

Nutrition, ethnicity, and body composition

Abstracts from a joint APCNS - Tianjin Municipal Bureau of Public Health conference in Tianjin, China, October 1995

Aims of the meeting: The fast growing economies of the Asia Pacific Region in recent decades are bringing about changes in lifestyle and disease patterns in the region. Ethnic diversity and stage of development confound the way in which "Westernisation" has previously been defined. Increased dietary fat intake and increasing body fatness are said to hold the key to changing disease patterns, but how much more is there to it which ethnic diversity can reveal? The purpose of this meeting was to appreciate what human difference can impart to the understanding of nutrition, health and disease.

Organised by: Tianjin Municipal Bureau of Public Health, Tianjin Institute of Hygiene and Environmental Medicine, Chinese Nutrition Society, Asia Pacific Clinical Nutrition Society, Asia Pacific Health Nutrition Association.

Organising committee: Qu Xue-shen (Honorary Chair), Di Gui-zhen, Gu Jing-fan, Guo Ze-yu, Bridget Hsu-Hage (Secretary), Widjaja Lukito (Treasurer), Mark Wahlqvist (Chair), Gayle Savige, Dan Stroud, Naiyana Tikky Wattanapenpaiboon.

I. Ethnicity and body composition

Plenary Lectures

The imperative of gold standard methodology as a basis for ethnic comparisons of body composition

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Gold standards in body composition

Since the landmark concepts of Wang et al, in which different models of body composition have been given a strong biological and structured basis, what can be measured, and what we should strive to measure have become much clearer. The molecular, cellular and tissue/organ compartments all have strong clinical and health implications, for which many different techniques of body composition measurement are available.

At the molecular level, total body protein is measurable by neutron activation, total body water by dilution techniques, and something approaching triglyceride fat is assessed by DEXA.

At the cellular level, ECF is also measurable by dilution techniques, and the cell mass is approximated by gamma counting. The structural materials of the skeleton are also measured by DEXA.

At the organ level, exciting advances in CT and MRI techniques have enabled organ volumes, particularly of visceral fat, to be measured.

However, a gold standard technique involves more concepts than a mere capacity to measure a particular component of a particular compartment. Issues arise of cost, portability, side-effects, applicability, and availability. The assumptions associated with each technique need to be clearly understood, and, not least, the role which these assumptions play in each human group or individuals who are measured.

Race, ethnicity and body composition

"Race" is characterised by a handful of phenotypical features, of which body composition is but one group, but genetic techniques have undermined the scientific validity of this categorisation. In general, phenotypic differences between classically described racial groups are only slightly greater than those which exist between nations, and both of these are small compared to the genetic differences within a local population.

Biological and genetic factors do not underlie ethnicity or culture, and it is common to produce biological explanations when the variable is politically or socially determined.

Recently, Senior and Bhopal have recommended that we should recognise that all current methods of classifying ethnic groups are limited, and that reports should state explicitly how such classifications are made. The potential for individual investigators to impose their personal values and ethnocentricity should be recognised. In considering differences in body composition between groups, consideration should be given equally and simultaneously to socio-economic, cultural or genetic factors.

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Body composition and disease: is there anything new to be learned?

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The observation that disease has an effect on the tissues of the human body is as old as medicine, itself, and was not lost on preliterate and pre-technological societies. Primary changes in the amount, proportions or quality of total body mass, specific organs and specific tissues constitute pathologies; conversely, changes in body composition secondary to and conditioned by diseases are myriad. The classification of most of the associations has been roughly addressed. Nutritional and dietetic therapeutics allows us to intervene to change proportions of fat and lean, while surgery provides some leverage to modify and reconstruct organs and appendages and also to remove excess fat. With respect to these secondary changes due to illness, however, one must determine whether they are generally

detrimental or adaptive/ accommodative before deciding to intervene. In the context of diet, body composition and ethnicity, ethnic groups differ with respect to their susceptibility to certain diseases and to the severity of their expression. Moreover, differences among different races in body composition are being documented systematically. The future holds in store the ability to analyse the molecular and chemical composition of the body. And we shall be able to focus not merely at the whole-body level, but at regional, segmental and even cellular loci. What must be kept in perspective is ensuring accessibility of the emerging technology to developing nations, as that is where the greatest diversity of both pathology and ethnicity is to be found.

Body composition in the aged: its relevance to functional outcomes

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Ageing is accompanied by changes in body composition - a reduction in fat free mass (FFM), which includes total body water, protein and bone mass, and an increase in fat mass (FM). Ageing is also complicated by reduction of physiological reserves, which lead to unfavourable changes in functional status. Frailty is more prevalent amongst the aged than their younger counterparts. Given that protein and bone mass constitute probably two of the most important nutritional reserves in the aged, it is therefore plausible that a

reduction in these two lean tissues partly contributes to frailty and its adverse health outcomes, which range from falls to institutionalisation and death. It is necessary to identify frailty which can be prevented or reversed before it becomes irreversible. Underlying body compositional changes which may result in falls and infectious diseases should be recognised. Maintenance of desirable body composition in the aged would help maximise functional status and health outcomes.

Nutrition deficiencies in the Asia Pacific region

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The twentieth century is marked for its impact on Nutrition not only because of its two world wars, but also by its rapid technological development and immense urbanisation.

The countries in the Asia Pacific region, which have fallen or still fall into the broad category of developing countries have had food shortage, famines, population pressures and poverty. In the developmental process, while famine is eradicated, population growth decreased and poverty slowly alleviated, invariable features

have been the migration of populations from rural to urban areas and the influence of communication technology.

These development challenges have been met in varying degrees and led to rising affluence, an aging population, food cultural shifts and environmental degradation. One of the consequences of this developmental transition is a changing profile of nutrition deficiencies, which continue to contribute to classical deficiency states and now as well as CNCD (chronic non-communicable diseases).

Diet and cardiovascular disease in the Asia Pacific region

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There are major changes in the dietary intake patterns of countries in the Asia Pacific region in relation to changes in the trends of mortality due to cardiovascular disease. Cardiovascular disease constitutes the major cause of mortality in many of the countries in the region. The mortality rate for coronary heart disease (CHD) has been on the decline since the mid 1960s in some countries such as Australia, New Zealand and Japan, while the decline in other countries including Singapore and Hong Kong appear to be occurring

about two decades later. In countries, other countries like Malaysia and China show an upward trend for CHD mortality. Nonetheless, the mortality rates due to CHD in New Zealand, Australia, Singapore followed by Hong Kong rank among the highest in the region. In China, Taiwan and Japan, cerebrovascular disease remains a major cause of death, although the latter two countries have undergone significant decline in stroke death rate since 1970.

The intake of fat from animal products, fish and vegetable oils need to be considered in the light of current knowledge of the different atherogenic and thrombotic effects of various fatty acids. Countries which have a higher mortality from CHD tend to have a higher intake of fat calories and proportion of fat from animal products. Related issues include the prevalence of hypercholesterolaemia and overweight in the various countries. Intakes of

other items with CVD implications in the region such as soybeans, dietary antioxidants like vitamin E and β -carotene, and alcohol consumption are also of consequence.

The wide dietary scope covering populations from diverse socio-cultural backgrounds and at different economic and technological development poses several challenges. Future research must be directed towards improving datasets for future decision making.

Diet and cancer in the Asia Pacific region

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The relationships between ethnicity and nutrition are evident in the Asia Pacific Region, and there are extraordinary contrasts in the diets of its populations. The past ten to fifteen years has seen a large increase in studies of diet and cancer, especially in China and Japan, and the attempt to relate diet to the large variation seen in cancers of many sites. Rapid culture change has occurred in many countries and has been accompanied by new technologies, new industries and new food patterns. Cancers previously uncommon in Asia have increased with affluence and the adoption of more "Westernised" diets among sections of the population. Changes in diets have occurred with migration, and the evolution of cancer incidence following migration from China and Japan to North America has been comprehensively

investigated. Studies of migrants, such as the Japanese in Hawaii and Europeans in Australia, suggest that many of the differences in cancer patterns among populations may be provisionally attributed to dietary factors, but much remains to be discovered. More than anywhere else, the Asia Pacific region offers opportunities for studies to better understand dietary carcinogenesis. To do this more information is needed about its culturally diverse populations, and should include dietary studies, and also cancer registration and expertise in nutritional epidemiology and environmental carcinogenesis. There is an opportunity in this region to develop new culturally based approaches to cancer prevention.

Anthropological view of food and health

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Humans seek food not nutrients. Although foods stimulate the taste, visual, thermal and tactile senses, it is the mental representation of foods that makes us decide whether certain foods are edible or poisonous, liked or disliked. We often confuse preference with liking a food. Foods may be preferable for health or economic reasons. However, liking foods is more of a hedonic reaction. Furthermore, liking or preferring a food must be taken within an appropriate context, often specified by culture. Clearly, food choice influences nutrition and health status. This is why nutritionists become so pre-occupied with the determinants of food choice.

The determinants of food choice most often discussed are availability and economic factors. In addition, there are powerful biological and cultural determinants of food choice.

Among the biological influences are certain innate taste biases (preference for sweetness, possibly for caloric availability, and aversion to bitterness that may be related to association with toxins), and the often observed responses of neophilia that would drive us to try new foods and of neophobia that would make us fear them. There are also inherited metabolic characteristics of individuals and ethnic groups, such as lactose intolerance which curbs the consumption of milk in some populations.

The impact of culture on food preferences is immense in magnitude and in its health consequences. Some cultural influences are of no nutritional significance, having to do with who handled the food; others may have negative consequences often in response to infectious diseases in infancy; but there are many culturally-linked practices that have positive nutritional and health impact.

Evaluating fat consumption trends in Malaysia

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Fat consumption trends in Malaysia have gradually undergone major changes in recent years. While coconut oil consumption predominated about three decades ago, palm oil and its fractions have evolved as the dominant edible oil in this multiracial population today. Dietary fat energy approximates 25% of the total energy intake with a polyunsaturated/saturated fatty acid ratio of 0.3. Fatty acid analysis of duplicate 24 hour recall food samples from segments of the population shows that the composition is largely palm oil related: high palmitic and oleic and moderate linoleic. Often, lauric + myristic fatty acids make up 7–10% of the composition suggesting the continued consumption of coconut oil largely as coconut milk

and used to flavour traditional recipes. Dietary cholesterol intake is less than 300 mg/day. The availability of linoleic acid (about 3% energy) seems moderate whereas dietary omega-3 fatty acids are usually below optimum. The implications of this fat consumption pattern on blood lipid and lipoprotein levels and related coronary heart disease risk have not been properly evaluated. These pertinent public health questions are presently being assessed through an ongoing epidemiological study evaluating dietary habits, fat consumption trends and fatty acid composition for their impact on coronary heart disease risk factors in an urban Malaysian population.

Uni-ethnicity and environmental plurality - studies in Chinese food and health

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The study of Chinese living in China and abroad provides a unique opportunity to examine the relationships between food and health in a population which is relatively homogeneous genetically. This means that variation in CVD risk profile observed between the Chinese populations in the different countries, and centres within the one country, is likely to be due to environmental differences. Food intake is potentially one of the most important environmental factors related to variation in CVD risk disease profile. The Monash Nutrition Research Group (MNRG) is studying food consumption patterns of Chinese populations living in China and Australia, and is examining factors associated with changing food consumption patterns at both individual and population levels.

Southern Chinese are a major donor population for overseas Chinese and are themselves ethnically diverse, as characterised by dialect spoken at home. Food consumption patterns of southern Chinese, unlike their northern counterparts, are traditionally high in

rice accompanied by pork, fish, leafy greens, soups, and tea. Melbourne Chinese show a significantly lower intake of all these food items. The food consumption pattern of Melbourne Chinese is undergoing inevitable change and acculturation towards that of mainstream, but that is also changing, Australia. Traditional foods are replaced with wheat products, red meat, non-leafy type of vegetables, nonalcoholic beverages, and coffee. The nutrient intakes and food sources of nutrient also are changing.

These observations illustrate the socio-environmentally dynamic nature of food habits, conventionally regarded as static. The motivation for native southern Chinese populations to make changes to their eating practices may differ from that of self-selected Chinese immigrants to Australia. The consequences of changing eating practices in the two groups, drawn from different locations and socio-economic backgrounds, will merit further enquiry.

Short communication

Body mass index of young adults in China

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Body mass index of young adults aged 20 to 45 years was observed in connection with household income, energy and macronutrient consumption. The sample consisted of 8477 urban and 20911 rural subjects, a part of the 1992 China national nutrition survey.

The mean values of BMI were 21.5 and 21.9 for urban males and females, 21.1 and 21.5 for rural males and females. Inhabitants of three big cities presented a higher BMI value than the national

averages. Undernourished people (BMI < 18.5) accounted for 9.0% of the urban and 8.0% of the rural populations, and the overweight (BMI > 25) constituted 14.9% and 8.4% respectively.

Across communities, the proportion undernourished is inversely related to the average energy intake, and the overweight proportion is positively related to the dietary fat intake in rural populations. Recent trends in BMI change in China are connected to food consumption.

Body composition of different ethnic groups in South Africa

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Anthropometric information from the three main ethnic groups in South Africa, namely Africans, Whites and Coloureds, collected during the past five years and covering the age groups 0 to 64 years of age, were compared.

Prevalence of underweight for age (-2 SD NCHS, WHO) was low for white children (3%) under two years of age whilst coloureds and Africans displayed rates double that observed for their counterparts. Prevalence of overweight in this age group was similar namely 5%. No difference was observed between urban and rural children or between males and females.

With increasing age however, marked differences in body weight were observed between ethnic groups, males and females

and between urban and rural groups. Although the prevalence of overweight increased in all three ethnic groups with age, more whites tend to become overweight than either Africans or Coloureds (45%, 38%, 24% respectively). More rural females were found to be overweight than urban females (58%, 30% respectively). Obesity on the other hand was found to be almost two times as prevalent in urban than rural females (58% and 30% respectively) with the highest prevalence recorded in the African females (African 60%, Coloureds 44%, Whites 22%). This is in contrast with the white South African male who has a higher prevalence of both overweight and obesity than his ethnic counterparts.

Ethnicity and nutritional status: a comparison of Indonesian and Dutch underfive children

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A cross sectional study to compare the nutritional status of Indonesian and Dutch underfive children was conducted in Jakarta, Indonesia.

A total of 168 Indonesian underfive children from high socio-economic class were recruited into this study. Their mean age, height and weight were 45.68 ± 7.57 months, 101.5 ± 5.4 cm and 17.2 ± 3.3 kg respectively. Thirty-two Dutch under-five children who lived in Jakarta were also recruited for comparison. Their mean age, height and weight were 45.22 ± 9.52 months, 102.6 ± 8.1 cm and 16.2 ± 2.7 kg respectively.

When height and weight were compared to the NCHS reference population, the Z score revealed that the nutritional status of both the Indonesian and Dutch children were equal to the NCHS American standard.

In this study, we observed that the nutritional status of Indonesian and Dutch underfive children living under the same socio-economic circumstances was similar. It was concluded that Indonesian underfive children have the same genetic growth potential as their western peers.

Body mass index as predictor for body fat: comparison between Chinese and Dutch Adult subjects

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The relation between body mass index (kg/m^2) and body fat from body density (determined by the underwater weighing technique) was compared in a group of Chinese and Dutch healthy subjects in relation to sex and age. The Dutch group was selected in relation to the Chinese group in that age, weight, height and body mass index did not exceed the maximal observed values of the Chinese subjects. Mean weight, height and body mass index was higher in the Dutch group, but body fat from density did not differ between the groups. Body fat predicted from body mass index, age and sex did not differ from the value obtained by densitometry in both countries. The

correlation between measured body fat and predicted body fat was 0.84 ($p < 0.001$) in the Chinese and 0.90 ($p < 0.001$) in the Dutch. The difference between measured and predicted body fat was related to the level of body fatness ($r = 0.55$, $p < 0.001$), but did not differ between the countries. In different age groups there were slight differences in the measured minus predicted values of the countries, but these differences lessened after correcting for differences in the level of body fatness in each age group. It is concluded that the relation between body fatness and body mass index is not different between the two studied populations.

Body fatness in Chinese in Southern China and Melbourne

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Epidemiological studies have shown consistently that body fatness is positively related to the occurrence of CVD disease, CVD and total mortality, particularly in the affluent populations. Body fatness has emerged as important predictors for most of the CVD risk factors in a study of Melbourne Chinese. We present here the body fatness distribution and its socio-demographic determinants in four Chinese populations, of which the relative affluent Melbourne Chinese will be compared.

We examined 1474 adult Chinese (835 men and 638 women) representatively sampled from Melbourne, Australia (271 men and 269 women), and three counties in Guangdong Province of the People's Republic of China (Chauzhou-202 men and 111 women; Meixian-169 men and 140 women; Xinhui-192 men and 118 women). A standard protocol was used to measure body weight and height, the waist circumference at the level of umbilicus and the maximal hip diameter. Body mass index (BMI) was calculated and the Bray's classification for underweight, acceptable weight, overweight or obese was used to describe total body fatness. Waist-to-hip ratio (WHR) was used to assess abdominal body fatness. The questionnaire was adopted from the NHF national survey. Subjects also received a standard CVD risk factor assessment.

In all four populations, BMI is highly and positively associated

with WHR. Melbourne Chinese men had a mean WHR higher than that of all three populations in China; no significant differences were found among the three male populations in China. For women, Melbourne Chinese had a higher mean WHR than the Chauzhou in China; again no significant differences were found among the three female populations in China. There was no significant difference in BMI among the four male populations. Melbourne Chinese women, however, had a mean BMI higher than that of their Chauzhou and Meixian counterparts; no significant differences were found among the three female populations in China. These results were age, education level and occupational status adjusted.

Our data indicate that Chinese women living in Melbourne had a relatively higher body fatness compared to their counterparts in China and that overweight, an indicator of increased total body fatness (BMI), is more prevalent in a population living in a relatively affluent society. In Chinese populations where the prevalence of obesity is almost zero, individual differences in abdominal fatness, attributable to age, education level or occupational status, appear to have a greater importance than differences in the population mean. Affluence, insofar as the non-obese Chinese population is concerned, probably has as much, if not more impact on body fat distribution as on total body fatness.

Total body protein change in growth hormone deficient (GHD) adults on recombinant human growth hormone

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Objectives. The study aim was to assess whether total body protein is reduced in adults with growth hormone deficiency (GHD) and to study the effect of growth hormone (GH) therapy using a recombinant product known as genotropin on total body protein (TBP) in GHD adults.

Design. The study was divided into two parts: Part I was of double-blind, parallel design with patients randomised to receive either genotropin or placebo for 6 months. Part II was an open treatment with genotropin in all patients for a further 6 months.

Patients GH adults, which were defined as isolated or part-of-hypopituitarism, aged 18-64 years, male ($n = 34$) and females ($n = 23$) were included in this study. Seventy-five healthy controls, matched for age, height and weight, were also included in this study.

Method. Total body nitrogen (TBN) was measured by in vivo neutron activation analysis (IVNAA) at baseline, 6 and 12 months. Measurements of TBN were standardised for age, sex and height by calculation of a nitrogen index (NI).

Results. GHD adults and healthy controls, both males and females, did not differ in age (40.2 vs 40.6y), weight (76.8 vs 80.7kg) or height (176.2 vs 172.4mm), but mean body mass index (BMI) of male patients was significantly greater than that of male healthy controls (24.6 vs 27, $P < 0.05$).

GHD adults did not have a depleted TBP compared to healthy controls (11.3 vs 12.2 kg in males, 7.5 vs 7.9 kg in females); NI also did not differ between GHD adults and healthy controls (0.98 vs 1.01 in males, 0.93 vs 1.00 in females).

At the end of 6 months, the group receiving GH therapy exhibited a trend towards an increase in TBN [mean \pm SEM: 1.65 \pm 0.08 kg (baseline) vs 1.70 \pm 0.09 kg (6 months), $p = 0.05$] and a significant increase in NI [0.94 \pm 0.03 (baseline) vs 0.99 \pm 0.03 (6 months), $P < 0.05$]. The placebo group demonstrated no significant change in either TBN or NI.

At the end of 12 months, the group receiving GH therapy for twelve months demonstrated a significant increase in both TBN [1.65 \pm 0.08 kg (baseline) vs 1.77 \pm 0.09 kg (12 months) $p < 0.01$] and NI [0.94 \pm 0.03 (baseline) vs 1.01 \pm 0.03 (12 months), $p < 0.05$]. The group receiving GH therapy for only 6 months also exhibited a trend towards an increase in TBN [1.46 \pm 0.08 kg (baseline) vs 1.52 \pm 0.08 kg (12 months), $p = 0.05$] and a significant increase in NI [0.96 \pm 0.03 (baseline) vs 1.01 \pm 0.03 (12 months), $p < 0.05$].

Conclusion. In this study, TBP in GHD adults was comparable to normal values. After GH treatment, TBP increased significantly, suggesting that long-term GH therapy impacts favourably on TBP stores in GHD adults.

The relation of middle-aged cadres' body fat content to lipidaemia, blood pressure and other disorders

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The body fat content (%BF) of middle-aged cadres, obesity prevalence and the relation of %BF with blood lipids and some diseases has been assessed. The BFA-100 body fat analyser was used to measure %BF; the principle of this instrument is bioelectric impedance. Male %BF > 25.0 and female %BF > 30.0 were regarded as obese. Cadres ($n = 320$) aged 35-59 years were measured: males ($n = 169$) were aged 47.9 \pm 7.1, females ($n = 151$) were aged 50.3 \pm 7.7. The %BF of males and females were 23.4 \pm 8.7 and 35.0 \pm 6.6 respectively, using BF criteria. The obesity prevalences for males and females were 43.8% and 75.5% respectively. Blood lipids and blood pressure (BP) were measured in males and the disorders of

hyperlipaemia, hypertension, coronary heart disease, hepar adiposum (fatty liver), diabetes, cholecystitis and cerebral infarction documented. The results showed that %BF was positively correlated with Apo-B (the marker opoprotein of low density lipoprotein and BP, and negatively correlated with Apo-A1 (the marker opoprotein for high density lipoprotein). There were differences in triglycerides, Apo-A1, Apo-B and BP between obese and less fat people, but there was no difference in total cholesterol between the two groups, except with cholecystitis. The rate of all documented disorders was higher in obese people than in those with a lesser %BF. Thus, in Beijing Chinese the measurement of BF has useful predictive value for disorders of increasing prevalence.

Multi-frequency measurements of bioimpedance are more effective than single-frequency measurements

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Single frequency measurements of bioresistance at 50 kHz, R_{50} , are used extensively for estimating Total Body Water (TBW) in human subjects employing the known correlation between TBW and H^2/R_{50} , where H is height. Equipment suitable for routine measurements of bioimpedance at multiple-frequencies has not been available until quite recently and it is now possible to easily determine F_c , the characteristic frequency, and R_c , the resistance at F_c .

The Cole-Cole theory makes several predictions. One is that measurements at multiple frequencies will lie on a semi-circle when

plotted as reactance versus resistance; this was demonstrated experimentally by Settle¹ et al in 1980 and confirmed again in more recent work². The theory defines the quantities R_0 and R_{∞} , the resistance at zero and at infinite frequency respectively. The theory predicts two correlations, one between Extra-Cellular Water (ECW) and H^2/R_0 , the other between TBW and H^2/R_{∞} . It is difficult to convincingly demonstrate these correlations in normal subjects, but there are several papers that have now found these correlations³.

A lesser known prediction of the theory⁴ is that the correlation between TBW and H^2/R_c is better than the correlation between TBW and H^2/R_{50} . This prediction can be explained as follows. The theory predicts that at F_c the measured resistance, $R_c = \frac{1}{2} (R_0 + R_{50})$. Since R_0 and R_{50} are proportional to ECV and TBW, the same combination of water volumes is measured for every subject. However, $R_{50} = R_c + \delta$, where δ is a quantity that varies between subjects. Hence, at 50 kHz a different combination of water spaces is measured for each subject. Bioimpedance data from human subjects has been analysed to estimate the standard deviation of δ . This value implies that the SEE from correlations between TBW and H^2/R_c will up to 1% better than the SEE for TBW and H^2/R_{50} , which is typically 3 - 6%. This is consistent with the improvement reported by Cornish et al⁴ who measured bioimpedance and D₂O dilution data in rats.

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Multi-frequency bioelectrical impedance for the prediction of total body water and extracellular water: validation in four different (ethnic) groups

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Multi-frequency bioelectrical impedance (MFBIA) can be used in the assessment of body water compartments. At low frequency body impedance is related mainly to extracellular water (ECW) and at high frequency body impedance is a measure of total body water (TBW). Body weight and body height were measured in the fasting state in different groups of healthy adult males and females from The Netherlands, Northern Italy, Ethiopia and China. MFBIA was measured at frequencies ranging from 1 kHz to 100 kHz. TBW and ECW were determined by dilution techniques with deuterium oxide and bromide respectively. The relation between TBW and ECW as measured by dilution technique and impedance index ($\text{height}^2/\text{impedance}$) at low and high frequency was not different between the four populations. When a prediction formula for TBW and ECW from impedance index, developed in another (Dutch) population was applied to the four groups, the differences in predicted and measured TBW and ECW were only small and not significant between the populations.

The residuals (measured minus predicted values) for TBW and

ECW were correlated with TBW/height ($r = 0.29$, $p < 0.01$) and ECW/height ($r = 0.48$, $p < 0.01$) respectively, parameters that can be regarded as crude measures of body build.

It is concluded that MFBIA is an appropriate technique to predict body water compartments. Difference between (ethnic) groups can be partly attributed to differences in body build.

| | Ethiopia | China | Italy | Netherlands |
|-------------------------------|-------------|-------------|-------------|-------------|
| Age (years) | 34.2 (6.3) | 31.5 (6.4) | 22.0 (2.0) | 31.4 (4.5) |
| Weight (kg) | 56.4 (10.1) | 58.3 (10.2) | 64.6 (11.1) | 74.4 (13.5) |
| Height (cm) | 163 (9) | 165 (7) | 170 (10) | 176 (10) |
| BMI(kg/m^2) | 21.3 (3.4) | 21.3 (2.6) | 22.2 (2.5) | 24.1 (4.8) |
| TBW (kg) | 26.9 (5.2) | 34.7 (5.9) | 35.6 (7.4) | 39.7 (7.0) |
| ECW (kg) | 11.7 (1.6) | 13.9 (2.3) | 14.1 (2.5) | 16.2 (2.4) |
| δ TBW (kg) | -0.5 (1.7) | -0.3 (2.0) | -0.1 (2.2) | -0.6 (2.2) |
| δ ECW (kg) | -1.0 (1.0) | -0.9 (1.3) | -1.1 (0.9) | -0.3 (0.9) |

BMI: body mass index; δ TBW: measured minus predicted TBW; δ ECW: measured minus predicted ECW.

An improved water displacement method (IWDM) for body measurement and its application

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In order to solve the problem of estimating body fat content of obese people and increase the measurement accuracy for body fat, an improved water displacement method (IWDM) was established. A highly sensitive human body volumeter added to a breath oxygen procedure, are the main features of the IWDM. The standard deviation of a single observation of body fat by IWDM is 0.1 kg, which is lower than the 0.36 kg for the ordinary water displacement method. The body fat content of 20 children aged nine, 73 obese

outpatients and 51 controls were estimated by IWDM successfully. The body fat content of the male and female obese groups was 27.7 ± 5.0 (19.7 - 40.0)% and 38.7 ± 5.9 (27.5 - 49.2)%, respectively. The body fat contents of a male non-obese employee group, a male weight lifter group and a female swimming group were $16.4 \pm 3.8\%$, $10.8 \pm 4.8\%$ and $17.2 \pm 2.7\%$, respectively. IWDM should reduce the measurement error of body fat and expand the applicable range of the "Density Method".

Body composition and physical activity of institutionalised elderly Indonesians with chronic energy deficiency

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The body composition and physical activity of elderly individuals were studied. Forty elderly subjects were divided into two groups according to their body mass indices (BMI). One group ($n = 20$) had BMI $< 17 \text{ kg/m}^2$ (low BMI) and regarded as in a chronic energy deficiency (CED) state (Grade II CED by WHO criteria, above 17 to 18.5 is Grade I), and the other group ($n = 20$) had BMI values between 22 to 25 kg/m^2 . Body composition was measured using skinfold thickness and bioelectrical impedance analysis (BIA). The Durnin and Womersley table was used to estimate fat mass (FM) from the sum of four skinfold thicknesses, namely biceps, triceps, subscapular and suprailiac. For BIA, two formulae were adopted to calculate fat free mass (FFM); they were the Lukaski and Deurenberg equations. Results obtained from these three formulae were compared. Physical activity level (PAL) was estimated on the basis of recorded daily physical activity patterns, and calculation of energy expenditure was based on values reported by FAO/WHO/UNU.

The Durnin and Womersley formula provided the highest value for FM. In elderly subjects with CED, FM calculated by the Lukaski equation was $4.2 \pm 1.2 \text{ kg}$ (when height was used as denominator) and $3.7 \pm 2.9 \text{ kg}$ (when armspan was used as denominator), higher than that by the Deurenberg equation. This was not so in the elderly subjects with a normal BMI. FM values derived from the Lukaski equation approximated those derived from the Durnin and Womersley equation. The discrepancy between the Lukaski and Deurenberg equations was less with an increase in FM.

Both groups had a similar PAL [$1.3 \times$ basal metabolic rate (BMR)]. Elderly subjects with CED had the same level of activity of daily living (ADL) as those with normal BMI. Although appropriate formulae to calculate FM in elderly Indonesians are not available, these findings suggest that the Lukaski equation is an acceptable formula to do this. The cut-off point to define CED proposed by James and colleague is not sensitive enough to detect perturbations in ADL of elderly Indonesians.

The agreement of three different methods in the estimation of percent total body fat

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Percent total body fat (%BF) assessed by three different methods was compared in a representative population of apparently healthy Anglo-Celtic Australians. Four-skinfold thickness measurement (SKF) and single-frequency bioelectrical impedance analysis (BIA) were performed on a total of 477 subjects (211 men and 266 women), aged 26-84 years. %BF estimated by SKF was derived from Durnin and Womersley's table, and Lukaski's formula was used to calculate %BF estimated by BIA. Dual energy X-ray absorptiometry (DEXA) using Lunar DPX densitometer was performed in a subsample of 68 men and 137 women.

There were significant differences between %BF estimated by BIA and DEXA or SKF. Mean differences between %BF estimated by DEXA and BIA (DEXA-BIA) were $3.7 \pm 5.6\%$ in men and $7.8 \pm 6.0\%$ in women, while those between SKF and BIA (SKF-BIA) were $3.9 \pm 5.5\%$ in men and $4.3 \pm 5.2\%$ in women. A significant difference between %BF estimated by DEXA and SKF (DEXA-SKF, $3.1 \pm 5.6\%$) was also found in women, but not in men. In addition, there

was a reduction in the agreement between %BF estimated by DEXA and SKF with increasing %BF averaged of the two methods. Similar observations were also made between BIA and DEXA, and between BIA and SKF only in women, not in men. In contrast, the agreement between BIA and SKF in %BF estimation in men was improved with increasing %BF.

In conclusion, significant differences in %BF estimated by BIA, DEXA and SKF were observed in the present study. Those differences, in most cases, were not independent of body fatness. Gender differences observed in the agreement between methods may be due to differences in body fat distribution between men and women. This may result from the differential capability of methods to estimate body fat at different sites such as subcutaneous and abdominal fat. Results of this study indicate the need to identify a reference method for %BF estimation, which would be required for comparisons between populations.

Comparison of D₂O with various methods for measuring total body water in growth hormone deficient adults

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Objective. The study aim was to compare different methods of assessing TBW in growth hormone deficient (GHD) adults with the reference method of deuterium oxide (D₂O) dilutometry.

Design. TBW in GHD adults was estimated by three different methods and compared with the reference method of D₂O dilutometry.

Patients. GHD adults, males ($n = 34$) and females ($n = 23$) with either isolated or partial of hypopituitarism, aged 18-64 years, were included in this study.

Measurements. TBW has been determined from:

- Deuterium oxide dilution, the D₂O concentration was measured using a Fourier Transfer Infrared (FTIR) spectrometer.

- Resistance (R) was obtained using a BEI-101A body composition analyser (RJL-Systems Inc, Detroit, MI, USA). TBW was calculated using the manufacturers software (Bodycomp II, version 1.1; RJL System Inc) and the regression equations of Kushner and Lukaski relating TBW estimated by D₂O dilution and $[\text{height(cm)}]^2/R$ as estimated by single frequency bioelectrical impedance analysis (BIA) in normal healthy adults.
- The sum of extracellular water (ECW) determined from *in vivo* neutron activation analysis (IVNAA) and intracellular water (ICW) determined from total body potassium (TBK) as measured by potassium 40 counting.
- Fat free mass (FFM) multiplied by 0.73 where FFM was determined as body weight less fat mass (FM) as estimated from skinfold thickness (SF) measurements.

Results. BIA (RJL, Kushner and Lukaski) estimates of TBW were strongly correlated and in agreement with the diluometric reference method [RJL: $r^2 = 0.91$ (P 0.001); bias -0.8 L with 95% CI of +0.2 to -1.8L; limit of agreement \pm 6L. Kushner: $r^2 = 0.89$ (P < 0.001); bias -0.2L with 95% CI of +0.9 to -1.4L; limit of agreement \pm 7L. Lukaski: $r^2 = 0.89$ (P < 0.001); bias +1.2L with 95% CI of +1.3 to -0.2L; limit of agreement \pm 7.5L].

Estimate of TBW as (ECW + ICW) was correlated and agreed with the D₂O dilution method [$r^2 = 0.84$ (p < 0.001); bias -1.0L with 95% CI of +0.2 to -2.2L, limit of agreement +7.9 to 9.8L]. SF estimates of TBW were strongly correlated with the D₂O reference method ($r^2 = 0.89$, P < 0.001), and were significantly biased (bias -2.3L with 95% CI of -1.2 to -3.3L, limit of agreement +4.6 to -9.1L). **Conclusion.** The BIA is the most appropriate clinical method of assessing TBW in GHD adults.

A simple water displacement method of measuring the change of body fat and water during bed rest

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The simple water displacement method (SWDM) of measuring the change of body fat means the $\Delta F = C_1 (V_{t_1} - V_{t_2}) - C_2 (M_1 - M_2)$ formula, where ΔF is the change of body fat, V_{t_1} , V_{t_2} and M_1 , M_2 represent total human body volume and body weight before and after the experiment respectively. Five male adults were studied in continuous bed rest for 16 days. During bed rest the energy intake of the subjects was 2913 ± 100 (2792–3014) kcal/d, the increase of body fat estimated by the ordinary water displacement method (OWDM) and SWDM was 1.20 ± 0.92 (0.02–2.42) kg and 1.28 ± 0.38 (1.01–1.93) kg respectively. With the "Energy Requirement =

Total Metabolic Energy - 12875 x Increase of Body Fat + 5650 x Decrease of Body Protein" formula, the range of energy requirement calculated using the data estimated by OWDM and SWDM was 771–2788 kcal/d (17.0–47.9 kcal/d/kgLBM) and 1165–1992 kcal/d (25.7–34.2 kcal/d/kgLBM) respectively. Sixteen days of bed rest were divided into 4 periods equally. With the " Δ Body Water = Δ Body Weight - Δ Body Protein - Δ Body Fat" formula, the body water loss of the successive I, II, III and IV periods calculated by SWDM was $0.62 \pm 0.35L$, $0.22 \pm 0.18L$, $0.23 \pm 0.16L$ and $0.06 \pm 0.30L$ respectively.

The adequacy of predicted body fat percent in Chinese children with Caucasian prediction formulas

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Body composition was measured by underwater weighing and by anthropometry and bio-electrical impedance in 165 Chinese boys and 150 Chinese girls, aged 7 to 17 years and living in Beijing. Until age 12 years there were no differences in body weight, body height and body mass index (kg/m²) between boys and girls, but body fat from density was slightly higher in girls. After age 12, boys had higher body weights, body heights and body mass index, but lower body fat as calculated from body density.

Predicted body fat from body mass index, body impedance and skinfold thickness was generally slightly lower compared to body fat from body density, except for body fat from impedance, which was both in boys and in girls slightly higher compared to body fat from body density. However, the mean differences were small and maximally reached 2.7% body fat in boys (impedance) and 1.7% in

girls (skinfolds). The standard deviations of the differences were within the estimation error of the used methodology and comparable with values obtained in other studies. The differences between measured and predicted values were slightly higher in the youngest and the oldest children, probably indicating invalid assumptions in the used methodologies at these ages. At the lower level of body fatness all prediction formulas systematically overestimated body fat, and at higher fat levels body fat was systematically underestimated.

It is concluded that prediction formulas developed in Caucasian subjects are generally valid in Chinese children. However, in countries with a high prevalence of low weight (low body fat) children, there may be a need for specific prediction formulas for body composition for the low body weight group.

Body fat measurement and obesity analysis of old people with different rest style in two places

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The author observed and compared body fat content, body fat distribution, energy intake and the prevalence of high energy intake

and obesity of 83 retired cadres in rest agencies (45 males, aged 67.4 ± 4.2 y; 38 females, aged 64.3 ± 3.8 y), and 47 old people in the old

flats (32 males, aged 69.8 ± 9.3 y; 15 females, aged 72.0 ± 11.4 y). Weight, waist-hip circumference, body fat content, energy intake and prevalence of high energy intake and obesity of subjects in rest agencies were higher than those in old flats. The authors considered that a high energy intake was the main cause of the higher body fat content and prevalence of obesity in the retired cadres. The authors

advised that a low-calorie diet was an effective method to reduce body fat and obesity prevalence. In this study the significance of circumference measurement in the trunk area to assess body fat content, body fat distribution and changes of body fat content was discussed.

II. Nutrition, Ethnicity and Health

Plenary Lectures

Short communication

Serum carotenoid status in Caucasian Australians (with and without Pritikin diet), and Japanese

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Knowledge about carotenoid status in health and disease has improved dramatically during the last few years. But little is known about how such status varies with food culture or ethnicity. In the present study we sought to assess the status of carotenoids in those with disparate food cultures, Caucasian Australians (on a usual or low fat Pritikin diet) and Japanese in Nagoya. The study included 20 healthy Caucasian women and 10 Caucasian women on a Pritikin diet from Melbourne and 20 healthy Japanese women from Nagoya, Japan. Fasting blood was obtained for carotenoid analysis using HPLC. Serum carotenoids are shown in Table 1. Japanese women had significantly higher serum lutein ($p < 0.001$), β -cryptoxanthin ($p < 0.001$) and β -carotene ($p < 0.001$) than did the Caucasian women (on a usual or Pritikin diet). There was no significant difference in serum lycopene or α -carotene between Japanese and Caucasians (with and without Pritikin diet). Serum β -carotene concentration in Caucasians on a usual diet was significantly higher than in Caucasians on a Pritikin diet ($p < 0.001$); fat intake may be critical for the bioavailability of these carotenoids. These findings indicate that Japanese women may have a lower risk of cardiovascular disease than Caucasian women insofar as carotenoid status is concerned. The reasons for these differences are not clear. The most likely possibility

is that Caucasian and Japanese women have different intakes of carotenoids. The second possibility is that absorption differs, perhaps because of different fat intakes. Thirdly, the catabolism or excretion of carotenoids may also be different between Caucasian and Japanese women.

Table 1. The serum carotenoids of Caucasian and Japanese women (with mean \pm SEM) nmol/L.

| | Caucasian Australians (n=20) | Caucasian Australians on Pritikin diet (n=10) | Japanese (n=20) |
|------------------------|------------------------------------|--|--------------------|
| Lutein | 291 \pm 25 | 317 \pm 45 | 877 \pm 84** |
| β -cryptoxanthin | 150 \pm 25 | 109 \pm 49 | 331 \pm 38** |
| Lycopene | 123 \pm 15 | 67 \pm 32 | 93 \pm 11 |
| α -carotene | 41 \pm 6 | 31 \pm 4 | 48 \pm 6 |
| β -carotene | 401 \pm 48 | 57 \pm 8** | 855 \pm 63** |
| Total carotenoids | 1006 | 581 | 2204 |

n is the number of subjects. The mean \pm SEM are shown. The significant differences with reference to Caucasian Australians on a usual diet, among Caucasian and Japanese are indicated by * $p < 0.01$, ** $p < 0.001$.

Dietary intakes of Singaporean Chinese

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A study was conducted in 1993 among Singaporean Chinese adults aged 18 to 69 years to obtain the mean population intakes of food energy and eleven nutrients. The data were obtained using a three-day weighing and recording method. The mean intakes of energy, protein, total fat, saturated fats, unsaturated fats, cholesterol, carbohydrate, dietary fibre, iron, sodium, calcium and vitamin A were 1974kcal, 78g, 66.5g, 27.7g, 38.8g, 340mg, 263g, 13.9g, 13.9mg, 3546mg, 493mg and 581 μ g respectively. The percent of energy derived from protein, fat and carbohydrate were 15.9%, 29.9% and 53.7% respectively, while the P/S ratio was 0.49:1. For both men and women, the mean intakes for protein, cholesterol and sodium were higher than the mean RDAs for Singaporeans while

those for energy, fat, carbohydrate, dietary fibre and vitamin A were less than the mean RDAs. For women, the mean intakes of iron and calcium were also lower than their mean RDAs. The high intakes of cholesterol and sodium and low intakes of dietary fibre and vitamin A, combined with the low P/S ratio could contribute to the high prevalence of chronic non-communicable diseases, especially heart disease in Singapore.

Findings from the study will be used as a baseline to monitor the intakes of Singaporeans towards the achievement of the national dietary targets set in 1991. Appropriate intervention programmes for the general population and specific high risk groups have commenced using a multi-pronged approach.

Cardiovascular risk factors in three communities of southern Chinese

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Obesity and anomalous serum lipids are known as the major risk factors for cardiovascular disease. The main factors for cardiovascular disease were measured on base surveys of three sub-ethnic distinctive community populations in Guangdong Province in 1989. Men and women (935) aged 25 years and over, were randomly sampled from three areas of Chaozhou, Meixian and Xinhui. A standard protocol was used to measure blood pressure, body weight, height, waist and hip circumferences. The laboratory was standardised for analyses of serum lipids by Centers of Disease Control (CDC), USA Serum total cholesterol (TC), high density lipoprotein cholesterol (HDL-C) and triglycerides (TG) were measured after a 12-hour fast. After adjusting for age, men and women in Chaozhou had the highest TC, TG, low density lipoprotein cholesterol (LDL-C) and systolic and diastolic blood pressure levels (all $P < 0.05$), while Xinhui adults had the lowest mean levels of all

the corresponding variables. Mean levels of body mass index (BMI), waist to hip circumference ratio (WHR), TC, TG, HDL-C, LDL-C, systolic and diastolic blood pressure of the three communities which were calculated as the main cardiovascular risk factors were 21 kg/m², 0.827, 6.05 mmol/L, 1.28 mmol/L, 1.33 mmol/L, 4.15 mmol/L, 118.6 mmHg and 77.9 mmHg respectively. There were no significant differences in WHR among men, HDL-C among women and BMI both in men and women between communities.

This study indicates that there are differences in blood pressure and serum lipids in these three sub-ethnic communities. The results may be due to the differences in socio-economic factors, dietary habit, heredity and education, which should be further investigated. The emphasis in policies for the prevention of cardiovascular disease in Chaozhou people is needed.

Cardiovascular disease risk profile in adult Chinese living in North Jakarta, Indonesia

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A cross sectional study of cardiovascular disease risk profile was carried out in North Jakarta, Indonesia. One hundred and six Chinese individuals (47 men and 59 women), aged 25 years and over, were recruited to collect baseline information. There was a high prevalence of overweight/obesity and hypertension, citing WHO criteria, especially in men (32.6% and 48.8%, respectively). The prevalence of "current smoker" was 12.2% for men and 3.9% for women. The prevalence of hyperlipidaemia (cholesterol ≥ 5.5 , and/or triglycerides ≥ 2.0) was 14.6% of men and 9.6% of women. Mean

values of BMI, WHR, and blood pressure were significantly higher in men than in women. Body fatness and blood pressure in women were significantly increased with age. In women, total cholesterol and LDL cholesterol were positively associated with BMI, while triglyceride was associated with WHR. These findings suggest Chinese Indonesian women have more favourable cardiovascular risk profiles than men and, that age is likely to be an important determinant for women.

Cardiovascular disease risk factors among Indian subjects living in Kuala Lumpur, Malaysia

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Several reports have shown that migrants from the Indian subcontinent have an increased risk of cardiovascular disease when settled in their new country. A cross-sectional study was carried out on coronary heart disease risk factors in a randomly selected group of 75 Indian men and 75 Indian non-pregnant/non-lactating women with ages ranging from 25 to 55 years old and living in Kuala Lumpur, Malaysia. Risk factors surveyed included hypertension, hypercholesterolaemia, low HDL-cholesterol, high LDL-cholesterol, smoking, diabetes, increased body mass index, increased waist-to-hip ratio and family history of coronary heart disease. The prevalence of coronary heart disease risk factors was higher in men than women. More than three risk factors were present in 48% of men compared to

26.7% of women ($P < 0.01$; $\chi^2 = 7.29$). Women were more sedentary than men (16% versus 5.3%). A higher prevalence of overweight was found in women (50.7% for women and 44.4% for men). The prevalence of hypertension was similar in both sexes. Cigarette smoking was observed among men only. Elevated blood cholesterol levels and higher waist-to-hip ratio were found in men than women. A higher prevalence of low HDL-cholesterol concentration (< 35 mg/dl) was found in these subjects. The results also indicate that for men, waist-to-hip ratio was a reasonable predictor of elevated triglyceride level and decreased HDL-cholesterol. In contrast, body mass index was associated with increased triglyceride level in women.

Cardiovascular disease risk factor prevalence in South Asian Melburnians

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Objective. To assess cardiovascular disease (CVD) risk factor prevalence South Asians residing in Melbourne.

Design. A population-based cross-sectional study of a representative sample of 530 people of South Asian (Indian, Pakistani, Bangladeshi, Sri Lankan) ancestry, aged 25 years and over. Subjects were systematically selected from a sampling frame generated by the Melbourne Telephone directory using a list of presumptive South Asian surnames furnished by South Asian community organisations in Melbourne.

Measurements. Measurements taken included: blood pressure, fasting plasma glucose, serum insulin and blood lipids. Anthropometric measurements, namely height, weight, waist and hip circumferences, were also taken. Body mass index (BMI) and waist-to-hip ratios were calculated. Data on some CVD risk factors such as smoking were collected using questionnaires.

Results. In the population surveyed, men and women differed significantly in their presentation of established CVD risk factors. Comparisons of prevalence (%) of selected risk factors between men and women are shown in the table.

A higher level of HDL cholesterol was observed in women, while higher levels of total and LDL cholesterol, triglycerides and serum

glucose were observed in men. No significant difference was observed in BMI (24.9±2.9 for men and 24.8±3.9 for women). Distribution of risk factors by age groups in both males and females showed that those aged 34–45 years appeared to have the highest prevalence of most of the risk factors except for self-reported NIDDM, which was more prevalent in those over 55 years in both males and females. The prevalence of NIDDM in this population is comparable to that observed in other studies of South Asians.

Conclusion. The South Asian males in Melbourne show a higher prevalence of the CVD risk factors hypertension, cigarette smoking and blood lipids, while the females show a higher prevalence of abdominal fatness.

| | Men | Women |
|--|------|----------|
| Combined high cholesterol (6.5 mmol/L) and triglyceride (2.0 mmol/L) | 11.0 | 4.3** |
| Hypertension | 22.1 | 15.6 |
| Non-insulin dependent diabetes (NIDDM) | 10.3 | 12.0 |
| General obesity | 5.1 | 9.4* |
| Abdominal obesity | 45.4 | 65.9**** |
| Smoking | 40.3 | 4.3**** |

*, $P < 0.05$; **, $P < 0.01$; ****, $P < 0.0001$.

Plasma lipids and dietary habits of Malaysian Indian subjects living in Kuala Lumpur, Malaysia

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This study aimed to determine whether the high rates of coronary heart disease in Indians living in Malaysia could be presumptively linked to effects of food composition on blood lipids. We studied the diet and consumption of clarified butter (ghee) in relation to the lipid profile of adult Indians living in Kuala Lumpur, Malaysia. Plasma lipids, glucose and anthropometric measurements were determined in 75 men and 75 non-pregnant/non-lactating women aged 25 to 55 years. A food frequency questionnaire was used to assess food intake over one year. Rice was the staple and consumed daily. The main sources of protein were fish, chicken and eggs, with

meat eaten rarely. Both males and females were unlikely to eat fruits. The frequent consumption of peanuts among women could be protective against coronary heart disease. Total blood cholesterol and LDL-cholesterol concentrations were higher in subjects from households using ghee in cooking. The consumption of the traditional Indian diet *thosai* was significantly associated with total cholesterol and LDL-cholesterol levels in men. The *chutney* which is eaten with *thosai* and contains plenty of grated coconut may contribute to the high cholesterol level in the subjects who eat *thosai* frequently.

The use of bitter buckwheat and konjac in weight reduction in obese patients with diabetes

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Bitter buckwheat is produced in the hill region of Szechuan Province, China, and has been used in traditional medicine for those with diabetes. Konjac is a wild plant, a tuber, and has been used as food, in the form of vermicelli or as a jelly sheet. These foods are rich in dietary fibre and possibly useful in weight reduction.

Ten diabetic patients with hyperlipidaemia, age 39–45, were studied. Their body weights were 10–20% above the desirable range and the average blood glucose level was 11.9 mmol/L. Five patients were given a bitter buckwheat diet, in the form of vermicelli, steamed bread, or roasted cakes, for 8–21 days; about 200g/d of buckwheat flour was ingested. Five patients were given a konjac diet, in the form

of vermicelli; about 20–30 g/d. All drug therapy was suspended.

Mean serum cholesterol levels in four cases fed bitter buckwheat flour, decreased from 7.2 to 6.6 mmol/L; serum triglyceride decreased in one case only from 1.9 to 1.8 mmol/L. In the group fed konjac, mean serum cholesterol decreased from 6.8 to 6.6 mmol/L, and mean serum triglyceride decreased from 1.9 to 1.8 mmol/L in two patients only. The blood glucose decreased to near normal.

The average weight reduction in the ten cases was 1.5 kg. The patients felt full after eating either diet and no side effects such as nausea, vomiting, abdominal pain, bloating or increased bowel movement were observed.

The effect of yogurt supplementation on the nutritional status of undernourished pre-operative colorectal cancer patients

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Colorectal cancer patients often have anorexia, nausea and vomiting due to diagnostic procedures and therapeutic side effects leading to inadequate food intake and undernutrition as well as increased energy requirements and metabolic disorders. Improvement in nutritional status prior to an operation leads to a better pre and post operative prognosis. Yogurt, a fermented milk, is easily digested and easily absorbed. Furthermore yogurt is highly nutritious and well tolerated. Transferrin is a sensitive parameter for assessing changes in protein nutritional status. To improve the nutritional status of colorectal cancer patients, an intervention study was carried out on

hospitalised pre-operative and undernourished colorectal cancer patients, for whom 3x160g yogurt plus 3x20g sugar was provided as a food supplement daily for 7 days. Anthropometric and laboratory assessments were performed at the commencement and the end of the study. There was a high prevalence of undernutrition among hospitalised colorectal cancer patients (74%). Significant increases in body weight and serum transferrin ($P < 0.05$) were observed after 7 days intervention. This finding suggests that yogurt can improve the nutritional status of colorectal cancer patients.

Nutritional risk for coronary heart disease (CHD) in 186 elderly patients in hospital

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Coronary arteriosclerosis is an important cause of death in the elderly in China. For this reason, a nutrition survey was conducted in 186 elderly patients admitted during December 1992 - February 1994 to provide better prevention and treatment.

Body composition: height was 167.1 ± 7.1 cm, body weight was 68.5 ± 10.9 kg. Fifty-two subjects had weights 10-19% higher than standard weights and their mean body fat content was $21.6 \pm 5.1\%$. Forty-seven subjects had weights 20-29% higher than the standard and their mean body fat content was $25.7 \pm 4.7\%$. Eleven subjects had a weight 30% or higher than the standard weights and their mean body fat content was $28.6 \pm 3.8\%$.

Laboratory examination: haemoglobin, total cholesterol (TC) and triglycerides (TG) were 157.8 ± 20.9 g/L, 5.2 ± 1.3 mmol/L and 1.7 ± 0.8 mmol/L respectively.

Food intake: A high fat diet is thought to contribute to obesity which is an important cause of coronary arteriosclerosis. In this population,

for those with CHD, saturated and monounsaturated fatty acid intakes were high while polyunsaturated fatty acids were low. An ω -3 fatty acid rich diet can decrease the TC/HDLC (high density lipoprotein cholesterol) ratio in plasma. Polyunsaturated fatty acids, especially ω -3, may prevent heart rhythm disorders caused by ischaemia through a change in components of the cardiac membrane and raise the threshold for ventricular fibrillation.

Dietary fibre intakes were also relatively low in CHD patients. Dietary fibre is hydrophilic in the intestine, and combines with ions and bile salts to decrease the absorption of fat. Fibre also decreases the ratio of Zn/Cu which may help prevent cardiovascular disease. In diets to prevent cardiovascular disease, it is appropriate to supply at least 10-15g dietary fibre in diet and many would say 20-30g from a variety of sources. Not only can blood lipids be optimised by diet, but tissue morphology and metabolic events favourably influenced.

Dietary intake and body composition in an urban elderly population in Beijing, China

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A cross-sectional study was conducted to investigate the relationships among dietary food and nutrient intakes, anthropometric characteristics and socioeconomic factors in an urban Chinese elderly population in Beijing, China. A total of 305 elderly individuals participated in the study with a mean age of 67.5 years.

The mean body mass index (BMI) was 25.1 ± 3.7 and 24.8 ± 4.7 kg/cm² for males and females, respectively. About 40% of males and 38% of females had a BMI above 24 and below 27.9 kg/cm² whereas 17% of both males and females had a BMI over 28 kg/cm². BMI was negatively correlated with age, so that 80% of overweight individuals

were younger than 75 years of age. However, body weight and triceps skin fold were negatively correlated with age in females only. Individuals with the highest BMI quartile (BMI > 27.3) had a significantly higher intake of meat compared with subjects in the lower BMI quartile groups ($P < 0.05$). BMI was positively associated with dietary intake of energy and protein ($P_s < 0.05$), and inversely associated with age and physical activity ($P_s < 0.05$) in multiple regression analysis. Moreover, BMI was positively associated with an individual's education level and household income ($P_s < 0.05$) in the study population.

*Deceased

The dietary survey of urban and rural inhabitants of Tianjin, China

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A dietary survey was carried out to assess food patterns and nutrition profiles among the 15-64 year old Chinese population of Tianjin.

Design: A randomised survey, with diet assessed by household food weighing plus consecutive individual three-day food records.

Setting: Tianjin, one of the three largest cities in China, includes urban and rural districts.

Subjects: A random stratified multi-level cluster sampling technique was used in the survey. Of the 5233 eligible subjects, 207 dropped out, giving a response rate of 96%.

Results: Distinct difference in dietary patterns and nutrient intakes were found between subjects living in urban and rural areas. The diet of urban people was richer in fat and high quality protein compared

with that of rural people. The percentage of energy intake from fat was about 31% in the urban diet and about 21% in the rural diet. Low intakes of vitamin A, riboflavin, calcium and zinc were found in both areas, with the situation being worse in the rural areas. Sodium intake was found to be high in both areas. Cholesterol intake was much higher among the urban people.

Conclusion: The present survey revealed that the intake of some nutrients was lower than those recommended and that total sodium intake was very high. The study suggests that an integrated nutrition intervention is needed taking account food habits and urban-rural differences in food supply, education and economics..

A longitudinal dietary questionnaire study of urban and rural area residents in Tianjin

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A longitudinal observation of three years duration on the nutritional status of urban and rural area residents in Tianjin (from 1986 to 1988) demonstrated substantial dietary change; animal foodstuff intake increased notably. Energy and protein intakes reached recommended allowances for essential nutrients, and some nutrients

exceeded the Asian and world mean intakes. Grain was still the main part of the diet with animal foodstuff a secondary part. Dietary intakes of both calcium and vitamin B₂ reached 50% of the recommended intakes.

A simple and quick method to evaluate the influence of food price policy on population nutrition and nutrition intervention

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Food Price Policy has a strong influence on a population's food choice and nutrition status, especially for low income families. Therefore, it is valuable to have a simple and quick method to evaluate its influence. Embracing the principles of nutritional rationality and economical feasibility, a mathematical model was established by means of Linear Programming to appraise the influence on and the rationality of the valorisation of particular

foodstuffs eggs and pork, in Tianjin. The 1990 data on food variety and price were used. It was found that a subsidy policy would not achieve improvement in the nutritional status of low income families. However, the concept of a "food choice space" has prospects for nutrition intervention. The conclusion is that this method can be used to judge the nutritional effect of food price policies and provide base line data of nutrition intervention.

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