

ENDEMIC GOITER IN GUATEMALA

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It has become increasingly clear that endemic goiter, while not specifically a tropical disease, is a very common contributor to the frequently suboptimal health of persons living in tropical and subtropical areas. The extensive survey program stimulated by the World Health Organization and its Regional Office for the Americas, the Pan American Sanitary Bureau, has shown every country on the mainland of the American tropics to have areas in which endemic goiter is a serious public health problem (Scrimshaw, 1954).

In Guatemala endemic goiter has been recognized for many years. Guerrero (1908) described a goitrous zone in the south of the country and Díaz (1918) presented further evidence as to the occurrence of goiter in Guatemala. A questionnaire sent to the mayors of rural villages by Herrera (1939) revealed at least seven goitrous zones. In 1950 systematic surveys were begun by the Institute of Nutrition of Central America and Panama (INCAP) in cooperation with the nutrition field unit of the national health department. Progress reports have been published locally (Muñoz, 1951; Pérez, 1951). The present summary report includes all of the data obtained from the cooperative studies.

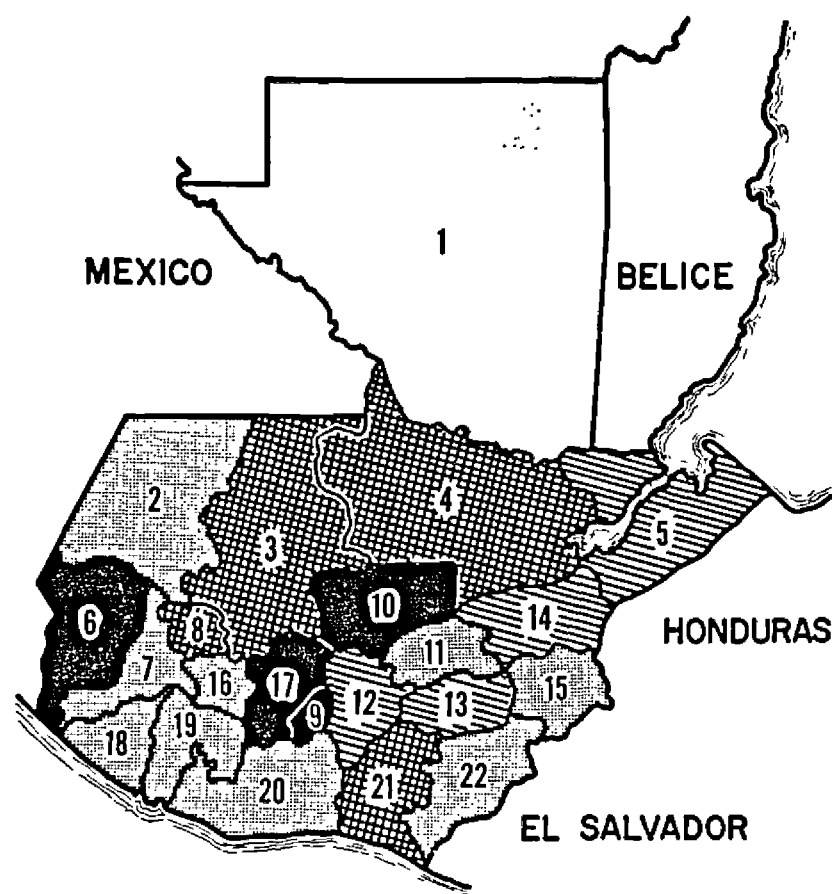
Approximately 1.4 per cent of the estimated total Guatemalan population of 2,788,122 were examined. The extent and severity of endemic goiter in Guatemala, as revealed by these surveys, was so great that in November, 1954, legislation requiring the iodization of all salt destined for human consumption was approved.

MATERIAL AND METHODS

A total of 39,484 persons from all 22 departments of the country were examined, of whom 70 per cent were school children, 2 per cent pre-school children and 28 per cent adults. In eight of the departments only the capital was visited but in the others the survey included both the capital city and a number of other towns and villages.

The technique of the examination for goiter was that recently recommended by the Third Latin American Conference on Nutrition (1953). The thyroid area was first inspected with the head thrown backward and then palpated with the head forward and the neck muscles relaxed. Only glands considered by palpation to be four to five times normal size or more were classified as positive for goiter. Normal size of a lateral lobe was taken to be approximately that of the thumb nail of the person being examined. For the purposes of the survey any gland of

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PERCENT OF GOITER

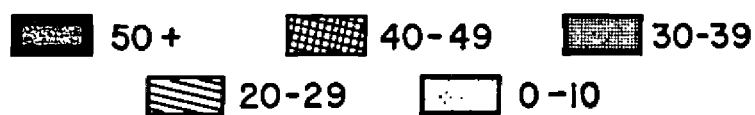


FIG. 1. Endemic goiter in Guatemala

No.	Department	Population	No. Examined	% Positive
1	Petén	15,897	659	7
2	Huehuetenango	198,872	2,283	37
3	Quiché	174,882	826	44
4	Alta Verapaz	188,758	1,550	42
5	Izabal	55,191	1,091	20
6	San Marcos	230,039	1,166	54
7	Quezaltenango	183,588	2,172	30
8	Totonicapán	99,434	592	45
9	Sacatepéquez	59,975	6,216	56
10	Baja Verapaz	66,432	1,068	64
11	Progreso	47,678	1,338	30
12	Guatemala	441,085	6,948	28
13	Jalapa	75,091	800	22
14	Zacapa	69,533	944	22
15	Chiquimula	112,837	1,021	33
16	Sololá	82,869	834	37
17	Chimaltenango	122,310	2,371	59
18	Retalhuleu	66,066	756	38
19	Suchitepéquez	125,196	1,353	37
20	Escuintla	123,809	3,487	34
21	Santa Rosa	109,812	1,352	39
22	Jutiapa	138,768	657	36
		2,788,122	39,484	38

doubtful or borderline size was classified as normal. Glands which were palpable as four to five times enlarged but smaller than those in size two were listed as size 1. Markedly enlarged glands easily visible with the head extended were classified as size 2 and those visible at a distance of several meters with the head in normal position as size 3. Adenomatous nodules of varying size were frequent and their presence was always noted.

RESULTS

The distribution of endemic goiter in the different departments of Guatemala is shown in Figure 1, together with a legend giving the population of the department, the number of persons examined in each and the percentage of goiter encountered. Only one department, Peten, had a percentage of goiter below 10 per cent while the department of Baja Verapaz had nearly 65 per cent goiter. Of the remaining departments, three had more than 50 per cent goiter and the rest between 21 per cent and 50 per cent. By weighting the percentage found in each department for the relative population of the department, the overall average for the entire country was calculated to be 38.5 per cent.

The distribution of goiter by age and sex is shown in Table 1. The finding of an equal incidence in males and females in Guatemala is of special interest and has been apparent in the survey results from the beginning. A somewhat greater incidence of goiter prevailed among adolescents than among primary school children. No special significance should be given to the higher figure for goiter in adult men and women since adults were examined from only six departments, all of them relatively high in goiter incidence, while children were examined in every one of the departments.

The size and type of goiter encountered in each age group is tabulated in Table 2. Twenty eight per cent of the goiter in adults, 14 per cent in adolescents and

TABLE 1
Distribution of goiter by age and sex

Age	Males		Females		Total	
	No. examined	% with goiter	No. examined	% with goiter	No. examined	% with goiter
0-12	14,384	34.6	11,640	33.7	26,024	34.2
13-18	5,202	46.4	4,076	45.6	9,278	46.0
19+	2,717	56.0	1,758	54.6	4,475	55.5

TABLE 2
Type and severity of goiter

Age	No. Examined	% Diffuse Goiter			% Adenomatous Goiter		
		Size 1	Size 2	Size 3	Size 1	Size 2	Size 3
0-12	26,024	24.8	6.4	0.8	1.3	0.7	0.2
13-18	9,268	30.2	10.6	1.4	2.1	1.5	0.3
19+	4,475	19.7	9.7	2.0	8.0	9.2	6.9

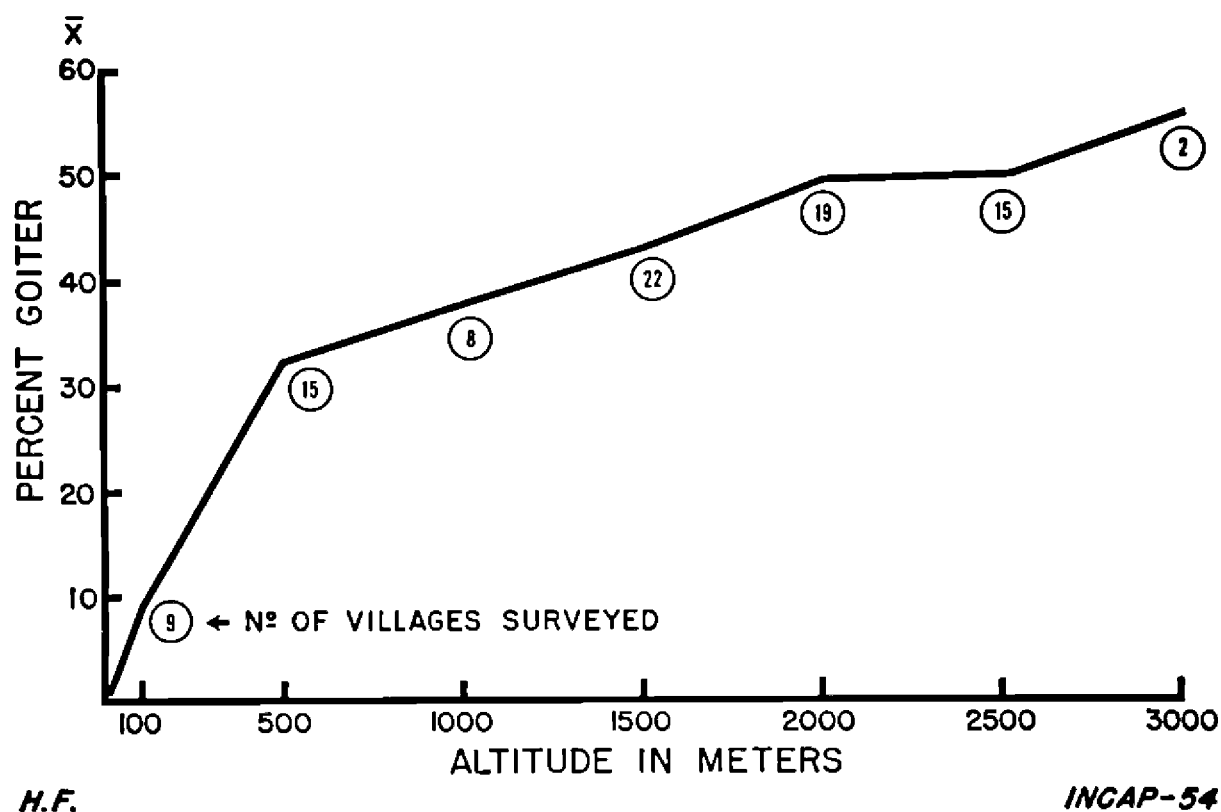


FIG. 2. Distribution of endemic goiter in Guatemala by altitude

8 per cent in children was readily visible (size 2 or 3). Slightly over 30 per cent of the goiters identified were found to contain adenomas. These nodules were not infrequent even in the youngest children examined. Since analysis of the data did not show a significant difference between the incidence of goiter in Mestizo and Indians residing within the same locality, no separate tabulations are presented for these groups.

In those departments with sufficient localities examined to permit comparison, except for Guatemala City and El Progreso, the differences in the incidence of goiter between persons living in the capital town of a department and those living in other towns and villages were not significant. In the department of El Progreso only 4 per cent of 320 children in the capital town were found to have goiter and only one child with endemic goiter was encountered among 196 examined in five nearby villages. Nevertheless, in the same department towns with incidence rates of 30, 39, 49, 58 and 74 per cent brought the department average to 31 per cent. Moreover, the capital cities of the surrounding departments had incidence rates of 22, 22, 25 and 56 per cent. The incidence of endemic goiter in Guatemala City was 25 per cent while that of the remainder of the department was 37 per cent. It should be noted that very few persons from middle and upper income groups were included in the survey, even in Guatemala City.

In Figure 2 average values for populations living at different altitude intervals are plotted. These figures are based on 90 of the centers of population studies. The number of centers falling within each altitude range is shown within the circles. The incidence of endemic goiter in Guatemala does show a definite correlation with altitude.

DISCUSSION

Probably no other country in the hemisphere has as widespread and severe a goiter problem within its national territory. Even by the conservative criteria used for the diagnosis, over a third of the population of Guatemala suffers from this disorder. The only department with an incidence of endemic goiter of less than 20 per cent is so scarcely populated as to contain only 0.5 per cent of the population.

If Kimball (1951) is correct in his belief that adenomatous goiters have their origin in iodine deficiency in the mother and are in this sense congenital, the data give further evidence as to the severity of the problem. Other complications often stated to be associated with endemic goiter such as deaf-mutism and mental retardation in children, as well as cretinism for which the association has been definitely established, are not uncommon in Guatemala. Unfortunately, there are no data available as to their incidence and distribution.

The failure to find a greater incidence of goiter in adolescent and adult females than males is unusual but not wholly without precedent since surveys in New Zealand have given similar results (Clements, 1951). However, no explanation for this difference from the surveys in other countries of the region is apparent at the present time.

The reports from other parts of the world (World Goiter Survey, 1946) that endemic goiter is more frequent in inland and particularly highland areas seem to be borne out by the findings in Guatemala. It should not be concluded, however, that tropical lowland areas will necessarily have a low incidence of goiter. The warm tropical areas in the Guatemalan departments of Retalhuleu, Suchitepéquez, Escuintla, Santa Rosa, Jutiapa, Chiquimula, Zacapa, and Izabal all have an incidence of endemic goiter greater than 20 per cent. One of the most severe endemic goiter areas yet reported anywhere in the world is to be found in Panama in the tropical coastal provinces of Chiriquí (Arce Larreta, 1951) and Herrera (Reverte, 1954). In El Salvador the highest incidence was found in the predominately tropical lowland department of Sonsonate (Cabezas *et al.*, 1953). Preliminary INCAP surveys in the tropical areas of Nicaragua are also encountering an appreciable incidence of goiter.

It has already been demonstrated that endemic goiter, as it occurs in children in Guatemala, can be greatly reduced by the administration of iodine at the level corresponding to that obtained from a daily intake of 10 grams of salt containing 1 part of iodine in 10,000 parts of salt (Scrimshaw *et al.*, 1953).

Although a complete survey has not been done, samples of Guatemala salt as first produced have been found to have as much as .16 parts of iodine per 10,000 parts of salt when analyzed by the alternative A.O.A.C. method (Official Methods of Analysis, 1950). This is above the level of 1 part per 100,000 recommended by the WHO Study Group on Endemic Goiter (1952) for *iodized* salt. Even though part of this iodine content is rapidly lost, INCAP studies show that as much as half of it may still be present after six months. Samples purchased at random in the market in Guatemala City during February of 1954 averaged .07 parts of iodine per 10,000 parts of salt.

Since the iodine content of the local salt is so nearly that believed sufficient to prevent goiter under ordinary circumstances, it is probable that one or more goitrogenic factors are increasing the physiological need for iodine. No direct experimentation has yet been carried out in Guatemala on this aspect of the problem. However, dietary surveys have shown vitamin A deficiency to be common, and vitamin A deficiency in turn has been shown to have a goitrogenic effect (Greer, 1950). Although lime is used in the treatment of corn for the preparation of tortillas, the surveys show that the total amount of calcium thus ingested is usually below recommended dietary allowances and therefore unlikely to exert a goitrogenic effect. A search must be made for specific goitrogenic factors in the Guatemala environment.

On the basis of present information, the Third Latin American Conference on Nutrition (1953) would seem to have been well advised in suggesting a higher level of iodization for salt in Latin America than that advocated by the WHO Study Group. The final resolution of this conference took into account the variations in salt consumption, data on physiological demands for iodine, the probable action of goitrogenic factors, and the successful experience for many years of the United States and Canada in recommending that the levels should not be less than 1 part of iodine per 20,000 parts of salt and not greater than 1 part in 10,000.

Salt in most tropical countries is consumed in a crude moist form unsuitable for iodization by methods employing potassium iodide. These necessitate the refining and drying of the salt, the addition of chemical stabilizers and packaging in moisture-proof containers. The resulting increase in price and change in the appearance of the salt which have been almost insuperable obstacles to its iodization in many tropical areas, have recently been overcome by the introduction of potassium iodate for this purpose. Potassium iodate has been demonstrated to be effective (Scrimshaw *et al.*, 1953; Stacpoole, 1953) and is stable for long periods of time even when added to crude salt without special refining, stabilizing or packaging. Thus salt can now be iodized and distributed in humid and tropical areas without changing habit patterns or increasing the price to the consumer.

Although no detailed surveys have been carried out in Central America, it is well known that iodine deficiency occurs in animals and may parallel the occurrence of human goiter. For this reason salt given to animals in tropical areas with a significant incidence of endemic goiter in the human population should also contain iodine. Potassium iodate also would seem to be the most suitable compound to use for this purpose.

SUMMARY

Of a total population estimated at 2,788,122 more than 39,484 persons were examined of whom 70 per cent were school children, 2 per cent pre-school children and 28 per cent adults. The overall incidence of goiter was 38.5 per cent. Only one out of 22 departments had an incidence less than 20 per cent. One department had more than 60 per cent goiter, three between 51 and 60 per cent and

the 17 remaining departments from 21 to 50 per cent. No differences in incidence of goiter were found between males and females in any age range, between Mestizos and Indians in the same locality nor persons living in department capitals and outlying villages. The average incidence of goiter increased with altitude. Endemic goiter is considered to be a serious public health problem in Guatemala and its prophylaxis through the iodization of all salt for human consumption has been approved by the government at a level between 1 part of iodine in 10,000 parts of salt and 1 part in 15,000. Because the salt used is crude and moist and distributed without special packaging, the use of potassium iodate is planned for this purpose.

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