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Progress and delays in combating goiter in Latin America[1]

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AFTER HIS CLASSICAL EXPERIENCE with the use of iodized salt for the control of endemic goiter in Akron, Ohio, Marine stated: "Simple goiter is the easiest of all known diseases to prevent . . . It may be excluded from the list of human diseases as soon as society determines to make the effort" (14). Thirty years later, having devoted his entire life to the implementation in the United States of the measure which he had demonstrated to be so practical, the same author stated: "We have not achieved the degree of control of simple goiter. . .in man that it would be reasonable to expect from past experience and our present knowledge of thyroid physiology and chemistry" (13).

Significant advances have been achieved in the control of this disease in the highly endemic areas of Switzerland and the United States, particularly Ohio and Michigan, in the latter. However, Kelly and Snedden summarized the result of a recent worldwide survey conducted for WHO (10) as follows: "Goiter. . .occurs with varying intensity in almost every country; few countries appear to be entirely free from it. . . The disease has been observed in the far north, in the tropics, and in the far south, it occurs quite independently of climate, season or weather. Moreover, in its incidence, goiter makes no distinction of race, nationality, color, creed or class."

This presentation will be limited to an analysis of the present situation of endemic goiter in Latin America, the action taken for its prevention and the problems encountered therein.

EPIDEMIOLOGY

From the time of the conquest to the present, there has been a gradual accumulation of literature on the occurrence of endemic goiter in all the continental countries of Latin America. I will not attempt to add to the excellent reviews published on this subject (8, 10, 20), which, furthermore, has been covered in various international meetings (5, 21). There is no doubt of its gravity as a public health problem in most countries, a fact which is illustrated in Fig. 1, taken from the report of the Conference on Endemic Goiter, sponsored by WHO in 1952 (23).

In general, prevalence is higher in the mountain areas, but its magnitude is also significant at sea level and on the coasts. The reports of the countries to the Third Conference of Nutritional Problems in Latin America (5) held in Caracas in 1953 indicated that there were areas where more than 50% of the population was affected by endemic goiter in Argentina, Boliva, Brazil, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, and Peru.

The most important etiological factor, iodine deficiency, has also been well documented by studies on the iodine content of drinking water, soils, and on total iodine intake, iodine balance, thyroid iodine uptake, and iodine urinary excretion (8, 11, 12, 18, 24).

Recent studies reported by Follis (8) and by de León and Retana (6), on the urinary excretion of iodine expressed in terms of micrograms of iodine per gram of creatinine, are very conclusive, as illustrated in Fig. 2 and Table 1. Figure 2 shows the different patterns of iodine urinary excretion of a group of schoolgirls in Washington, D.C. and a group of persons from an area in Bolivia where goiter is highly endemic. It can be seen that in the Washington girls there are no values under 50 μg, in contrast with the group from Bolivia, where the number of cases in the 0–25 and 25–50 μg categories is the largest and where, in addition, no values higher than 150 μg were found. Table 1 shows the correlation between the values of urinary excretion of iodine, and goiter prevalence. The situation of Guatemala, which is particularly interesting, will be discussed in more detail.

The high-calcium content of drinking water has been considered a contributing etiological factor for endemic goiter in some areas, and the possibility of goitrogenic substances in foodstuffs has also been suspected. Nevertheless, since a higher iodine intake could correct these situations, they do not invalidate the principles of prevention with iodine.

A high prevalence of cretinism and deaf-mutism is known to exist in many areas of Latin America with a high incidence of goiter. The possibility of endemic goiter

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FIG. 1. Principal zones of high endemicity of goiter in Latin America. (From Stanbury (23).)

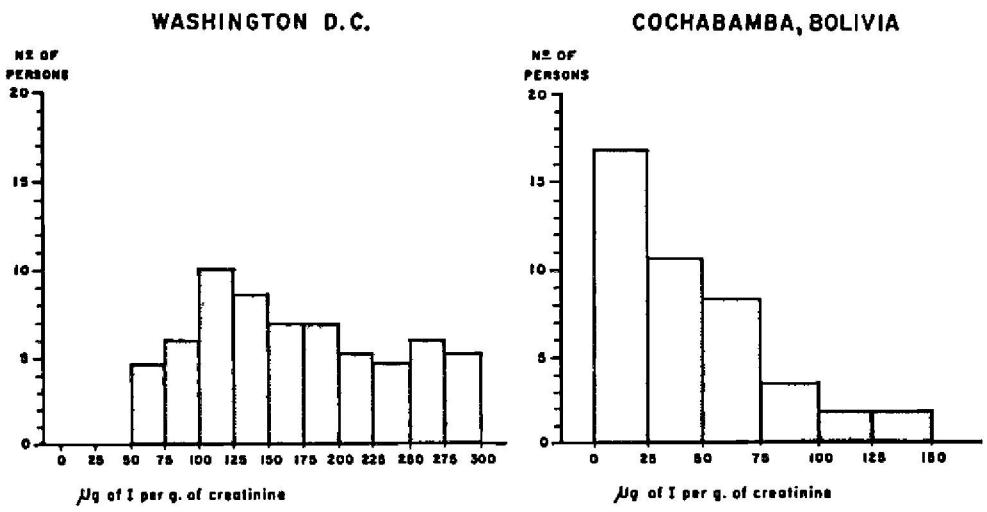

FIG. 2. Iodine urinary excretion. (From Follis (8).)

as the factor responsible for these conditions has been suggested. Although no conclusive evidence to demonstrate this possibility is available, the association between endemic cretinism and endemic goiter has been documented in nine countries of Latin America (5).

Among other health problems which have been associated with endemic goiter, we can mention hypothyroidism with reduced physical and mental activity, thyrotoxicosis, carcinoma of the thyroid, and other types of carcinoma (4). Although many studies suggest these associations, evidence for a direct cause-effect relationship between endemic goiter and the above-mentioned complications is not conclusive. There is no doubt, however, that endemic goiter, even when considered as nothing but a mechanism of adaptation to a low-iodine intake, and not as the factor directly responsible for the above-mentioned conditions, is indeed an abnormal condition and should be prevented.

PREVENTION

Since iodine deficiency is the recognized primary factor responsible for endemic goiter, the correction of this situation by administering additional amounts of iodine

TABLE 1. *Iodine urinary excretion and goiter**

Country	0.25†	26–50†	>50†	% of Goiter
Brazil (Paraiba)	0	11.1	88.9	9.5
Guatemala‡	0	6.2	93.8	5.2
Venezuela (Los Andes)	52.3	28.6	19.0	56.9

* From de León and Retana (6). † % Of persons, excreting the indicated figures in μ of I/g of creatinine. ‡ Representative sample of the whole country after 5 years of salt iodization.

to the entire population is accepted as the most practical and effective preventive measure.

It has been shown that regular kitchen and table salt is the most adequate vehicle for administering the needed additional iodine. The main advantages of salt are that it is a universally consumed product, and that its average daily consumption is less variable than many other foodstuffs from one individual to the next in a given population. Thus, total coverage and an adequate and safe dosage are possible.

Drinking water has also been suggested and has been used as a vehicle for iodine. Its disadvantage is that the amounts regularly consumed by different individuals are subject to wide variation. Furthermore, it is less economical, as only a small portion of available water is used for drinking purposes. In addition, adequate systems of water supply which could be treated are not available in large underdeveloped areas where goiter is endemic. Bread or other staple foods have been proposed as vehicles for iodine, but their consumption by the different members of the population is not regular.

The distribution of iodine in tablets, candies, or drops is extremely impractical as a mass preventive measure. They have been tried in many instances but always abandoned because coverage and cost limitations prevent an efficient operation of such a program (1). We consider that the establishment of measures of this type is only practical at the individual level or for experimental purposes, but not as a public health measure. In some countries they have constituted a reason for delaying the implementation of salt iodization for the prevention of endemic goiter, as public health workers have the impression that they are sufficient to control the problem.

It is therefore clear that salt is the most adequate vehicle for iodine supplementation, although its use also presents certain problems. Potassium iodide, the first and most widely utilized compound to iodize salt, is unstable in the moist and impure salt commonly employed in most of the Latin American countries. This problem has been solved by the use of potassium iodate, which has proved equally effective, safe, and stable in nonrefined salt (3, 22). The methods developed for iodizing fine and dry salts, such as spraying or dry mixing, are not adequate for iodizing moist or coarse salts, but effective and economical methods for this purpose have also been developed (9).

Another limitation of salt for the purpose under discussion is that, in many areas where endemic goiter is a problem, salt production takes place in very small and primitive exploitations of either mines or seawater. Under

these circumstances, the iodization becomes impractical from the economic point of view.

In view of this last problem, the Pan American Health Organization (PAHO) is cooperating in studies now being conducted in a highly endemic area of Ecuador, to determine the practicability and effectiveness of intramuscular injections of iodinated oil as a preventive method for endemic goiter in areas where salt iodization is not possible. The PAHO is also stimulating, supporting, and coordinating other studies in Latin America that can contribute to the understanding of epidemiological factors as yet unclarified and of the association of goiter with other health problems, particularly cretinism, deaf-mutism, growth retardation, cancer, and thyroid diseases.

There is no doubt, however, that we already have the knowledge and experience to control goiter as a public health problem, and that they have been available for many decades. Likewise, their applicability in the large majority of Latin American areas where goiter is still highly prevalent is unquestionable. In the following paragraphs I would like to analyze the reasons that have prevented this knowledge from being utilized.

PRESENT SITUATION OF ENDEMIC GOITER CONTROL IN LATIN AMERICA

I would prefer to begin with a description of situations where effective programs have been implemented. These are few in number, but their significance is great, because they demonstrate the feasibility of control (7).

At the national level, two countries in Latin America, Guatemala and Colombia, have implemented the measure of salt iodization for the control of endemic goiter.

In Guatemala (Figs. 3–5) surveys carried out in 1952 indicated an average prevalence of endemic goiter of 38.5%. In some areas, prevalence was as high as 90% (15). In 1956, a law was passed under which iodization of all the salt produced in or imported into the country was made compulsory. This legislation was effectively enforced by 1960, when about 85% of all the salt consumed in the country was properly iodized, and a system controlling the measure was in full operation. In 1962, another survey showed an average prevalence of endemic goiter of 15%; by then it was estimated that about 90% of all the salt consumed in the country was properly iodized. A new survey conducted in 1965,[2] showed an average prevalence of 5.2%. No areas with a prevalence of over 20% were found in this last survey. Prevalence surpassed 10% in only two areas, one of which was situated close to a neighboring country where salt is not iodized, in a region where there is evidence of consumption of salt from that country. The other is an area where very small producers of salt from ocean water are probably selling their product locally, without control. Even in these areas, however, reduction is very significant when compared with previous prevalence figures (6). As indicated previously, studies on iodine urinary excretion, carried on at the same time, showed high values. Of the 40 communities included in the sample and distributed throughout the country, the only two in which the average value of iodine excretion for the community was below 50 μg/g of creatinine were located in the areas where goiter prevalence was still above 10%.

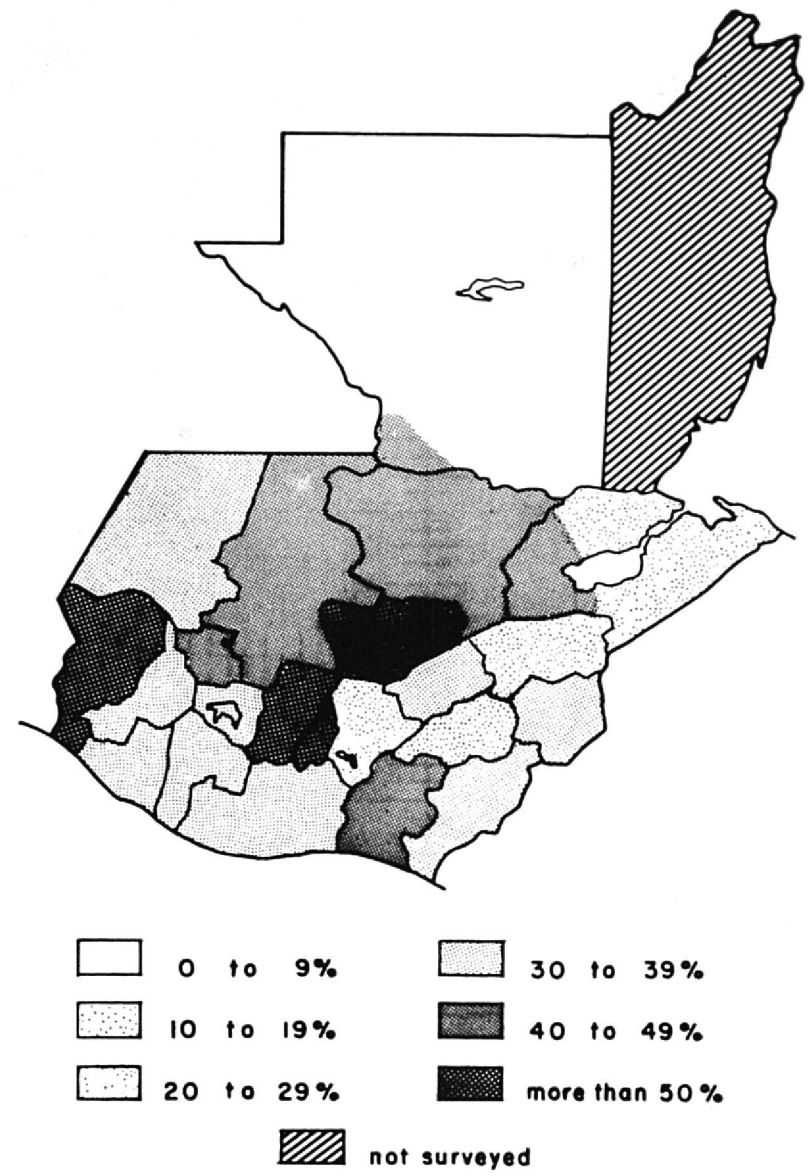

FIG. 3. Prevalence of endemic goiter in Guatemala (1952).

Salt in Guatemala is iodized according to the recommendations of the Third Latin American Conference on Nutritional Problems, with potassium iodate at a level of about 1 part of iodine in 15,000 parts of salt, with acceptable limits of 1 in 10,000 and 1 in 20,000. No undesirable effects or complications have been observed in Guatemala which could be attributed to salt iodization.

It should be noticed that the level of enrichment is much higher than the one recommended by the WHO Study Group (23), which consisted of 1 part iodine in 100,000 parts of salt, and provides a higher amount of iodine than is accepted in the recommended allowances of the Food and Nutrition Board of the National Research Council (NRC) (16). The recommendation of the Third Latin American Conference on Nutritional Problems (5) was based on the fact, among others, that endemic goiter exists in areas where the natural iodine content in the salt commonly used is of 2–8 parts for 100,000 (2). This obviously indicates that the demand is higher probably because of the factors already men-

[2] This information was obtained as part of a nutritional survey carried out in Guatemala with the cooperation of the Guatemalan Government, INCAP and OIR/NIH. This research was supported by the Advanced Research Projects Agency (Project AGILE) and was monitored by the Nutrition Section, Office of International Research, National Institutes of Health, under ARPA Order no. 580, Program plan no. 298.

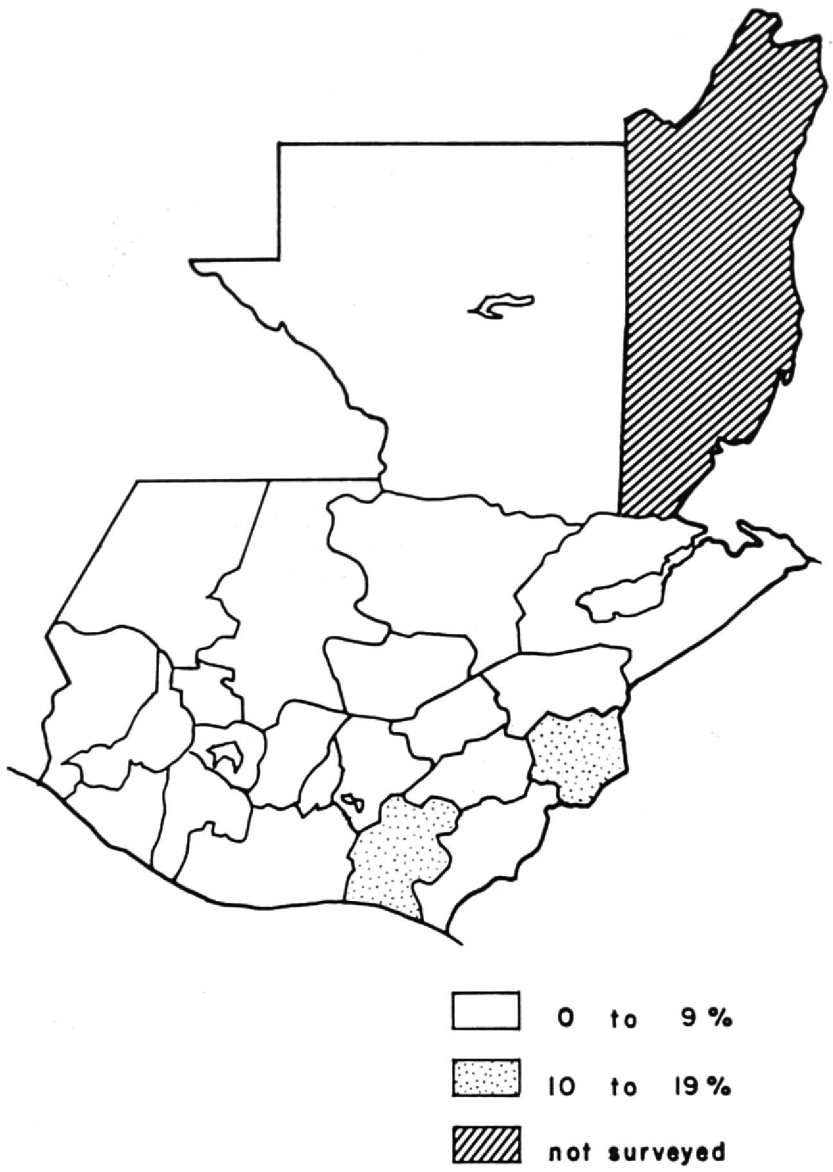

FIG. 4. Prevalence of endemic goiter in Guatemala (1965).

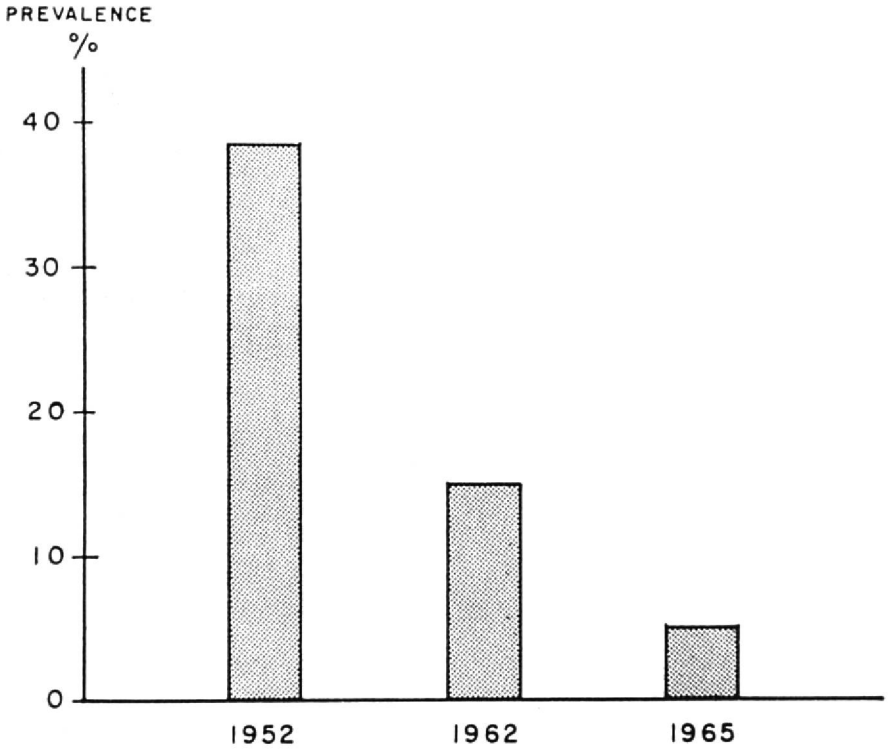

FIG. 5. Endemic goiter in Guatemala.

tioned, such as high-calcium intake and the presence in food of substances which increase iodine requirements. It was also considered that the level of 1 part of iodine in 10,000 parts of salt has been used in the United States successfully and without known undesirable effects.

The main conditions that made this program a success in Guatemala were the great interest of the responsible public health authorities, who decided to follow the recommendations of INCAP, and the fact that these agencies were able to convince the political authorities of the country, and particularly the salt producers who constituted in this case the affected private sector. Properly organized, they decided to support the program, absorbing the cost of iodization without introducing any change in price or in any other noticeable condition of the product. Furthermore, an adequate system of control was established and enforced.

In Colombia (19) after a survey indicating an average prevalence of goiter of 52.6% in school children, iodized salt distribution began on an experimental basis in 1950, in one of the highly endemic areas where the average prevalence was 81% in school children. In 1952, 2 years after the experimental distribution of iodized salt, the prevalence of goiter in the same population had been significantly reduced to 34%. More recently, in 1963, iodization of salt was enforced for all the salt produced by the large mines, which amounts to 74% of all the salt produced in the country. The remaining 26% is salt produced from ocean water and is not being iodized. In 1965, 2 years after this measure was enforced, the population previously surveyed, which consumes the salt iodized from the mines, was studied, and a prevalence of goiter of 0.8% in school children was found (Fig. 6). No information is yet available on the situation in the rest of the country or in other population groups. This very dramatic drop in the prevalence of endemic goiter in school children is recurrent proof that this is the most convenient group on which to assess the magnitude of the problem in any area, as well as to evaluate the results of corrective measures. Most of the goiters observed at that age are still reversible.

In Colombia, salt is being iodized with potassium iodide at a level of 1 part iodine in 20,000, as significant losses of iodine were observed when analyzing the salt at the consumption level. This ratio has been increased to 1

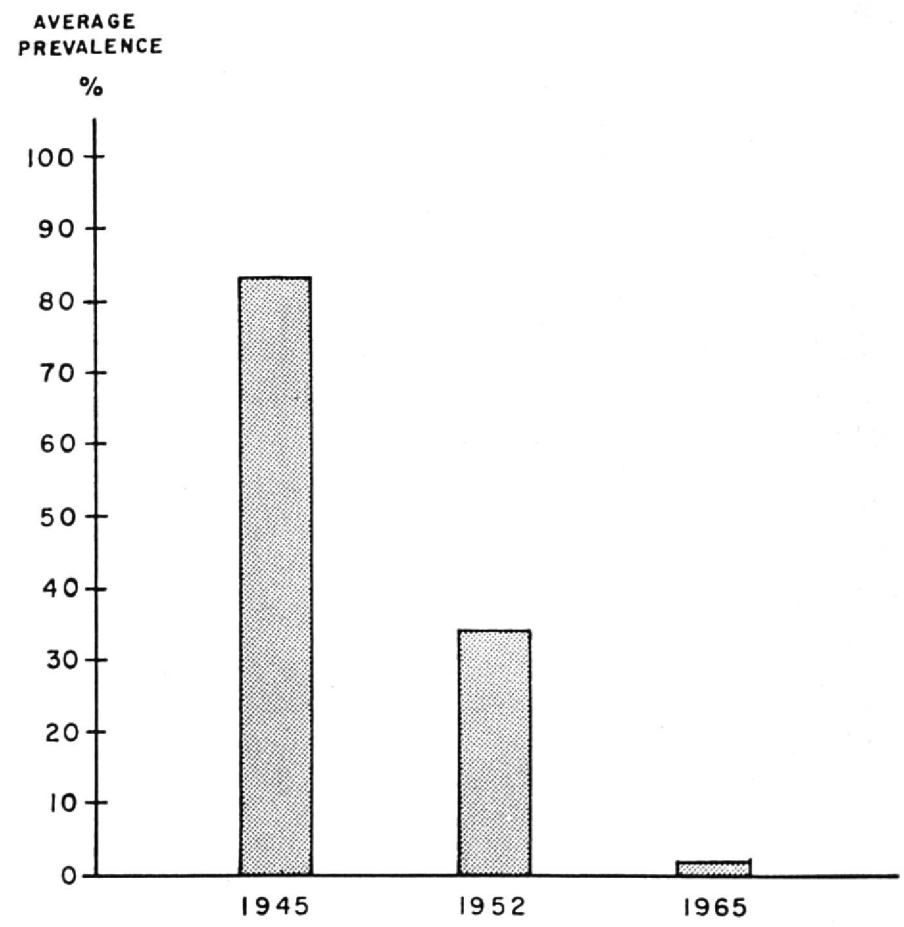

FIG. 6. Endemic goiter in school children, Caldas, Colombia. (From Rueda Williamson et al. (19).)

in 15,000. In our opinion, the use of potassium iodate instead of potassium iodide should be given preference.

In other countries, efforts have been made to iodize the salt on a regional basis, that is, limiting the measures to the areas where goiter is highly endemic. This is the case, for instance, in Argentina, where the salt consumed in the province of Mendoza has been iodized since 1953 (17). This measure has proved successful, both clinically and by determinations of thyroid iodine intake, and iodine urinary excretion. More recently, in 1961, the measure was also implemented in Salta, another Argentinian province where prevalence is high. There are still other areas greatly affected by goiter in that country, where no preventive action is being taken. In any case, it is difficult, if not impossible, for most countries to attempt to localize the iodization of salt in the endemic areas. In most instances, the measure can only be applied effectively on a national basis, which was the experience in Mexico (1). It is also inefficient to iodize only certain types of salt. In Mexico, for instance, only refined table salt is iodized. However, crude salt, left untreated, is much more commonly used, particularly in the rural areas where the problem is greater.

It has also been argued that only salt for human consumption should be iodized. This would not only complicate the control system unduly, but there is also no question that the iodization of salt used in animal feeding will also be beneficial. Furthermore, the recommended level of enrichment would have no adverse effects on the usual industrial processes in which salt is used. We are left with the problem of individual cases that, for medical reasons, should not consume the relatively high amount of iodine contained by iodized salt. These cases, if they really exist, are very few and should be dealt with by allowing the individuals involved to use noniodized salt, which they could obtain under medical prescription.

In many other countries in Latin America the legislation requiring the iodization of salt has been passed but has not been implemented, and, in others, nothing has been done.

Public health authorities, both at the national and international levels, have been very conscious of and interested in the problem. Their interest and actions have moved legislators to pass the corresponding laws; but, as indicated, implementation has been neglected.

The last international effort at the continental level to study and attempt to solve the problems which have prevented the application of salt iodization was a conference held in Salta, Argentina, in June 1965, under the auspices of PAHO, UNICEF, and the Argentinian Government (21). In addition to responsible public health authorities, the official or private persons in charge of implementing the measure at the administrative and economic levels were also invited to this conference. This invitation was the result of the realization that obstacles to application of the measure are primarily presented by economic and administrative limitations. In some countries, for instance, salt production is entirely controlled by one organization, either governmental or private. In others, a reverse situation exists, wherein a large proportion of the total production comes from a large number of very small producers. In both situations there are advantages and disadvantages, of which the latter have been considered responsible for the fact that the iodization is not implemented. It is clear, however, that a more basic problem, of a political or social nature must bear the blame. This problem is not only characteristic of goiter prevention, it affects most public health activities although it is particularly obvious in the case of endemic goiter because this disease is so easy to prevent. The problem is lack of consciousness at all levels of society, from the general population to the policy-making bodies, of the importance of health in the general population, and of the value of preventive measures.

Too much emphasis has been given, particularly in the last decade, to "economic development," with the implication that health and other social problems are only the consequence of low economic conditions. We believe that this is only partially true. Many health problems are extremely important contributing factors in low economic development, and health must be considered as an important component of any rational plan or policy for social and economic advancement. Society, and particularly governments, do not consider expenditures on health worthwhile investments.

Public health workers, recognizing this situation, should not, therefore, stop at complaints about this matter. They should understand it and double their efforts to present their case in a way that is convincing to the responsible authorities and to society in general (within their own way of thinking with careful consideration of the economic, social, and other implications, and, whenever possible, with adequate documentation). When considering the actions which should be recommended in the field of public health, they should not neglect the value of other factors determining governmental functions, as well as the characteristics and structure of the society within which they are working.

The prevention of endemic goiter or, to be more accurate, the failure of its prevention in most of Latin America until now is a very apt example of the insufficient or inadequate integration of public health programs within the overall activities and interests of governments and society.

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