

The Canadian Medical Association Journal

Vol. 59

DECEMBER, 1948

No. 6

THE NUTRITION AND HEALTH OF THE JAMES BAY INDIAN*

R. P. Vivian, M.D.,

*Professor and Chairman of the Department of
Health and Social Medicine,
McGill University, Montreal*

Charles McMillan, M.D.,

*Assistant Professor of the Department of
Health and Social Medicine,
McGill University, Montreal*

P. E. Moore, M.D.,

*Director, Indian Health Services,
Department of National Health and
Welfare, Ottawa*

E. Chant Robertson, M.D.,

Hospital for Sick Children, Toronto

W. H. Sebrell, M.D.,

United States Public Health Service

F. F. Tisdall, M.D.,

Hospital for Sick Children, Toronto

W. G. McIntosh, D.D.S.,

Faculty of Dentistry, University of Toronto

IN a previous study¹ of the Canadian Bush Indian evidences of marked malnutrition were found and it was concluded that:

"Many characteristics, such as shiftlessness, indolence, improvidence and inertia, so long regarded as inherent or hereditary traits in the Indian race, may at the root be really the manifestation of malnutrition. Furthermore, it is probable that the Indian's great susceptibility to many diseases, paramount amongst which is tuberculosis, may be attributable amongst other causes to the high degree of malnutrition arising from lack of proper foods."

This is of concern not only to the Indian but to the white population, as any attempt to

* This study was made possible through the financial support (recommended by the Special Joint Committee of the Senate and the House of Commons on Indian Affairs) of the Departments of National Health and Welfare and Mines and Resources, and by a grant made by the Canadian Life Insurance Officers Association.

eradicate tuberculosis in Canada must include the institution of preventive measures for everyone. In addition, from the economic standpoint a group of people in poor health tends to be a liability rather than an asset to the nation.

The present investigation of the Canadian Bush Indian was planned to include not only a medical examination, particularly from the standpoint of their health and development, nutritional state, and prevalence of tubercular infection, but also a dental examination and a study of their housing and sanitation, or lack of it. In addition, possible methods for augmenting or improving the food supplies of the Bush Indians were to be thoroughly investigated. This would include the study of practical means for increasing their supplies of wild foods, of the chances of really interesting the Indians in raising gardens, and of the possibility of improving the nutritional value of the food purchased at the posts. A study of how to improve the economic condition of the Indians through fur conservation and possibly through the development of village industries and handicrafts was also included in the plan of the study. However, it was felt that if recommendations were to be made as a result of this investigation, it was also essential to have sociological and anthropological information. For instance, it would be useless to recommend a limited agricultural program, even if suitable soil and climatic conditions were present, if the Indian's only ambition was to be a hunter and he could not be led to take any lasting interest in gardening. In other words, it would seem essential to obtain more information on how the Indian thinks and on how he could best be helped to improve his living conditions.

. The study was planned by the "National Committee on Community Health Surveys" under the chairmanship of Dr. Percy Vivian. The following personnel are taking part in the overall study: 6 physicians, a dentist, an x-ray technician, a photographer and 3 anthropologists. The present report is limited to the medical and dental aspects of the study which were carried out in August 1947.

AREA SELECTED FOR STUDY

The James Bay region was chosen as the area for study on account of its accessibility (Fig. 1). The Indians of the James Bay area are typical of the Canadian Bush Indians. With the exception of the Moose Factory Band, they are as isolated from outside influences as the more remote bands. The Indians congregate in various bands and spend 7 to 9 months each year looking after their traplines in the interior. Then in the spring or early summer they come down to the trading posts of the Hudson's Bay Company situated on James Bay to trade their furs for food, clothing and other

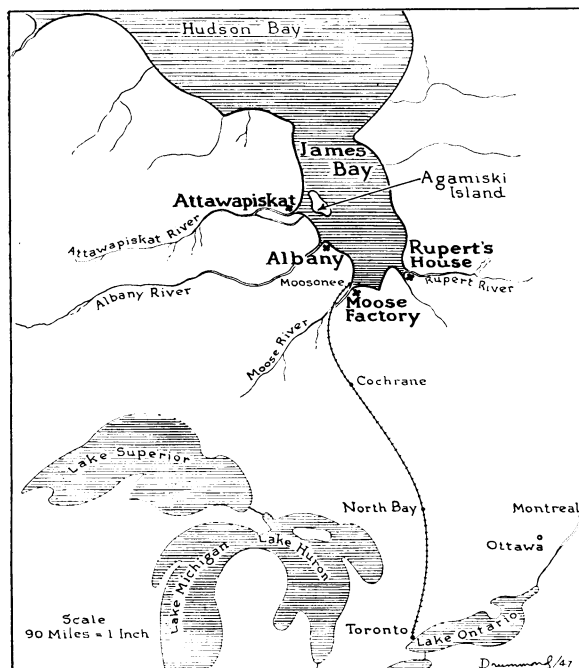


Fig. 1.—Great Lakes and James Bay regions showing Toronto, Moosonee, Albany, Attawapiskat and Rupert's House.

articles of interest to them. The supplies for the area, which were formerly brought in by boat through Hudson Straits, are now distributed by small boats from Moosonee, which is the terminus of the Ontario Northland Railway, 500 miles directly north of Toronto. The number of James Bay Indians is approximately 4,000.

James Bay is the southern extension of Hudson Bay, which is the second largest sea on earth, being 1,300 miles long and 600 miles wide. It is exceeded in size only by the Mediterranean Sea. Hudson Bay was discovered in 1610 by Henry Hudson, who set out from England in the barque *Discovery* with a crew of 20 men. After proceeding through the Hudson Straits, he entered Hudson Bay believing he had discovered the Northwest Passage to the Pacific Ocean. It was late autumn when they reached the southern extremity, now

known as James Bay, and realized they were not on the Pacific but on an inland sea. They wintered in James Bay and in the spring started to return to England. Unfortunately for Hudson, his crew mutinied and cast him adrift in a small boat with 7 loyal members of his crew. The *Discovery* with the remaining members of the crew returned to England.

In 1668 two French explorers, Groseilliers and Radisson, interested the English in the possibility of fur trading in Hudson Bay. Two boats set out from England, one ship became disabled but the other, called the *Nonsuch* proceeded through Hudson Straits and south on Hudson Bay. The party wintered at a place they named Charles Fort, which is now Rupert's House, at the mouth of Rupert's River. Two years later, on May 2, 1670, England's Company of Adventurers, now known as Hudson's Bay Company, were given a charter that made them owners of a large portion of the New World.

Two bands were chosen for intensive study, the Attawapiskat Band at the western and the Rupert's House Band at the southeastern sections of James Bay. In July, 1947, Professor Gordon Brown, Associate Professor of Anthropology, University of Toronto, who is in charge of the sociological and anthropological aspects of the study, along with two anthropologists, Dr. J. J. Honigmann and Mr. A. J. Kerr, inspected the Moose Factory, Albany, Attawapiskat, Fort George and Rupert's House bands. The Attawapiskat Band and the Rupert's House Band were chosen for study as the economic status of the former band was very poor while that of the latter was good. This better financial state of the Rupert's House Indian is due to the successful beaver conservation scheme initiated by the Hudson's Bay Company. Arrangements were made for Dr. Honigmann to live with the Attawapiskat Band and Mr. Kerr with the Rupert's House Band for a period of approximately one year.

The party was transported by rail to Moosonee, at the south end of James Bay, and then by water (Fig. 2) and air (Fig. 3) to the Attawapiskat Band and to the Rupert's House Band. Due to adverse weather conditions, it was necessary to turn into the Albany River on the west coast, and the Moose River on the south coast, which afforded an opportunity to examine members of the Albany and Moose Factory Bands in addition to the Attawapiskat and Rupert's House Bands as originally planned.

HOUSING AND SANITATION

The James Bay Indians live under most primitive and deplorable conditions. Their homes are either patched-up tents (Fig. 4) or one-roomed log shacks. Filth, refuse and excreta surround them. There is usually a

covered box where some of their food supplies are stored. Often there is no furniture whatsoever, not even a table or chair. The habitations are usually without floors, the ground being covered by spruce boughs on which they sleep. The tent or hut is frequently occupied by more than one family.

Cooking utensils are frequently limited to a frying pan, an iron pot and a lard pail used for a teapot (Fig. 5). Drinking water is dipped from the nearest stream. These Indians seldom go in swimming. Although head lice were found frequently, their skin and clothing appeared reasonably clean.

Fortunately the nomadic life of following the traplines cause frequent shifts of camp site, except during that portion of the year spent at the posts. Here sanitary conditions are at their worst, and this is where most outbreaks of disease occur.

FOOD SUPPLY

The food supply of the Attawapiskat and the Rupert's House Indians was investigated. These two bands of Indians obtained food from two principal sources, namely, (1) from the stores and missions, and (2) from hunting and fishing.

Foods obtained from stores and missions.—The Attawapiskat band was able to buy food from the Hudson's Bay store at their home site and a smaller outpost store at Lake River, from a store run by an independent trader at Attawapiskat, and also from the Roman Catholic mission at the same locality. The traders and the priest in charge of the mission very kindly gave us a complete list of all the food supplied to this band of Indians. In addition, an estimate

was made of the relatively small number of potatoes grown by this band.

The Rupert's House band obtained food from the Hudson's Bay store, from Mrs. Watt, the widow of a former Hudson's Bay Post manager there, who runs a small bakery, from the Roman Catholic mission, and from a garden planted by the Indians. The amounts of food

TABLE I.
FOODS PURCHASED AT ATTAWAPISKAT
Nov. 1, 1946 - Oct. 31, 1947
AMOUNTS PER PERSON PER DAY

	Weight oz.	Calories
Flour.....	8.24	820
Sugar and jams.....	3.32	370
Fats and butter.....	1.30	328
Milk and cheese.....	8.54*	166
Oatmeal and cereal products.....	1.01	114
Vegetables.....	1.72	52
Citrus fruits and tomatoes.....	0.45	3
Other fruits.....	0.45	33
Canned meats.....	0.41	29
Other foods.....	0.01	—
Total.....		1 915

* About 0.04% cheese.

TABLE II.
FOODS PURCHASED AT RUPERT'S HOUSE
MAY 1, 1946 - APRIL 30, 1947
AMOUNTS PER PERSON PER DAY

	Weight oz.	Calories
Flour.....	8.93	884
Fats and butter.....	2.62	638
Sugar and jams.....	2.96	318
Oatmeal and cereal products.....	1.86	219
Milk and cheese.....	6.22*	138
Canned meat.....	1.10	76
Citrus fruits and tomatoes.....	0.78	7
Other fruits.....	0.91	61
Vegetables.....	1.45	45
Other foods.....	0.12	1
Total.....		2,387

* About 0.007% cheese.

TABLE III.
TOTAL NUTRIENTS FROM ALL SOURCES. AMOUNTS PER PERSON PER DAY.

Nutrient	Attawapiskat band	Rupert's House band	Weighted recommended allowance (Food and Nutrition Board, N.R.C., 1945)
Calories.....	2,546	3,103	2,790*
Protein, gm.....	114	110	64
Calcium, mgm.....	425	363	970
Iron, mgm.....	17	17	11
Vitamin A, I.U.....	7,184	2,280	4,300
Thiamine, mgm.....	1.3	1.5	1.3
Riboflavin, mgm.....	1.5	1.7	1.85
Niacin, mgm.....	16.0	17.0	13.0
Ascorbic acid, mgm.....	12.0	14.0	68.0

*Men allowed 4,500 calories daily for 9 months and 3,000 daily for 3 months; women 3,000 daily for 9 months and 2,500 daily for 3 months.

The Recommended Allowances vary with the sex and age of the individual. These amounts would provide the Recommended Allowances for the men, women and children of the two bands.

obtained from all these sources were listed for us by those in charge of these organizations.

Foods obtained from hunting and fishing.—The store managers gave us a list of all the furs purchased. An estimate of the amount of other game obtained by the Indians was made by the anthropologists. We also obtained information as to the approximate weight of the edible portion of each animal. Specimens of the game commonly eaten were obtained and assays made of many of the nutrients.² For the fish, item 95-a in "Tables of Food Composition in terms of Eleven Nutrients"³ was used.

It is believed that the records of the foods obtained from the stores and mission, which included that given out as Family Allowances and Relief, were quite accurate. No other sources of store food were available. It should be noted that the amounts of food obtained from hunting and fishing were based on estimates, which however were made with great care. In making these estimates the weights of the edible portion of many of the animals, birds and fish were obtained. However, the food was obviously not evenly distributed among all the members of the bands or throughout the different seasons of the year. Allowance was made for the rolled oats and lard given to the dogs. A very small amount of berries was obtained which was not included in the calculations. Similarly, the fish liver oil and vitaminized biscuits supplied by the Indian Health Services and the Indian Affairs Branch and given to the children when possible, that is, when they were attending school in the summer months, were not included.

The amounts of the foods purchased and the total nutrients available from all sources are set out in Tables I, II and III.

NUMBER EXAMINED AND PROCEDURES FOLLOWED

In Table IV is set out the number examined from each band. It is worthy of note that at Attawapiskat, out of a total of 467 with headquarters at the post, no less than 278, or 60%, were examined, and, similarly, at Rupert's House, out of a total of 375, 214, or 57% of the band, were examined. The total number of Indians examined was 728.

The procedure followed was to obtain, usually with the aid of an interpreter, the name and age of each subject. He, or she, was then given a number for identification. The height and weight were taken, with the shoes and out-

side clothes off. In addition, the transverse width of the chest, the width of the iliac crests, and the circumference of the right calf were taken. The next step was to have a full chest plate x-ray taken by means of portable x-ray

TABLE IV.
NUMBER EXAMINED AT EACH BAND

<i>Band</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
Attawapiskat.....	134	144	278
Rupert's House.....	119	95	214
Albany.....	81	72	153
Moose Factory.....	30	53	83
Total number examined.....	364	364	728

equipment. This was done by Mr. Gordon Stockley, x-ray technician, who, together with the equipment, was kindly loaned by the Tuberculosis Prevention Division of the Department of Health of the Province of Ontario. For this purpose the subjects were stripped to the waist, the women putting on paper capes. In all, 492 x-ray plates were made. No x-rays were taken at Albany or Moose Factory. After completion of the x-ray, the patient was then examined medically. An appraisal was made of his general condition and alertness, both mental and physical, and he was examined for the presence of old or active tuberculosis of the cervical glands, enlarged thyroid, bony deformities, possibly due to old rickets, and changes in the hair, skin, eyes, lips and tongue which may result from malnutrition. The heart was examined and, at Attawapiskat, the blood pressure and pulse rate were taken. Clinical examination of the lungs was not carried out. The presence of vaccination scars was noted. Following the medical examination, the majority had a dental examination, which included a survey of both the hard and soft tissues. In a few instances, dental x-rays and bacterial smears from the gingival tissues were taken.

Due to the fact that records of the food consumed by the different bands for a period immediately preceding the investigation could only be obtained from the Attawapiskat and Rupert's House bands, the observations reported here are largely limited to these two bands.

GENERAL CLINICAL FINDINGS

Age and sex.—The age and sex of the subjects examined at the four bands are set out in Table V.

TABLE V.
AGE AND SEX OF INDIANS EXAMINED.

Band	Sex	Years of age										Total
		0 to 4	5 to 9	10 to 14	15 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 and over	
Attawapiskat:	Male	13	14	17	12	24	16	17	8	8	5	134
	Female	17	20	13	10	27	19	15	7	10	6	144
Rupert's House:	Male	10	17	12	14	26	12	10	9	5	4	119
	Female	9	10	14	10	16	10	11	7	5	3	95
Albany:	Male	10	15	7	7	16	11	3	4	6	2	81
	Female	7	7	9	12	13	9	6	5	1	3	72
Moose Factory:	Male	1	3	4	3	3	6	3	2	3	2	30
	Female	2	12	16	6	8	1	4	3	1	0	53

General appearance.—It was the impression of all observers that the Indians examined were short and not well muscled. This was borne out by the measurements taken, the details of which are shown in the later section on physical measurements. It was also the impression of all observers that they moved slowly and were apathetic. The children were much more docile than white children. On comparing the Attawapiskat and the Rupert's House bands, the latter band was the more active physically and displayed more initiative.

Vaccination scars.—Vaccination scars were found in 77% of all Indians examined, indicating the effectiveness of the efforts of the Indian Health Services to have every Indian vaccinated against smallpox. In recent years, diphtheria toxoid and pertussis vaccine have been given simultaneously with the vaccination and the administration of the toxoid and pertussis vaccine repeated.

Enlarged thyroid.—Marked enlargement of the thyroid was seen in only one subject, a woman of 70 years of age, at Rupert's House. A barely perceptible enlargement of the thyroid was found in 5.3% of all the subjects examined, the majority in young women. This indicates the need for the continued use of iodized salt. For the past three years all salt sold through the Hudson's Bay Posts has been iodized salt.

Examination of heart, blood pressure and pulse rates.—In only a negligible number of Indians was a heart murmur heard. An irregular pulse was also encountered very infrequently. The blood pressure was recorded on 81 males and 76 females of the Attawapiskat band 17 years of age and over. In the 36 males over 40 years of age, 7 had systolic blood pressure over 150, the majority being just over this mark. There were two exceptions, one aged 65 with a systolic blood pressure of 214, and the

other aged 73, with a pressure of 170. In the females 49 years of age and under, no one had systolic blood pressure over 150. Over 49 years of age, out of 21 examined 8 had systolic blood pressure over 150, the highest being 218 in a woman aged 58 years. The blood pressure findings are not markedly different from what one would expect to find in comparable age groups of white people.

The pulse rates of the 85 males and 88 females 17 years of age and over were taken. The rates are similar to those of a white population of comparable ages.

TUBERCULOSIS

The prevalence of tuberculosis of the cervical glands, as indicated by active discharging lesions (Fig. 6) or old scars, is recorded in Table VI.

TABLE VI.
PREVALENCE OF TUBERCULOSIS OF CERVICAL GLANDS AS INDICATED BY ACTIVE DISCHARGING LESIONS OR LARGE OLD SCARS

Band	Number examined	Healed scars		Active discharging lesions	
		No.	%	No.	%
Attawapiskat.....	278	9	3.2	3	1.1
Rupert's House.....	214	4	1.9	2	0.9
Albany.....	153	16	10.4	3	1.9
Moose Factory.....	83	4	4.8	0	0

The tuberculosis survey, which was limited to the Attawapiskat and Rupert's House bands, includes 492 men, women and children who were x-rayed for the presence of pulmonary tuberculosis. Examination of the x-ray plates disclosed suspect tubercular lesions in 18 patients, inactive lesions in 2 patients, and active pulmonary tuberculosis in 14 patients. Eighteen Indians had involvement of the cervical glands. In addition to these 492 patients there were 2 active cases of tuberculosis of the

spine and 3 active cases of pulmonary tuberculosis at Attawapiskat who were too ill to present themselves for examination. Also, the Indian Health Services' records showed that a further 10 patients from these bands with active pulmonary tuberculosis were in sanatoria. Thus for the purpose of the tuberculosis survey a total of 507 persons from these two bands were considered. A summary of the findings is set out in Tables VII and VIII.

TABLE VII.
TUBERCULOSIS MORBIDITY

<i>Number considered</i>	<i>Attawapiskat band 291</i>	<i>Rupert's House band 216</i>
Active pulmonary tuberculosis in bed	3	0
Active pulmonary tuberculosis from x-ray	9	5
Active pulmonary tuberculosis in sanatoria	8	2
Total active pulmonary tuberculosis	20	7
Inactive pulmonary tuberculosis from x-ray	1	1
Suspect pulmonary tuberculosis from x-ray	8	10
Extra-pulmonary tuberculosis—active	5	2
Extra-pulmonary tuberculosis—healed	9	4

TABLE VIII.
TUBERCULOSIS MORBIDITY

<i>Band</i>	<i>Incidence of active tuberculosis rates per 100 population</i>		
	<i>Pulmonary</i>	<i>Extra- pulmonary</i>	<i>Total</i>
Attawapiskat	6.9	1.7	8.6
Rupert's House	3.2	0.9	4.2
Averages	5.3	1.4	6.7

6.9% of the persons considered at Attawapiskat (including 8 cases in sanatoria) have active pulmonary tuberculosis. In a reasonably comparable white population in Ontario, as shown by x-ray survey, the incidence is 0.15%.⁴ The ratio is therefore 46:1. Even if the 8 cases who were not in the community when the survey was made are excluded, the ratio is still impressive, 26:1.

A significant finding in the survey is that the incidence of both pulmonary and extra-pulmonary tuberculosis at Attawapiskat is twice that at Rupert's House.

PHYSICAL MEASUREMENTS

The transverse width of the chest at rest was measured at the level of the nipples, using straight arm calipers without pressure. The distance between the widest flares of the iliac crests was measured with the same calipers but firm pressure was applied. The maximum circumference of the calf was measured with a flexible metal tape measure.

Children from 2 to 5 years of age.—The heights, weights and widths of these children were similar to those of American white children reported by other investigators^{5, 6, 7} and can be considered satisfactory.

Children from 6 to 9 years of age.—The weights for heights of these children were similar to those of the Toronto school children surveyed in 1939.⁸ When the width of the children was taken into consideration also (by the use of Pryor's tables,⁵ which are compiled from measurements of white California children), their weights were still satisfactory with the exception of the Attawapiskat girls, 40% of whom were 6 to 14 pounds lighter than the expected weights.

Children from 10 to 19 years of age.—The weights of many of the children of these ages were not sufficient for their heights when compared with white children. This was most evident in those over 15 years of age. The records of the girls were poorer than of the boys. Two-thirds of the Attawapiskat girls, half of the Rupert's House girls, and one-third of the boys in both bands were 10 to 30 pounds underweight for their heights and widths.⁵ When the heights and weights were plotted on Wetzel grids,⁹ many low weights were again evident.

Comparison with other Indian tribes.—Very few measurements of Indian children have been reported.^{10, 11, 12} The Cree children, whom we measured, were taller than the Pueblo and Maya children of the southern United States, but were similar in stature to Dakota Indian children, except for the Attawapiskat older boys who were taller. When the weights for heights of these Cree children were compared with those of the Dakota children, it was found that 50% of the boys between 10 to 15 years at Rupert's House and 60 to 66% of the boys and girls of the same age at Attawapiskat had lower weights. It is unfortunate that tables

based on the measurements of large groups of Indian children are not available.

It is well known that the food needs of adolescent children are high. The poor weight records of these Indian adolescents suggests that these needs were not being met. After the age of 12 or 13, the boys go off on hunting trips with their fathers and are thus able to supplement their meals with game. Their sisters are unable to do so as they remain in camp. This may be a partial explanation for the better growth in the boys. It is interesting to note that 4 of 5 cases of active tuberculosis found in this age group at Attawapiskat were girls.

The common type of body build in these Indian children.—In order to obtain some idea of the general body build, the height, weight, hip width and girth of the calf measurements were checked with the percentile graphs recently published by Stuart and Meredith.¹³ The most striking finding was the extremely small calf circumference in these children. Their general body build was short and broad.

Adults.—When compared with measurements of American white adults⁵ all the adults at Rupert's House and all the women at Attawapiskat were short in stature. The men at Attawapiskat were approximately normal in height. About half of all the younger women (from 20 to 39 years of age) were 10 pounds or more underweight for their heights and builds. This condition was somewhat more prevalent in the Attawapiskat band than in the Rupert's House band. Nearly 40% of the young men of this age group at Attawapiskat were similarly underweight. In the older age groups the percentages showing such a degree of underweight decreased. A considerable number of other women were grossly overweight, especially at Rupert's House. The greater prevalence of fairly severe degrees of underweight at Attawapiskat suggests that the total intake of food in that band was insufficient. Also the underweight is most prevalent during the main child-bearing years when the nutritional needs of women are at their height.

CLINICAL SIGNS WHICH MAY BE ASSOCIATED WITH MALNUTRITION

During the medical and dental examinations particular attention was paid to the presence of abnormal conditions involving the skin, lips,

eyes, tongue and gums, which are frequently associated with malnutrition.

Skin—pigmentation.—A brownish pigmentation of the elbows, extending down the extensor surface of the arm to about the middle of the forearm, was observed in a number of the Indians examined, particularly at Attawapiskat and Albany. Slight scaling of the skin over the elbows was also present in many instances. Similar pigmentation and scaling were noted on the skin of the knees. These changes, observed in approximately 10% of the adult females but rarely seen in males, are similar to mild skin changes sometimes seen in pellagrins. However, no other evidences of pellagra were present. It was concluded that the immediate factor in producing these changes was the pressure on the knees from kneeling in canoes and resting the arms on the side of the canoe when pulling in fish nets.

Skin—folliculosis, hyperkeratosis and xerosis.—Folliculosis can be felt more readily than it can be seen. It consists of papules due to epithelial metaplasia of the hair follicles associated with changes of the sebaceous glands. In the early stages, it resembles "goose flesh". However, on briskly rubbing the skin "goose flesh" disappears, while folliculosis remains. Lesions usually first appear on the lateral surface of the arm and the extensor surface of the thigh. As the condition develops, the papules which at first were simply rounded become rough and horny due to keratotic plugs projecting from hypertrophied hair follicles. This stage is referred to as hyperkeratosis. Xerosis is used to designate a dry, crinkled skin. Folliculosis, hyperkeratosis and xerosis in certain instances will respond to the administration of vitamin A.¹⁴

Of the 492 Indians examined at Attawapiskat and Rupert's House, 57 showed evidence of folliculosis (Fig. 7). The condition was seen more frequently at Attawapiskat (14%) than at Rupert's House (8%), and occurred two and a half times as frequently in the female as in the male. Although the condition was seen in all age groups, it was found more frequently during the adolescent period (10 to 19 years). Hyperkeratosis was seen in only 2 individuals, both young adult females, members of the Attawapiskat Band. Xerosis was observed in only 1 male, an adult over 40 years of age, at Rupert's House. However, this condition was encountered

in 20 females, the majority over 40 years of age (Fig. 8). Its prevalence was the same in both bands. Similar skin changes were noted at Albany and Moose Factory. All three conditions occurred with greater frequency in females than in males. The authors were impressed with the excellent condition of the skin of the majority of the subjects examined. When lesions were present, they were slight in degree. It is the custom of the Indians to wear heavy clothing at all seasons. This keeps their bodies well covered, with the exception of the face and hands, and consequently there is very little irritation due to exposure to weather.

Skin — seborrhœa. — Seborrhœic changes can occur at the nasolabial folds, the external canthi of the eyes and behind the ears as a result of a lack of riboflavin.¹⁵ The condition is characterized by greasy, yellowish, flaky scales on a mildly erythematous base. No seborrhœic changes were encountered at Attawapiskat. In contrast, at Rupert's House these changes were seen in 7 subjects, 3 males and 4 females.

Lips.—Cheilosis is characterized by swelling, redness, scabbing and fissuring of the mucous membranes of the lips. It has been reported in individuals suffering from a lack of riboflavin.¹⁵ There are many etiological factors which influence swelling, redness, scabbing and fissuring, such as exposure to weather, irritation from biting the lips and mouth breathing, as well as a lack of riboflavin. In the absence of other evidences of riboflavin deficiency, the authors believe that little reliance can be placed on lip lesions alone as an indication of riboflavin deficiency.

Redness, swelling and slight fissures were seen in the majority of Indians examined (Fig. 9). These signs were found with approximately equal frequency in both sexes and at all ages, with the exception of individuals over 40, who showed less swelling, redness and scabbing than was encountered in the younger age group. Also, these signs were seen more frequently at Rupert's House than at Attawapiskat.

Angular stomatitis is characterized by the development of fissures at the angles of the mouth, with an inflammatory reaction. It may be associated with a lack of riboflavin but, like cheilosis, there are other etiological factors. When this condition heals, scars remain. This sign was seen with approximately equal fre-

quency in both sexes but occurred with much greater frequency at Rupert's House than at Attawapiskat (Fig. 10). Less than 0.5% of those examined at Attawapiskat had active lesions and 3.5% showed scars, as compared to 10% with active lesions and 30% with scars at Rupert's House.

Tongue.—It is well known that a lack of niacin will produce the fiery red tongue of pellagra, with atrophy of the papillæ and the development of fissures. However, other factors may be involved in the production of these changes. The tongue changes were all relatively mild. In fact the authors were impressed with the excellent condition of the tongues. In only a few instances were the pathological changes of a marked degree. These signs were seen with approximately the same frequency in both sexes and in both bands.

Eyes.—The most striking abnormalities of the eyes which were encountered were pterygia and thickening of the conjunctiva. The relation of these changes to diet is a moot question. The thickening of the conjunctiva was clearly evident in certain children even as young as 5 years of age. It was seen with increasing frequency in each succeeding decade of life. Out of 150 Indians 20 to 39 years of age, 126 showed obvious thickening of the conjunctiva, the thickening being of a severe degree in over 50%. After 40 years of age, every one of 130 Indians examined showed obvious thickening of the conjunctiva, the thickening being of a severe degree in no less than 90%. Under 40 years of age, the condition was encountered somewhat more frequently at Attawapiskat than at Rupert's House.

Twenty-five subjects with pterygia were observed at Attawapiskat and 26 at Rupert's House. The pterygia were of a severe degree, that is, extending well out on the surface of the cornea in 10 individuals at Attawapiskat and 6 at Rupert's House (Fig. 11). The majority were over 40 years of age, although the condition was seen occasionally in individuals in the third and fourth decades of life. At Attawapiskat the condition was more severe and three times more prevalent in females than in males, which is contrary to other experience with Bush Indians.¹

The colour photographs were taken by M. J. Sym, Winnipeg.



Fig. 2.—*Jano II* which transported the members of the expedition by water.



Fig. 3.—“Norseman”—plane which transported the members of the expedition by air.



Fig. 4.—Indian tent at Rupert's House with family standing outside.

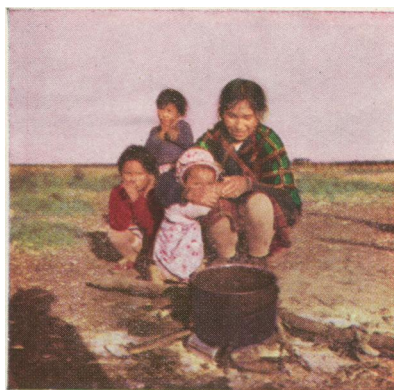


Fig. 5.—Mother and 3 children cooking outside tent at Attawapiskat.

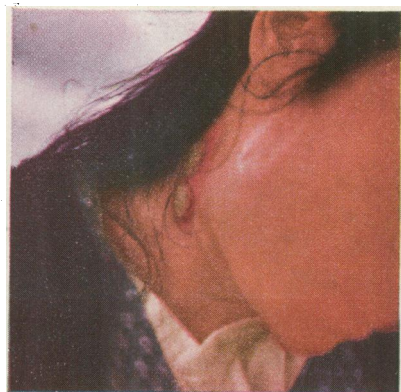


Fig. 6.—Discharging tubercular glands—female, aged 31.

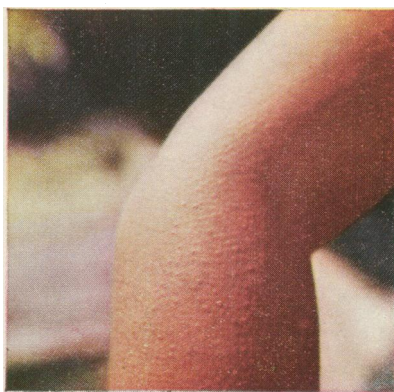


Fig. 7.—Folliculosis of the skin of arm—female, aged 17. Note resemblance to “goose flesh”.



Fig. 8.—Xerosis of skin of leg—female, aged 59. Dryness with thinning and crinkling.

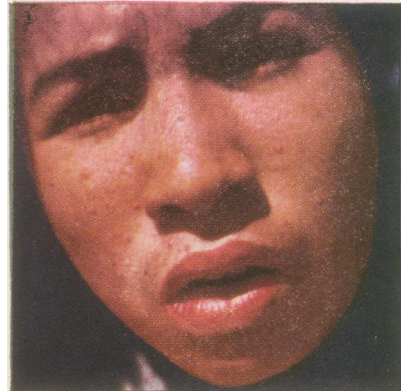


Fig. 9.—Cheilosis—female, aged 14. Note swelling, redness and vertical striæ of lips.

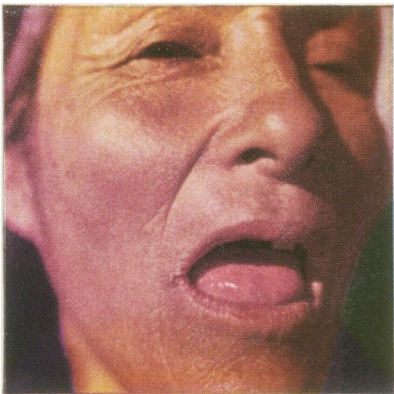


Fig. 10.—Angular stomatitis—female, aged 50. Note reddened moist fissure at angle of mouth extending on to skin of face.

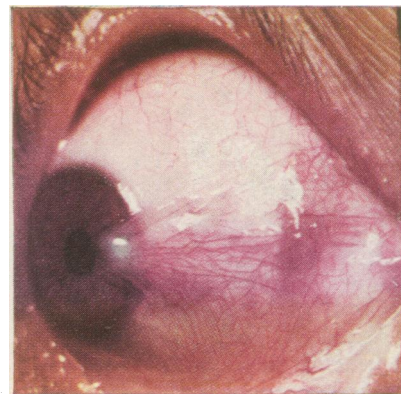


Fig. 11.—Thickening of conjunctiva and pterygium extending well across the cornea—male, aged 46.

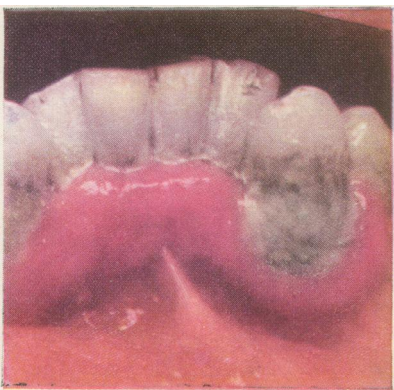


Fig. 12.—Grade 3 gingivitis with redness, swelling and retraction of gingival tissue—male, aged 36.

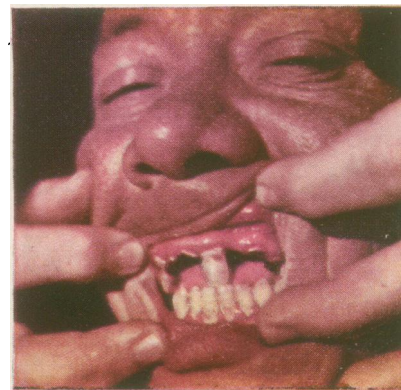


Fig. 13.—Dental caries—male, aged 33.

DENTAL EXAMINATION

Gingivitis.—Many factors are involved in the production of gingival inflammation. Local factors, such as malocclusion or crowding of the teeth, can cause abnormal food impaction and retention. Soft sticky foods that require little mastication provide insufficient stimulation for the gum tissue and form irritating plaques on the teeth. Mouth breathing can cause an inflammatory reaction in the gingivæ. Two of the most frequent local causes are the formation of dental calculus or tartar, and inadequate oral hygiene.

1, 2 and 3. Changes recorded as grade 1 are slight redness and swelling of the gingival margins or tips of the papillæ, or both. In grade 2 the redness and swelling have increased until a distinct swollen band of gingival tissue can be seen around the necks of the teeth. This band is often a dark red colour, and is usually well demarcated from the normal tissue next to it. More severe degrees of involvement, with marked redness and swelling and extension of the inflammatory process over the alveolar process are designated as grade 3 (Fig. 12). At this stage the soft tissues usu-

TABLE IX.
PREVALENCE OF GINGIVITIS AT ATTAWAPISKAT AND RUPERT'S HOUSE

Band	Grade of gingivitis	Age in years			
		2 to 12	13 to 25	26 to 45	46 and over
Number examined		48	40	53	38
Attawapiskat	None	77%	22%	7%	5%
	1	21%	58%	61%	66%
	2	2%	15%	24%	24%
	3	0%	5%	8%	5%
Number examined		34	47	33	26
Rupert's House	None	38%	9%	0%	0%
	1	56%	57%	30%	8%
	2	6%	28%	39%	42%
	3	0%	6%	31%	50%

From a systemic standpoint there is considerable evidence that a deficiency of ascorbic acid can be an etiological factor in the production of these changes. In certain countries, such as Newfoundland, where the average daily intake of ascorbic acid is low, gingivitis, with resultant early loss of the teeth, is almost universally seen,¹⁶ whereas in other areas, such as the British West Indies, where the ascorbic acid intake is high although the diet is deficient in other nutrients, gingivitis is seldom encountered.¹⁷ Also, when patients with a mild to moderate degree of gingivitis are treated locally to clear up the redness, swelling and tenderness of the gums, and then placed on a diet supplying only 8 to 10 milligrams of ascorbic acid per day, the gingivitis recurs much more frequently than when food is consumed supplying 75 milligrams of ascorbic acid daily.¹⁸ Finally, it has been reported¹⁹ that gingivitis responds to the administration of ascorbic acid over a period of many months.

The condition of the gums and teeth from the dental standpoint is being reported in full elsewhere.²⁰ For the purpose of this report, the gingivitis encountered has been graded as

ally have become detached from the teeth and there is obvious pocket formation between the gums and the teeth. The frequency with which these changes were encountered in different age groups at Attawapiskat and Rupert's House is recorded in Table IX. It is striking that the frequency and severity of inflammation of the gingiva are much greater at Rupert's House than at Attawapiskat. For example, above the age of 46 gingivitis of the severest grade was ten times as prevalent at Rupert's House as at Attawapiskat.

Dental caries.—The percentage of Indians examined at Attawapiskat and Rupert's House

TABLE X.
PERCENTAGE OF INDIANS WITH NO MISSING,* DECAYED OR FILLED TEETH AT ATTAWAPISKAT AND RUPERT'S HOUSE

Age in years	Sex	Attawapiskat band	Rupert's House band
2 to 12	Male	48%	0%
	Female	62%	20%
13 to 25	Male	50%	24%
	Female	50%	9%
26 to 45	Male	37%	14%
	Female	21%	0%
46 and over	Male	43%	12%
	Female	18%	0%

*An unerupted tooth was not considered as missing.

with no missing, decayed or filled teeth is recorded in Table X (Fig. 13). Again, as with gingivitis, dental caries was found to be much more prevalent at Rupert's House than at Attawapiskat. The low incidence of caries at Attawapiskat is striking. As still further evidence of the caries experience, the presence of alveolar abscesses, as shown by swelling of the mucosa over the alveolar process, with fistula formation and suppuration, was noted and the results recorded in Table XI. It was found with much greater frequency at Rupert's House than at Attawapiskat.

TABLE XI.
PREVALENCE OF ALVEOLAR ABSCESS

Age in years	Attawapiskat	Rupert's House
2 to 12.....	1.5%	40.0%
13 to 25.....	3.0%	23.0%
26 to 45.....	14.5%	61.0%
46 and over.....	36.5%	62.0%

DISCUSSION

The extremely high incidence of both pulmonary and extra-pulmonary tuberculosis constitutes the most serious medical problem. It reflects lack of sanitation and cleanliness, close contact with persons with open tubercular lesions and inadequate therapy. Also, poor nutrition probably is an important contributing factor.

In regard to the food supply, the figures for the preceding year show that the total available calories for the members of the Rupert's House band were probably adequate, while for the members of the Attawapiskat band the total calories were probably inadequate for good health. In regard to the individual nutrients, the calculated available amounts for both bands in comparison to the United States National Research Council Recommended Allowances (1945) appear adequate, with the exception of ascorbic acid and calcium. However, the average nutrient figures tend to be misleading because of marked seasonal variations in the food supply. The almost complete absence of any method of food preservation restricts the use of game and perishable food during certain seasons. The difficulty in transportation in the winter limits the food intake largely to game and what supplies the Indian can carry to his traplines. These factors undoubtedly result in large month-to-month variation in the nutritive value of the food

supply. Isolation of the different families militates against any equal distribution of the game secured. Furthermore, the influence of environmental factors, such as the rigorous climate, the high physical exertion necessary in everyday life, excessive light reflected from the snow, and the prevalence of tuberculosis, all of which may increase the nutritional needs above normal, must be taken into consideration.

The current nutritional state of an individual may be affected by the food supply of preceding years. Before the institution of family allowances and relief, and in the case of the Rupert's House band, the establishment of the beaver conservation scheme by the Hudson's Bay Company, records of actual starvation were encountered in both bands. We are informed by reliable observers that many of the members of the Attawapiskat band chronically suffered from lack of food until about 5 years ago, while it is only during the last 10 years that the Rupert's House band have enjoyed a relatively good caloric intake.

The clinical findings clearly show the inadequate state of nutrition. This is especially reflected in the anthropometric measurements on the 10 to 19 year age group where nutritional needs are very high. Of the children in this age group, two-thirds of the Attawapiskat girls, one-half of the Rupert's House girls, and one-third of the boys in both bands were 10 to 30 lb. underweight for their heights and builds. The prevalence of this degree of underweight suggests important nutritional failure. Children under 9 years of age showed satisfactory growth except the Attawapiskat girls from 6 to 9. Of these, 40% were 6 to 14 pounds lighter in body weight than the weights given in Pryor's tables. Also a considerable degree of underweight (10 lb. or more) was seen in 50% of the young women from 20 to 39 years of age. The examiners were impressed by the general apathy, slowness and inertia of the group as a whole, as well as by the evidence of premature ageing.

Although no severe acute vitamin deficiency diseases were seen, many signs, such as may be found in early mild or moderate deficiencies, were observed. In most instances it is not possible to correlate these signs with the immediately preceding food supply. Thus the lip changes of cheilosis were seen in over half of those examined at Attawapiskat and in about 70% of those seen at Rupert's House. This

lesion, like many other vitamin deficiency lesions, may be due to a variety of causes and cannot be regarded as a sure sign of riboflavin deficiency without supporting evidence. The fact that fissures at the angles of the mouth were rare at Attawapiskat but seen in about 10% of those examined at Rupert's House points more strongly to the presence of riboflavin deficiency in the Rupert's House band. This, however, is not supported by the food survey.

Changes in the tongue were too slight to be of any significance and no clear-cut evidence of niacin deficiency was found.

Thickening of the conjunctivæ and pterygia were very prevalent and severe. The former appeared at an early age, being obvious in some children 5 years old and present in everyone over 40 years of age. Under 40 it was more prevalent in the Attawapiskat band than at Rupert's House. Folliculosis of the skin was also more common in the Attawapiskat band than at Rupert's House. Both these changes have been attributed by some observers to a lack of vitamin A. It is noted that the recent food supply is higher in vitamin A at Attawapiskat (due to the large number of water fowl eaten) than at Rupert's House.

A severe grade of gingivitis in persons over 26 years of age was found in 30 to 50% of those examined at Rupert's House but in less than 8% of those at Attawapiskat. As already mentioned, a low vitamin C intake may be a factor in the production of this lesion. However, the available vitamin C in the preceding year's food supply was practically the same for both bands.

There was a very striking difference in dental caries in the two bands. At all ages, the teeth at Rupert's House showed a much greater prevalence of dental caries than at Attawapiskat. The latter band, although poorer nutritionally, was more remote from civilization and had remarkably good teeth. Thus, between the ages of 13 and 25 years, 50% still had no missing, decayed or filled teeth, as compared with 24% of the males and 9% of the females at Rupert's House. While the total sugar intake for the preceding year was slightly higher at Attawapiskat (3.3 ounces per person per day compared to 2.9 ounces at Rupert's House), the use of hard candy at Rupert's House was nearly three times as great as at Attawapiskat (0.34 ounce per person per day compared to 0.12 ounce at Attawapiskat). Other reports have indicated

that partial starvation retards tooth decay.²¹ Both bands used surface water for drinking and analyses showed it low in fluorine at both areas, 0.1 part per million.

Small goitres were found in 5.3% of the Indians examined, mostly in young women, indicating the need for continued use of iodized salt in this area.

RECOMMENDATIONS

1. *Improved medical and dental services.*—The miserable housing, sanitary and general health conditions under which these people exist make the provision of more adequate local health and medical services the most imperative need. Such local services should provide not only better nursing, dental and medical care but also regional hospital facilities. This could well be accomplished by the construction of a central regional hospital with nursing stations at outlying posts. Because of the serious tuberculosis problem, a B.C.G. program should be instituted and a travelling clinic visit each band at intervals for the purpose of making chest x-rays of all members of the band, with prompt removal of active cases for treatment. If necessary, the families of patients sent away for treatment should receive assistance. This assistance should be extended to the patient on his return to the band.

Similarly, a dental service, primarily for the removal of oral infection and the replacement of teeth when this is essential to the health of the patient, should be provided by having a travelling dental clinic which would be stationed at the regional hospital and would visit the outlying bands at regular intervals.

2. *Improved food supply.*—Every effort should be made to increase the use of locally available foods. An abundance of game birds, fish and fur-bearing animals would be one of the best methods of improving the food supply. Although the soil is poor, the climate unfavourable and the Indians not inclined to agriculture, potatoes and other root vegetables can be successfully produced in this area. An increased consumption of locally produced vegetables would make a desirable improvement in the diet. Preservation of seasonally available food by smoking, drying, salting and canning, as well as by the use of root cellars, are all practicable procedures if carried out as part of a planned program. Also, in certain key areas, game and

other food which is now lost through spoilage could be saved if quick-freeze facilities were available to the communities.*

It would be desirable to improve the vitamin and mineral value of the staple foods which the Indian must purchase. It is entirely feasible to do this by incorporating thiamine, riboflavin, niacin, vitamin D, calcium and iron in the flour. Studies should be carried out to determine the practicability of incorporating vitamin A in the lard and vitamin C in the powdered milk.

The distribution of cod liver oil and vitaminized biscuits by the Indian Administration should be continued.

3. *Health and nutrition education.*—Comparison of the physical condition of the two bands studied shows that raising the economic level will accomplish little without accompanying health and nutrition programs. A resident nurse could undertake the educational work of such a program. The Indian must be taught in a simple and practical way the elementary rules of sanitation and health, and the need for better preservation, preparation and choice of food.

REFERENCES

1. MOORE, P. E., KRUSE, H. D., TISDALL, F. F. AND CORRIGAN, R. S. C.: *Canad. M. A. J.*, 54: 223, 1946.
2. JOHNSTONE, W. M., POCOCK, R. AND WILMS, M.: Nutritional Values of certain Game consumed by Northern Canadian Aborigines. (In Press.)
3. Tables of Food Composition in terms of Eleven Nutrients, U.S. Dept. of Agriculture Publication No. 572.
4. BRINK, C.: (Director, Division of Tuberculosis Control, Province of Ontario). Personal communication.
5. PRYOR, H. B.: *As the Child Grows*, Silver-Burdett, New York, 1943.
6. MEREDITH, H. V.: Univ. Iowa Study in Child Welfare, N.S. No. 292, 1935.
7. BOYNTON, B.: Univ. Iowa Study in Child Welfare, N.S. No. 325, 1936.
8. Height, Weight Survey of Toronto Elementary School Children, Department of Trade and Commerce, Dominion Bureau of Statistics, Ottawa, Can., 1939.
9. WETZEL, N. C.: *J. Am. M. Ass.*, 116: 1187, 1941.
10. STEGGARDA, M.: *Maya Indians of Yucatan*, Carnegie Inst. of Washington, Publication No. 531, 1941.
11. PITNEY, E. H.: *Physical Size and Growth of Pueblo Indian Children*, Dissertation for Ph.D., Yale, 1940.
12. WISSLER, C.: *Ann. N.Y. Acad. Science*, 20: 355, 1910-11.
13. STUART, H. C. AND MEREDITH, H. V.: *Am. J. Pub. Health*, 36: 1365, 1946.
14. PLATT, B. S.: *Brit. Med. Bulletin*, 3: 179, 1945.
15. SEBRELL, W. H. AND BUTLER, R. E.: *Pub. Health Rep.*, 54: 2121, 1939.
16. ADAMSON, J. D., JOLLIFFE, N., KRUSE, H. D., LOWRY, O. H., MOORE, P. E., PLATT, B. S., SEBRELL, W. H., TICE, J. W., TISDALL, F. F., WILDER, R. M. AND ZAMECNIK, P. C.: *Canad. M. A. J.*, 52: 227, 1945.
17. PLATT, B. S.: *Nutrition in the British West Indies*, His Majesty's Stationery Office, London, 1946.
18. LINGHORNE, W. J., MCINTOSH, W. G., TICE, J. W., TISDALL, F. F., MCCREARY, J. F., DRAKE, T. G. H., GREAVES, A. V. AND JOHNSTONE, W. M.: *Canad. M. A. J.*, 54: 106, 1946.
19. KRUSE, H. D.: *Milbank Memorial Fund Quart.*, 20: 290, 1942.
20. MCINTOSH, W. G.: *Dental Studies and Nutritional Findings in the James Bay Indian*. In Press.
21. MASSLER, M. AND SCHOUR, I.: *J. Pædiat.*, 31: 431, 1947.

* On the recommendation of the authors, the Hudson's Bay Company are installing such a unit at Rupert's House for the use of the Indians in that area.

OLD AGE FROM THE PSYCHIATRIC VIEWPOINT*

A. B. Stokes, M.B.

Toronto, Ont.

REPETITION cannot be made too often or too urgently that the aged are with us in greater numbers than ever before, and that the problems issuing from this circumstance will become more intricate as the numbers increase, both actually and comparatively, over the next few decades. The Royal Commission on Population in England estimated that by 1989 the number of persons of pensionable age (men 65 and over, women 60 and over) will equal the number of children (age under 15). The Registrar-General's forecast places that parity as early as 1971.² In the United States the proportion of the total population 65 years of age or over has about doubled between 1860 and 1940.⁷ The population trends in the Province of Ontario show similar tendencies⁴ and it is unlikely that the overall Canadian figures will be very different despite the probability of significant local variations.

The broad statistical happenings in our kind of social structure allow three general observations. First, the economic productivity per unit of population is likely to fall away unless technical developments continue to make it possible for fewer able-bodied to produce more. Whatever increases in technical efficiency there may be, an obligation will still hold to use human capacity wherever it exists, and not to set aside any worth because an arbitrary age limit has been exceeded. The problem of the exploration of the capacities of the aged is immediately raised. Secondly, the falling away of the ratio of children to aged means that the traditional care of the infirm by the family of the next generation is likely to be increasingly hindered. The strain on the fewer children may well become intolerably increased and the problem of the care of the senile will continue to arise progressively as major social issue. In that issue the lumping together of all forms of senility into a single group irrespective of differences of degree and kind is a danger to be avoided. Thirdly, the speed of onset of the demographic change is likely to outstrip the

* Read at the Seventy-ninth Annual Meeting of the Canadian Medical Association, Section of Psychiatry, Toronto, June 24, 1948.