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FACTORS AFFECTING THE OUTCOME OF  
TREATMENT OF PULMONARY TUBERCULOSIS  
IN SUB-OPTIMAL CONDITIONS:

An 18-month Follow-up of 224 Patients

By

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## Goitre Survey, Omay Tribal Trust Lands, Kariba District, Rhodesia

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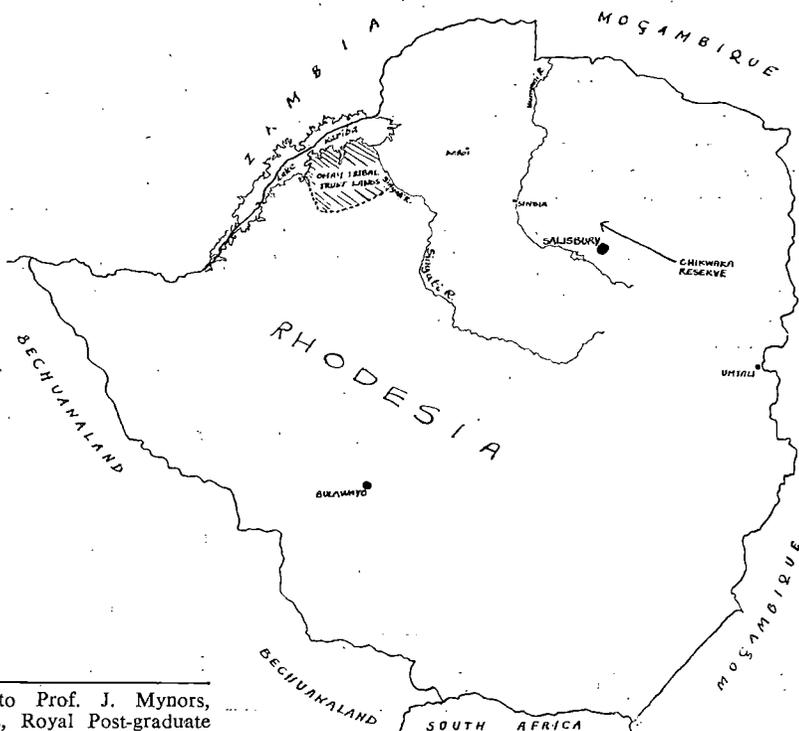
There is very little published information about goitre in Southern Rhodesia (Kelly and Sneddon, 1960; Dent and Strover, 1966), and of that available much is not quantitative and impressions rather than figures have been recorded. This survey was undertaken on behalf of the Department of Surgery, University College of Rhodesia, in conjunction with a leprosy survey of the same

area, to obtain quantitative data on the incidence of goitre in the region.

### AREA AND PEOPLE

The area covered lay in the Omay Tribal Trust Land, the Sengwe Native Purchase Area and part of the Matsudonna Forest area, which are all part of Kariba district in the north of Rhodesia near Lake Kariba. The area is bordered by the Sinyati river in the east and Sengwe river in the west, Lake Kariba in the north and the Zambesi Escarpment in the south, and corresponded to census areas 5/1, 5/2 and 4/2 (Census of Africans, 1962). The surface area of these divisions is about 30,500 square miles, with a total population of 7,000 and a population density of 4.3 persons to the square mile (Census of Africans, 1962) (see map).

Map of Rhodesia  
showing area surveyed



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The country consists of low hills below 3,000 feet, vegetated by savanna woodlands. Soils are weakly developed and shallow, being classified in the Lithosol and Sialatic groups (Thompson, 1965) and overlying sandstone and shale of the Triassic and Permian periods (Bond and Stowe, 1965). The rainfall varies from 16 inches to 24 inches, falling mainly in summer, and the mean temperature is 22.5°C. to 25°C., with the hottest months in summer. The area is classified suitable for extensive beef production (Vincent and Thomas, 1965), but the presence of tsetse fly precludes this and the land produces less than 2s. per acre per year.

The people are members of the Tonga tribe and are ruled by chiefs Molo (area 5/1), Negande (area 5/2) and Nebiri (area 4/1). Each chief has a number of fishing camps on Lake Kariba in addition to farming lands in the area. In general, men and older boys run the fishing camps, whereas the women with their younger children tend the crops of sorghum and maize. However, there is traffic between homeland and camp, some men returning inland at planting time and the boys returning from the camps to go to school. Fish forms a main item of the diet at the camp, but not inland. Drinking water at the camps is obtained from Lake Kariba and that at the inland villages from holes dug in dry river beds.

#### METHODS

Two observers conducted the goitre survey and the W.H.O. technique of survey and system of goitre classification was used (Perez *et al.*, 1960). Thus the people were graded:

*Group 0.*—Persons without goitre. By definition these are taken to be persons whose thyroid glands are less than four to five times enlarged.

*Group 1.*—Persons with palpable goitres. The thyroid is considered to be more than four to five times enlarged, although not visible with the

head in normal position. Most of these will be readily visible with the head thrown back and the neck fully extended.

*Group 2.*—Persons with visible goitres. Persons with goitres which are easily visible with the head in normal position, but which are smaller than those in Group 3.

*Group 3.*—Persons with very large goitres. The goitres of persons in this group can be recognised at a considerable distance.

In addition, the goitres were classified as smooth or nodular by palpation. Observation during swallowing with the head extended was particularly useful in differentiating Groups 0 and 1. Evidence of hypothyroidism, hyperthyroidism and cretinism was sought.

The people were divided into age groups by years 0-5, 6-12, 13-18 and 19 and over; but age had to be assessed as no birth dates were available. These groups correspond roughly to infants and toddlers, non-adolescent school age children, adolescent and adults.

The chiefs were asked to collect their people together at a central site on a particular day. Two of these sites happened to be at schools (Negande and Nebiri), so these school age groups were particularly well represented. In addition, some huts near to the selected site were visited in an effort to survey the less enthusiastic. The fishing camps were visited by launch, and as the villages were localised it was possible to survey most of the inhabitants of these camps.

#### SAMPLE SIZE

Estimates of the total population under the domain of each chief were made from the 1961-1962 census (Census of Africans, 1962) and from the number of taxpayers under each chief (Mavger, 1966). This number was multiplied by a factor of 4.4 to give the total population under each chief (Mayger, 1966). Thus the percentage of the total sampled are presented in Table I.

Table I  
ESTIMATES OF SAMPLE SIZE

Chief	No. Surveyed	Estimate of Total from Census	Per cent.	Estimate D.C.	Per cent.
Molo .....	48	1,552	3.1	2,103	2.3
Nebiri .....	324	1,714	18.9	1,839	17.6
Negande .....	178	1,930	9.2	2,301	7.7
TOTAL .....	550	5,196	10.6	6,243	8.8

These sample sizes are satisfactory by the standard suggested by Perez *et al.* (1960), who calculated that for a rural area 2 to 3 per cent. of the group should be examined. The representation in the sample of the various age groups of the population is more difficult to estimate, but it should be noted that pupils from the schools, which only contain boys, were included in the Negande and Nebiri samples and that no fishing camp belonging to Chief Negande was surveyed.

## RESULTS

In all, 550 men, women and children were surveyed and Table II shows them classified according to chief and site of residence.

Table II

CLASSIFICATION ACCORDING TO CHIEF AND  
SITE OF RESIDENCE

	Nebiri	Negande	Molo	Total
Inland - -	238	178	21	437
Fishing camp	86	—	27	113
TOTAL -	324	178	48	550

Table III shows them classified according to age, sex, goitre group and type of goitre.

Calculated from this table, the overall incidence of goitres was 45 per cent., the percentage of goitre in groups > 1 was 6.6 and that of nodular goitre was 2.0 per cent. No case of hypothyroid-

ism, hyperthyroidism or cretinism was seen. Table IV shows the percentage of goitre according to age and sex, the percentage of the total population inspected in each of these age groups and the weighted percentage (Perez *et al.*, 1960).

The incidence in adolescent girls was 77 per cent. In age groups 0-5 years it was 21.2 per cent. for males and 19.1 per cent. for females.

From Table III a contingency table was constructed, in which three criteria of classification—age, sex and presence or absence of goitre—were considered. A likelihood ratio test was run on a 4 x 2 x 2 table in which 4 was the number of age groups, and the test made for independence of incidence of goitre with respect to the other two criteria of classification. The result was significant at the 1 per cent. level; incidence, as the data suggests, depends on either age or sex or both. This significant result seems to be mainly due to the very high proportion of goitres in the female age groups 5-12 (67.9 per cent.) and 12-18 (77 per cent.), but it is doubtful whether one could make any further analysis of this data owing to the sharp variation in sex ratio with age.

## DISCUSSION

A prevalence of endemic goitre greater than 10 per cent. is almost universally considered to constitute a public health problem. Data regarding the incidence in Rhodesia is scanty but the impression is that the incidence is high and has been reported quite frequently by medical officers (Dent and Strover, 1966). The same authors in surveying a limited population of schoolchildren

Table III

CLASSIFICATION ACCORDING TO AGE, SEX, GOITRE GROUP AND TYPE

Age Group in Years	Group 0		Group 1		Group 2		Group 3		Sub-total	Total
	Smooth	N	Smooth	N	Smooth	N	Smooth	N		
0-5 M.	41	0	10	0	1	0	0	0	52	119
	F.	54	0	12	0	1	0	0	67	
6-12 M.	47	0	48	0	9	0	0	0	104	160
	F.	18	0	37	0	1	0	0	56	
12-16 M.	27	0	16	1	3	0	0	0	47	73
	F.	6	0	17	0	3	0	0	26	
19+ M.	61	0	27	2	4	0	0	0	94	198
	F.	48	0	37	5	11	2	0	104	
TOTAL	302	0	204	8	33	2	0	1	550	

Table IV  
PERCENTAGE GOITRE IN AGE GROUPS, SEX AND THE WEIGHTED PERCENTAGE

Age group and sex	% for group and sex	% for group	% of total pop. in group (1)	Weighted % (2)
0-5 M	21.2	20.6	23.0	4.7
F	19.1			
5-12 M	54.8	59.4	20.2	12.0
F	67.9			
12-18 M	42.5	54.8	13.0	7.1
F	77.0			
19+ M	35.1	44.9	43.8	19.7
F	53.9			
Overall		45		43.5

(1) Derived from 1962 Census of Africans.

(2) Weighted % = % in each group with goitre  $\times$  % of total population in that group  $\div$  100 (Perez *et al.*, 1910).

in Chikwaka Reserve North-East of Salisbury found an incidence of 63 per cent. amongst the boys and 80 per cent. amongst girls. A recent survey in the Chimanda Tribal Trust Land North-East of Mt. Darwin (Gelfand and Whittle to be published) reveals an incidence of 35 per cent. of goitre over all age groups. Iodine deficiency among domestic animals in Rhodesia has been recognised by Affleck (1958) in the Karoi area, on the farms along the south bank of the river Hunyani near Sinoia and at Raffingora.

The highest incidence of endemic goitre in most goitrous areas occurs in girls 12-18 years of age (Caughey and Follis, 1965; Clements, 1960; Demoix, 1948) and the finding was confirmed in this survey.

Nodular goitre rarely occurred before adult life (one case), a similar finding to some other authors (Clements, 1960; Denmaeyer and Vanderbought, 1953), but different to that of Dent and Strover (1966) who remarked on the high incidence of nodular goitre in the Chikwaka Reserve. The overall incidence of nodular goitre was two per cent. (Table III) and that of larger goitres ( $>$  group 1) was 6.6 per cent. and that of group 3 very low (one in 550). This particular group is the one likely to require surgical treatment for cosmetic or symptomatic reasons, so the problem here is not large. The same applies to the likely incidence of carcinoma of the thyroid estimated as one per cent. during the lifetime of patients with nodular goitre (Sokul, 1954) or lower (Miller, 1955). No obvious cases of myxoedema, hyperthyroidism or cretinism were seen in this survey.

It is appreciated that the value of this paper would be enhanced if the iodine content of the water supplies and iodine excretion patterns could have been estimated although from previous surveys, such as that of Caughey and Follis (1965), it seems likely that iodine deficiency would prove to be the underlying cause of endemic goitres in these people.

The Government (1954) considered the iodization of all crude salt in Rhodesia, but were deterred for technical and administrative reasons. Direct questioning revealed that people in the Omay region bought their salt from the local stores and this was crystallised salt. This salt is more difficult to iodize than the refined variety, but simple methods of iodization of crystallised salt have now been developed. (Holman and McCartney, 1960).

#### SUMMARY

The incidence of goitre in 550 men, women and children of the Kariba District was found to be 45 per cent.; 6.6 per cent. of these had goitres which were easily visible and two per cent. had nodular goitres.

The adolescent female group had the highest incidence of goitre (77 per cent.) followed by females in the age group 6-12 (67.9 per cent.).

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