

## Review

# International trends in nutritionally-related health and their implication for health policy\*

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To establish health policy which will be relevant and effectual for a decade or more, let alone the much longer term, is a challenging task for any period of human or planetary history. Presently it is more so than ever because of major demographic, economic, technological and scientific, climatic and territorial changes and uncertainties. There are various scenarios which might be envisaged for food-health relationships before global population size is expected to stabilize by about 2050, dependent on planetary health. These will reflect achieved food intakes which for many will not be optimal but realizable and food systems with varying degrees of safety, security and sustainability. Health patterns themselves are bound to continue to change from those associated with different levels of economic development to those which have more to do with locality, climate, education and equity. Every aspect of health is in some way intertwined with food and this will become more explicit. Decisions about food-health relationships will take into account the United Nations MDGs (Millennium Development Goals), but be strongly influenced by technology, affordability, sustainability and ethics.

**Key Words:** health and nutrition policy, scenario planning, food systems, well-being, morbidity, mortality

## FOOD INTAKES

What people eat is determined by many factors, especially locality (terrain, water and climate), culture (preferences, habits and beliefs), migration, transport and trade, socioeconomic factors, education (especially maternal education and communication or information systems) and governance (particularly distribution, access to resources and infrastructure, conflict resolution and food regulatory systems).<sup>1-3</sup> Once, it was dominantly local factors which prevailed, but, increasingly, it is global issues that are to the fore.

Apart from very remote and impoverished communities, or those with very strong cultural roots and practices, eating patterns are in a more rapid state of transition than at any other time in human history.<sup>4</sup> They are being driven by massive food trade, evidenced in national Food Balance Sheets (Food and Agricultural Organisation of the UN) and major changes in food technology with almost every basic food commodity now available in a derivative form (processed) at a distance from its harvest or production and with extended shelf lives. Drastic food intake changes have taken place in the past, over extended periods of time, with non-uniform survival of the species. These include times of technological innovation, as with gathering, fishing and hunting, and preservation like fermentation, curing, marinating, smoking and salting of food. The transition to subsistence agriculture or pastoral lives, from gathering and hunting and then to more and more mechanized agriculture were examples. They were associated with dependency on a narrower range of cultivated foods, but more settled existences and the vagaries of weather and territorial maintenance. There were

substantial shifts towards root vegetables and cereals with increasing refinement as the millers came along; and more dairy products as cows were milked and their milk processed and stored in various ways. Food diversity often suffered. There is anthropological evidence that, beyond infancy, achieved life expectancies of hunter-gatherers could exceed those of subsistence agriculturalists by decades.

Urbanisation has been a complex phenomenon for food habits and health patterns. It has ranged from the unfavourable poverty, filth and privation of the industrial revolution and with migration from rural communities to the favourable diverse food inputs into town farmers' markets, retail stores and restaurants, with hygiene and responsive health systems.

Against this background, the current international trends in food intake can be considered. Broadly, they are in 3 different economic settings-deprived, transitional and affluent. In the first of these, adequacy, quality, safety and

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security are relevant. In the second, quality and safety become relatively more important. In the third, quality and abundance without adequate energy expenditure are paramount.

### Values

In the first economic setting, maternal malnutrition, low birth weight, growth retardation, food borne illness and micronutrient deficiencies are characteristic. In the second, these problems may persist and be complicated by positive energy balance, especially reflected in increased abdominal fatness and the features of the metabolic syndrome with its progression towards diabetes and cardiovascular disease.<sup>5</sup> In the third setting, total and abdominal obesity become more prevalent and sarcopenia (reduced and reducing skeletal muscle mass) along with osteopenia and osteoporosis become more evident- related to inadequate physical activity and resistance exercise, poor quality (low favourable food component density) diets, and avoidance of sunlight (for vitamin D synthesis in skin and other unclear benefits of diurnal rhythms).

Each of these economic settings, their associated morbidities and their nutritional characteristics can be exacerbated or minimized by certain foods or food patterns. Of particular interest as deleterious are the increasing consumptions of refined, fatty, sugary, cured and salty foods. These include highly processed grains, root vegetables, oils and fats and sugary drinks. They, inter alia, compromise appetite regulation and do not provide their fair share of favourable food components or essential nutrients (i.e., are low in food component density). By contrast, the active inclusion of whole grains, pulses, nuts, other seeds, fruits, fungi, vegetables, fish, lean meat in small quantities, and low fat dairy products (e.g., yoghurts) provides protection against a wide range of nutritionally-related health problems.

Where they are not available or affordable, strategies to increase the nutritional value of staple foods are being developed.<sup>6</sup> Hand-in-hand with economic development through education, infrastructural provision and good governance food availability, diversity and security are being achieved in some locations e.g., South Africa, China, India, Indonesia, Brazil.

The relevant risk and protective foods can differ in different settings. For Chinese-speaking peoples, preliminary observations suggest that adverse trends may be emerging through:

- reduction of green vegetable intake
- reduction in tofu intake
- reduction in fungus intake
- reduction in organ meat intake e.g., chicken liver
- persistence of high salt (sodium) intakes
- reduced intake of Chinese tea (Oolong)
- limited use of fruits
- increased use of sugary drinks
- increased use of fatty meats with changed animal feeding practices
- uncertainty about the composition of eggs eaten
- uncertainty about the risk-benefit of milk and dairy products for previously low users
- increased use of alcoholic beverages, some novel for Chinese and with different susceptibilities and risk

profiles to Europeans (e.g., lower tolerance in women with higher susceptibility to hypertension and stroke, both a greater risk with alcohol).

These food intake questions can be considered in terms of nutrients, but this form of analysis, whilst useful, does not take account of food structure, its entire chemistry or intake patterns and associated effects on bio-availability. Efforts are underway to provide more integrated and analytically complete assessments of food intake.

In the meantime, nutrients which assume particular significance in transitional economies include;

- macronutrients
  - water for water-rich foods and as a safe beverage
  - dietary fibre in its own right and as a marker for the intactness of foods and foods of lower energy density
  - carbohydrate, especially whether from refined or unrefined foods, whether simple sugar like fructose, oligosaccharide or non-starch polysaccharide
  - lipid whether its fatty acids are saturated, mono-unsaturated, polyunsaturated of the n-3 or n-6 type or trans
  - alcohol
- micronutrients
 

especially the water-soluble thiamin (B<sub>1</sub>), riboflavin (B<sub>2</sub>), pyridoxine(B<sub>6</sub>), hydroxocobalamin (B<sub>12</sub>), folate and the fat-soluble vitamins A and D; and the elements potassium (sodium/potassium ratio), magnesium, calcium, iron, zinc, and selenium.<sup>7</sup>
- phytonutrients
 

Adequate amounts and a broad spectrum of plant-derived health-protective phytochemicals in several chemical families and from biologically different plant foods are required and this may be difficult to achieve in some settings.<sup>8,9</sup>

There are dietary pattern (e.g., rice-based), food cultural (e.g., milk avoidance, salty taste preferences), food supply (e.g., production, trade and cost of meat), food marketing (e.g., sugary drinks instead of tea and intact fruits) and other factors which account for these nutrient concerns.

### NUTRITIONAL STATUS

Nutritional status is the product of a number of factors including food intake and nutrient handling by the body. But it is much more and each aspect is undergoing change in most populations around the world. For example, it also represents:

- how we eat and what determines our eating behaviour
- our state of mind, since we eat and metabolise in relation to how we feel
- whether we are persistently or recurrently hungry because of lack of food
- our physical activity and physical fitness, because both reflect our energy and nutrient balance (what comes in and what happens to it and over what time), and partially determine our energy and nutrient acquisition and needs. Most countries are witnessing declines in physical activity and fitness.<sup>10</sup>
- our body composition, which is made up of structural elements like bone, muscle, ligaments, connective

**Table 1.** Systems affected by nutritionally-related disorder or disease (NRD)

System	Examples	Nutritional Factors <sup>#</sup>
Nervous	Cognitive impairment at all life's stages	Deficiencies of iodine, iron, folate, B <sub>12</sub> , essential fatty acids (-); Dyslipoproteinaemias dependent on apo E status (-)
Reproductive	Cerebrovascular disease	Macrovascular disease risk factors
	Movement disorders (e.g., Parkinsonism)	Oxidants - Antioxidants
	Spermatogenesis	Food antioxidant capacity (+)
Respiratory	Menstrual cycle	Phytoestrogens (+)
	Menopause	Phytoestrogens (+)
	Bronchoconstriction (asthma)	n-3 fatty acids(+)
Musculo-skeletal System	Alveolar Function - macrophages	Food antioxidants (+)
	Inflammatory arthritides (e.g., Rheumatoid)	Vitamin D (+)
	Bone health (osteoporosis)	n-3 fatty acids (+)
Gastrointestinal System	Microflora and gut function (Gastric – H. Pylori; Colonic-Chronic Inflammatory Bowel Disease - Neoplasia)	Food antioxidants (+)
		Vitamin D (+)
		Ca, P (+)
		Na effects on calcium excretion (-)
		Homocysteine (through folate, B <sub>6</sub> and B <sub>12</sub> ) (-)
		Vitamin A (deficiency and toxicity) (-)
		Fruits and vegetables (phytochemicals) (+)
		Vitamin C (+)
		Prebiotics (+)
		Probiotics (+)
Cardiovascular	Motility Disorders	Antibiotic factors (+/-)
		n-3 fatty acids (+)
		Caffeine (-)
		Polyphenolics (culinary herbs) (+)
		Ginger (+)
		Alcohol (-)
		Growth factors (+/-)
		n-3 fatty acid sources (fish & plants) (+)
		Na (-)
		K/Mg/Ca (+)
Cardiovascular	Hepato-Biliary Pancreatic BP (Blood Pressure)	Fatty fruits (olive, avocado, cocoa, red palm) (+)
		Nuts (+)
		n-3 fatty acids (+)
		Cholesterol (-)
		Phytosterols (+)
		Saturated and trans-fatty acids (-)
		n-3 fatty acids (+)
		Salicylates (fruits) (+)
		Polyphenolics (plants) (+)
		Arginine from nuts (+)
Cardiovascular	Lipids	Low glycaemic index food (+)
		Polyphenolics (+)
		Alcohol (-)
		n-3 fatty acids(+)
		Wholegrains, fruits and vegetables (phytochemicals) including dietary fibre (+)
Cardiovascular	Platelet function	including dietary fibre (+)
Cardiovascular	Endothelial function	
Cardiovascular	Glycaemic status and its consequences	
Cardiovascular	Cardiac rhythm	
Cardiovascular	Abdominal fatness	

<sup>#</sup> Favourable (+); Unfavourable (-)

tissue and skin along with other “lean tissue” like the body organs: of blood and lymph; of energy stores, principally fat in adipocytes in subcutaneous and intra-abdominal fat tissue, but also intermuscular, peri-organ, and intramuscular, along with glycogen in liver and muscle especially, and protein which can be used for energy provision. Body water is the most abundant compound. Any one of these measures of body composition may be compromised. The principle trend is currently for a combined increase in body fat (adiposity), decrease in lean mass, especially muscle (sarcopenia) and decrease in bone mass and density (osteopenia and osteoporosis), despite abun-

dant food supplies in advantaged economies. Intransigent problems of stunting (height for age) and wasting (weight for height; CED) with poverty are seen not only nationally and regionally in Africa, South Asia and parts of Meso- and South America, but within otherwise transitional (e.g., Indonesia) and affluent (indigenous Australians) economies.

- measures of bodily function which are readily related to nutrient status e.g., anaemia, muscle strength, immune dysfunction, failure of dark adaptation.

Nutritionally-related disorders which can affect any body system or organ<sup>11</sup> (Table 1):

**Table 2.** The critical international health trends affecting Nations and by which Nations affects the world.

	Relevance Nutrition
1. Changing demography	+++
<ul style="list-style-type: none"> <li>• Ageing (rapid, as much as 1 year every 3 years)</li> <li>• Migration (in &amp; out)</li> <li>• Work-Force</li> </ul>	
2. Changing climate, ecosystems infrastructure and costs	+++
<ul style="list-style-type: none"> <li>• Sustainability</li> <li>• Affordability</li> </ul>	
3. Changing health patterns	+++
<ul style="list-style-type: none"> <li>• Disappearing boundaries (travel, communications, what we accept)</li> <li>• Because of “Ways of Living”</li> <li>• New exposures (environmental, infectious agents)</li> <li>• New disease paradigms (disorders of gene expression; inflammatory disorders)</li> <li>• What is diagnosable and measurable?</li> <li>• New expectations (well-being; performance)</li> <li>• New health care providers and systems</li> </ul>	
4. Changing technology	+++
<ul style="list-style-type: none"> <li>• Individual profiling (genomics, activities behaviours and experiences, relationships, whereabouts)</li> <li>• Predictive capacity/Risk analysis and management</li> <li>• Self-diagnosis and management</li> </ul>	
5. Changing international policy	+++
MDGs (Millennium Development Goals) For children, women education, food security, infectious disease environmental sustainability, Global partnerships in Development	

However, these are usually only defined at the extremes of under-nutrition (e.g., protein energy malnutrition; or chronic energy deficiency; micronutrient deficiencies especially iron, iodine, vitamin A, vitamin D) or over-nutrition (e.g., overweight, abdominal obesity or total obesity; so-called chronic diseases like diabetes and its precursor in the metabolic syndrome, cardio-vascular disease, certain cancers, osteoporosis).

Almost all infectious disease has compromised nutritional status as a contributor. Thus, most of the Global Burden of Disease<sup>12,13</sup> is in one way or another related to nutritional status. Some of it remains poorly defined like intestinal helminthiasis and other parasitoses whose appearance is usually in conjunction with nutritional disorder. In other cases the virulence of infection, especially, viral is determined by the nutritional status of the population or its farm animals.<sup>14-18</sup>

The management of health problems (disorders or disease) may itself alter nutritional status. This may be requiring changes in food intake, bed rest or hospitalization or institutionalization, or through the use of medication with anorexic, malabsorptive, metabolic or anti-nutrient properties. Therefore changing health care may change nutritional status and is increasingly likely to do so.

Thus, nutritional status is increasingly recognized as a correctable contributor to the changing patterns of disease. Quite new is the so-called Double Burden of Disease<sup>19-21</sup> which is probably better thought of as a spectrum of Nutritionally-Related Disorders and Diseases (NRD).<sup>22</sup> It is in epidemic proportions and it is unclear how this will yet manifest itself beyond the already established problems of diabetes and cardiovascular disease. It behoves policy-makers to have regular monitoring and response

mechanisms in place for the under-pinning problems of nutritional status.

## FOOD SYSTEMS

The IUNS (International Union of Nutritional Sciences) made recommendations for a New Nutrition Science (NNS) in 2005 – the Giessen Declaration.<sup>23</sup> It encouraged a more food system approach to nutrition science, which took into account every step from food collection, harvest or production to purchase preparation and consumption. This approach would require nutrition science to develop in 3 dimensions: the biomedical, socio-economic and environmental. Perturbations in any of these dimensions may signal consequent changes in human nutritional status and health. There is a close relationship, however, between human and planetary health and it is envisaged that a less anthropocentric view of food systems may, in the enlightened self-interest of the human species, be sensible if not an imperative. Table 2 which sets out some major trends in international health, estimates that virtually every trend has nutritional relevance.

A food system must provide for food safety, food security and food sustainability:

### Safety

Food safety is of at least four kinds – cleanliness, microbiological, toxicological, and nutritional.<sup>24,25</sup>

The tighter scrutiny of food which is traded is improving domestic food standards in many food exporting countries. Food borne illness of a microbiological kind is still a major burden of disease, but is responding to preventive food hygiene strategies like HACCP (Hazard and Critical Control Point) approaches (FSANZ – www.

foodstandards.gov.au). Ingredient and Nutritional labeling of foods helps ensure that the nutritional quality of foods is scrutinized and relates to consumer expectations. Regrettably, even though most advanced economies have demanding standards on food additives and contaminants, the latter are proving to be an increasingly problematic area. This is because sampling and analytical methods may not have been equal to the task, especially when food fraud has been perpetrated; or because biological effects of some contaminants were not fully appreciated (e.g., for endocrine disruptors from pesticide or herbicide residues or plastics). Again, the epidemiology of these compounds and their health effects is poorly developed and we depend heavily on *in vitro* or animal experimental studies and their extrapolation.

We can expect that consumers will increasingly demand information about the whole food chain in relation to their food purchases or they will endeavour to retreat to more local foods, nearer to where they live so that they can use local food knowledge. This is what once obtained when people managed more of their own food supply chain.

The information will be about both how crops are grown and what animals are fed and, then, how it is processed, transported, packed and stored. This has been prompted by recent concerns about BSE, residue usage by untrained farmers, and concealed adulteration. It is also a reflection of growing consumer interest in the sustainability of the food supply.

### **Security**

Food security is partly related to food safety as outlined above, but management of food stocks in an orderly and equitable way in times of food shortage is a matter of good governance. This requires functional and responsible governments. It can also be abetted by information systems more sophisticated, available and affordable now than ever before.

These trends may give some optimism to peoples who have been plagued by adverse climate, conflict and incompetent administrations leading to food deprivation. They are strategies which can be supported by science and technology informed and guided governments.

Much is now said and resources allocated to the threats that terrorism may present to the food supply. Whilst much can be done to improve these aspects of food security, other trends need also to be addressed.

These include the competing needs for energy and food where arable land is limited.<sup>26</sup> Biofuels, especially from edible oil crops and sugar, are already pushing up food prices. The trends also include the growing shortages of water for food production and processing and the pollution of much of the world's fresh water.<sup>27</sup> They include the increasing resource costs and risks of long-distance transport of food by road, rail, sea and air.

### **Sustainability**

In the past, since the writings of Malthus, controversy has reigned in regard to how possible it will be to feed a growing world population, currently about 6 billion and possibly destined to reach about 10 billion by 2050 or thereabouts before plateauing and even decreasing (as is

the case in some countries already). That with appropriate distribution, the present world population could be fed enough energy (calories) is fairly clear. It is much less clear that all would receive food sufficiently nourishing for optimal health. Large populations would continue to depend on nutrient – poor starchy staples. Hence strategies like Harvest Plus ([www.harvestplus.org](http://www.harvestplus.org)) to improve the nutritional value of staples. Where conventional plant breeding and farming practices fall short of the needs, bio-technology, with good governance, may come to the rescue.

But what is now more pressing is climate change and the pressure that will put on the present major food-producing nations (like the USA, Canada, Europe, Argentina, Australia, China, India and Thailand) to deliver in the face of drought and other extreme weather conditions.

Already, we have seen how food prices in Taiwan during 2006–2007, have risen in response to the worst Australian drought on record.

For fishing nations and high fish-eating communities, it will be a serious eventuality when fish stocks are irreparably depleted as is projected in the next 25 years or so.<sup>28,29</sup> There will be the question of equity as well. How justified will it be for someone to have fish 6 times a week and another none, because there is not enough to go round?

Will we be satisfied with some technological solution to these dilemmas when we now know how valuable fish can be for human health? And what of increasing contamination of fish stocks with residues and mercury?

### **FOOD-HEALTH RELATIONSHIPS**

There has been a progressive broadening of the concept of food-related health which is an important trend in its own right. This has embraced well-being as a part of health, in accord with WHO definitions of health.<sup>30</sup> The more comprehensive understanding of health determinants as psychosocial and environmental as well as bio-medical and of nutritional status to reflect whole food systems also fosters more engagement by a growing range of stake-holders. A good example is the International Science Council (ICSU, Paris, [www.icsu.org](http://www.icsu.org)) initiative on “The Sciences for Health and Well-Being” which involves atmospheric and earth sciences as well as the bio-medical sciences.

#### **Well-being**

Well-being can obtain in the face of hardship, disability and disease. It is a state of mind and ability to cope with demanding situations, with minimal sense of threat or stress. It is a condition which can be altered favourably in various ways which may include personal reflection, social and physical activity, recreational pursuits like music and reading, and eating in familiar, interesting and restful environs, knowledge and skills to enhance personal health, and access to support systems in time of need,<sup>31-41</sup> The effects of well-being on NRD like obesity, diabetes and cardio-vascular disease are likely to be considerable.<sup>42-46</sup>

One reason for a greater adverse effect of “unhealthy eating”, especially on energy balance, fat distribution and its consequences, may be the compounding effects of lack of a sense of well-being. In another way, Professor Bruce

McEwen has referred to this phenomenon as untenable allostatic load, where the body response or defense mechanisms are over-loaded.<sup>47-51</sup> Yet another angle to this area of potential health advancement, linked to food intake and patterns, is the pursuit of happiness which may be ephemeral when materialistic<sup>52-55</sup> and resort to “comfort food”.

Whilst these phenomena may play a large part in the expression of international nutrition trends, it is recognized that they are poorly understood and inadequately measured.

### **Morbidities**

The several morbidities related to the spectrum of food intakes and nutritional states to be observed rarely emerge in isolation and tend to cluster as a disease pattern (so-called chronic diseases, also referred to as eco-nutritional diseases).<sup>56-58</sup> They are generally preceded by pre-disease states or disorders not clinically apparent, like the metabolic syndrome; and, in turn by clusters of risk factors. These risk factors may be several, as for cardio-vascular disease with obesity, hypertension, lipoprotein abnormalities, impaired fasting glycaemia, homocysteinaemia, increase inflammatory markers and more, but which are over-lapping for other morbidities like diabetes, certain cancers, and osteoporosis. Almost invariably, there is an adverse dietary pattern, physical inactivity and marginal resilience to varying life challenges, perhaps beginning much earlier in life, to account for these classical and emerging risk factors and pre-morbidities.

This understanding can be applied to more policy-relevant international nutritional trend analysis.

### **Mortalities**

Because disease specific mortalities are very dependent on the quality of death certification, all-cause mortality is often a more robust outcome measure. It also allows for smaller population sizes to be studied and for integrated assessment of contributors to premature or changing mortalities. This has been used to effect in the FHILL (Food Habits in Later Life Studies) of the IUNS (International Union of Nutritional) and SENECA (Survey Europe on Nutrition in the Elderly: a Concerted Action) of nutrition and ageing.<sup>58-64</sup> It acknowledges, too, that there may be common nutritional factors leading to all-cause mortality from different specific diseases. Sometimes the nutrition connection may be rather remote, but no less important; an example is nutritionally-related obesity, associated obstructive sleep apnoea and road trauma through falling asleep at the driving wheel.<sup>11</sup>

The catalogue of NRDs for trend analysis grows as indicated in the following list:

*Infectious diseases.* A recent WHO report<sup>65</sup> indicates that infectious disease are emerging faster than at any time in history. Other centuries-old threats such as influenza, malaria and tuberculosis are also thriving. It is likely that the nutritional status of the infected host, of the species and the environmental integrity of food production are implicated. Vitamin D, selenium and phytonutrient nutrition are just a few of the candidate intermediaries.

*CVD.* There are several nutritional pathways to connect the way we eat to coronary events, stroke and peripheral vascular disease.

*Cancer.* Food safety, nutrient quality of foodstuffs, energy balance and throughput, meal patterns, early life nutritional programming of genes, sunlight exposure for vitamin D synthesis in skin and more converge to change cancer incidences.

*Diabetes.* The incremental changes in food serving size, water and other nutrient densities of food and beverages, nutrient profiles (macro, micro- and phyto-), along with multi-faceted reductions in energy expenditure challenge insulin sensitivity and surreptitiously create extensive dysmetabolic states.

*Frailty.* Life-long inappropriate and under-utilization of skeleton and muscle increase in prevalence with food and beverage intakes less musculo-skeletally protective and the delicate line between too much and too little sunlight (UV) exposure (skin cancer and cataract versus vitamin D deficiency) difficult to tread. Still, some of the net frailty, proneness to fall and loss of independent living is preventable and correctable even in later life.<sup>66</sup>

*Mental health.* Mood disorders are increasing and their management is increasingly pharmaco-therapeutic with its cost and risk-benefit barriers. The nutritional, exercise and social strategies to lessen this health and economic burden are not matching the rates of emergence of the mental health problems.

*Alcohol.* There is confusion in nutrition and health circles about the benefits and risks of alcohol. This is of particular concern because of the wide-ranging potentially adverse social, economic and multi-body-system effects of alcohol, as well as those on the unborn child.

There are growing problems, in some countries like Australia<sup>67,68</sup> especially amongst young people, and young women in particular, whose alcohol literacy is immature. However, recent reports in Japan are encouraging, perhaps because of economic factors. The Nikkei Business Daily, in August 2007, surveyed Japanese in their 20s and found decreasing use and expenditure on alcohol (“a waste of money”) along with decreases in other consumer goods. Some 34.4% said they did not drink at all or drank less than once a month.

At the same time, higher alcohol consumption amongst men in China is increasing stroke rates<sup>69</sup> in a population where there is high susceptibility to stroke already. There is a lack of appreciation of the fairly linear relationship between alcohol intake and blood pressure<sup>70</sup> and with stroke. This contrast with a generally J-shaped curve for coronary heart disease with some protection at lower intakes. The populations for which alcohol intake recommendations are made need careful definition and the trends watchful monitoring.

## INEQUITIES

### *Individuals and communities*

There has been a significant trend in recent years to develop community nutrition programs in affluent societies, which has been reflected in tertiary education sector health care professional training. This has involved family doctors, nurses, dietitians, laboratory technicians, pharmacists, physiotherapists, occupational therapists and others. A driver for this has been the growing costs of tertiary and secondary health services and non-domestic nursing home care, along with improved ambulatory care. There has also been a genuine recognition of the superiority of and satisfaction with such care in many cases. It is, however, difficult to fund the nutritional dimension to community health centres and programs from the private sector without direct government support or inclusion in Universal National Health Insurance schemes (e.g., Australia). Those most in need usually are least able to pay, judging from numerous studies which show a higher prevalence of NRDs amongst the educationally and socio-economically disadvantaged.<sup>71</sup> There is also some refinement taking place in this analysis as Nutritional and Health Literacy is understood to be more immediately relevant to the expression of inequity. This particularly applies to obesity, diabetes and cardiovascular disease. However, it also applies to hunger amidst affluence as seen in nutrition surveys in Australia.<sup>72</sup>

Community programs generally bring individuals closer to the resources required to correct the inequalities in nutrition and health status. Depending on their modus operandi, they may enhance community involvement (often un-tapped and un-measured), social support networks and recruit under-utilized facilities.

Curiously, it is just these programs which are recognized in developing societies to make a difference to individual and community nutrition as with the Puskasmas network in Indonesia<sup>73</sup> and the Barangay system in the Philippines ([www.barangay.gov.ph](http://www.barangay.gov.ph)).

Not only is this approach significant on a day-by-day basis, but is strategic in times of nutritional crisis when the poor and marginalized are most likely to suffer.

In transitional economies and less socially sensitive advanced economies the community nutrition and health approach is often missing. Community advocacy can eventually ensure the community and its individuals are taken into account.

Noteworthy is the repeated finding that maternal literacy (including nutritional facility) accounts best for health and economic advancement.<sup>74,75</sup>

Not all communities respond equally to these approaches. In Australia, an indicative report on regional foods and health points to some of the critical differentiators which may include how attractive a location is to its own residents and to others (business and travellers) when it has the opportunity to be a focus for food and beverage production, processing, consumption and marketing.<sup>76</sup>

### *Cost-effectiveness*

With the growing costs of health care and, especially of diagnostic technology and pharmaceuticals, interventions ahead of disease expression and ones which draw on

**Table 3.** Millennium Development Goals: Eight Goals

- 
1. Eradicate extreme poverty and hunger
  2. Achieve universal primary education
  3. Promote gender equality and empower women
  4. Reduce child mortality
  5. Improve maternal health
  6. Combat HIV/AIDS, malaria and other disease
  7. Ensure environmental sustainability
  8. Develop a global partnership for development
- 

lower cost agricultural, horticultural and aquacultural approaches with safe and healthy foods is attractive, especially when the local economy is supported as well. The cost-effectiveness multiples may be several fold and may mean affordability or not.

There is a growing need for evaluation of how various eating patterns relate to health outcomes on a national and local basis and to what extent they account for difference in use of health services. This is a recognition of the need for food and nutrition economics

### *Accessibility*

Needless to say, there may be much knowledge available and yet it may not be accessible. The same is true of foods themselves and of nutritionally competent health services.

This is more and more so as people become dissociated from the food system. Some measures like food labelling, web-sites and the media help. Some sources are dubious or unreliable. There is much need for those who espouse evidence in consumer organisations, the education system, retailing and health care to evolve a more informative and reliable information regime. This will need to take account of inequities.

### *Role of nutrition informatics*

Nutrition informatics is rapidly evolving.<sup>77</sup> It can provide accessible and reliable information, but codes of practice and external evaluation are increasingly required to help consumers make the best use of it. It will eventually change food choice and the underlying food systems. It is one of the most powerful developments in international nutrition.

## GOALS AND TARGETS

### *MDGs (Millennium Development Goals)*

Most of the UN System Millennium Development Goals<sup>78</sup> relate in some way to food, nutrition and health. They are beginning to influence international nutrition trends for the better although much remains to be done (Table 3).

The energy crisis with the need to solve both food and energy production requirements simultaneously, for conflict avoidance, and not to exacerbate climate change will be of increasing and over-riding importance in optimizing international nutrition trends.

Targets will need to reflect the MDGs, paying particular attention to each of food safety, security and sustain-

ability with their various multidimensional inputs and outputs.

#### AUTHOR DISCLOSURES

Mark L Wahlqvist has no conflicts of interest.

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## Review

# International trends in nutritionally-related health and their implication for health policy

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## 營養相關健康議題之國際趨勢與其衛生政策之應用

在人類任何時期或是地球歷史中，建立一個能適合未來十年或更長時期衛生政策，是一項很具挑戰的任務。目前，因為主要的人口、經濟、技術、科學、氣候及地貌的改變與不確定性，使得這個任務比其往常更加艱鉅。在2050年全球人口數達到預期的平衡之前，食物與健康的關係，可想像有各種的狀況，是會依隨地球的健康而異。這些將反映出食物攝取狀況，可想而知，有許多人可能未達到理想狀態，食物系統會有不同程度的安全性、防護性與持續性。健康模式本身將與經濟發展程度而持續改變，此外，也與地域、氣候、教育與公平性更有關聯。健康的每個面向將或多或少與食物相牽扯，並且這將更明朗化。與食物－健康攸關的決定需考慮聯合國千禧發展目標，但是仍強烈受到科技、承受力、持續性及倫理的影響。

**關鍵字：**健康與營養政策、情境規劃、食物系統、安康、罹病率、死亡率