

## NUTRITIONAL, BIOCHEMICAL, AND OTHER STUDIES ON SOUTH AFRICAN POPULATIONS\*

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### PART I. INTRODUCTION

In this section, as a background, some facts are given on South Africa's populations, aspects of their patterns of mortality and morbidity, the dietary situation and certain changes associated with urbanization and westernization. Much further information in several of these respects is given in textbooks by Gillman and Gillman,<sup>1</sup> Trowell,<sup>2</sup> Gelfand,<sup>3</sup> Brock<sup>4</sup> and others.

#### GENERAL INFORMATION

South Africa has an area of about half a million square miles. In 1960, the total population was about 16 million, which comprised 3 million Whites, 11 million Bantu, 1½ million Coloureds (Eur-Africans), and half a million Asiatics (almost wholly Indians). About five-sixths of Whites and Asiatics (60% Hindu, 35% Moslem and 5% Christian) are urban-dwellers. Concerning the Bantu, there are approaching 300 million Africans on the continent, of whom about 65 million are Bantu and live mainly south of the Equator. Of the South African Bantu, composed of several ethnic groups (Xhosa, Zulu, etc.), roughly a third are urbanized, a third work on farms of White persons and the remainder live in Reserves. Of the Coloureds, two-thirds live in urban or peri-urban areas. Almost half of the White population resides in the Transvaal, the great majority of the Asiatics live in Natal, particularly Durban, and the Coloureds dwell mainly in the Cape Province. The Bantu are concentrated in the Transvaal, Cape Province, Natal and Orange Free State, in that order. While considerable increases in all populations are expected in the future, that of the Bantu perhaps may be less 'explosive' than conjectured, on account of a rising literacy rate and increasing contraception practice among the young.<sup>5</sup>

The history of the racial groups, of course, is outside the scope of this introduction, but very briefly, Whites began to settle in the Cape in the middle of the 17th century, at much the same time as Bantu groups migrated southwards from Central Africa. The Coloureds largely are of Malay-Hottentot admixture; the Malays were brought in early as slaves from the East Indies. The Asiatic moiety has derived primarily from those who immigrated between 1860 and 1910 as indentured labour for the sugar plantations in Natal.

In comparison with Whites overseas, South African

Whites are a 'young' population; the non-White population are 'younger' still (Table I).

TABLE I. APPROXIMATE AGE STRUCTURES OF POPULATIONS IN 1960

Population	% 45-64 years	% 65+ years
Urban Bantu (Johannesburg)	11	3
Whites	17	7
Coloureds	11	4
Asiatics	8	3
England and Wales	25	12
New Zealand	20	10

South African populations differ in diet, socio-economic state, culture, religion and other respects. While lines of demarcation are not clear-cut, ethnic groups differ in patterns of health and ill-health, and in biochemistry, metabolism and pathology. An endeavour to define and elucidate some of these differences is the main object of our research work.

#### CAUSES OF DEATH OF BANTU AND WHITES IN JOHANNESBURG

Inspection of the causes of death in 1960 of Bantu and Whites, 0-14 years, in Johannesburg, showed: (a) In both populations, approximately 90% of deaths occurred from 0-4 years, particularly from 0 to 2 years. (b) Death rates among the Bantu were 3-4 times greater than among Whites. (c) Chief causes of death in the Bantu were gastroenteritis, diseases of the respiratory system, tuberculosis and other infections (B.1-17), and avitaminosis (kwashiorkor). For Johannesburg Whites, chief causes were the same as for England and Wales, i.e. diseases of early infancy, congenital malformations, gastroenteritis and infectious diseases (B.1-17).

Concerning older people, of 15+ years, examination showed: (a) Among the Bantu, about a fifth of the deaths were from traumatic causes and, regrettably for comparative studies, a further fifth from 'senility or unknown causes';<sup>6</sup> whereas among Whites these two causes were responsible for about 15% of the total deaths. (b) Among the Bantu, leading causes of death were cardiovascular disease other than coronary heart disease, diseases of the respiratory system, infectious diseases (B.1-17) and cancer. Among Whites, leading causes were coronary heart disease, cancer, 'strokes' and diseases of the respiratory system. (c) Among the Bantu, deaths from specific deficiency diseases, excluding pellagra, were of very little public health significance. (d) Death rates of Bantu and Whites for the 15+ years' period were closely similar.

To throw more light on the 'unknown causes' moiety of Bantu deaths, by using teachers, we are trying to establish the circumstances of death, from relations, of 100 consecutive persons thus certified.

Some information on Asiatics is given in Parts VI and VII. The Coloureds are not discussed because they form a negligible part of the research undertaken.

\*The writer has been engaged in research work on human nutrition and in allied fields since 1944. This is a condensation or review of investigations published or in progress.

After the Introduction (Part I), the projects undertaken have been divided, for convenience, into sections dealing with infants and children, adults, calcium and iron metabolism, coronary heart disease, diabetes and lastly, what might be called, Bantu lessons to Western medicine (Parts II-VIII). Total references in the original papers number several thousands; accordingly, references, apart from those concerning the writer's work, have been kept to a minimum.

While full acknowledgements will be made at the end, it is desired right at the commencement, to express gratitude to the persons without whose help and advice the research to be described could not have been carried out. These are primarily my senior colleagues, Drs. F. W. Fox, E. Kahn, J. Higginson, I. Bersohn, H. C. Seftel, H. Grusin and S. D. Mistry, and my chief laboratory assistants Misses U. B. Arvidsson, M. Andersson (now Dr. M. Alberts), C. D. de Lacy, Mrs. B. D. Richardson and Mrs. B. F. Walker.

#### CAUSES OF ADMISSION TO HOSPITAL OF BANTU AND WHITES IN JOHANNESBURG

Data on causes of admission to hospital can give rise to misleading conclusions, especially when they concern different races. The chief factors vitiating comparisons are: (a) ratio of beds available to populations at risk, and (b) age structure of populations. In Johannesburg, the situation is roughly as follows: In 1960, among *Bantu children*, the chief causes of admission were gastroenteritis, avitaminosis (kwashiorkor) and diseases of the respiratory system. Among *White children*, the chief causes were gastroenteritis and diseases of the respiratory system. Among *Bantu adults*, the chief causes (excluding maternity and traumatic injuries) were diseases of the respiratory system, infections (B.1-17) and cancer. Among *White adults*, the chief cause (excluding maternity and traumatic injuries) was coronary heart disease.

#### Comment

At the outset, therefore, it is evident that the diet of the Bantu is by no means their sole cause of ill-health, and that non-dietary factors (especially infections from overcrowding, poor hygiene, etc.) play an important role in regulating their health pattern.

#### THE FOOD SITUATION IN RELATION TO RECOMMENDED DIETARY ALLOWANCES

The amounts of nutrients consumed by Whites are believed to correspond approximately to those of White populations overseas, although precise information is lacking. It is possible that the recommended allowance targets are reached, if not exceeded, in the majority of the population. Some observations on the diet of Asiatics are given later.

The carrying out of dietary surveys of any type present many difficulties and, not surprisingly, information on the Bantu is relatively scanty. Early studies were undertaken by Fox and Back,<sup>7</sup> Brock and Latsky,<sup>8</sup> Kark and Le Riche<sup>9</sup> and others. In 1952-53, surveys in rural Bantu areas were made by the Division of Nutrition, Government Department of Health, Pretoria.<sup>10</sup> Limited studies have been carried out in locations at East London, Springs and Alexandra Township (Johannesburg). Some observations on particular groups, e.g. the Pedi<sup>11</sup> and the Venda<sup>12</sup> have been published.

The National Nutrition Research Institute is now investigating food intakes of groups of White, Bantu, Coloured and Asiatic families in Pretoria, as part of their studies on the nutritional status of schoolchildren.

The dietary situation of the Bantu is complex.<sup>7-12</sup> Among the Bantu in the Reserves and, also, to a lesser extent, among workers on farms, the traditional diet with local modifications, is still followed. Climatic and agricultural conditions vary greatly from place to place; moreover, the cash earnings of urban workers sent to their homes in the country can have a considerable influence on the family diet. Broadly, maize, in one form or another, is still the staple food, supplemented in certain parts with 'kaffir corn' (*Sorghum vulgare*), millet and wheat products. Additional foods include dried peas and beans, groundnuts, pumpkin, 'kaffir melon' and other vegetables, fruits and wild greens (*mfino, morogo*). Consumption of fer-

mented cereal products (*marewu, 'kaffir beer'*) varies regionally.

Meat is consumed irregularly and milk usually in small quantities in season. Rural Bantu purchase varying, although increasing, amounts of foods such as sugar, tea, coffee and condensed milk. Unfortunately, the combined information available is very inadequate and there are large gaps in local knowledge on the diet consumed seasonally in the different climatic and tribal regions. Workers on White farms have certain basic foods supplied to them in quantities that are prescribed by Government regulations.

In towns, domestic servants often partake of much the same foods as their employers; maize-meal porridge, however, is still popular with many. Some groups of men are well catered for by industrial concerns, especially the gold and coal mines. The townships' population, i.e. the vast majority of urban Bantu, purchase their own food and eat a partially westernized diet. In contrast to those in rural areas, town dwellers usually have three meals, rather than two, per day. Bread and maize products are major sources of energy. The consumption of sugar is increasing considerably, meat is eaten fairly regularly, often one or more times a day, and more milk is taken. Municipally-prepared 'kaffir beer' is popular with men and, to a much lesser extent, with women; the home-made varieties, however, are still prepared in large amounts. Tea, coffee, soft drinks, fat and tinned foods are consumed to a much greater extent in urban than in rural areas.

There is therefore no diet characteristic of the South African Bantu. In respect of nutrients, however, and when measured against recommended allowances,<sup>14</sup> it is probable that for the bulk of older children and adults, the diet is adequate in calories and gross protein, low in animal protein and fat, high in carbohydrate and crude fibre, low in calcium, usually or frequently high in iron and borderline or low (with exceptions in some groups) in most of the vitamins. Unfortunately, the extent by which marked shortfalls from orthodox allowances constitute real physiological deficiencies is not known. This is a critical drawback and is responsible for numerous controversies that are mentioned repeatedly in the sections that follow. This lack of knowledge, of course, touches on a universal problem and is not simply a local one.

Most of our research concerns the Bantu and their reactions to changes in environmental factors.<sup>15</sup> The dynamic character of some of these changes and certain of the associated ramifications, will now be described.

#### OUTLINE OF CHANGES INHERENT IN URBANIZATION AND WESTERNIZATION<sup>15</sup>

##### *The Present*

Among indigenous inhabitants of Africa, numerous changes are taking place at varying speed—from primitiveness to sophistication, from savagery to a highly organized community. The usual trend of leaving the land in order to settle in more populated centres, is taking place. The migration has been promoted in part by the mechanization of farming, but more particularly by the increasing labour needs of industry, by ease of travel and by the greater opportunities and other attractions of

urban life. Of the whole continent, this movement by far has been most marked in South Africa, and of the South African cities, more particularly in Johannesburg. In 1911, 12.6% of the South African Bantu were urbanized, whereas by 1960, the figure reached 28%. In Johannesburg in 1936, the Bantu and White moieties of the population were approximately 260,000 and 246,000 respectively, but by 1965, the figures had increased to 636,000 and 384,000, respectively.

Urbanization has both its advantages and disadvantages. On the credit side there are better provisions for medical treatment, hospitalization, infant and antenatal services and preventive inoculations (smallpox, diphtheria and poliomyelitis). With few exceptions, these facilities are virtually free. There have been great changes in the housing situation. Since 1948, about 80,000 dwellings have been built in Johannesburg. Associated with this building activity is the provision of potable water, sewage and refuse disposal services. Seasonal shortages of food, often a feature of rural life, are no longer to be feared. Free or almost free tuition is available and the literacy rate among the present generation of urban children is 95%. Wages are higher and employment much more regular. Capable workers can progress from unskilled to skilled occupations. A five-day week for a large proportion of workers allows time for entertainment and recreation.

However, many of the results of urbanization are disquieting, to say the least. Under kraal conditions, delinquency, especially among the young, presents little problem, being dealt with by robust, if rough-and-ready tribal justice. In the towns, crime is more prevalent, both petty and serious, and there are far more traumatic injuries and deaths. Understandably, instability of family life is greater, with adverse repercussions, especially among the young. With many workers, much time, money and energy are spent in transport to and from their places of employment. Easy facilities for credit encourage spending beyond their means, unfortunately with frequent sequestration of hire-purchase articles.

Regarding nutrition, breast feeding which is almost invariably successful among Bantu mothers, is giving place, by pressure of plausible advertising, to the adoption of processed foods. The great majority of these are prepared in too dilute a manner, thereby predisposing to, if not causing, kwashiorkor. The amount of vitamin D ingested is low, so that overclothing of babies (who in kraal life are semi-naked), with consequent insufficient exposure to available radiation, causes rickets to be a common and sometimes a severe disease. The considerable replacement of coarsely-ground or lightly-milled maize, by white bread and the decreasing consumption of fermented porridge (*marewu*), have resulted in a reduced intake of B complex vitamins. This change, coupled with the consumption of illegal alcoholic concoctions supplied by shebeens, has contributed to an increase in alcoholic pellagra. Wild 'spinaches' are far less abundant in urban areas, so that there is a decrease in the intake of certain mineral salts and vitamins. The familiar iron 'kaffir pot' has been almost wholly superseded by enamel and aluminium vessels, thereby lessening the intake of adventitious iron, at least in certain population groups. We have found haemoglobin levels of Bantu women servants in White

households to be significantly lower than those of poorer rural women. Despite improvements in hygienic conditions, studies indicate that about half of Johannesburg's urban Bantu children are infested with parasites, mainly ascaris; yet in parts of the somewhat sparsely populated highveld areas, helminthiasis is as low as 5%, providing a correspondingly lower nutritional handicap. Regarding shigellae and salmonellae infections. It has been shown, unexpectedly, in serial studies on schoolchildren, that prevalence is almost equally high in urban, peri-urban and rural areas (Part II). While leading causes of death in adults are roughly those that prevail in any underdeveloped population, the health pattern is altering in relation to the 'diseases of civilization'.

#### The Future

Prediction of the health of the future of the Bantu, especially in relation to nutritional diseases, is simplified by considering what has transpired with other emerging populations.<sup>16</sup> Present-day Bantu are confronted by problems similar to those that faced the poorer moiety of Whites one or two generations ago.<sup>17</sup> We can therefore look forward to a falling infant mortality rate and to considerable reductions in nutritional deficiency diseases (kwashiorkor, rickets, and pellagra) and infectious diseases (gastroenteritis, pneumonia and tuberculosis). However, as just indicated, the increased expectation of life undoubtedly will be accompanied by a rising prevalence of degenerative diseases (cancer, diabetes and coronary heart disease). Against these latter changes we are virtually helpless.

What can be done to combat the unsatisfactory aspects of changes that are remediable? The immediate reaction (as would be the case when considering the poorer section of any population) is—if their socio-economic level is raised, can we not look forward to improvements? If increased spending power means better housing and hygiene, more nourishing food and so forth, we can confidently expect benefits to health and nutritional state. If, however, as elsewhere, much of the increase in money goes into expensive clothing, cigarettes, gramophone records, transistor radios, amusement, 'fah-fee' (a betting game), and insofar as food is concerned, on more white bread, sugar, soft drinks and more fortified liquor, then the results of increased spending power will be disappointing. What has just been written, unfortunately, is now taking place and it is feared that it will continue to be the pattern for the future.

The crucial difficulty lies in endeavouring to inculcate into the Bantu, within their material resources, the capacity to choose more wisely in their pattern of living, to be governed less by snobbish thinking, the acquisition of status symbols, etc.—features which strongly influence the life of 'civilized' people, but which are far more dominant in emerging populations. Sufficient has been written to show that neither more intensive schooling nor higher wages will provide the immediate answers to this problem of seeking to improve the wellbeing of the urban Bantu. The problem is not parochial, it will be encountered in measure by all emerging African states within the present century.

Is the situation then wholly beyond correction? In wartime, opportunities arise for studying how the health of

millions of people is affected by their having to consume a fairly standard diet for several years. During the last war the diet consumed and the state of health that prevailed have been described for certain countries affected in varying degree by war conditions.<sup>15</sup> Briefly, it was noted that often the general state of health was not only maintained, but improved. Of the dietary changes (which were regarded as more influential than the non-dietary changes), there was (a) an increased consumption of milk by the young; (b) the replacement of white bread by higher extraction bread and (c) an increased consumption of potatoes and vegetables. However, the lessons to be learnt from these mass nutritional experiments, albeit involuntarily performed, have been wholly ignored by Western populations. Since the latter populations are loth to profit from past lessons and from research findings, it is far too much to expect a more enlightened reaction from primitive emerging populations.

It must not be thought that the inevitability of the adverse side of the future health picture of the Bantu should in any way inhibit the positive efforts now being made in health and nutritional education. Thus, every effort should still be made to stress the value of antenatal care and to encourage perseverance in breast feeding; to

endeavour to make the young prefer milk to 'soft drinks', to encourage a diet based on a mixture of cereals rather than reliance on one, to press for the greater consumption of legumes at the expense of the inordinately increasing consumption of sugar, to hinder the replacement of *marewu* and 'kaffir beer' by the more fortified liquor consumed by Whites and to encourage the buying of the cheaper but still nutritious cuts of meat. Many other goals worth striving for could be added. In relation to nutrition in particular, it is important to grasp that these people need not continue to have an inferior bill of health until such time as they are able to afford and eat precisely the same kinds and amounts of food as the White population. The diet of the latter, in certain respects, is far from ideal.

#### *Comment*

Many aspects of the foregoing are referred to later. A summary is therefore unnecessary. Concerning future research, from a public health point of view, a great deal more needs to be known, firstly, of the specific mortality and morbidity situations prevailing in the Bantu, especially those related to nutrition, and secondly, of details of their diet in urban and different rural regions, including information on local practices and taboos. The same comments, of course, apply, in large measure to the South African Coloured and Asiatic populations.