THE BASIC APPROACH TO THE PROBLEM OF THE RECOGNITION OF HUMAN MALNUTRITION

SOME PERSONAL VIEWPOINTS

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The need for more accurate information concerning the criteria of human malnutrition, and a satisfactory basic approach to the problem of its recognition, is still growing in importance in the nutritional field. In South Africa improved housing and nutrition for certain population groups are much under discussion these days, necessitating more efficient nutrition surveys in both urban and rural areas—surveys which will necessarily have to include socio-economic and other dietary investigations as well as clinical, somatometric and laboratory methods.

Lack of information concerning practical methods for recognizing and measuring the extent of human malnutrition, particularly in growing children, is still holding back much important work in this country. The importance of this gap in our knowledge is evident not only from the literature, but also from the fact that the Joint FAO/WHO Expert Committee on Nutrition at its recent sessions in Rome and at Fajara (Gambia) devoted a great deal of its time to the discussion of these questions; the opinion of the Committee was that there was urgent need for an international document which would indicate the kinds of surveys that might most usefully be undertaken to assess nutritional status; and that it was desirable for WHO and FAO to provide (as far as possible) advice, leadership and aid in the solution of these problems. Such surveys could serve either as a basis for programmes to improve nutrition, or for purposes of basic research into the criteria of good nutrition and general well-being, which might lead to a useful re-evaluation of the more doubtful criteria now employed—often only too dogmatically.

These issues should, for the time being at least, be subject to constant review in accordance with advances in our knowledge and thinking on this whole matter. To attain this end, concise critical reviews of current opinion concerning the more important claims in this field and the extent of their usefulness or reliability in nutrition survey work, should be welcomed, and this paper is a small effort in this direction.

It is when trying to raise standards of living and levels of nutrition (two very basic objectives) that one realizes the complexity of the problem of nutrition; there is no one single approach for its solution. Correct appraisal, however, of the rise or fall in 'standards' or 'levels' calls for reliable measurement or 'yardsticks'; and if with these we are to measure or even appreciate

deviations from the normal, we have to know what constitutes normality.

BASIC APPROACH TO THE PROBLEM OF NUTRITIONAL ASSESSMENT

The new emphasis in the approach to the problem of nutritional assessment seems therefore to be on Normal Nutrition Values.

Too often the procedure in any large-scale nutritional assessment experiment on, let us say, the school-going population of a country is still essentially as follows: Itinerant school medical officers, assisted by school nurses and lay workers, would proceed to examine, weigh and measure school-children after having agreed more or less on the standards to be adopted. After examination, the children are classified on the lines of the Dunfermline scale (see p. 294). It is obvious that such classifications cannot be regarded as reliable, because of lack of proper knowledge and definition of the elusive concept of normality.

On the other hand, programmes for correction of malnutrition should not be allowed to stand over indefinitely merely because of lack of further scientific data to diagnose the situation in full. Every possible effort should be made to get at least an idea of the approximate extent of under-nutrition by application of useful current methods. Then with the so-called Normal subjects as experimental material (and these have first to be found) one could get down to other practical issues, such as testing out the reliability of doubtful current methods, as well as new ones.

Further usefulness of nutrition surveys lies in the fact that they enable us to establish normal nutrition values for certain age-groups, socio-economic segments, etc., of a population or population-group—even if only roughly, since the extent of possible adjustment to a wide range of dietary intake with no recognizable ill-effects, still remains an important consideration. Structural changes will set in only when deficiency is already fairly well advanced (often even to an irreversible degree) which makes early detection of slight deviations from the normal important, and this cannot be solved by a clinical examination only.

An inevitable basic need, therefore, is the establishment, in the first instance, of normal nutrition values for the particular country, region or population-group under examination. Time thus spent initially is time invested at great interest and results of this kind constitute a valuable contribution to the knowledge of the subject, not only from the national but even from the international point of view.

McCarrison in 1937 defined Nutrition as 'the sum of the acts or processes by which the structure and functions of organs and parts of the body are established and maintained. It is, in short, that function of the body by which health is maintained'.

It is generally agreed that the main factors underlying malnutrition include *disease* (both congenital and acquired), *parasitic infestation* (e.g. helminthic, malaria, schistosomiasis), and *endocrine disorder* or imbalance (e.g. Frölich's syndrome), while minor factors such as defective hygiene, overcrowding, insufficient sleep and emotional or psychological maladjustment can all play some role in the production of malnutrition.

On the other hand, it is clear that *nutrition cannot be satisfactory unless the diet is satisfactory*.

So, before considering malnutrition, we should have some idea of what constitutes normal nutrition, particularly as we are apparently dealing with 2 standards—normal and optimum. The term 'normal nutrition', as ordinarily used, indicates something which is satisfactory but not optimal, and the fact that the first 2 groups in the Dunfermline scale are labelled 'excellent' and 'normal' already shows that 'normal' is not the same as 'optimal'.

To the nutritionist the most important aspect of the nutrition problem is the definition of satisfactory and optimum diets. We have already defined an optimum diet as a diet additions to which will not cause any improvement in the individual's physical development, functional efficiency, or resistance to disease or strain. Without an optimum diet no individual can enjoy optimum nutrition; on the other hand, several factors referred to above can prevent normal nutrition or normal health from being achieved, even on an optimum diet. The unfortunate fact is that some of these elements are still only partially under human control, with a consequence that, although as nutritionists we should be 'aiming at the stars to shoot the tree-tops' we should also be realistic enough not to delay remedial advice and action because of lack of definition of so-called optimal nutrition standards. Let us meantime, therefore, rather get more clarity on so-called satisfactory or normal ranges in nutrition.

Optimum nutrition can perhaps best be defined as a state of nutriture in which there is no further room for improvement in the individual's physical development, functional efficiency and resistance to disease or strain, while downward departures from this optimum (if not the result of defective diet or disease) may be due to any one of the other factors cited above as possibly influencing nutrition.

On the other hand, to distinguish between optimum nutrition and optimum health, this definition is perhaps somewhat unsatisfactory since it excludes the effects of 'conditioned' deficiency-states in which, for example, gastro-intestinal or endocrine disorder may 'condition' a deficiency-state even when an optimum diet is not only available but perhaps actually being consumed.

As yet, therefore, no clear distinction can be drawn between optimum nutrition and optimum health and the literature is still vague on this point. There is probably no such thing as a normal diet, and normal nutrition as opposed to optimum nutrition can probably be achieved on what is usually referred to as a satisfactory diet, which can be defined as a diet which is adequate enough to prevent any deterioration in health and efficiency under the normal conditions or demands of life, and carries with it some margin to make it adequate for at least some of the abnormal calls which the individual is likely to meet, such as infectious illness, violent exercise, undue exposure to cold or heat, and so forth.

Having now attempted to get a better concept of normal, satisfactory and optimum standards in relation to nutrition and diet, the problem of malnutrition and

its assessment can perhaps be approached more satisfactorily.

THE PROBLEM OF MALNUTRITION AND ITS ASSESSMENT

While the nutritionist recognizes the numerous factors which enter into the production of malnutrition, his argument consistently is that the dietary factor is the one which can, if only to some extent, be controlled. His problem, therefore, is to know how the role of a defective diet in the production of an observed state of malnutrition can be reliably assessed and distinguished from all possible contributory factors. How could it, for instance, through examination of a group of school children, be determined what percentage of them are not receiving an adequate diet and in which components it is inadequate? *What* physical deviations from normal (as a result, not of the presence of disease, but solely of lack of a proper dietary intake or enough food) are to be looked for or measured in these children, and *how* or by what methods?

Roughly speaking there are 3 degrees of severity in which malnutrition may manifest itself, the worst of course being starvation, which usually is essentially the result of deficiency of total calories in the diet, and where the individual is obviously thin, underweight and of inferior stamina.

In the intermediate degree the individual, while not necessarily thin, may on close examination show certain definite symptoms of vitamin or mineral deficiency, often first detectable in the skin and mucous membranes. Contrary to starvation, this type of malnutrition is more often than not caused by general lack of 'protective' foods in the diet and—what is more important—can often occur even on a 'normal' total calorie intake.

In the mildest degree of malnutrition, often referred to as sub- or under-nutrition, the stigmata of vitamin or mineral deficiency may be absent and the deficiency may be only recognizable by means of rather elaborate biochemical or physiological tests; height and weight may even be on the average. The essential criterion of this stage of sub-nutrition is that, generally, the physical and mental efficiency, stamina, and resistance to disease, can be improved on a more 'protective' diet. Hence the intrinsic value of food-supplementation experiments, particularly in rapidly-growing children.

It is perhaps not always fully appreciated how much laboratory and clinical research are applicable to early life, the formative years of childhood, puberty, and adolescence, when growth is occurring and when the baleful effects of under- or malnutrition are probably of greater concern than afterwards, however significant this latter period may also be.

Because of this we shall, purely by way of illustration, assume throughout the rest of this discussion that we have decided to undertake a good nutrition survey on (say) a representative sample of children drawn from the school-going population of (say) an industrial city.

THE VALUE OF CLINICAL APPRAISAL

The general consensus of opinion today is that there is obvious need for a more comprehensive basic approach to the problem of the recognition of human malnutrition than mere clinical assessment. But, however adverse (if not perverse) the manifestations of nutrition deficiency may be, there nevertheless are certain unmistakable signs and symptoms induced chiefly through undernutrition which an experienced clinician can usually recognize even though, by itself, clinical appraisal—note, not only clinical examination—is usually nonspecific. Moreover, the clinical examination is an extremely important facet of nutritional assessment—not so much because the clinician can expertly distinguish between malnourished and normal subjects as because the 'conditional' factor already referred to can largely be eliminated only with his help.

In other words, the clinician's primary role in any nutrition-survey team is to screen off all the diseased subjects, leaving it then to the other members of the team to distinguish between Malnourished and Normal subjects by means of further tests. Not that he could not also assist with the latter; but elimination, right at the beginning, of any possible evidence of present active disease is held to be the soundest basic approach to the whole problem with which this paper deals. He is, in the first instance, therefore, the pathologist and only in the second instance the nutritionist.

After correct sampling the clinician will, before anything else, search for evidence of congenital or hereditary derangement, acquired disease or endocrine disorder, the subjects of these being classified as 'diseased' and rejected, while the other members of the team may then proceed to classify the remainder into 'Normal' and 'Malnourished'. Even if the main function of the clinician ends here, it nevertheless has been a very important one.

Clinicians, furthermore, hold that besides detecting other pathological conditions it should be possible in a clinical examination also to detect the stigmata of at least some recognized deficiency disorders, e.g. the epiphyseal enlargement of rickets, keratomalacia of vitamin-A deficiency, and so forth. Some of these stigmata are today established beyond question and a child showing any one of them would certainly be placed by the clinician in group 4 of the Dunfermline scale ('general condition poor and requiring treatment'). Also other stigmata such as departures from normality in the skin and mucous membranes, known to clear up on a good all-round diet, may be recognizable even when the responsible factor cannot be identified by the clinician. In certain conditions, of course, such as advanced scurvy, rickets, and pellagra, symptoms may show up even to the extent of 'smiting' him.

But, however undefinable symptoms may be, such as abnormal manifestations of the facial skin and buccal mucosa, commonly associated with deficiency of riboflavin, nicotinic acid or other components of the vitamin-B complex, the fact remains that the finding of any of these stigmata would lead a competent examiner to place the child in group 4 of the Dunfermline scale, for although he may have the gravest suspicion of defective diet, the deficiency state as witnessed by him may be a manifestation of a 'conditioning' gastro-intestinal or other disorder even in the presence of a satisfactory

diet. So again, the clinical slant on nutritional phenomena of this kind, seems indispensable.

For this reason it is always better to conduct nutrition surveys of a more elaborate kind in hospital vicinities so that full use can be made of the resources of hospital diagnostic departments. Particularly when it comes to the establishment of normal nutrition values, it is always an advantage to have hospital facilities available in view of the great importance of the elimination of disease as a 'conditioning' factor in malnutrition.

It is also not always appreciated that successful clinical identification of the so-called 'conditioning' factors is as indispensable a part of our armamentarium as the need for more satisfactory somatometric and dietary-survey methods since, while there is the greatest need today for more accurate knowledge concerning normal human requirements, this gap in our knowledge can really only successfully be bridged through further careful research, not so much on diseased or malnourished as on *normal* human beings.

Unfortunately, nutritional assessment today is still too often carried out along Dunfermline lines only as a sort of haphazard 'trouble shooting' survey of health and nutrition, often based only on available statistics not specially collected for nutrition-survey purposes and then correlated with the vital statistics of the country. This can give rise to very erroneous conceptions concerning the real incidence of malnutrition in a community or country.

In nutritional assessment on the lines of the Dunfermline scale, school medical officers would, for instance, examine, weigh and measure (say) batches of school children after having met to concur on the standards which are to be adopted. After examination each subject is put into one of the four convential groups of the Dunfermline scale as follows:

General Condition	*Assessment*
1. Excellent	Normal (nutrition satisfactory)
2. Good	
3. Slightly sub-normal and requiring supervision	Considered as Malnourished
4. Poor and requiring treatment	

Two questions immediately arise here: (1) In relation to the reliance which can be placed on figures of this kind, since different examiners have different standards of Normality in classifying children according to the Dunfermline scale, although probably all examiners would be agreed on the recognition of the two extreme groups—1 and 4. (2) Experience shows that there is difference of opinion as to where the borderline between groups 2 and 3 really lies, apart also from the subtle difference between clinical appraisal and clinical examination:

The clinical *examination*, one feels, should aim at provisional elimination or rejection of all obviously diseased subjects through careful search in the first place for marked evidence of congenital abnormalities, acquired disease or endocrine disorder; and, furthermore, through search for stigmata of recognized deficiency-disorders, or any other stigmata which will be regarded by an experienced clinician as probably indicative of minor ill-health of some sort.

Clinical *appraisal*, carefully applied, can often help to establish the existence of what was referred to earlier in this paper as the second or intermediate degree of malnutrition. It is, however, generally admitted today that it is unreliable in detecting the third or mildest degree of malnutrition or, in terms of the Dunfermline scale, it is unreliable in differentiating between the second and third groups, i.e. individuals, respectively labelled as 'general condition good' and 'general condition requiring supervision'.

To conclude, the clinician cannot be left out of the picture, but *the clinical examination should, in the first instance, not be employed as a means of selecting malnourished subjects but of excluding present active disease or pathology* as a possible 'conditioning' factor for improper absorption or utilization of food in the body, irrespective of the actual dietary intake or availability of enough good food. To omit the clinical examination or health survey aspect of any important nutrition investigation is unwise, for the potential influence of disease in hampering proper nutrition is too important to be overlooked. This includes all conditions which interfere with digestion, absorption or utilization of nutrients, even those that increase their requirement, destruction or excretion—the so-called 'genetotrophic' factors. The interpretation of the results of a general clinical examination will, therefore, always be tentative until all the other available data are also known.

With this material we may then proceed 'to separate the goats from the sheep' and, very important, to test out the reliability or otherwise of the methods in use, as well as new ones. It is here that our greatest basic contribution to the knowledge of the subject will probably be made.

SOMATOMETRIC INDICES

Briefly, somatometric methods include body measurement from which, by the application of mathematical formulae or indices, figures are derived which are supposed to give information on the state of nutrition. Let us, however, state very categorically here that, of the numerous physical indices of nutrition so far proposed, no agreement has yet been reached as to which index is the best. It should, nevertheless, be our aim to make our methods as thorough and far-reaching as possible in the present state of knowledge. As in the case of clinical assessment, somatometric or anthropometric indices probably also play some useful part in their own particular way.

The most important reason for the use of somatometric indices in the judgment of the nutritional status of individuals must probably be looked for in the original work of Franzen * who, by using statistical methods, tried to discover on which items a group of medical men—consciously or subconsciously—based their clinical assessment findings when working with large groups. He concluded that in actual practice, when asked to select malnourished children, the points uppermost in their minds were: (*a*) musculature (the amount and

* Franzen, R. (1929): *Physical Measures of Growth and Nutrition.* New York: Amer. Child Health Assoc.

quality of muscle), (*b*) adipose tissue (the amount and quality particularly of the subcutaneous tissue,) and (*c*) skeletal dimensions, or maturation.

In judging the amount and quality of soft tissue, i.e. both muscle and subcutaneous tissue, the physicians emphasized the fact that at the back of their minds they were continually relating the amount and quality of soft tissue to the skeletal size or peculiarities.

Franzen then measured the weight, skeletal, muscular and fat dimensions of many thousands of children and correlated his measurements with medical judgment based more or less on Dunfermline lines. In this way various methods employing numbers of body measurements were evolved to assist in forming an adequate picture of soft tissue in relation to skeletal build. The usefulness of many of these physical indices of nutrition may, or may not, in time fully justify their employment. As matters stand today, however, one feels that the most honest reply to give on this point is as follows:

Although malnutrition may adversely affect the growth and maturation of bone and the growth of tissue mass, the indices constructed from these measurements are greatly influenced also by inherited growth patterns, presumably acting through the endocrine glands. The endocrine and other organs participating in osteogenesis certainly are very largely responsible for the shifting of calcium from the tissues into the bones and *vice versa*. Calcium and phosphorus, although essential for bone growth, also influence cell metabolism in general and, furthermore, there is a strong general impression today that any attempt to explain bone or skeletal derangements as due chiefly to malnutrition is something which is being strongly contradicted by observers in the laboratory and in the clinic.

It is possible that other indices may still be involved which will detect differences between groups of malnourished and normal children and it is not the intention here to discourage the use of somatometric methods. So far, however, none of these indices can be relied upon to classify (say) a child as malnourished or normal. Stature (as a result of skeletal development) can probably be as strongly influenced by endocrine and racial trends as by dietary habits. At the utmost these indices might be employed as rough 'screens' to eliminate from a population-group individuals who are mensurationally below normal. The exclusive use of somatometric indices, of whatever kind and however successfully carried out, must still be looked upon as inadequate, and they cannot be used to supplant, but only to supplement, clinical and laboratory methods. Actually, there is a personal standard for each individual and these indices are probably also under the control of factors other than just nutrition.

On the other hand, it is true that in the majority of children the effects of nutrition over a period of time do become depicted in their physical development, and that the periodical recording of these changes may be useful; particularly when by a simple objective method, such as for instance the 'Wetzel grid' or the 'Red graph method', bi-annual observations show how satisfactory progress has been in the past and give strong indications also of the progress which may be expected in the near or distant future.

There are strong reasons for believing that healthy developmental progress of each individual child continues in an established channel as though this were a preferred path, deviation from which may culminate in a pathological state.

It has not been possible to find in the literature any valid reason for a change of opinion on the present commonly-accepted view that physical fitness—however vague the term—is probably as closely related to *function* as to *structure*, if not more so, and is not easily to be expressed in numerical form.

LABORATORY METHODS

From the foregoing it is evident that, although there may be certain recognized clinical stigmata and measurements which will detect malnutrition (particularly if present in rather gross form), a number of them are still unreliable for the detection of minor degrees of malnutrition and they often fail to distinguish between the effects of disease and of dietary deficiency.

A further line of investigation in any worth-while survey, therefore, seems to be the analysis of the diet into deficiency (in quantitative terms) of precise dietary essentials. Biochemical tests represent the only satisfactory way in which the role of dietary deficiency can be separated from that of other factors in the production of malnutrition; they give a promise at least of quantitative knowledge about vitamin and mineral metabolism in the body, but before they can be usefully applied a level of adequate dietary intake has to be decided on, requiring methods other than mere biochemical ones.

As already stated, an adequate level must obviously be one which allows at least some margin for unusual calls upon essential nutrients as, for instance, in fever and violent exercise. But how much margin? Voigt, in the last century, fell into the error of assuming that because an average German workman consumed 118 g. of protein daily, this constituted an adequate level, while subsequent research has shown that this is really a luxus consumption level. Very often students of nutrition are in danger of falling into the same error by assuming that because doctors, students and laboratory workers in hospitals and research institutes normally consume a satisfactory diet, or fairly so, their particular plasma ascorbic-acid levels (merely to take an example) should be looked upon as desirable, while this actually may represent a luxus consumption level. No matter how desirable these levels may be, we are not justified in saying that health necessarily suffers if they are not attained.

Many tests suffer from the same difficulty as the method of clinical assessment according to the Dunfermline scale, in so far that there is as yet no final acceptable definition of the lower level of normality or of the borderline between normality and sub-normality. And this difficulty still applies to some biochemical tests recommended as useful in nutrition survey work. The only real way in which the majority of these questions can be finally solved, will probably be by the elaborate process of demonstrating that physical development,

functional efficiency and resistance to disease and strain in a group of individuals are not increased by further additions to an experimental diet over reasonably long periods while the individuals are exposed to all the stress of ordinary life. The inherent difficulties involved in the execution of an ideal experiment of this nature are, however, obvious, but until some such data are available some of the remedies for malnutrition must remain tentative from the strictly scientific angle. In this respect the work of Ancel Keys in Minnesota deserves special mention here. Since 1945 he has been working along these lines and his useful contribution towards closing part of this lamentable gap in our knowledge of the subject has been greatly appreciated.

Laboratory studies, in the first instance, usually include at least examination of the blood, urine and stools (particularly in tropical regions). The blood undoubtedly is a sensitive body tissue, detailed examination of which may often prove informative. One need only refer to the possible value of haemoglobin determinations, examination of smears for malarial parasites, chemical determination of plasma ascorbic acid, blood protein, calcium, phosphorus and phosphatase levels, liver function tests, etc.

In the absence of infection or other disease and of intestinal parasites and malaria, the finding of anaemia might be regarded as indicative of malnutrition. An exception to this would be the nutritional anaemia of infants, which usually develops when mixed feeding is introduced late. The important point, however, is that anaemia is uncommon in adolescents and in them, if the possibility of blood loss due to internal parasites were a remote one, low figures might be indicative of dietary deficiency; but again the finding would require careful interpretation against a geographical, climatic and socio-economic background.

Moreover, our knowledge concerning the exact lower levels of normal haemoglobins is still imperfect; work so far has shown so much overlap between the bloods of Normal and Malnourished individuals that really only the very low levels of haemoglobin could possibly be accepted as undoubted evidence of malnutrition. Even then mere haemoglobin determinations will not give us the full story, the only real key to iron therapy or deficiency being determination also of the mean corpuscular haemoglobin concentration (M.C.H.C.).

There is also the very common procedure of routine determinations of calcium, phosphorus and phosphatase for correlation with figures for these substances as found in qualitative analysis of the diet and urine. Great differences may, however, exist between the ability of any two persons to absorb and use calcium properly on high intakes of phytic and oxalic acids, proteins or fat. Again, while calcium and phosphorus are undoubtedly important in bone metabolism, they also greatly influence general cell metabolism and attempts to explain deficiency in bone growth primarily on the basis of derangements in mineral metabolism are no longer sufficient, and are being contradicted by the correlation of observations in the laboratory and in the clinic. It is becoming more and more obvious that the entire metabolic picture is necessary for interpreting the manner in which the body will deal with its calcium, phosphorus and vitamin D.

In this respect much current thought is also being given to the so-called 'genetotrophic' disease factors which occur when a diet fails to provide sufficient supply of one or more nutrients that are required in increased amounts because of the characteristic genetic pattern of the individual concerned. It is generally accepted today that some individuals are born with an impaired ability to utilize certain nutrients which, when ingested in so-called normal amounts, may prove insufficient for proper nutrition. It is also becoming increasingly apparent that, even some time after dietary deficiencies have been ameliorated, certain residual effects in the organism may continue to play a part that is not understood; and the effects of transient nutrition deficiencies on the subsequent absorption, utilization and metabolism of nutrients is another field where further research is definitely indicated today.

DIETARY STUDIES

This is a *sine qua non* on the simple basis that (as already stated) there can be no normal or proper nutrition unless the diet is satisfactory. Dietary-study methods are, however, beset with great difficulties, particularly when it comes to the interpretation of data. In this respect, one can hardly do better than quote from the article of Hunscher and Macy in the *Journal of the American Dietetic Association* of July 1951, on the use and abuse of dietary study methods:

> 'Planning intakes of any population group is complex and involves knowledge of many important factors in addition to the mere chemical composition of foods. Many of the limitations imposed upon dietary studies by these factors have been determined. For an individual group to undertake additional investigations of the diets of populations without familiarizing themselves with the background knowledge which we now possess will result in needless waste of effort and funds and will continue to introduce erroneous conclusions into the literature of nutrition . . . . whether the line of duty is one of keeping a running inventory of nutrients provided in a school lunch room, or evaluating dietary intake for purposes of therapy, or distributing a new food product, or of research, there are numerous potentially hazardous pitfalls . . . . (and) there is a need to keep abreast of the fast moving outflow of scientific literature pertaining to the composition of foods, the factors affecting nutritive quality and utilization, and ways and means of best collecting and sampling diets for estimation or analysis; they will be alert to the advantages and limitations of the different types of interpretation of the data collected and will draw only warranted conclusions.'

NUTRITIONAL ASSESSMENT AND GOVERNMENT NUTRITION PROGRAMMES

We ought, therefore, in a way to be 'burning the candle at both ends' all the time, viz. by assessing the real situation while at the same time sponsoring remedial programmes, since no programme for correction of undernutrition or malnutrition should necessarily have to wait on further or full scientific data.

An insistent demand from an informed profession for improved dietary standards would slowly strengthen the demand for government action; and while it is perhaps not the main responsibility of Nutrition or Health Departments to decide upon the best economic measures for improving the nutrition situation, it nevertheless is necessary to insist that a remedy be found, and public

ignorance and indifference have to be stimulated into demand for action.

Nutrition surveys in themselves would be fairly useless if this did not serve to stimulate governments to a more vigorous application of remedial measures. Having, however, obtained an idea of the probable percentage incidence of malnutrition in a community or country, we might as well go one step further and *use our so-called normal (undiseased and adequately nourished) subjects for the determination of normal nutrition values for the various segments of the population systematically investigated by us*. This at least seems to be a constructive way of setting about the nutrition problem of a country. More light on the whole concept of Normality or Adequacy in Nutrition is badly needed.

SUMMARY

It is argued that correct or more satisfactory assessment of the nutritional status of humans required, in the first instance, reliable standards of measurement or 'yard-sticks' based on the concept of what *normality* really constituted.

Besides concentrating somewhat exclusively on the determination of the extent and nature of malnutrition present in a population-group or community, and on the application of suitable remedial measures, greater use for research should be made of the so-called normal subjects, in order to fill certain gaps in our present knowledge concerning normal nutrition standards.

Great importance is attached to clinical examination, which should, in the first instance, not be employed chiefly as a means of appraising or selecting undernourished individuals, but rather to exclude, as far as possible, active disease or pathology as a possible 'conditioning' factor for improper absorption or utilization of food in the body even when the diet is satisfactory.

Diseased subjects, having been screened off, the balance of the group may then be further divided into (*a*) individuals who are undernourished not because of the presence of any obvious disease but merely through lack of enough and/or proper food, and (*b*) so-called normal persons (apparently healthy and adequately nourished).

The usefulness is discussed of including other methods to *supplement* the clinical, such as socio-economic and other dietary investigations, together with somatometric and laboratory methods.

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