUKHERJEE, S.—*Studies on the Antigens of VIBRIO CHOLERA by gel diffusion technique, Part I. Observations on the Antigenic make up of soluble Vivrio material—Annals Bicchem. Exp. Med. 20-31-1960.*

By means of intra-gel absorption technique the authors made a preliminary attempt to analyse the antigenic structure of *V. Cholera.* In this work soluble vibrio material obtained from the distilled water lysate of live *V. Cholerae* and normal saline extracts of boiled vibrios were used. The results indicate that the latter contained at least four distinct antigens, including group and specific ones. Three of the bands appeared to be due to TCA precipitable fraction, while the distilled water lysate of vibrios normally gave one precipiten band with the O Sera. The precipiten pattern changed when the lysate was boiled and this, according to the authors, might be due to alteration or denaturation of the bacterial antigens. The work is being continued.

DESIGN AND OPERATION OF SEPTIC TANKS—GAUR CHANDRA GHOSH—*Central Public Health Engineering Research Institute Bulletin No. 4 (1959).*

The author has discussed the general principles and practice for design of septic tanks as practised in different countries, and compared them with Indian conditions.

Design and operation of septic tanks for Indian conditions require considerable amount of scientifically planned field research before any standard can be laid down. These standards will naturally vary for different parts of the country. On the basis of present day knowledge, a small domestic type of septic tank for a minimum of 10 users should have a per capita capacity of about 3.75 cubic feet. It should have two compartments, the first one having about $\frac{1}{2}$ to $\frac{2}{3}$ of the total capacity. The liquid depth should be between 3 to 4 feet. The openings between the two compartments should preferably be slots placed above the maximum designed sludge level. The free board may be 12 inches. Under rural conditions the accumulation of sludge does not exceed one cubic feet per capita during the first year, and in most cases it is much less. The per capita sewage flow (where faeces, urine and only ablution water are admitted) does not generally exceed $1\frac{1}{2}$ gallons per day. Such a tank should function satisfactorily for at least three years or perhaps more without the necessity for de-sludging. For disposal of the primary effluent from a septic tank, bore holes and soakage pits are considered more suitable for this country compared to subsurface irrigation which is much more complicated.

For Industrial plants a per capita liquid capacity of $2\frac{1}{2}$ cubic feet is considered satisfactory. The annual accumulation of sludge in such plants is about 0.6 cubic feet per capita during the first year. In three years, owing to compaction, the total per capita accumulation of sludge is only about 1.5 cubic feet. Such plants should be able to show satisfactory performance if they are de-sludged at three years intervals. Annual de-sludging, which is the present practice, is considered unnecessary. It is also not necessary to annually de-sludge (as generally practised) a properly designed percolating filter. Occasional flushing with water under pressure after a period of rest should be sufficient to recondition the filter beds. Removing the filtering media and refilling them after washing and cleaning may be necessary only after a period of 3 to 5 years.

HEALTH SERVICE STATISTICS RECORD SYSTEM—DORIS L. DUXBURY—*Public Health Reports, January 1960, Vol. 75, No. 1, pp. 1-10.*

A simple system of recording statistics on on health services is outlined in relation to health department programs. As the scope of public health continually broadens, the need for statistics concerning past and present services to each program also increases, for the health department as a whole as well as for specific divisions within the department. These service statistics are useful for program reviews, evaluation and planning, for making an equitable distribution of funds, and for justifying budget requests.

A description is given of the utility and introduction of a mark sense punch card system for gathering service statistics in the Michigan department of health. With this system, collection of the data is quite simple—the field worker records the services he gives on mark sense cards by means of pencil marks with a special electrographic pencil. Mark sense cards are punched mechanically, thereby the process of manual punching is eliminated, and tabulations of the items of information provided by these cards yield valuable service statistics which are useful to the individual worker, the program director, and the administrator.

SOME FACTORS ASSOCIATED WITH THE DEVELOPMENT OF CORONARY HEART DISEASE—THOMAS R. DAWBER, WILLIAM B. KENNELL AND CTHERS—*American Journal of Public Health, October 1959, Vol. 49, No. 10, pp. 1349-1356.*

As a part of the longitudinal study of factors associated with the development of cardiovascular disease which is being conducted at Farmingham. Mass., this report is concerned with the educational status and national origin of the subjects, and their smoking and drinking habits, from an analysis of six years' follow-up experience. A random sample of two-thirds of the population, aged 29-62 year, was selected for study and the respondents constituted 69% or so among the chosen sample. During the six years of follow-up of males aged 45-62 at the time of entry, to which this study is restricted, an inverse association was found with educational status, and no association between national origin and the incidence of new coronary heart disease (CHD). Smoking showed an association with an increased incidence of non-fatal myocardial infarction, and of death from CHD, but no association with an increased incidence of angina pectories in men 45-62. Chlesterol levels tended to be higher among cigarette smokers than among non-smokers and higher among ex-smokers than among those who never smoked. With respect to relative weight and blood pressure, none of them showed a similar association with smoking. Alcohol consumption per showed no association with CHD, although heavy smoking was associated with heavy alcohol consumption.

ANALYSIS OF MORTALITY AND FERTILITY DATA OF THE SOVIET UNION—ROBERT J. MYERS—*Public Health reports, Nov. 1959, Vol. 74, No. 11, pp. 975-981.*

The Soviet Union often claims on the basis of the crude death rate that its mortality is the lowest in the world, while in the past it was very high—actually for 1956 the reported crude death rate is some 20 per cent lower than that of U.S.A. But the comparison of mortality is not valid owing to the unusually young distribution of the Soviet population. Similarly, on the basis of the crude birth rate, the Soviet Union claims a high fertility rate. No doubt, in recent years, the Soviet crude birth rate is reported to be higher than that of most West European countries and almost the same as for the United States, but the comparison of fertility on this basis is again faulty for the reason mentioned above.

This paper analyses mortality and fertility in the U.S.S.R. on the basis of standardization by age. The analysis shows that account being taken of the age and sex distributions of the population, the mortality of the Soviet Union is some 25 per cent higher than that of U.S.A. and fertility is about 24 per cent lower. Analysis tends to confirm the accuracy of the reported figures for the Soviet expectation of life at birth which, for 1956, are nearly 4 years lower than for U.S.A., for both men and women.

ASSOCIATION NEWS

THE TEACHING OF PREVENTIVE AND SOCIAL MEDICINE

Dr. A. K. Niyogi, Professor of Preventive and Social Medicine, Baroda Medical College, has raised the following points in connection with the teaching of Preventive and Social Medicine in the undergraduate Medical Colleges. Any comments or replies to these questionnaries will be thankfully received by the undersigned for further circulation.

S. C. SEAL,
Convenor, Medical Education and Scientific Sub-Committee.

Questionnaires

1. Is time now ripe to lay down minimum staffing pattern considering the scope of teaching and research? If so, what should be the minimum need?
2. Should the Rural Health Unit be with the Preventive and Social Medicine Department or not, for better integration of training?
3. Should the department have a laboratory for training and field research?
4. Should the department have a conveyance for training and field research?
5. What should be done about the minimum study hours that have been recommend? Is it being implemented?
6. Should paramedical training be undertaken (as the training of nurses in hospitals) and if so, what staff should be recommended?
7. What can be done to encourage research by the Preventive and Social Medicine Department?
8. Considering the Scope of the subject should the teaching of Protozoology, Helminthology, Psychology and the lectures and clinics on common infectious diseases and on nutritional physiology be undertaken by the P. & S. M. Department or left to the original department concerned.
9. Considering the scope of the subject should the examination P. & S. M. be held at the end 2nd clinical year before Medicine, Surgery and Obstetrics are fully taught?
10. How to restore separate examination on the subject in those institutions where it has been abolished?
11. Should you not consider the question of evaluating the training in P. &. S. M. so far given?
12 Should the department be a vacation a a non-vacation one?

BIHAR STATE BRANCH

The first annual conference of the branch was held on 13th December, 1959 at the Public Health Institute, Patna. Sri B. C. Patel, the Hon'ble Health Minister of the state inaugurated the conference. The following office-bearers were elected for 1960:—

President:—Dr. B. B. A. Dalal, Vice-Presidents: Dr. S. B. Lal and Dr. S. N. Sinha, State Secretary:—Dr. S. C. Ray, Treasurer:—Dr. R. V. N. Sinha, and Joint Secretaries:—Dr. S. K. Sinha and Dr. K. Prasad.

MEMBERS OF THE EXECUTIVE COMMITTEE

Sri K. R. Bhide, Sri D. N. Jha, Sri B. P. Tripathy, Sri R. N. Sharma, Sri R. C. Mitra, Dr. S. R. Chatterjee, Dr. C. S. Prasad, Dr. M. K. Banerjee, Dr. R. K. Ray, Sri D. N. Verma.

Elected representatives to Central Council: Sri K. R. Bhide, Dr. S. B. Lal, Dr. S. N. Sinha, Dr. S. R. Chatterjee, and President of the State Branch, Dr. B. B. A. Dalal.

The following resolutions were passed by the conference:—

1. Resolved that the state Govt. be moved to open up a Register for registration of the Auxiliary Health workers, Sanitary Inspectors and Health Inspectors, as done in cases of the Health Visitors, Nurses, Midwives, Dais, Compounders and Dressers etc.

2. Resolved that the State Govt. be moved to upgrade the existing pay scales of Sanitary Inspectors from 60/- to 100/- which had been prescribed several years back when the Sanitary Inspectors' Course was of 9 months' duration, to the scale of 75/- to 150/- since the training has been upgraded to 12 months duration and the Tuition and Examination fees have since been nearly doubled to bring it to the same par the Medical Laboratory technicians who have the same basic educational qualification, and the same length of training, free of any tuition fees.

Further resolved that to give an incentive to good work and in view of the great responsibilities entrusted to the Sanitary Inspectors and their arduous nature of work, the State Govt. be moved to create a selection grade of Sanitary Inspectors' consisting of 25% of the total posts of Sanitary Inspectors in the scale of Rs. 100/- to Rs. 190/-, which should be filled up by promotion from amidst those existing qualified Sanitary Inspectors who have put in at least 10 years of service in the field of public health.

LETTERS TO THE EDITOR

DR. SURENDRA PAUL,

Alipurduar

Now-a-days we are to meet in our daily practice a large number of cases suffering from allergy, gastro-intestinal diseases, etc. Most of them, are due to constant use of utensils made of alluminium or its cheap alloys. The following two cases will throw some light over the problem. It is for our fellow-practitioners to carry on further researches towards this direction so that the truth might be revealed.

(1) About a year ago a male patient came to me. He was aged about 65 years, and had a boney hard tumour—like growth over mandible resembling sarcoma. The age of the tumour was about 2 years at that time. On examination the gum was found healthy and there was no tooth. From the history of the case it was revealed that he felt occasional itching sensation over the mass. He was administered anti-histaminic drug and on the following day it was found that the growth had become soft and had also reduced a little. But complete disappearance of the growth could not be made possible even changing the brands of the anti-histaminics. Then elimination treatment was also started along with the anti-histaminics, keeping only milk and rice as his diet. But this process also failed. At this stage, on enquiry, I came to learn that he used utensils made of Alluminium. He was advised to use earthenware utensils instead of those made of alluminium. The patient started doing the same from that very day, and to much astonishment of mine, it was found on the very following day that the growth had disappeared completely. There has been no relapse since that time.

(2) I myself was the victim of the second case. About a year ago one morning, on rising up from the bed, I felt pruritic sensation over dorsum of both palm and fingers. I took it to be mosquito-bite. But, in the evening the itching sensation was unbearable and I took Sandosten tablets; I was relieved of the symptoms after three hours of ingestion. After about a fortnight I was attacked and this time it was accompanied by erruption over both surfaces of palm, feet and fingers. This time too, I was relieved of symptoms by the same treatment. On enquiry I found that I was using an alluminium kettle for keeping drinking water during the preceding month. It was discarded and the result was that I had no relapse since that time.

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