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Connected Community and Household Food-Based Strategy (CCH-FBS): Its Importance for Health, Food Safety, Sustainability and Security in Diverse Localities

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In this article, I argue that Connected Community and Household Food-Based Strategy (CCH-FBS) could contribute to the resolution of outstanding nutritionally-related health problems. The 1995 Food-Based Dietary Guidelines (FBDGs) have been customized in regions and nations, encouraging integrated food systems and culturally-sensitive food-health relationships with economic development. Climate change and diminishing fuel and food affordability have made their role in promoting food security critical. Localities with their eco-systems, communities and households, could apply FBDGs to correct mismatches between food systems, individual health needs, and environmental integrity. Improved infrastructure should allow communities and households to be usefully connected and operate with CCH-FBSs.

KEYWORDS FBDGs, eco-nutrition, new nutrition science, EBN (Evidence-Based Nutrition)

In recent times, various approaches, especially by the international food and nutrition professional community, have been developed to address

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widespread food insecurity and nutrition–related disorders and disease (NRD) (Wahlqvist et al. 2008b), problems which contribute to much of the global burden of disease (World Health Organization 2004), compromise quality of life and contribute to premature mortality (Caballero and Popkin 2002). These approaches include international and national health policies or programs (Food and Agriculture Organization of the United Nations 1993; Meerman 2008), dietary guidelines (DGs) (Clay 1997; World Health Organization and Food and Agriculture Organization 1996), and the Millennium Development Goals (MDGs) where almost all are in one way or another related to food or NRD (United Nations Development Program 2000). The Food-Based Dietary Guidelines (FBDGs) were developed in 1995 by WHO and FAO in Cyprus (Clay 1997; World Health Organization and Food and Agriculture Organization), underpinned by the best food and nutrition science available and with a broader socio-cultural vision than their DG predecessors. The goal of the FBDGs is to provide nutrition education and guidance to consumers in terms they can understand and apply to meet their nutritional goals. The FBDGs have achieved wide recognition and application at the regional and national levels (Joint WHO/FAO Expert Consultation 2003; Keller and Lang 2008; Krishnaswamy 2008; Safavi et al. 2007; Schneeman 2001; Wahlqvist and Kouris-Blazos 1999b; Wahlqvist et al. 1999b). It is difficult to know how successful they have been, but there is clearly recognition at the international organizational level that there is still much to do at all levels of economic development (Joint WHO/FAO Expert Consultation; United Nations Development Program 2000).

It seems that the translation of various food and nutrition policies into action in communities (including schools and work-places) and households (CH) has been inadequate for much of the world. There are encouraging signs of progress where CHs have taken up the food and nutrition agenda locally, at both ends of the socio-economic spectrum. This has occurred in impoverished localities in Malawi to deal with nutritional deprivation (Meerman 2008) and in communities in France and Australia to arrest the epidemic of obesity (Romon et al. 2008; Sanigorski et al. 2008); the positive dynamics of a neighborhood economy, peer support, and a critique with active response to facilities, livelihoods, and food systems have been mobilized and effectual. This situation contrasts with the relentless frustration and disappointment of unsustainable nutrient specific or medical diet-oriented approaches which have tended to dominate nutritional strategies for a generation or more. Nevertheless, the architecture, social, and infrastructural requirements for locality success still obtain and are the province of agencies and governments which are consultative with the people for whom they have responsibility.

Recognizing the importance of these relationships sets the stage for a translational advancement of the FBDGs, which is called here Connected Community and Household Food-Based Strategy (CCH-FBS) and

is represented in its entirety in Figure 1. Commensality or food-sharing is at the center of the household which gives strength to a CH approach.

The Development and Achievements of Food-Based Dietary Guidelines (FBDGs)

Food-Based Dietary Guidelines are based on the familiar idea of dietary guidelines, but FBDGs depart from them in important ways. Dietary Guidelines are essentially nutrient based (fat, alcohol, salt, sugar, calcium, iron), but expressed as food groups. As a result, this may create confusion about the term "Food-Based" since most guidelines around the world also mention foods, e.g., eat more vegetables, cereals. However, FBDGs are a more integrated way of describing the human diet, because they go beyond addressing "foods" simply as "food groups." They consider the ways in which foods are produced (as with agriculture), prepared (as with cuisine), processed (as by the food industry) and developed (as with novel/functional foods). They also take into account traditional foods, dishes and cuisine, making such guidelines more practical and user-friendly at the individual level. Thus, they have much intrinsic merit, but this may not be fully realized unless there is a process whereby they are developed in communities and households.

Following the FAO/WHO International conference on Nutrition, held in Rome in 1992 (World Health Organization and Food and Agriculture Organization 1992), most countries committed themselves to the development of National Plans of Action for Nutrition (NPAN). To address these in practical policy terms and to develop a plan for re-orientation from nutrients to foods, a World Health Organization working party met in Cyprus in March 1995 (World Health Organization and Food and Agriculture Organization 1996). At this meeting the concept and philosophy behind FBDGs was formalized and encompassed in the "Cyprus declaration." This concluded that FBDGs be developed in a cultural context and that public health issues determine their relevance. Also the declaration recognized that DGs reflect food patterns, not numeric goals, are positive and encourage enjoyment of appropriate dietary intakes that are consistent with good health.

The requisites for FBDGs to be operationalized are several, and include a broad socio-cultural approach to food and health, with sensitivity to food traditions and beliefs; major advances in food science to allow an appreciation of food component complexity and its implications for human biology; scientific studies to determine whether food patterns, food scores (like variety, traditionality, and acculturation), are predictive of health outcomes and are amenable to useful change in their own right; the application of the new discipline of nutrition informatics to nutritional epidemiology with the ability to handle large data bases which include food intakes, health outcomes, and their trends; an appreciation of the ecological implications of dietary

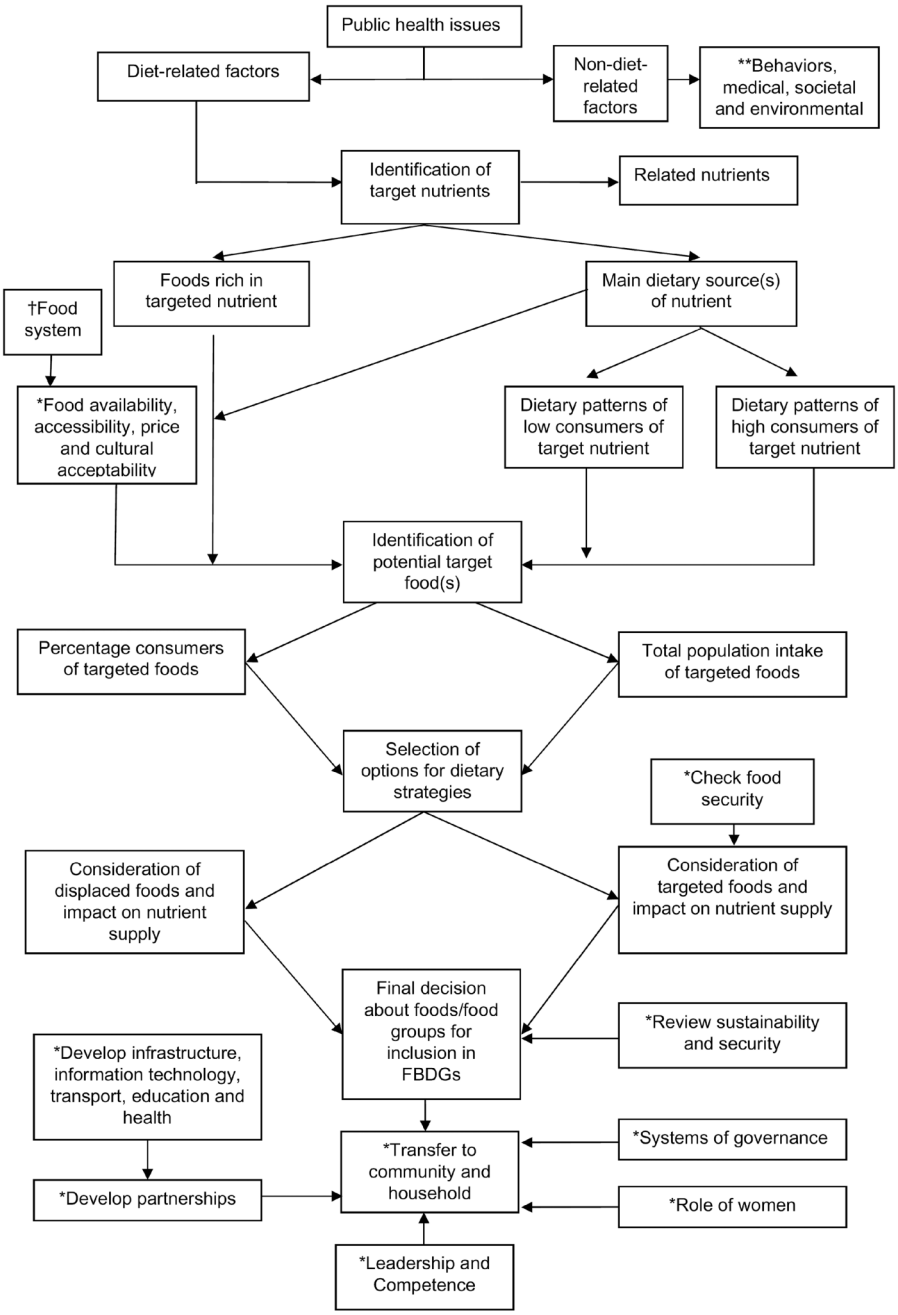

FIGURE 1 Formulating CCH-FBDGs to optimize health, to ensure safety, sustainability and security and to enhance prevention (based on the WHO/FAO Cyprus report, 1995).

*Novel additions to 1995 Cyprus report (World Health Organization and Food and Agriculture Organization 1996). **Based on IUNS-New Nutrition Science (NNS) (Beauman et al. 2005; Wahlqvist 2005a, b). †Production through agriculture, horticulture, aquaculture, biotechnology; transport; package; storage, retailing, marketing.

guidelines; and economic analysis that takes into account food system viability and consumer affordability.

Figure 1 embodies the original flow-chart to show how, using the scientific basis, concepts and requisites established in Cyprus, FBDGs could be progressed in defined populations with their own needs and NRD patterns. It starts with the public health issues at the top of the chart and allows, through various steps and options, final decisions about foods and food groups for inclusion in FBDGs (bottom center of the chart).

The FBDG initiative was set in train by an expert group which enunciated their rationale, reviewed their scientific basis, set out the principles for their local adaptation, and recommended they become integral to health policy (Clay 1997). By 1996, they were jointly published by the 2 supporting UN agencies, WHO and FAO (World Health Organization and Food and Agriculture Organization 1996).

The process of their regionalization (Western Pacific, 1999; Eastern Mediterranean, 2005) (Keller and Lang 2008; Wahlqvist et al. 1999a) and nationalization (China, 2007; Thailand, 2001; Iran, 2007; India, 2008) (Ge, Jia, and Liu 2007; Krishnaswamy 2008; Safavi et al. 2007; Schneeman 2001) was underway. Various syntheses and reviews of progress have taken place. For example, Wahlqvist and Kouris-Blazos (1999) observed that in both established and migrant communities in the region, a sense of food and nutritional anchorage in traditional food patterns had value for implementation of FBDGs; that a variety of more liquid fats, as well as foodstuffs, often encouraged higher vegetable and fish intakes while minimizing risk from adverse fatty acid patterns; and that the traditional and current increasing quest for food convenience might be handled in informed and health-promoting ways for the community at large (Wahlqvist and Kouris-Blazos 1999a, 1999b; Wahlqvist et al. 1999b). While this particular review indicates some success, it is arguable just how widely and uniformly these representations of FBDGs have been disseminated and assimilated by communities and households (Smitasiri and Uauy 2007).

A noteworthy trend in the application of FBDGs has been the emphasis on a whole-of-life approach and one which embraces the whole and extended family. For example, again in the Western Pacific, the recommendation was made to transfer as much as possible of one's food culture and health knowledge and related skills (in food production, choice, preparation, and storage) to one's children and grandchildren and to the broader community. This should include knowledge transfer through the teaching of cooking techniques (as part of survival skills) to all primary and secondary schoolchildren (Wahlqvist et al. 1991; Wahlqvist et al. 1999b). In addition, enjoyment of food and eating in the company of others, with avoidance of the regular use of energy-dense (nutrient poor) celebratory foods which are high in fat and or sugar (e.g., ice-cream, cakes, pastries, sweet drinks in European-derived food cultures, confectionery in Malay cultures and crackling

pork in Chinese food culture) were recommended in the Western Pacific (Wahlqvist et al. 1999b). Food-Based Dietary Guidelines consistently encourage a variety of low-energy-dense foods e.g., at least 20 biologically distinct foods a week drawing from all food groups (Hodgson, Hsu-Hage, and Wahlqvist 1994; Wahlqvist, Lo, and Myers 1989). Cross-cultural notions also appear as with ways to increase food variety by inclusion of healthy dishes from other cuisines e.g., tofu and leafy greens from Asia (Erlich 2004), tomato/legume dishes from the Mediterranean (Knoops et al. 2004) or South America. We can see here that there have been encouraging indications that communities and households will become players themselves in the evolution of FBDGs.

Mutual Guideline Compatibility

While the present FBDGs operate on the assumption that dietary patterns operate as an integral to determine health patterns and mortality, the evidence that disease-specific dietary guidelines can be compatible with each other grows increasingly. In 2003, when WHO and FAO reported on diet and chronic disease, nutrient and disease-specific evidence was adduced for a global strategy to contend with the increasing burden of food-related disease. The report sought to integrate solutions by way of food patterns (Joint WHO/FAO Expert Consultation 2003). This focus on food patterns has been exemplified in the second WCRF-AICR report on "Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective" (World Cancer Research Fund/American Institute for Cancer Research [WCRF/AICR] 2007). In this report, nutritional deficiencies, including iodine deficiency disorders, infectious disease, and chronic diseases other than cancer (obesity, diabetes and cardiovascular disease, osteoporosis, other musculo-skeletal disease, gastrointestinal disease, dental disease), breast-feeding guidelines and guidelines for physical activity are reviewed for their evidential basis and taken into account in formulation of the guidelines for cancer (WCRF/AICR 2007). This ensured consistency with the new edition of recommendations for the prevention of cancer and for those living with cancer or caring for people with cancer that include recommendations for body fatness, food and drink, and dietary supplements, among others There has been further work on evidence-based policy to deal with these conclusions at various levels which are societal as well as personal (WCRF/AICR 2009). For overall health outcomes and those which are disease specific, a raft of cohort studies, although predominantly European (EPIC, SENECA/ HALES/ FINE) or North American (Harvard School of Public Health, Iowa Women's Health, Hawaiian), some North-East Asian (Shanghai Women's and Men's), Australian (Melbourne Health 2000), and International (FHILL) support a food pattern approach to dietary guidance and food policy (Wahlqvist et al. 1995). A final imperative for mutual guideline compatibility is the commonality of basic underlying

disease pathways and mechanisms—their ultimate spectrum of manifestations depends on various genetic polymorphisms, epigenetic phenomena, early life and life-long stages of lifestyle-related gene expression to biological challenges and defense mechanisms, which are affected by the eco-system in which we find ourselves and which we influence (Wahlqvist 2002a, 2002b; Wahlqvist and Specht 1998).

Adaptation, Adoption, Implementation and Evaluation of FBDGs—A Movement toward CCH-FBS

The first step in the development of FBDGs is for a jurisdiction or policy agency to recognize that the location and peoples for which it is responsible has nutritional problems—and there is almost nowhere that does not. Then the decision to act in a food-based approach way is required, followed by customization of FBDGs. A program of implementation is then developed with planned and agreed milestones; and finally, the program is evaluated for its impact and decisions made about continuation, modification or promulgation.

The problems in this process are generally in implementation, evaluation, and continuation, and I argue here that inexpensive, minimally demanding, engaging and participatory approaches to assessment, monitoring, evaluation, and re-vitalization are of interest. The best examples are probably participatory techniques like Rapid Assessment Procedures (RAP) (Scrimshaw and Gleason 1992; Scrimshaw and Hurtado 1987).

Generally, participatory approaches involve communities and embrace households, and are therefore the logical focus of FBDGs. With the advent of information technology and readily accessible telecommunication with mobile phones, hand held information devices, which can be wireless and solar powered, professional and community players in community nutrition can be more effective. This is because relevant information can be instantly available, conversations can be had at a distance, monitoring and critiques can be participatory, and accountability and recognition are more evident. Governance, and with it food security, tends to improve (Ogunrinade, Oniango, and May 1999). There is an added advantage that small business can flourish around this technology and it can be managed by women who become more empowered (Johnson-Welch, MacQuarrie, and Bunch 2005). One of the best examples, which this author has observed, of this phenomenon at work in community health and local rural development with small business development for women and improved local government, is in Kuppam, southern India. Initial funding came from Hewlett Packard in Bangalore, India (Kuppam HP i-Community 2008). The creation of a wireless zone of about 30 km radius around Kuppam, and informatics-connected mobile combined primary health care and agricultural field stations were pivotal. At the same time local government and small digital businesses for

women (like family event photography) were supported with hardware, software, information kiosks or centers, and training. The program developed a momentum and viability of its own.

If FBDGs are seen as intrinsic to community development and recruit now-available technologies to connect communities, households and individuals, they have greater prospects. For this to happen, new partnerships need to be forged such as those which underpin the entire food and water systems, with education, health, IT (information technology), telecommunication, financial services and local government. This would take the guidelines (FBDGs) to a food-based strategy which could be referred to as a connected community and household food-based strategy (CCH-FBS) (Figure 1).

FBDGs—The Example of China

A fundamental feature of the ability of China to play an early and foundation role in the development of the FBDGs in 1995 was that its nutrition scientists maintained a thread of basic community-oriented research during the most difficult times and rapidly re-asserted themselves once the opportunity arose. I refer by way of illustration, to the work of 6 individuals during the period of the 1960–1990s, Dr Gu Jin-Fan, Dr Lo Che-Sam, Dr Chen Jun-Shi, Dr Zhao Fa-Ji, Dr Chen Chun-Ming, and Dr Ge Ke-You.

The resurgence in nutrition science after the Great Cultural Revolution (1966–1976) began at the Tianjin Institute of Nutrition, Hygiene and Environmental Medicine under the leadership of Prof Gu Jin-Fan, also Editor of Acta Nutrimenta Sinica, along with the increasing stature of the National Institute of Nutrition and Hygiene in Beijing. However, there were notable achievements over many years, under difficult circumstances and with profound public health nutrition relevance. These included the work of Dr Lo Che Sam of Sun Yat Sen Medical School in Guangzhou defining micronutrient deficiencies like that of riboflavin in studies in the 1970s involving thousands of individuals (Lo 1984). These argued the case for less-milled rice as a food-based solution, rather than micronutrient supplementation, and at a time when increasing dairy intake as a riboflavin source was not feasible. The monumental studies of Nutrition (Food Patterns) and Cancer across China by Chen Jun-Shi working with Richard Peto and Colin Campbell (Campbell et al. 1991; Chen et al. 2006; Chen et al. 1990) also contributed to the new wave of evidence which identified links between food patterns and disease and supported the growth of national food and nutrition policy. The International Union of Nutritional Sciences (IUNS) moved to welcome the Chinese Nutrition Society as a member in 1985. In 1986, I had the privilege of conducting teaching programs in Clinical Nutrition with a Public Health emphasis throughout China with the Chinese Nutrition Society. In 1989, China produced Dietary Guidelines which were distinctly food-based and with a strong sense of policy. With prescience, and the

knowledge of food trends in places like Shanghai (Zhao, Guo, and Chen 1995), Chinese nutritionists like Zhao Fa-Ji anticipated the importance of changes in the food system away from plant foods to animal-derived foods like pork for the environment, as well as changes in food affordability and health. The guidelines were revised in 1997 as described by Dr. Ge Keyou (Ge et al. 2007) to reflect these changes.

As China's economy has changed and become more productive its eating habits and food patterns have changed remarkably within the space of some 30 years (Chen et al. 2006; Zhai et al. 2002; Zhao et al. 1995). The major health outcome measures, like prenatal and childhood mortality and life expectancy, have improved impressively, but the pattern of disease has moved quickly towards one of obesity, diabetes and ischemic heart disease and certain cancers like colo-rectal, breast and prostate where food and exercise patterns are critical. As observed by Ge Keyou, FBDGs reflecting these changing trends have not penetrated the country as a whole or beyond a more informed constituency. National Action Plans are slow to reach most communities and households (Ge and McNutt 2000; Ge et al. 2007). The reasons for this are complex. The flow of policy information from the central government or its various health, food and agricultural authorities to community news-boards where it is pasted or given to school-children to take home may involve several steps unless assigned high priority. Participatory food and health activities are patchy. The internet is developing rapidly with its own community and could target local change-agents more effectively. Nerveless, the focus on the one child and the cultural regard for elders can rally support for FBS in community and household. Various non-government organizations (NGOs) which are food-oriented foster these opportunities.

The very success of China's economic development is now part of the reason why global and national Chinese food security is re-emerging as a concern. This is partly because of demand and purchasing power for more expensive and convenient foods; and partly because of the financial, and resource (particularly energy) costs of the whole expanding food system—namely, arable land, cultivation and harvest, transport, packaging, storage, retailing, and marketing (Figure 1). Intensive food production usually requires greater inputs of fertilizers (nitrogen from the petrochemical industry and limited global residual phosphate deposits except for China) and pesticides which tend to increase in the food chain and water supply (Roberts 2008). The economic success of aquaculture in China is now threatened because of unacceptable antibiotic residue levels in the produce, a consequence of more intensive farming, over-crowding of the fish, more infectious disease transmission, and related antibiotic usage (Alibaba.com. 2008; Anderson 2005).

A further factor in the relationship between economic development and food insecurity, not just in China, but in many and major food-producing areas is climate change (for example extreme weather conditions like

drought and floods in Australia). China has experienced unprecedented rain and snow in southern latitudes during 2008 and drought in the north. There is now growing appeal world-wide for climate-change sensitive DGs (Carlsson-Kanyama and González 2009). In addition, the loss of bee populations and apiculture, possibly because of changed susceptibility to the Varroa mite in winter in parts of China, the USA, and New Zealand and its consequences for horticulture is an unfolding if controversial story, especially for fruit and vegetable production. China produces most of the world's deciduous fruit and the more important issue seems to be that of pollinator shortage with increasing food production (Aizen et al. 2009; Allsopp, de Lange, and Veldtman 2008; Mitchell et al. 2009).

There have been repeated threats to poultry meat and egg production with viral diseases like Newcastle Disease and avian influenza, at a time when dependency on this food-stuff has grown substantially in recent years in China and other nations. This is particularly relevant to nutritionists since selenium deficiency in poultry, in the same areas where humans may be deficient (as in North-Eastern China) can increase the likelihood of greater viral pathogenicity (Diamond, Hu, and Mansur 2001).

An experience which Australia has had, and which is relevant for China's ecology and thus future sustainability, is that of inappropriate use of marginal lands for grazing of ruminant animals like sheep and cattle for meat (and wool in the case of sheep). Major ecological damage has ensued. With growing concern about the adequacy, quality and costs of imported ruminant meats into China, consideration is being given to opening up marginal lands in Western China for this purpose (Derbyshire and Curry 2006).

Thus, there is a host of emergent food system developments in China which have health implications, and in which China is not alone. Approaches which are both local and international are needed to limit and avert these trends. Encouragingly, in China today, more resources are being directed to broad-based, linked activities directed at food toxicology, monitoring and surveillance on the one hand and to environmental protection and remediation on the other (Wang 2007).

This is seen best at the regional level where the connections between risks and benefits of economic development, the food system and health system, and outcomes are more explicit and the responses more relevant. An example of this is Zhejiang province, with China's fastest growth rates going back to the early 1990s, but with relatively good vital statistics. In Zhejiang there is also evident governance in health and agriculture; an ancient, innovative, and contemporary food system with much local and traded produce and an attractive cuisine (Erlich 2004; Wahlqvist, Savige, and Wattanapenpaiboon 2004). It also has an educational system, particularly distinguished and well-funded in its tertiary sector; and a consortium of bio-medical institutes making up the regional CDC. Operationally, these facilities function with a good deal of voluntary and organized cohesion.

With the rapid changes in China's food systems, there is an increased need for food and nutrition scientists and professionals who can foster and lead in the face of new threats to food security. In 2008, under the auspices of the IUNS and Chinese Nutrition Society, a Nutrition Leadership program for young Chinese speaking nutrition scientists, public health workers, clinicians, and others who work in the food-health systems, participated in workshops in Hangzhou (Zhejiang University) and Shanghai (Fudan University's Huadong Hospital) to foster a future generation and network of inspired, talented and informed nutrition leaders, with problem-solving skills (Wahlqvist et al. 2008a). Participants were chosen from applicants from 20 provinces, with wide geographic dispersal, and from Taiwan. Mentors were established and exceptional Chinese-speaking leaders from China and its Diaspora. In China, this has begun to increase inter-generational participation, essential to ensure professional succession arrangements and building overall capacity. This event presages more of this kind of activity, which is already in train in most regions of the world and which is represented in IUNS.

One of the areas of active discussion among the future leadership is how China's food system and professionals will engage with the international community. The opportunities for China to contribute to the alleviation of the nutritional problems in Africa and elsewhere in Asia are considerable. However, this is a contribution which could be best made if it is jointly inclusive of CH in both Africa and China, so that neither loses its historical and continuing advantages in local, mostly rural, communities. The shared recent experience of economic crisis and food insecurity in Africa and China demonstrates how quickly people return to their home-community and continue to identify with it, potentially to re-vitalize it.

At the 2005 International Nutrition Congress in Durban, South Africa, there was a focus on China–Africa partnerships in nutrition, in which China's Vice Health Minister participated. Chinese investment in Africa could be part of the solution, but the ways in which this is effected are already debated and controversial (Maclean 2008). At present, China is acquiring much arable land in Africa, partly for property development and partly for food production. This food production may or may not benefit both Africa and China depending on food price, return to local rural workers, and terms of trade.

Understandably, Africans do not want a repeat of the European exploitative colonization of Africa, by a different name. It may be an advantage at this early stage to have a Code of Practice or Terms of Engagement which would guide such investment or provide a reference point for investors. Young leaders and their mentors could contribute to this process. But if we consider how this might develop it will probably be most effective if the nutrition leadership of China and Africa work together and if they have a sense of and commitment to the community and to households. Local nutrition

and international nutrition then become a continuum. This can be acknowledged in a successor or enlarged FBDG construct. This is, in part, what is envisaged in CCH-FBS. Social responsibility and ethics can thereby gain a place in this extended FBDGs concept. By a pro-active approach of this kind, it may be possible to avert major food production difficulty and shortage in China, which some forecast within 20 years (Anderson 2005).

Changing Roles of FBDGs in Safety, Security, and Sustainability

There is no question that food safety, security and sustainability were in the minds of the architects of FBDGs, and the China case is a clear example of their importance. However, these elements do not get adequate attention in the implementation process or even in the professional development of those responsible for food and nutrition policy. In Figure 1, which depicts the CCH-FBS model, they are made more explicit than with the first generation of FBDGs for international use by additions (*) to the original core process. The whole food system (†) (Food and Agriculture Organization of the United Nations 2009) and its relevant characteristics are identified, especially those to do with availability, accessibility, affordability and acceptability. Behaviors (medical, societal and behavioral) are an additional input, as are checks on food security (including safety) and sustainability. Governance and competent leadership are seen to be a sine qua non (Ogunrinade et al. 1999), along with partnerships across a wide range of infrastructural and disciplinary needs and a recognized role for women.

Food safety is a crucial part of food security. Public health nutrition professionals usually think of safety in microbiological, toxicological, and nutritional terms. What is changing is that there are safety issues in the food chain which do not easily fit these categories (Roberts 2008), and which are troublesome to consumers. Our increasing remoteness from the source of our food (how and where food is grown and what happens during animal production, for example), the introduction of processes all the way along the food system with which we are unfamiliar (preservation techniques, packaging materials), and the nature of ingredients and formulation of recipe foods are examples.

An area of increasing interest is how animals, including fish, for human consumption are fed (e.g., in the case of BSE, bovine spongiform encephalopathy) and how plants are grown (as in the case of pest control). For safety, if not environmental reasons, accountability and traceability of these practices, people will want there to be a paper trail, readily accessible, probably through the internet, of these practices. This will require communities and households to be in contact with source material, and it will also provide opportunities for content providers who may or may not be governmental. In other words, we can look forward to forms of governance for the food system which will be community-driven, just as is currently

happening with the medical system. However, vigilance will also be required because some tracking technologies may prove hazardous. For example, ultra-small molecular nano-particles or devices may soon be available for tracking, but, if in food itself, may be harmful. (Hsieh and Ofori 2007; Lin et al. 2008; Zha et al. 2008).

Safety is also an issue with respect to food and agricultural developments, some of which are proceeding apace with very little, if any, risk-benefit analysis. A current example is the emerging field of nano-foods and nano-nutrition. Engineering molecules to perform unique functions and confer designer characteristics on products is cutting edge science, and already, nano-ingredients are being incorporated into foodstuffs and are generating substantial revenues. So, too, new nano-packaging materials to increase shelf-life and nano-ingredients which can be programmed for individualization of food taste, smell and texture are on the way (Hsieh and Ofori 2007). The problem is that there are virtually no human studies to evaluate the risks and benefits to health. It is difficult to generalize about ingredients with such potentially wide-ranging properties. But, in some cases, nano-particles used in industrial applications have been shown to have kinetics with decreased clearance and accumulation in body tissues (Lin et al. 2008). Nano preparations of elements like iron, zinc, calcium, chromium and titanium can have their absorption greatly enhanced over the usually available forms, which could, theoretically, be an advantage, e.g., in iron deficiency (Ashwood, Thompson, and Powell 2007; Daniells 2009; Zha et al. 2008). However, nutrient-nutrient interactions of a new order and toxicity without the usual checks and balances which obtain from natural food-related forms will not apply and toxicity is more likely (Daniells 2009). In that event, these food products in the public domain, rather than medical foods (where higher levels of risk may be tolerable), can be expected to have adverse effects, many of which are yet to be understood.

Food security goes well beyond food safety. It has historically, and contemporaneously, for those most affected by food insecurity, had to do with poverty, natural disaster, conflict, inadequate infrastructure and poor governance, poor household management, personal behavior, misfortune, or disability and disease (Food and Agriculture Organization of the United Nations 2009). Figure 1 draws attention to how a new generation of FBDGs will, if effective, have a focus on households and communities.

The growing discrepancy between energy availability and demand, and of rising food prices is making food purchase and transfer to home or work-place for preparation and consumption more difficult. This will create pressure for local availability of locally produced food. The dependency on cars to acquire and transport food (e.g., from supermarkets) is an illustration of the dilemma many communities find for themselves (Wahlqvist and Lee 2007). At the same time, in North-East and South-East Asian communities, there is a traditional preference for frequent purchase of fresh food or

convenience food from local markets, vendors, or small shops (like 7-Eleven®) (AllBusiness 2009; Coyle 2006; The Coca-Cola Retailing Research Council 2005; Wikipedia 2009). At these shops, many different non-food and beverage transactions can often take place making the local precinct lively, congenial, and serviceable. This style of living also encourages fiscal prudence and minimal use of credit along with saving. Often there are opportunities to barter and spare cash. This might seem a somewhat nostalgic view to those who have lost their neighborhood facilities and public transport, safe walking, or cycling facilities in the name of progress, but it is still a viable and enjoyable way of life for millions of people. It is necessary to think about these food supply routes and characteristics as we face the contraction or actual collapse of a number of financial institutions in the USA and those in other countries linked to them.

For people and households with marginal incomes, as prices rise, difficult decisions arise in regard to essential expenditure. First, the distribution of food between household members may change and often the mother suffers first, as she wears the brunt of household economic management. Then, the "bread-winner" or main income earner uses available funds to get to work to earn the money-this is most difficult where there is a long distance and car-dependency to get to work. Within the family budget other non-food items may be maintained (depending on various factors like school fees and purchase of addictive tobacco or alcohol-dependency) (Haddad 2009). Then, there may be a reduction in food diversity as more expensive fish, meat, milk and dairy products, nuts, fruits, and vegetables are sacrificed; grains, which may be refined rather than whole-grain are the fall-back food (Angeles-Agdeppa 2002; Hoddinott and Yohannes 2002; von Braun, Swaminathan, and Rosegrant 2004).

Notwithstanding these considerations, conflict, arms, and petroleum are at the root of much of the present economic crisis and contributory to the related food insecurity. In turn, food and water insecurity lead to more conflict and a vicious downhill cycle in development prospects (Klare 2001).

In addition to safety and security, sustainability is an increased issue with respect to changing FBDGs. We are now witnessing the greatest threat to planetary health and the sustainability of the human food supply since the beginnings of agriculture some 10,000 years ago (Diamond 1987; McMichael 1993). Although it is unrealistic to revert to pre-agricultural society, we need to learn as much as we can from nutritional archeology and anthropology to guide us quickly towards a more sustainable food future. This, therefore, needs to be explicit in regard to FBDGs (see Figure 1).

The characteristics of food sustainability are food and biological diversity (Wahlqvist and Specht 1998), agricultural practices which limit eco-system loss, avoidance of over-population, a value system which is not anthropocentric and takes into account planetary health, efficient use of energy, preference for renewable energy without recourse to food crops for bio-fuels, food

waste minimization, the use of technology which will enhance the nutritional value of crops as in the HarvestPlus program (http://www.harvestplus.org/) (HarvestPlus 2008), limiting the effects of climate change.

Increasingly, food choice, and the DGs which inform it, needs to be predicated on whether it is consistent with sustainable food systems (Carlsson-Kanyama and González 2009; Food and Agriculture Organization of the United Nations 2009; Nutrition Ecology International Center 2009; Nutrition Security Institute 2009; Public Health Association Australia 2009; The Earth Institute Columbia University 2009; World Health Orangization Regional Office for Europe 2009). Partnerships among international, national and local groups will be necessary and are likely to be catalyzed by altruistic sponsors, the imperative of crisis, or the vigilance and advocacy of communities and individuals. The latter is evident now in the climate change movement and in women's rights organizations. It is apparent that, although extremely important for robust and fundable initiatives, evidence-based nutrition (Wahlqvist et al. 2008b) is not enough. Translational nutrition science is needed, along with a certain passion and commitment from the scientists involved, tied together with the rise of community-based movements.

Increasingly, food shortages and mal-distribution of quality food and its affordability will present even more ethical issues than at present (Solomons 2002; von Braun and Brown 2003). One of the emerging themes has to do with globalization of food supplies through trade and selective localization of steps in the food chain. With it the availability, price and nutritional value of food to consumers in various settings are often less favorable and the significant economic returns are mostly directed away from those who toil throughout the system and towards agribusinesses and commodity speculators. For example, food production and processing may take place in separate low labor cost localities and the food be less available where it is most needed. Wholesaling, packaging, distribution, and retailing may take place in localities with higher incomes. The ultimate so-called 'value–added' foods, often of low nutritional value, are the ones that are bought at higher but more affordable price in various jurisdictions. The simplest illustration of this phenomenon comes from intact grains, legumes, and other seeds which have been used traditionally in nutritious "peasant" dishes, but many of which are now traded, in fractionated form, into their various components (fat, plant sterols, dietary fiber, fat, proteins, starch, healthful, and phytonutrients, but with micronutrient losses); these fractionated food-stuffs are then used as separate ingredients or re-assembled, or just sold as highly refined products, which might have been fortified or restored with some of the nutrients lost—this is increasingly what constitutes the low nutritional quality breakfast cereals or drinks. These are food systems charged with inequity for consumers and the work-force and with ethical questions about who gets what. These food chains represent corrupted food systems which could be challenged by informed and empowered communities and households—CCH-FBS at work.

Where fish stocks are precarious at a time when we have evidence about how much (and how little) fish is required for each of "optimal, reasonable or marginal health status," who will receive it and how much will they get? And who will have the educational advantage (health and nutritional literacy) to choose between different sorts of fish with risks (from pollutants) and benefits (from calcium, vitamin D, n-3 fatty acids, CoQ10 or ubiquinone, and fish protein). Who will be relegated to the next best alternative to serve, perhaps one or two of these functions, but not all? How will this be done?

From FBDGs to CCH-FBS

Given the complexity of the issues outlined above, it does seem time to move to a more proactive stage in the FBDGs era. The case is made in this article for local ownership, responsibility and feedback about such guidelines and their significance for communities and households. Systematic evaluation and monitoring in communities can be undertaken by iterative methods which are participatory and responsive like Zielorientierte Projektplanung (ZOPP) (Wahlqvist 2000; ZOPP 2008).

There is growing evidence that programs which focus on communities in an integrated way for the uptake of healthy behaviors, whether diet, exercise, or substance abuse (tobacco, alcohol, prescription and illicit drugs) are more likely to succeed (Sugiyama et al. 2008). Healthy localities or neighborhoods, are ones conducive to eating in healthy and enjoyable ways, playing and walking without being afraid because of poor lighting or unsafe areas, where running (Chakravarty et al. 2008) and cycling are accepted and respected and where it is socially unacceptable to smoke or drive under the influence of alcohol, or to behave like a bully (Moodie 2008). These features of a community can reduce morbidity, disability, and mortality (Chakravarty et al.; Gladwell 2008). The work of Bruhn and Stewart in the Pennsylvanian Italian community of Roseto and its surrounding communities indicated that social cohesion might be the main health differentiator between communities (Bruhn 2004; Chakravarty et al.; Gladwell). These early observations have now developed into an understanding of how community-interconnectedness may enable global health to improve and be more equitable in the face of threats like climate change (Friel et al. 2008).

Urbanization is not necessarily bad for health. In Asia, highly urbanized Japan and Hong Kong are among the top few places with longevity and long disability - adjusted life expectancies (DALYS) (World Health Organization 2004). In Sweden, communities are medium density with ecologically sound zones between and efficient public transport to connect the living areas; it also ranks among the countries whose citizens experience greater longevity. Several European countries have the combination of a cycling culture and use of public transport—Netherlands, France, Denmark, and Sweden for

example. With higher levels of physical activity goes greater possibility for dietary license for quantity and occasional indiscretion on quality because enough food can be eaten for the nutrients required without becoming over-fat. Hence, FBDGs can be more effectively implemented (Figure 1).

Partnerships should enable local energy supplies (new generation solar and captured human movement in clothing and apparel), potable water supplies and safe, efficient sanitation. Innovative technology will focus more and more on the development and sustainability of energy, water, food and health needs and opportunities at the local level. In so doing, economic and health advancement through food and nutrition should be possible. Microfinance for women, as developed by Muhammad Yunus and his Grameen Bank, in villages and rural communities has a good track record of recruiting small business activity around home gardens, food stores and restaurants, mobile phones, digital photography, project monitoring, and more (Katz and Hammond 2006; Yunus 2003). Local entrepreneurship, subject to good governance, will be intrinsic to the leadership requirements.

CONCLUSIONS

Today the need to take steps to bolster food security is of even greater urgency than the past because of the quickening pace of economic transition in the most populous nations of China, India, and Indonesia, the economic crisis in so-called more advanced economies like the USA and the European Union, along with rising energy and food prices and the threats to food production and transport of these factors along with climate change. A new era of food insecurity is upon us unless we act swiftly and cohesively. It will not be enough to have "Harmonization of FBDGs" as has been suggested (Smitasiri and Uauy 2007) Harmonization tends to standardize inter-locality difference in DGs and, thereby, negate some of the intrinsic value of FBDGs which cultivate difference in approach with an agreed underpinning of broadly-based food and nutrition science.

Strategy will also be more ready and relevant if scenario planning is used and it canvasses the possibilities of any one of the following: (1) food adequacy with quality, (2) food adequacy without quality, or (3) food inadequacy. With the first scenario the nutritional situation is favorable and made more so through associated ways of living with regular physical activity and avoidance of substance abuse, along with steps to ensure sustainability and affordability. With the second scenario, where there is enough food, it is ideally given quality through diversification, with home, school or community gardens, for example, or by barter in a modest trading arrangement. With the third scenario, beyond short term food assistance, the household or community or both will probably need to address questions of livelihood without which nutritional deprivation will be unrelenting. Such scenario

analyses can only be exploratory vignettes and fall short of the in-depth and sensitive understanding that a facilitated CCH-FBS might provide.

A promising food-based example of a strategy for the second scenario is the HarvestPlus biofortification program (Bouis et al. 2009). It is engaged, for the present, in plant breeding programs to improve the nutritional quality (micronutrient density) of staple crops (rice, wheat, pearl millet, cassava, beans, sweet potato, and maize) with iron, zinc, and pro-vitamin A, as carotenoids in its second 5-year plan (2009–2013). It will expand this further into its third period. It is based on the knowledge that economically or geographically marginalized peoples may have adequate energy (calorie) intakes, but the staples which allow this and the rest of what is usually a monotonous diet without sufficient diversity, means such people suffer micronutrient deficiencies of various spectra, the most common being iron, iodine, zinc, vitamin A, folic acid, and others depending on the context. Some of these situations could be dealt with by preventing or treating the underlying cause (as in intestinal helminthiais for iron and zinc), small regular amounts of animal-derived food (as with almost all micronutrients) or with dietary diversification, iodine often remaining an exception because of its limited sources especially in localities with iodine poor soils. However, for more than a billion people nutritional adequacy, let alone quality, is not affordable or achievable, and poverty means a narrow food focus on hunger-relieving, less expensive staples. One approach is to make these staples more nutritious. For most HarvestPlus program staples, plant breeding has now produced crops which approach or achieve the target micronutrient concentrations. The agronomics encourage optimism that the production will be sustainable. Implementation requires the support of governments, NGOs (non-government organizations), local entrepreneurs, the private sector, and civil society. But, most of all, the program is now focusing on the "end-users," the households, and the communities for relevant, acceptable, viable, and long-term successful outcomes. Crops and the foods which can be produced from them will generally need to have local specificity, but they will provide opportunities for the rural communities involved to produce surpluses which can be traded and build local economies. The connectedness of more and more communities will provide resilience and build capacity among communities. It is an illustration of CCH-FBS.

To be most effective, FBDGs need to be aligned with the MDGs of the United Nations (United Nations Development Program 2000), i.e., the eradication of extreme poverty and hunger; the achievement of universal primary education, gender equality, and empowerment of women; reductions in child mortality and improvements in maternal health; combatting HIV/AIDS, malaria and other diseases; achievement of environmental sustainability; and the creation of a global partnership for development.

The UN report in 2008 on the MDGs reported significant progress, especially with poverty and hunger alleviation, (United Nations 2008).

However, the global economic, energy, food, health, and climate change crises which coalesced in the same year threatened this progress and almost 100 million people have been added to the abject poor and hungry, still constituting about one-sixth of the world's 6.7 billion population. The likelihood of success in dealing with world-wide food-related health problems should be increased by active participation of communities and households, aided by communication and information technology namely, CCH-FBS. Other requisites, to be met by new technologies and partnerships, will be local energy supplies, potable water, sanitation, and more arrangements for microfinance involving women. In all such initiatives, social policies are required to enhance prospects of success; CCH-FBS encourages this approach.

Infrastructural requirements for systems of governance, law and order, education, health transport, and telecommunication among others ought to be met by government. With this, much can be done by communities, but many cannot and should not wait, especially for the current fiscal, energy, and food crises to abate. Community organization and strategy can provide opportunity where otherwise there may be little.

REFERENCES

Aizen, M. A., L. A. Garibaldi, S. A. Cunningham, and A. M. Klein. 2009. How much does agriculture depend on pollinators? Lessons from long-term trends in crop production. *Annals of Botany* 103 (9): 1579–1588.

Alibaba.com. 2008. China's fish farms are cleaner—for now. http://resources.alibaba.com/topic/299015/China_s_fish_farms_are_cleaner_for_now.htm (accessed October 19, 2009).

AllBusiness. 2009. 7-Eleven to open 500 stores in Beijing. http://www.allbusiness.com/retail-trade/miscellaneous-retail/4427833-1.html (accessed October 19, 2009).

Allsopp, M. H., W. J. de Lange, and R. Veldtman. 2008. Valuing insect pollination services with cost of replacement. *PLoS ONE* 3 (9): e3128.

Anderson, E. N. 2005. Chinese food history. http://www.krazykioti.com/index.php?option=com_content&task=view&id=32&Itemid=45 (accessed October 19, 2009).

Angeles-Agdeppa, I. 2002. Food and nutrition security and poverty alleviation in the Philippines. *Asia Pacific Journal of Clinical Nutrition* 11 (suppl.): S335–S340.

Ashwood, P., R. P. H. Thompson, and J. J. Powell. 2007. Fine particles that adsorb lipopolysaccharide via bridging calcium cations may mimic bacterial pathogenicity towards cells. *Experimental Biology and Medicine* 232: 107–117.

Beauman, C., G. Cannon, I. Elmadfa, P. Glasauer, I. Hoffmann, M. Keller, M. Krawinkel, T. Lang, C. Leitzmann, B. Lotsch, et al. 2005. The principles, definition and dimensions of the new nutrition science. *Public Health Nutrition* 8 (6A): 695–698.

Bouis, H. E., C. Hotz, B. McClafferty, J. V. Meenakshi, W. H. Pfeiffer, P. Eozenou, and A. Rahman. 2009. Biofortification: A new tool to reduce Micronutrient Malnutrition. *Annals of Nutrition & Metabolism* 55 (suppl. 1): 57.

Bruhn, J. G. 2004. *The sociology of community connections*. New York: Kluwer Academic Plenum Publishers.

Caballero, B., and B. M. Popkin. 2002. *The nutrition transition: Diet and disease in the developing world (food sicence and technology international)*. London: Elsevier Science Ltd.

Campbell, T. C., J. S. Chen, T. A. Brun, B. Parpia, Y. S. Qu, C. M. Chen, and C. A. Geissler. 1991. China: From diseases of poverty to diseases of affluence. Policy implications of the epidemiological transition. *Ecology of Food and Nutrition* 27:133–144.

Carlsson-Kanyama, A., and A. D. González. 2009. Potential contributions of food consumption patterns to climate change. *The American Journal of Clinical Nutrition* 89 (suppl.): 1704S–1709S.

Chakravarty, E. F., H. B. Hubert, V. B. Lingala, and J. F. Fries. 2008. Reduced disability and mortality among aging runners: A 21-year longitudinal study. *Archives of Internal Medicine* 168 (15): 1638–1646.

Chen, J., R. Peto, W. H. Pan, B. Q. Liu, T. C. Campbell, J. Boreham, B. Parpia, P. Cassano, and Z. M. Chen. 2006. *Mortality, biochemistry, diet and lifestyle in rural China: Geographic study of the characteristics of 69 counties in mainland China and 16 areas in Taiwan*. Oxford, UK: Oxford University Press.

Chen, J. S., T. C. Campbell, J. Y. Li, and R. Peto. 1990. *Diet, lifestyle and mortality in China*. Oxford, UK: Oxford University Press.

Clay, W. D. 1997. Preparation and use of food-based dietary guidelines. In *Food, nutrition, and agriculture (FAO)*, 43–47. Geneva: Food and Agriculture Organization.

Coyle, W. 2006. A revolution in food retailing underway in the Asia-Pacific region. http://www.ers.usda.gov/AmberWaves/June06/Features/Revolution.htm (accessed October 19, 2009).

Daniells, S. 2009. Nano iron could lead to big fortification future. http://www.nutraingredients.com/Research/Nano-iron-could-lead-to-big-fortification-future (accessed October 19, 2009).

Derbyshire, E., and P. Curry. 2006. China: A vast land being swallowed. http://www.new-ag.info/06-4/focuson/focuson2.html (accessed October 19, 2009).

Diamond, A. M., Y. J. Hu, and D. B. Mansur. 2001. Glutathione peroxidase and viral replication: Implications for viral evolution and chemoprevention *BioFactors* 14:205–210.

Diamond, J. 1987. The worst mistake in the history of the human race. *Discover* (May) 64–66.

Erlich, R. 2004. Cultural and historical trends and influences of food, nutrition and cuisine on health and development. *Asia Pacific Journal of Clinical Nutrition* 13 (2): 125–130.

Food and Agriculture Organization of the United Nations (FAO). 1993. *Developing national plans of action for nutrition*. Rome: FAO.

Food and Agriculture Organization of the United Nations. 2009. FSN Forum: Global forum on food security and nutrition. http://km.fao.org/fsn/fsn-home/en/?_cache=1 (accessed October 19, 2009).

Friel, S., M. Marmot, A. J. McMichael, T. Kjellstrom, and D. Vågerö. 2008. Global health equity and climate stabilisation: A common agenda. *The Lancet* 1372 (9650): 1677–1683.

Ge, K., and K. McNutt. 2000. How the Chinese link dietary advice to their National Plan of Action for Nutrition. *The Journal of the American Medical Association* 100 (8): 885–886.

Ge, K., J. Jia, and H. Liu. 2007. Food-based dietary guidelines in China—practices and problems. *Annals of Nutrition and Metabolism* 51 (suppl. 2): 26–31.

Gladwell, M., ed. 2008. The Roseto Mystery. In *Outliers: The story of success*, 3–11. New York: Little, Brown and Company.

Haddad, L. 2009. The impact of women's employment status on household food security at different income levels in Ghana. http://www.unu.edu/Unupress/food/8F144e/8F144E0b.htm (accessed October 19, 2009).

HarvestPlus. 2008. HarvestPlus: Breeding crop for better nutrition. http://www.harvestplus.org/ (accessed October 19, 2009).

Hoddinott, J., and Y. Yohannes. 2002. *Dietary diversity as a food security indicator*. Washington, DC: International Food Policy Research Institute.

Hodgson, J. M., B. H. H. Hsu-Hage, and M. L. Wahlqvist. 1994. Food variety as a quantitative descriptor of food intake. *Ecology of Food and Nutrition* 32:137–148.

Hsieh, Y. H. P., and J. A. Ofori. 2007. Innovations in food technology for health. *Asia Pacific Journal of Clinical Nutrition* 16 (suppl.): 65–73.

Johnson-Welch, C., K. MacQuarrie, and S. Bunch. 2005. *A leadership strategy for reducing hunger and malnutrition in Africa: The agriculture-nutrition advantage*. Washington, DC: International Center for Research on Women (ICRW).

Joint WHO/FAO Expert Consultation. 2003. *Diet, nutrition and the prevention of chronic diseases*. Geneva: WHO/FAO.

Katz, R., and A. Hammond. 2006. Microfinance entrepreneur receives nobel prize. *World Resources Institute,* October 13. http://www.wri.org/stories/2006/10/microfinance-entrepreneur-receives-nobel-prize (accessed October 19, 2009).

Keller, I., and T. Lang. 2008. Food-based dietary guidelines and implementation: Lessons from four countries—Chile, Germany, New Zealand and South Africa. *Public Health Nutrition* 11 (8): 867–874.

Klare, M. 2001. *Resource wars: The new landscape of global conflict*. New York: Henry Holt.

Knoops, K. T. B., L. C. P. G. M. de Groot, D. Kromhout, A.-E. Perrin, O. Moreiras-Varela, A. Menotti, and W. A. van Staveren. 2004. Mediterranean diet, lifestyle factors, and 10-year mortality in elderly European men and women: The HALE project. *The Journal of the American Medical Association* 292 (12): 1433–1439.

Krishnaswamy, K. 2008. Developing and implementing dietary guidelines in India. *Asia Pacific Journal of Clinical Nutrition* 17 (suppl. 1): 66–69.

Kuppam HP i-Community. 2009. Kuppam HP iCommunity, Andhra Pradesh, India. http://www.kupnet.org/ (accessed October 19, 2009).

Lin, P. P., J. W. Chen, L. W. Chang, J. P. Wu, L. Redding, H. Chang, T. K. Yeh, C. S. Yang, M. H. Tsai, H. J. Wang, et al. 2008. Computational and ultrastructural toxicology of a nanoparticle, Quantum Dot 705, in mice. *Environmental Science & Technology* 42 (16): 6264–6270.

Lo, C. S. 1984. Riboflavin status of adolescents in southern China. Average intake of riboflavin and clinical findings. *The Medical Journal of Australia* 141 (10): 635–637.

Maclean, W. 2008. Chinese workers impress Africa but results not always good. *Daily Nation*, August 21. http://www.nation.co.ke/News/africa/-/1066/461718/-/149j1tiz/-/index.html (accessed October 19, 2009).

McMichael, A. J. 1993. *Planetary overload: Global environmental change and the health of the human species*. Cambridge, UK: Cambridge University Press.

Meerman, J. 2008. Making nutrition a national priority: Review of policy processes in developing countries and a case-study of Malawi. Rome: FAO (Nutrition Requirements and Assessment Service).

Mitchell, R. J., R. J. Flanagan, B. J. Brown, N. M. Waser, and J. D. Karron. 2009. New frontiers in competition for pollination. *Annals of Botany* 103 (9): 1403–1413.

Moodie, R. 2008. The way we treat each other. *The Medical Journal of Australia* 188 (8): 477–480.

Nutrition Ecology International Center. 2009. http://www.nutritionecology.org/overview/about.html (accessed October 19, 2009).

Nutrition Security Institute. 2009. Nutrition Security Institute. http://www.nutritionsecurity.org/ (accessed October 19, 2009).

Ogunrinade, A., R. Oniango, and J. May. 1999. *Not by bread alone: Food security and governance in Africa*. Johannesburg, South Africa: Toda Institute for Gobal Peace and Policy Research.

Public Health Association Australia. 2009. A future for food. http://www.phaa.net.au/ (accessed October 19, 2009).

Roberts, P. 2008. *The end of food: The coming crisis in the world food industry*. London: Bloomsbury Publishing.

Romon, M., A. Lommez, M. Tafflet, A. Basdevant, J. M. Oppert, J. L. Bresson, P. Ducimetiere, M. A. Charles, and J. M. Borys. 2008. Downward trends in the prevalence of childhood overweight in the setting of 12-year school- and community-based programmes. *Public Health Nutrition* 67:E166.

Safavi, S. M., N. Omidvar, A. Djazayery, M. Minaie, A. Hooshiarrad, and R. Sheikoleslam. 2007. Development of food-based dietary guidelines for Iran: A preliminary report. *Annals of Nutrition and Metabolism* 51 (suppl. 2): 32–35.

Sanigorski, A. M., A. C. Bell, P. J. Kremer, R. Cuttler, and B. A. Swinburn. 2008. Reducing unhealthy weight gain in children through community capacity-building: Results of a quasiexperimental intervention program, Be Active Eat Well. *International Journal of Obesity* 32:1060–1067.

Schneeman, B. O. 2001. Preparation and use of food-based dietary guidelines: Lessons from Thailand and the Philippines. http://ftp://ftp.fao.org/docrep/fao/W5849t/W5849t08.pdf (accessed October 19, 2009).

Scrimshaw, N. S., and G. R. Gleason. 1992. *Rapid assessment procedures—Qualitative methodologies for planning and evaluation of health related programmes*. Boston: International Nutrition Foundation for Developing Countries (INFDC).

Scrimshaw, S. C. M., and E. Hurtado. 1987. *Rapid assessment procedures for nutrition and primary health care*. Los Angeles: University of California/The United Nations University.

Smitasiri, S., and R. Uauy. 2007. Beyond recommendations: Implementing food-based dietary guidelines for healthier populations. *Food and Nutrition Bulletin* 28 (1 suppl. international): S141–S151.

Solomons, N. W. 2002. Ethical consequences for professionals from the globalization of food, nutrition and health. *Asia Pacific Journal of Clinical Nutrition* 11 (suppl. 3): S653–S665.

Sugiyama, T., E. Leslie, B. Giles-Corti, and N. Owen. 2008. Associations of neighbourhood greenness with physical and mental health: Do walking, social coherence and local social interaction explain the relationships? *Journal of Epidemiology and Community Health* 62:e9.

The Coca-Cola Retailing Research Council. 2005. The fresh imperative: Creating excellence in Asian fresh food retailing. http://www.accenture.com/Global/Services/By_Industry/Retail/R_and_I/FreshImperativeRetailing.htm (accessed October 19, 2009).

The Earth Institute Columbia University. 2009. Millennium Villages Project. http://www.earth.columbia.edu/articles/view/2129 (accessed October 19, 2009).

United Nations. 2008. Malawi achieves food security—One household at a time. http://www.unmultimedia.org/radio/english/detail/36564.html (accessed October 19, 2009).

United Nations Development Program. 2000. Millennium Development Goals. http://www.undp.org/mdg/basics.shtml (accessed October 19, 2009).

von Braun, J., and M. A. Brown. 2003. Ethical questions of equitable worldwide food production systems. *Plant Physiology* 130:1040–1045.

von Braun, J., M. S. Swaminathan, and M. W. Rosegrant. 2004. *Agriculture, food security, nutrition and the millennium development goals*. Washington, DC: International Food Policy Institute (IFPRI).

Wahlqvist, M. L. 2000. Objective orientated project planning (ZOPP). *South African Journal of Clinical Nutrition* 13 (1): S39.

Wahlqvist, M. L. 2002a. Eco-nutritional disease or nutrition and chronic disease. *Asia Pacific Journal of Clinical Nutrition* 11 (suppl.): S753–S754.

Wahlqvist, M. L. 2002b. Chronic disease prevention: A life-cycle approach which takes account of the environmental impact and opportunities of food nutrition and public health policies—The rationale for an eco-nutritional disease nomenclature. *Asia Pacific Journal of Clinical Nutrition* 11 (suppl.): S759–S762.

Wahlqvist, M. L. 2005a. The new nutrition science: Sustainability and development. *Public Health Nutrition* 8 (6A): 766–772.

Wahlqvist, M. L. 2005b. Guest editorial: Inauguration. *Public Health Nutrition* 8 (6A): 667–668.

Wahlqvist, M. L., and R. L. Specht. 1998. Food variety and biodiversity: Econutrition. *Asia Pacific Journal of Clinical Nutrition* 7 (3/4): 314–319.

Wahlqvist, M. L., and A. Kouris-Blazos. 1999a. Food-based dietary guidelines (FBDGs). In *Nutrition and Healthy Ageing*, ed. J. Pojda, 24–26. Geneva: UN ACC Sub-Committee on Nutrition.

Wahlqvist, M. L., and A. Kouris-Blazos. 1999b. Food-based dietary guidelines (FBDGs): traditional cuisines, modern foods and the environment. *Indian Journal of Nutrition and Dietetics* 36, 398–404.

Wahlqvist, M. L., and M. S. Lee. 2007. Regional food culture and development. *Asia Pacific Journal of Clinical Nutrition* 16 (suppl. 1): 2–7.

Wahlqvist, M. L., C. S. Lo, and K. A. Myers. 1989. Food variety is associated with less macrovascular disease in those with Type II diabetes and their healthy controls. *Journal of the American College of Nutrition* 8 (6): 515–523.

Wahlqvist, M. L., G. Savige, and N. Wattanapenpaiboon. 2004. Cuisine and health: A new initiative for science and technology "The Zhejiang Report" from Hangzhou. *Asia Pacific Journal of Clinical Nutrition* 13 (2): 121–124.

Wahlqvist, M. L., A. Kouris-Blazos, A. Trichopoulos, and E. Polychronopoulos. 1991. The wisdom of the Greek cuisine and way of life. Comparison of the food and health beliefs of elderly Greeks in Greece and Australia. *Age and Nutrition* 2 (3): 163–173.

Wahlqvist, M. L., B. H.-H. Hsu-Hage, A. Kouris-Blazos, and W. Lukito. 1995. *"Food Habits in Later Life – A Cross Cultural Study" an IUNS study (1988–1994) of health, food habits and lifestyle in over 2000 elderly people in Asia (China, Philippines, Japan), Australia (Anglo-Celts, Greeks, Aborigines) and Europe (Greece, Sweden)*. Melbourne, Australia: HEC Press.

Wahlqvist, M. L., A. Worsley, P. Harvey, P. Crotty, and A. Kouris-Blazos. 1999a. Food-based dietary guidelines for the Western Pacific: The shift from nutrients and food groups to food availability, traditional cuisines and modern foods in relation to emergent chronic non-communicable diseases. Manila, Philippines: WHO.

Wahlqvist, M. L., A. Kouris-Blazos, P. Crotty, T. Worsley, P. Harvey, H. Tieru, and L. T. Cavalli-Sforza. 1999b. *Development of food-based dietary guidelines for the Western Pacific region*. Manila, Philippines: WHO.

Wahlqvist, M. L., D. Li, J. Q. Sun, K. Ge, H. Y. Paik, S. H. Cho, S. K. Lee, C. J. Huang, and M. S. Lee. 2008a. Nutrition leadership training in North-East Asia: An IUNS initative in conjunction with nutrition societies in the region. *Asia Pacific Journal of Clinical Nutrition* 17 (4): 672–682.

Wahlqvist, M. L., M. S. Lee, J. Lau, K. N. Kuo, C. J. Huang, W. H. Pan, H. Y. Chang, R. Chen, and Y. C. Huang. 2008b. Evidence-based nutrition (EBN) in the Asia Pacific region: Clinical practice and policy-setting. *Asia Pacific Journal of Clinical Nutrition* 17 (1): 2–7.

Wang, X. 2007. Food safety: The 11th 5-year plan Health Supervision Bureau, MOH, China. http://www.china.org.cn/e-news/news070710-1.htm (accessed October 19, 2009).

Wikipedia. 2009. Convenience store. http://en.wikipedia.org/wiki/Convenience_store

World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). 2009. *Policy and action for cancer prevention—Food, nutrition, and physical activity: A global perspective*. Washington, DC: AICR.

World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). 2007. *Food, nutrition, physical activity, and the prevention of cancer: A global perspective*. Washington, DC: AICR.

World Health Orangization Regional Office for Europe. 2009. Nutrition and food security. http://www.euro.who.int/nutrition (accessed October 19, 2009).

World Health Organization and Food and Agriculture Organization. 1992. Promoting appropriate diets and healthy lifestyles. In *International Conference on Nutrition, the World Declaration and Plan of Action on Nutrition*, 31–33. Rome: FAO/WHO.

World Health Organization and Food and Agriculture Organization. 1996. *Preparation and use of food-based dietary guidelines. Report of a joint FAO/WHO consultation Nicosia, Cyprus*. Geneva: WHO.

World Health Organization. 2004. The global burden of disease: 2004 update. http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_full.pdf (accessed October 19, 2009).

Yunus, M. 2003. *Banker to the poor: Micro-lending and the battle against world poverty*. New York: Public Affairs.

Zha, L. Y., Z. R. Xu, M. Q. Wang, and L. Y. Gu. 2008. Chromium nanoparticle exhibits higher absorption efficiency than chromium picolinate and chromium chloride in Caco-2 cell monolayers. *Journal of Animal Physiology and Animal Nutrition* 92 (2): 131–140.

Zhai, F., D. Fu, S. Du, G. Ge, C. Chen, and B. M. Popkin. 2002. What is China doing in policy-making to push back the negative aspects of the nutrition transition? *Public Health Nutrition* 5 (1A): 269–273.

Zhao, F., J. Guo, and H. Chen. 1995. Studies on the relationship between changes in dietary patterns and health status. *Asia Pacific Journal of Clinical Nutrition* 4:294–297.

ZOPP. 2008. ZOPP: Goal Oriented Project Planning. http://web.mit.edu/urbanupgrading/upgrading/issues-tools/tools/ZOPP.html (accessed October 19, 2009).