

BIBLIOTECA

HEALTH ASPECTS OF THE COMMUNITY DEVELOPMENT PROJECT, RURAL AREA, TURRIALBA, COSTA RICA, 1948-51¹

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Most human societies today give prominent emphasis to health. Communities recognize this basic need by establishing health systems which range from the folk practitioner in the simpler communities to a complicated interdependence of hospital, clinic, private physicians, dentists, laboratories and pharmacies in the more evolved communities. Little is known, however, of the factors which affect the rate of evolution from the simpler to the more elaborate systems, especially in tropical and subtropical areas, and how this process contributes to integrated community development. Neither do we know how and to what extent health influences community activities and organization. Nevertheless, very few scientists would question the validity of including health as one of the important aspects of the integrated approach required in a community development program.

As the solution of community problems seems to be at the root of the current efforts to improve the lot of mankind, further basic research on the role played by health in the economic, social and cultural status of a community must be conducted before we can approach with confidence the more complex problem of development for broader geographical areas. This paper describes the design and initial progress of a research project of this type in an area in which many problems of tropical medicine and hygiene are encountered.

Research design. In 1947 the Inter-American Institute of Agricultural Sciences

¹ The project was initiated by Julio O. Morales who supervised the collection and tabulation of the social, economic and agricultural data and Charles P. Loomis who helped in the design and execution of part of the sociological studies. They were assisted by Antonio Arce and Edwin Murillo. Marta Coll Camalez designed the health questionnaire and completed the initial collection and analysis of the data. The dietary surveys were designed and completed by Ana T. Blanco de Sariola and calculated by Margaret Moen Fiester.

The clinical studies were initiated by Dr. Nevin S. Scrimshaw and carried out by the following personnel under the direction of Dr. Oscar Vargas M., Director of Public Health of Costa Rica: Dr. Alfonso Salazar B., special nutritional examinations; Drs. Rodrigo Portocarrero and Rodolfo Vinocour, general physical examinations; Dr. Carlos Manuel Ortega P., dental studies; Dr. Lisímaco Leiva and Dr. Juan Dávila R., fluoroscopic examinations; Carlos Brenes Zamora, parasitological examinations; Fernando Leal, hematology and serum protein determinations; Joaquín B. Soto, serological and liver function tests and a supporting group of nurses and social workers. Dr. Emilio Picón assisted in the clinical nutrition examinations. Roberto Sasso was in charge of statistical analysis. Preparation of the final data was aided by a grant from the W. K. Kellogg Foundation.

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began economic and sociological studies in Turrialba, Costa Rica. A complete agricultural and population census was taken, and detailed maps of land use, land tenure, land ownership, and house distribution prepared. A sociological survey administered to 519 rural families was designed to discover informal prestige and clique leaders, community and neighborhood affiliation, characteristics associated with socio-economic status, and other fundamental social characteristics of the population.

Although a number of sociometric questions were included in the sociological survey, two proved sufficient to determine leadership status for the purposes of this study. "What families do you visit most often?" was used to establish clique groups and their leaders. "Whom would you select to represent you and the people of your area on a commission?" determined informal prestige groups and their leaders. The family or person mentioned most often within each informal group was considered the leader. Less than half of the rural families were included in this survey but they provided sufficient information regarding

TABLE 1
Composition of the sample by occupational groups and by type of subsample, Rural Zone, Turrialba, Costa Rica—1948

OCCUPATIONAL GROUP	NUMBER OF FAMILIES		TOTAL
	Purposive subsample	Random subsample	
Farmer.....	17	17	34
Laborer.....	16	73	89
Administrative personnel.....	5	3	8
Other.....	3	6	9
Total.....	41	99	140

the 25 neighborhoods surrounding the town of Turrialba to permit the determination of these groups and their leaders in the 1,241 families of this rural zone. Of the 132 "leader" families thus selected 41 were considered of major importance to their communities and were included as a group in the health study. This was done because it was felt that progress might be most rapidly brought about in the area by working with the leaders and that a thorough knowledge of their habits and attitudes would be essential for such efforts.

The remaining less important "leader" families were grouped with the "follower" families and a randomized sub-sample of 99 selected. This was stratified by neighborhoods in proportion to the families in each neighborhood so as to assure the broadest possible geographic distribution of the subsample within the area. This sample was of course necessary to characterize the community as a whole. Thus 140 families in all, 41 of the most important leaders and 99 from the remainder of the population were included in the health study.²

² Due to the nature of the sample, estimates of the population are calculated by multiplying the frequency distribution obtained in the random sample by 12 and adding the fre-

The major characteristic of stratification by neighborhoods concerns economic organization. As a higher proportion of the population of the community live in the "haciendas" than in the "small and medium farm" neighborhoods, the sample has 81 families in "haciendas" and only 59 in the other types of neighborhood. Usually the "haciendas" form both economic and social units and their boundaries coincide with the boundaries of the neighborhood. Both subsamples are divided in similar proportions between these two types of neighborhoods.

The health studies were initiated in cooperation with Michigan State College by administering a questionnaire to the 140 family subsample, to obtain information on: a) sanitary conditions of the home and surroundings; b) health and hygiene habits; c) available clinical, hospital, medical and dental facilities; d) dental care, and e) maternal and child care. Besides obtaining information on the conditions prevalent at the time of the interview, efforts were made to secure data on the opinions held by the families in relation to these conditions.

The 1948 health survey was followed in 1950 by a dietary study on the same subsample. The questionnaire covered: a) one-week and one-day dietary intake; b) seasonal consumption of foods; c) refusal of food and special food intake by individuals in the family; d) the knowledge of cooking and nutrition of the female head of the family; e) basic dietary problems recognized by the informants; f) composition of the family by age, sex and occupation; g) home production of food, and h) other general information. A total of 137 families gave this information.

In 1951, in cooperation with the Costa Rican Ministry of Health and the Institute of Nutrition of Central America and Panama, the same 137 families, making a total of about 900 persons, were given the following examinations; a) general physical; b) nutritional; c) dental; d) parasitological; e) fluoroscopic; f) hematological and serological; g) protein and vitamin serum levels; and brief medical histories were obtained.

The accumulation of these data on one community presents an unusual opportunity to study the interrelationships of health with social factors such as informal leadership and social class; with economic factors such as occupation and income; with institutional factors such as health systems and with the factors affecting community development. Furthermore, the Turrialba Community is expanding and changing its health systems under the impetus of the cooperative efforts concentrated on the Community.

In the presentation which follows it is not possible to discuss more than a few of these interrelations and the technical data cannot be presented in detail. They will be described and discussed in a series of specialized articles. This introductory paper is intended to explain the design and scope of the project and to discuss the possible applications of some of the more significant relationships thus far observed in a continuing community development project.

Adequacy of the diets. The weekly family diets in all groups were usually found quencies obtained in the purposive sample. This procedure acknowledges the fact that each family in the random sample represents 12 families in the population, while the purposive sample was supposed to be a full-coverage of the "important informal leader" stratum.

to be deficient in vitamin A and riboflavin and frequently also in protein of adequate quality, calcium and ascorbic acid. Two-thirds of the families had no meat on the day before the dietary interview and nearly one-fourth used no milk at all. Although, 72 per cent were unaware of the unsatisfactory nature of their own diets, 90 per cent recognized that there was a relation between being well fed and being healthy. The magnitude of the education work necessary is revealed, however, by the fact that only about half of the people had heard of vitamins and the majority of these had little or no understanding of their role in nutrition.

TABLE 2
Differences in intake per consumption unit among economic groups, Community Development Project, Rural Zone, Turrialba, Costa Rica, 1950*

ECONOMIC GROUP	LABORER WITHOUT LAND	LABORER WITH LAND	SMALL FARMER	FOREMAN, STOREKEEPER, SKILLED WORKER
Calories.	3213	3483	3753	3402
Protein, gms.	78	86	88	79
Animal protein, gms.	14	20	23	26
Calcium, gms.4	.6	.8	.5
Iron, mgs.	24	25	26	20
Vitamin A† "activity" I.U.	600	960	1230	1320
Thiamine, mgs.	2.0	2.1	2.4	1.7
Riboflavin, mgs.	1.0	1.2	1.3	1.2
Niacin, mgs.	15	15	17	15
Ascorbic acid, mgs.	67	79	106	112

* Intake is given as per consumption unit using as a basis N.R.C. (U. S.) standards for a physically active man except in the case of calories where the F.A.O. calorie recommendations are followed. Thus, for calories, age, weight and mean annual temperature are taken into consideration in determining the caloric needs of the family and a physically active man of the average age and weight of the adult males in the sample is used as a unit of comparison. The N.R.C. tables make no direct allowance for differences in weight or differences in requirement within adult age groups. Therefore, the reference standard for the calculations may be too high, since the people of Turrialba are on the whole smaller and lighter than the U. S. population. For comparisons among groups this is not important, but it should be taken into consideration in evaluating the adequacies of the group diets in respect to individual nutrients.

† Based on a recommended allowance of 3,000 I.U. of vitamin A. (The allowance would be 5,000 I.U. if two-thirds of the vitamin A activity came from vegetable sources, and 6,000 if all came from vegetable sources).

Eighty-one per cent stated that they would not be willing to accept skim milk, either fluid or dried, most of them believing that it had little food value. The average figures for calcium were found to be misleading because the 37 per cent of the families using calcium oxide in the preparation of corn for tortillas compensated for the remainder using wood ash and having a very low calcium intake. The fat intakes were very low, so that only 13 per cent of the total calories were derived from this source.

The diets were found to vary among the major economic groups as shown in Table 2. The differences in animal protein and vitamin A are highly significant

statistically. The slightly better diet for the families of workers with land to cultivate and the small farmer working his own land indicates that nutrition tends to be better when the family can produce part of its own food. The foods thus produced frequently include those which supply nutrients commonly deficient, a fact which emphasizes the importance of encouraging the rural family to raise part of its own food.

Although the specific data are not presented here, adequacy of diet also appeared related to leadership status. The families headed by a person who was both a prestige and a clique leader tended to have the best diets. These families were also better off economically, so that their superior diets may be partly a reflection of their superior purchasing power. Again the differences occurred primarily in their intake of animal protein and vitamin A.

In general the families living on large haciendas were not as well nourished as those from the medium and small farms, but this group included a larger proportion of workers without land to cultivate. As might be expected, family size affected the availability of animal protein and riboflavin to a significant degree, the larger families having less available per consumption unit.

Incidence of parasites. It is probable that the adequacy of the diet is further reduced by an adverse effect of multiple parasite infestation on digestion and absorption as well as by the physical drain resulting from several of the common species. Not only are the individual intestinal parasites found with the high frequencies listed in Table 3, but also 90 per cent of the people have two or more parasites, 56 per cent three or more and 17 per cent four or more. It is therefore not surprising to find that 35 per cent of the families have unsafe toilet facilities or none at all. Although 63 per cent of the families had privies, the majority of these were in very poor condition. The percentage wearing shoes is very small, 4.5 per cent in families with sanitary facilities and only 0.8 per cent in those without. Similarly the control of intestinal infestations and enteric diseases is greatly complicated by the uncertain nature of the water supply. Only 14 per cent of the families obtained water from a spring at its source and 44 per cent used water from a river, pond or ditch.

There was evidence of awareness of these problems since 43 per cent of the 140 families in the sample were concerned about their water supply, 46 per cent about their sanitary facilities, and 13 per cent about their washing and bathing arrangements. At the present time malaria is only a minor public health problem. Most of the infections are now acquired during work on the coast rather than contracted in Turrialba. In the entire group four per cent of the people had positive blood smears for malaria and 3.7 per cent had palpable spleens.

Differences in the incidence of parasitic infestation between males and females were not significant, but the incidence increased with age in both sexes up to ten years and remained high thereafter. The tapeworm, *Hymenolepis nana*, was found more frequently in children under ten who showed an incidence of 7.5 per cent of this parasite. Protozoa were found slightly more often in persons from large *fincas* than from medium and small ones but the differences were not great. In the case of helminth and larval infections the differences were small and in-

consistent. As shown in Table 3, *E. histolytica* occurred more frequently in the laboring groups having their own land, but the differences among occupational groups in respect to the incidence of other parasites have very little significance. Except for *E. histolytica* which tended to occur less frequently in clique and prestige leaders, leadership status appeared to bear little relation to parasite infestation.

Although the percentage of persons having parasite infestations was found to be high, it was not practical to determine the intensity of the involvement. Annual treatments by the Ministry of Health may have kept extremely heavy con-

TABLE 3
Per cent incidence of intestinal parasites in 140 families, Community Development Project, Rural Zone, Turrialba, Costa Rica—1951*

	LABORER WITHOUT LAND	LABORER WITH LAND	SMALL FARMER	FOREMAN, STOREKEEPER, SKILLED WORKER
Number of persons	299	167	237	79
<i>Endamoeba histolytica</i>	18.7%	26.9%	9.3%	17.7%
<i>Endamoeba coli</i>	4.0	5.3	5.5	5.1
<i>Giardia intestinalis</i>	3.7	4.2	2.1	2.5
<i>Trichomonas intestinalis</i>	8.7	9.5	4.2	5.1
<i>Chilomastix mesnili</i>	5.3	4.8	2.5	3.8
<i>Balantidium coli</i>	0.7	0.0	0.8	0.0
Positive for one or more protozoa.	28.8	39.5	18.6	26.6
<i>Ascaris lumbricoides</i>	58.5	58.7	62.0	70.9
<i>Trichuris trichiura</i>	96.3	94.0	96.2	94.9
<i>Necator americanus</i>	64.2	58.1	63.3	57.0
<i>Strongyloides stercoralis</i>	8.4	10.2	3.8	8.9
<i>Hymenolepis nana</i>	4.0	4.2	2.5	3.8
<i>Taenia saginata</i>	0.3	0.0	0.0	1.3
Positive for one or more helminths.	97.7	95.2	96.6	98.7

* One stool sample was collected from each individual. If both Lugol stained and fresh saline suspensions were negative, the zinc sulfate flotation technique was employed.

centrations of any one parasite from developing. Whatever the reasons may have been, specific correlations of parasites with hematological and blood vitamin values could not be established. Even in the case of hookworm infestation, the slightly lower hemoglobin (12.8 grams) and red blood cell (4.28 million) concentrations were not significantly different from those of persons without hookworm (13.3 grams., 4.38 million), nor did hematological values correlate with economic group, leadership status or type of farm. This was probably due to the multiplicity of factors present in the same individual which could influence hematological values. One-fourth of the entire group had hemoglobin values of 11.9 or below. Of these, 5 per cent were microcytic anemias (M.C.V. < 80) and 58 per cent were macrocytic (M.C.V. > 94).

Medical and dental findings. Of the total group of 945 examined on the basis of medical history alone, 21 per cent were considered to be in only fair health and 2 per cent in poor or very poor health. A similar impression was obtained from the physical examinations. The nutritional status was considered to be only fair in 21 per cent and poor or very poor in 4 per cent on gross inspection. However, over one-third of the entire group had exceedingly bad dentition, i.e., more than half of their teeth missing or carious, and only 22 per cent were without caries. Most of the latter were infants and young children. Gingivitis was observed in over one-fourth of the people but was considered due to poor dental hygiene rather than specific nutritional deficiency.

Although the riboflavin content of the diets was low, the serum riboflavin levels were within normal limits and the incidence of angular stomatitis (11 per cent) and seborrhea (2 per cent) was low. Mild to moderate circumlimbal vascularization of the cornea was observed in over one-fourth of the individuals examined, but the significance of this finding is uncertain. Approximately 40 per cent of the persons showed definite thickening and increased vascularization of the bulbar conjunctiva, but in Central American rural areas these signs are greatly influenced by chronic exposure to smoke in the houses and to dust during the dry periods. The frequent deficiency of vitamin A in the diet and the relatively low serum levels of carotene and vitamin A encountered suggest that inadequate intake of vitamin A may be a predisposing factor. The dry cracked skin of the extremities in nearly a quarter of the individuals and frank follicular hyperkeratosis in 12 per cent are at least consistent with this suggestion, although by no means diagnostic.

Five per cent of the population had palpable livers. Serum alkaline phosphatase values were not elevated in either adults or children. The absence of elevations in children agrees with the almost complete absence of skeletal deformities suggestive of rickets.

Although it is reasonable to assume that economic status, leadership and type of community influence both the serum vitamin levels and the many physical signs which were tabulated, the multiplicity of factors influencing these findings and the general lack of specificity of most of the physical signs are such that consistent and significant correlations could not be demonstrated, at least without detailed age and sex breakdowns beyond the scope of this introductory report.

Maternal and child health. The women in the study reported a total of 1,171 pregnancies during their lives. They stated that 11 per cent of these ended in abortions and 3 per cent in infants dead at or immediately after birth. In seventeen per cent of this total the children died during the first year after birth and in an additional 7 per cent they died before 14 years of age. Thus according to this information 449 of the products of the 1,171 pregnancies during the period represented by their reproductive life span were lost before adolescence, data unavailable to health authorities because many of these deaths would not be reported to them.

The reasons for such a high loss are many. Only 4 per cent of the births were attended by a physician and 20 per cent by an obstetrical nurse. The majority

were attended by untrained midwives. The inadequate diets of the mothers probably also increased the incidence of abortions and deaths from prematurity. Moreover, as soon as a child is born it is exposed to the dangers of a wide variety of intestinal infections³ as well as parasites. All of the intestinal parasites discussed above have been found in preschool children.

It is also apparent that the nutrition of the infants is a precarious matter because of the uncertainty of the supply of mother's milk and the nature of the supplementary or substitute feeding provided. Thirteen per cent of the women were unable to nurse their babies and another 24 per cent had stopped nursing by the time the child was six months of age. At the age of one year 74 per cent of the babies were no longer receiving any breast milk; yet at this age only 64 per cent of them were receiving fruit juice, 46 per cent whole milk, 36 per cent cereal, 21 per cent egg and 9 per cent meat. Sugar water was given in significant quantities as a food to nearly half of these children. The educational problems relating to maternal and child care in such a situation are obvious.

Other factors listed as contributing to the mortality were whooping-cough, tetanus and diphtheria, all controllable by proper inoculations, and pneumonia, measles and malaria which ordinarily should not be fatal with adequate treatment. A further indication of the lack of medical attention is the fact that no cause of death could be suggested by the mother for approximately half of the deaths occurring between birth and 14 years of age.

The community approach to solutions. Turrialba has developed through the years an increasingly complicated pattern of health systems designed to meet these and other fundamental health problems. This pattern combines characteristics of the simpler community systems, such as the "curandero" (folk practitioner) and "partera" (mid-wife), with the relatively elaborate Social Security Hospital and the Public Health Unit. In addition, a physician and dentist have private offices in the town. In all, five medical doctors serve a population of nearly 30,000 inhabitants and the pharmacists are called upon frequently for advice on medical problems.

Inquiry as to the number of visits made by persons in the study for medical purposes during 1948 was included in the health questionnaire and tabulated by percentage of visits to each health service. Differences were observed in the habits of people of "hacienda" and small and medium farm neighborhoods (Table 4). This was due primarily to the employer-employee sharing of the Social Security quotas. Small farmers operate in both capacities and many seem to prefer to run their own health risks. In general, the data seem to indicate that the rural population prefers professional services when available, but is willing to use non-professional advice when other cannot be secured.

³ In a recent survey carried out by the Ministry of Health in cooperation with the Tropical Research Foundation of Chicago, 46 individuals in the Turrialba study furnished a single fecal sample for culture. In this small group, *Proteus*, *Shigella sonnei*, *Salmonella wichita*, *S. typhisius*, *S. muenchen*, and *Paracolon* (Arizona and Bethesda types) were identified. Of 19 employees of the Inter-American Institute of Agricultural Sciences in Turrialba, examined at the same time, one was found to have *Sh. alkalescens* and another *Sh. paradysenteriae* Flexner IIB (Wb).

In simpler communities, health systems arise from the direct efforts to meet the needs of the people as they see them. These systems are also developed in close harmony with the economic means and other fundamental characteristics of the culture. In more evolved communities, this harmony with "felt needs", economic means and other cultural characteristics is not as close because *responsibility for program formulation and execution is largely removed from the community to the state or national levels*. The result usually takes the form of numerous programs bearing on health, uncoordinated at the community level, failing to meet adequately the "felt needs" of the people and sometimes confusing them. On the other hand, the local population loses the ability to comprehend the technological and economic limits placed on community services

TABLE 4

Use of different health systems in two types of neighborhoods, Rural Zone, Turrialba, Costa Rica, 1948

SYSTEMS	PER CENT OF VISITS	
	Large hacienda type neighborhood	Neighborhood of small and medium farms
Social Security Hospital.....	62	47
Public Health Unit*.....	2	10
Private dentist.....	3	5
Private physician.....	3	8
Obstetric nurse.....	0	1
Mid-wife.....	2	3
Folk practitioner.....	9	7
Pharmacist.....	19	19
Total.....	100	100

* At the time the questions were asked, the Public Health Unit in Turrialba was not active. It has since been reorganized and well staffed, partly as a result of the needs revealed by this study.

by the resources and degree of development of the country. Their demands for services often surpass even the most visionary estimates of potentialities.

Turrialba is an example of the operation of these factors. Most of the heads of families interviewed in 1948 reported that there were fundamental deficiencies in the services offered by the two most important community health agencies, the Social Security Hospital and the Health Unit.⁴ The people expected curative services from both agencies, even though the Health Unit's program stressed preventive medicine.⁵ They did not seem to appreciate the financial and technical limitations under which both agencies must work.

The health problems reported above, on the other hand, are ample evidence

⁴ See footnote, Table 4.

⁵ Also observed by George Foster in a 1951 report of the Institute of Social Anthropology in Washington, D. C., "A Cross-cultural Anthropological Analysis of a Technical Aid Program", p. 65-66.

that the health needs of the families were not being adequately met by existing services, although many governmental departments and agencies were active in the area. The maximum use of the limited resources available is not obtained because the activities of the school system, the agricultural organizations, and the health agencies are not fully integrated at the community level. The closest possible cooperation of all these agencies is required for a more effective approach to the health problems revealed by the study. It is evident that better nutrition, control of parasites, improvement of water supplies and sanitary facilities, and improved maternal and child care are all necessary in the Turrialba community.

The specific public health measures developed to meet the situation must be integrated in the broader community development program. In Turrialba an attempt is now being made to do this by placing emphasis on the following operational principles.

1. *Increasing the participation of local people, both rural and urban, in program formulation and execution.*

2. *Promoting closer cooperation among agencies serving the community.*

3. *Reaching the entire population with simple and economical methods of health education and service.*

As the Turrialba Community Development Study progresses, experience will be accumulated in the practical application of these principles to action programs. Their application is believed essential for the permanent success of all efforts to improve public health on a community or area basis, particularly in those areas which are undergoing an active transition to more evolved health systems under the stimulus of international programs.

SUMMARY

The Turrialba, Costa Rica, Community Development Project was initiated in 1947 with studies of economic and social structure. 140 families were selected from the rural population for health and dietary studies during 1948-51. This sample included the major economic, leadership and geographical groups on a proportionate basis and was composed of 940 individuals. This group was also used in 1951 for detailed clinical, dental, fluoroscopic, parasitological and blood vitamin and protein studies. The major public health problems included dietary deficiency of vitamin A, riboflavin, calcium and animal protein; very high incidence of multiple intestinal parasitism; unsatisfactory drinking water, sanitary and bathing facilities; poor infant feeding practices and general ignorance of the basic principles of hygiene and nutrition.

The Turrialba Rural Community development study is being continued, and efforts are being made to improve the integration of all agencies concerned with the project; to secure increased participation of local people in program formulation; and to adapt or develop simple and economical methods of health education and service to reach the entire population. These measures are considered essential for the lasting success of national or international efforts to improve public health on a community or regional basis.