

HEALTH CLAIMS ON FOODS

Rationale and scientific support for health claims on foods

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The role of diet and physical activity in health has been increasingly documented and pinpointed as a major target for health-promoting strategies. The supply, availability, marketing and price of food products have a strong impact on consumers' diets.¹ Therefore, national food and agricultural policies should be consistent with the protection and promotion of public health, and governments should be encouraged to examine food and agricultural policies for potential health effects on the food supply.² There is already a clear shift in many countries and regions regarding the scope of agricultural and food policies, from a farmers' to a consumers' perspective. The supply of nutritious foods with appropriate macronutrient composition, energy density and micronutrient content is a prerequisite for optimal nutrition and a main target for nutrition policies. In addition to optimising the nutrient content of foods, an increasing body of evidence regarding effects of food components – both nutrients and other substances – and food properties on physiological functions, provides a basis for additional benefits of foods on health, performance and well-being. This is the basis for the functional foods concept that was conceived in Japan in the late 1980s.³

The escalating cost of pharmacological treatment of diseases and risk factors related to lifestyle factors, such as diet and physical activity, is another increasingly important driving force for the development of nutritionally optimised foods. Several recent large-scale intervention studies (e.g. Tuomilehto *et al.*⁴ and Knowler *et al.*⁵) have demonstrated that diet and physical activity can be at least as effective as commonly used drugs against obesity, elevated blood pressure and blood lipids and type 2 diabetes. The principle of trying lifestyle changes including diet and physical activity before introducing lifelong pharmacological treatment of risk factors such as

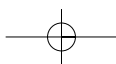
elevated blood pressure and plasma cholesterol levels is gaining acceptance and becoming common practice in the medical community.

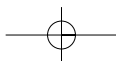
Functional foods are foods with health claims

Health claims on foods have received increased attention, both from the producers' perspective as a means of marketing foods with added value in terms of health, and from the consumers' point of view in terms of consumer education and improved health. However, there is also a risk of overemphasis of the importance of single foods for health. Different national and international bodies attempting to regulate this rapidly evolving market apply various approaches, not least to make claims compatible with and supportive of the general nutrition recommendations. There is a broad consensus that any regulatory framework should protect the consumer, promote fair trade and encourage innovation in the food industry.⁶

Functional foods are generally regarded as foods with scientifically substantiated beneficial effects on health, well-being and performance, in addition to providing the normal nutrients.⁷ Rather than formally defining functional foods, however, most national and international bodies have discussed and defined a number of health claims typically used for foods with added value in terms of health, well-being and performance. Guidelines were recently adopted by the Codex Alimentarius Commission.⁸ A claim means any representation that states, suggests or implies that a food has particular characteristics relating to its origin, nutritional properties, function, nature, production, processing, composition or any other quality. The two main types of claims are regarding: (i) what the food contains, i.e. nutrient content claims and comparative

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claims; and (ii) what the product does in terms of health, well-being and performance, i.e. health claims.⁹

Health claims can be: (i) *generic* (general) and relate to the importance for health of the dietary composition, to which the product can specifically contribute through its favourable nutritional composition; or (ii) *product-specific*, meaning that a certain effect on health, performance or well-being is obtained by consuming the particular food product.⁹

Codex guidelines⁸ specify three different types of health claims: (i) *nutrient function claims* describing a generally accepted role of a nutrient in growth, development and normal physiological functions of the body; (ii) *other function claims* – previously referred to as *enhanced function claims* as suggested in the Functional Foods Science in Europe (FUFOSE)⁷ project – referring to specific beneficial effects of food and food components on physiological and psychological functions other than nutrient function claims as described above; and (iii) *reduction of disease risk claims* referring to the reduction in one or several risk factors for diet-related chronic diseases, obtained by consuming certain foods or diets. Although the nomenclature shows some variation as seen in Table I, these principal types of health claims are now well established internationally.

In many countries claims about disease risk reduction, mentioning the disease in question, are regarded as incompatible with medical products legislation. However, such claims have been used in the USA since the implementation of the Nutrition Labelling and Education Act (NLEA) in 1993 and in Canada since 2003. Already in 1989 the Medical Products Agency in Sweden decided, under certain conditions, no longer to apply medical products legislation on foods 'normally found on the dinner table'. This paved the way for the Food Industry's Code of Practice introduced in collaboration with the authorities in 1990.¹⁰ A corresponding decision by the Commission of the European Communities in 2003 preceded the proposal for a regulation on nutrition and health claims for foods.^{9,11}

Scientific substantiation of claims essential

Scientific substantiation is of key importance for any type of claim: (i) to provide truthful information and to support consumer confidence in foods for which there are claims; (ii) to satisfy regulatory requirements; and (iii) to allow fair market competition. This is one of the areas of public health nutrition where evidence-based science is, and should be, used. The type of claim determines the type and extent of evidence required. For instance, a generic claim reflecting the well-established relationship between saturated fat intake/plasma total and low-density lipoprotein (LDL) cholesterol levels/risk of cardiovascular disease will be based on the same extensive documentation that underpins the general recommendation to limit saturated fat intake to 10% of the energy intake in most national and international nutrition recommendations (e.g. WHO¹). Claims about a specific effect of a proprietary food, on the other hand, would rely in the first instance on human nutrition studies with volunteers consuming that particular food product.^{9,12,13}

PASSCLAIM defines the criteria

A major European Commission (EC)-supported concerted action project, 'Process for the Assessment of Scientific Support for Claims on Foods (PASSCLAIM)', was recently concluded. The project was organised by the International Life Science Institute (ILSI Europe) during 2001 - 2005 and engaged more than 160 scientists from academia, industry, research institutes, public interest groups and the regulatory environment. The main objective was to produce a generic tool for assessing the scientific support for health claims for foods.

PASSCLAIM defined a number of generally applicable criteria for the scientific support of claims, listed in Table II. These criteria emphasise the need for direct evidence of benefits to humans, recognise the usefulness of markers of intermediate effects and

Table I. Health claims classification according to FUFOSE,⁷ Council of Europe,¹² Codex Alimentarius Commission⁸ and the proposed EU regulation¹¹ (adapted from Aggett *et al.*¹³)

FUFOSE (1999)	Council of Europe (2001)	Codex Alimentarius (2004)	Proposed EU regulation (2003)
Nutrient function claims not considered	Nutrient function claims not considered	Nutrient function claims	Health claims related to the generally accepted role of nutrients and other substances
Enhanced function claims	Enhanced function claims	Other function claims	
Disease risk reduction claims	Disease risk reduction claims	Disease risk reduction claims	Health claims related to disease risk reduction

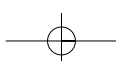


Table II. The PASSCLAIM criteria for the scientific substantiation of claims¹³

1. The food or food component to which the claimed effect is attributed should be characterised.
2. Substantiation of a claim should be based on human data, primarily from intervention studies, the design of which should include the following considerations:
 - Study groups that are representative of the target group
 - Appropriate controls
 - An adequate duration of exposure and follow-up to demonstrate the intended effect
 - Characterisation of the study groups' background diet and other relevant aspects of lifestyle
 - An amount of the food or food component consistent with its intended pattern of consumption
 - The influence of the food matrix and dietary context on the functional effect of the component
 - Monitoring of subjects' compliance concerning intake of food or food component under test
 - The statistical power to test the hypothesis.
3. When the true endpoint of a claimed benefit cannot be measured directly, studies should use markers.
4. Markers should be:
 - Biologically valid in that they have a known relationship to the final outcome and their variability within the target population is known
 - Methodologically valid with respect to their analytical characteristics.
5. Within a study the target variable should change in a statistically significant way and the change should be biologically meaningful for the target group consistent with the claim to be supported.
6. A claim should be scientifically substantiated by taking into account the totality of the available data and by weighing of the evidence.

highlight that effects should be both statistically and biologically meaningful. A consensus report¹³ presents these criteria and gives an outline of the context within which they are to be assessed.

The context within which a claim is made should be considered in relation to existing legislation as well as dietary guidelines. Foods for which health claims are made should fit into a healthy diet. Requirements on the nutritional composition of the food product for which a claim is made, in addition to the active component(s), are a matter of discussion, not least within the European Community in terms of 'nutrition profiling'. In any case, products for which health claims are made should be possible to accommodate within a balanced diet according to current nutrition recommendations. Other important contextual points stressed in the PASSCLAIM project are that the regulations should in principle reflect the evolving science base taking into account new scientific developments as appropriate, rather than for instance excluding certain areas *a priori*. An important point outside the scope of PASSCLAIM is that a claim should reflect its scientific basis, and, at the same time, should be understandable, and not be misleading to the intended consumer.¹³

The way to develop valid scientific study designs and to identify, validate and use markers to explore the effects of diet on health was dealt with by a number of expert groups, each focused on a specific theme. Seven comprehensive reviews on diet-related cardiovascular disease, bone health and osteoporosis, physical performance and fitness,¹⁴ body weight regulation, insulin sensitivity and diabetes, diet-related cancer, mental state and performance, and gut and immunity¹⁵

formed the basis for development of the criteria. One study made a synthesis and review of existing processes.⁹

The criteria describe the standards by which the quality and relevance of the scientific evidence should be judged and thus the extent to which a claim based on them can be said to be scientifically valid. Therefore, the criteria have the potential to increase public confidence in the role of diet in maintaining and improving health and well-being.

A key issue is that substantiation of a claim should be based on human data, primarily from intervention studies (criterion 2, Table II). There are many forms of human studies, which can be broadly classified into intervention and observational. Intervention studies include the randomised controlled trial (RCT) looking at physiological or psychological effects. RCTs are often the final piece of evidence for a claim, after data have been gathered from observational and other types of study. It is desirable to have more than one RCT showing the effect to be claimed. Mechanisms for the effects are desirable but not essential to know.¹³

Concluding remarks

Health claims on foods provide opportunities for marketing of foods with added value in terms of health, well-being and performance. Provided that strict criteria for the scientific substantiation of such claims are applied, and that the scientific evidence is translated into clear and balanced statements understandable for the intended consumer and taking into account the importance of the whole diet, foods

with health claims would provide well-documented alternatives for increasingly health-conscious consumers, for the benefit of consumer health. Furthermore, possibilities to develop and market such foods have the potential to focus on and promote nutrition as a main quality parameter with resulting improvements of the nutritional composition of a broader range of food products for the benefit of consumers in general.

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CHRONIC DISEASE PREVENTION

Global strategies to prevent chronic diseases¹

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Chronic, non-communicable diseases such as heart disease, stroke, cancer and diabetes, despite being the leading global causes of death and disability, are notably absent from international development discussions and actions. This paper makes four points. First it reaffirms the critical importance of chronic diseases as causes of ill health globally – and especially in low- and middle-income countries – and their potential, and underappreciated, constraint on economic and social development in all countries. Secondly, it emphasises the unrealised potential for the prevention and control of all major chronic diseases. Thirdly, it considers the absence of chronic diseases from the Millennium Development Goals (MDGs) and how best to align the chronic disease agenda with the MDG agenda. Fourthly, it highlights the importance of operational research to support the implementation of global strategies for the prevention and control of chronic diseases, rather than more epidemiological, clinical or laboratory research.

The burden of chronic diseases

Since the early decades of the last century chronic diseases have been the leading causes of death and disease in most wealthy countries. Only recently has it been appreciated that these diseases are now the leading cause of death in all regions of the world, except Africa.

This year there will be an estimated 58 million deaths, 35 million of which will be due to chronic diseases. Approximately 16 million of these chronic disease deaths will be premature, i.e. occurring under the age of 70 years. Of all chronic disease deaths 80% occur in low- and middle-income countries, and the death rates in these countries are considerably higher than in high-income countries. The burden of chronic diseases (as measured by disability adjusted life-years) is increasing, now accounting for nearly half of the global burden of disease (all ages). While the proportion of

burden from chronic diseases in adults in developed countries remains stable at over 80%, the proportion in middle-income countries has already exceeded 70%. Surprisingly, almost 50% of the adult disease burden in the high-mortality regions of the world is now attributable to chronic diseases.² Population ageing, urbanisation and changes in the population distribution of risk factors, in response to local and global forces, have accelerated the epidemic of chronic diseases in low- and middle-income countries.³

Cardiovascular diseases will account for approximately 16 million deaths in 2005 and for 13% of the disease burden among adults over 15 years of age. Coronary heart disease and cerebrovascular disease (stroke) are the two leading causes of mortality and disease burden among adults over age 60. An estimated 7.5 million cancer deaths will occur this year. Lung cancer is the most readily preventable cancer with an estimated 1.5 million deaths reflecting the emergence of the tobacco epidemic in low-income and middle-income countries.

Although we are most comfortable with epidemiological expressions of the burden of chronic diseases, from a policy perspective the social and economic burdens are at least of equal importance. Unfortunately, and in contrast to considerable work on the impacts of infectious diseases – for example, by the Commission on Macroeconomics and Health⁴ – there have been few systematic studies of these impacts of chronic diseases. The recent Macroeconomics and Health Report for Central and Eastern Europe highlights the importance for this region of reducing adult mortality, with the expected gains being much greater than for reductions in childhood mortality.⁵

The impact of chronic diseases on social institutions will, fortunately, never be as acute as HIV/AIDS; it will be less visible, but in the long term they will have enormous adverse effects on societies. There is considerable evidence from wealthy countries of the costs of specific chronic conditions – diabetes,⁶ cardiovascular diseases⁷ and, increasingly, obesity,⁸ for example, have received much attention. Recent, albeit limited, data from five low- and middle-income countries highlight the impact of cardiovascular disease on the middle-aged workforce, just as was apparent in wealthy countries when these epidemics were at their peak in the middle decades of last century; this report also stresses the equal importance of cardiovascular disease to women and men.⁹ The forthcoming World Health Organization report, *Preventing Chronic Diseases: A Vital Investment*, will present estimates of the economic impact of heart disease, stroke and diabetes on the economies of several countries.¹⁰

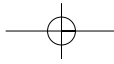
The causes of chronic diseases are known and they are preventable

An impressive body of research has identified the causes of the major chronic disease epidemics, with the notable exception of breast and prostate cancers. The current distribution of the major risk factors for chronic diseases are indicators of future health status, and 5 of the top 10 risks worldwide are specific to chronic diseases.¹¹ These major chronic disease risk factors – tobacco use, inappropriate diet and physical inactivity (primarily expressed through unfavourable lipid concentrations, high body mass index, and raised blood pressure) – explain at least 75 - 85% of new cases of coronary heart disease.¹² In the absence of elevations of these risk factors, coronary heart disease is a rare cause of death, at least until the very oldest age groups. Unfortunately, the vast majority of the populations in almost all countries are at risk of developing chronic diseases because of higher than optimal levels of the main risk factors. Only about 5% of adult men and women in wealthy countries are at low risk with optimal risk factor levels. There are only a few very poor countries in which these factors have not yet emerged as major public health problems.

It is not surprising, given the extensive knowledge on the causes of chronic diseases, that they are on the whole preventable. Application of this knowledge has had a major beneficial impact on chronic disease death rates in many wealthy countries, especially for cardiovascular disease and, to a lesser extent, lung cancer in men.¹³ These declines account for the rapid increases in life expectancies in adults in many wealthy countries, even though much of this benefit has accrued to the more advantaged segments of these populations.

Chronic diseases and the Millennium Development Goals

The absence of chronic diseases from the MDGs is notable, given their domination of the global mortality and burden of disease patterns in all regions except Africa, and their contribution to health inequalities. The origin of the MDGs in the international development discourse in the 1990s helps explain this absence. The United Nations conferences in the 1990s focused on a narrow range of health concerns around maternal and child health issues and infectious diseases, and came up with a set of targets that concentrated attention on these issues. There is a need to both develop acceptable chronic disease prevention



and control targets and at the same time work towards broadening the health development agenda in line with the complexities of the health situation in all countries.

There are several reasons to attempt to align the chronic disease agenda with the MDGs. First, the MDGs represent a compact between rich and poor countries and this key concept of partnership can be used to further the chronic disease prevention and control agenda, especially given the emerging evidence on the economic implications of chronic diseases, which are probably of equal importance to other causes of ill health in perpetuating poverty. Secondly, there is a real danger that an overriding commitment to the MDG agenda will distort resource allocations for countries, donors and the WHO, away from the social and economic reality. As poor countries build their health systems to provide prevention and control services to achieve key MDG goals, these same services could readily be used for chronic disease prevention and control programmes. Finally, monitoring of MDG 6 will in future include trends in health-adjusted life expectancy (HALE). Since chronic diseases are major contributors to HALE, their relevance to the MDGs is reinforced.

The reasons for the neglect of chronic diseases by international development agencies are complex. In all countries there is the inevitable priority given by health systems to acute infections, especially those like severe acute respiratory syndrome (SARS), which can have major and rapid adverse economic impacts. There is a misconception that chronic diseases are still the preserve of men in wealthy countries, despite the irrefutable evidence to the contrary. The notion that these conditions are caused by 'lifestyles' totally under the control of individuals not only persists in most countries but in some is the dominant paradigm for health, despite the overwhelming importance of the social, economic and cultural environment in determining human behaviours. Since the major determinants of chronic diseases are not under the direct control of individuals, the case for government leadership in the chronic disease agenda is strong.

Research priorities for chronic diseases

Essentially, the causes of chronic diseases are known and there is little need for research to identify new and unknown causes. However, further research is required to explore the many variations in the occurrence of chronic diseases, both within and especially among countries.¹⁴ Of particular interest is life course research examining influences that accumulate over a lifetime, and complementary attempts to explain socioeconomic inequalities in risk, between both individuals and regions.

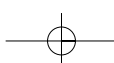
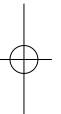
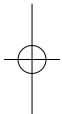
A critical research issue is the need for a comprehensive analysis of the non-health effects of chronic diseases. Cost-of-illness studies are only a start. More important is further assessment of the direct and indirect economic effects of chronic diseases on societies, communities and families and on already stretched health services. These impacts will only increase as societies age.

A major priority for new research is prevention policy and programme effectiveness and issues of importance for the spread of the chronic disease epidemics to poor populations. Policy-directed research will have the biggest public health payoff in the short term, as it has had for tobacco control. There is an urgent need for epidemiologists and other public health scientists to explore the applicability of new research methods to the underlying social, economic and cultural determinants of chronic diseases. Some of the required research is more a matter of academic interest; some may in time provide extra leads to effective public health action. However, the unresolved issues should not detract from the urgency of applying what we know, especially in low- and middle-income countries that will bear the brunt of the global chronic disease epidemics.

Strategic issues

The main issue for policy makers, at all levels of public health in low- and middle-income countries, is how to deal with the growing burden of chronic diseases in the presence of persisting communicable disease epidemics. Furthermore, this challenge must be faced even where health system resources are already inadequate. Although considerable policy gains can be made very cheaply, especially inter-sectorally, extra resources must be found, just as for infectious disease prevention and control. This requires a greater share of national resources for health care, better use of existing resources, and new sources of funding. A special tax on tobacco products for disease prevention and control programmes is a readily available source of new funds, and experience with these forms of funding is growing.

Another critical policy issue concerns the appropriate balance between primary and secondary prevention and between the population and high-risk approaches to primary prevention. If the goal is to increase the proportion of the population at low risk and to ensure that all groups benefit, the strategy with the greatest potential is the one directed at the whole population, not just people with high levels of risk factors or established disease.¹⁵ All other strategies will, at best, only blunt the epidemics and probably increase inequalities; they will not prevent the epidemics. The ultimate public health policy goal is the reduction of population risk, and since most of the population in most countries is not at the optimal risk level, it follows



that the majority of prevention and control resources should be directed towards this goal in the entire population. Evidence is available in support of the cost-effective policies required for the task of making the small – but powerful and surprisingly rapid – shifts in risk distributions in entire populations in a favourable direction.⁹ Similarly, management decisions based on measures of overall risk are more cost-effective than those based on single risk factors.

Untold lives are lost unnecessarily because of inadequate acute and long-term management of chronic diseases. Relatively cheap interventions for chronic diseases are available,¹⁶ and single combination pills including aspirin and drugs for blood pressure and cholesterol lowering for possible use in chronic care are under development.¹⁷ Even in wealthy countries, however, the potential of these and other interventions for secondary prevention is far from fully utilised. The situation in poorer countries is even less satisfactory. There are many opportunities for co-ordinated chronic disease risk reduction, care and long-term management. Smoking cessation and the identification and management of diabetes, for example, are just two priorities. Cost-effective interventions, such as the use of aspirin in people with myocardial infarction, would prevent a quarter of the deaths associated with heart attacks and are usually much more cost-effective than more radical interventions.

A coherent policy framework, encompassing legislation, regulation and mass education, is critical for chronic disease prevention and control, since individual behaviour change is difficult in the absence of conducive environmental alterations. A suggested stepwise framework for a comprehensive response to chronic disease prevention and control is under development and can be modified according to national needs, goals and targets.¹⁰

Unfortunately, the global and national capacity to respond to chronic disease epidemics is woefully inadequate. Few countries have implemented comprehensive prevention and control policies and development of capacity, especially for policy and programme development and implementation research, has not kept pace with the epidemiological transition. The gaps between the needs for chronic disease prevention and control and the capacity to meet them will grow even wider unless urgent steps are taken.

The WHO and governments cannot confront the challenges of chronic disease prevention and control alone. The WHO Global Strategy on Diet, Physical Activity and Health is the strategic framework within which the WHO and Member States can work together across sectors in preventing chronic diseases. This population-wide prevention strategy is based on extensive consultations with stakeholders: Member

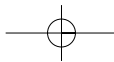
States, the United Nations and intergovernmental organisations, civil society and the private sector.

Globally, there is still only limited advocacy for the prevention and control agenda and what there is tends to be fragmented. The lack of unified advocacy for health promotion compares poorly with the growing dominance of commercial and consumer groups that have placed treatment at the centre of health policy debates and funding priorities. Broader alliances of major health professional bodies, NGOs, consumer groups and others are needed to promote the prevention of major risk factors for chronic diseases and to track progress to agreed national and global goals – perhaps modelled on the MDGs. Since the determinants of chronic diseases are multisectoral, advocacy and action must extend well beyond the health sector. The involvement of NGOs in articulating the demand for speedy implementation of policies and programmes relevant to chronic disease control is critical for catalysing policy change and for mobilising communities to ensure that the benefits flow to the entire population.

While the pace of globalisation of the major risks for chronic diseases is increasing, progress towards prevention and control is slow. Sustained progress will occur only when governments, international agencies, NGOs and civil society acknowledge that the scope of public health activities must be rapidly broadened to include chronic diseases and their risk factors. Chronic disease prevention and control advocates should use the MDG framework and experience as a model for their own efforts, which should be synergistic with, but not in competition with, the infectious disease agenda.

Finally, most of the facts in this paper are known to many policy makers and politicians. Yet action is limited. There is a serious need for research into the most effective levers for policy change around the chronic disease agenda. With this knowledge we could identify the best advocacy approaches and the best entry points and partners for the multisectoral actions that are required. Will childhood obesity, for example, provide the spur for action? It is often said that chronic diseases began to be taken seriously in wealthy countries as a response to their direct impact on politicians. Will we have to wait for a generation of middle-aged politicians in low- and middle-income countries to be struck down by heart attacks and strokes before these issues are taken seriously? The fact that the WHO and many of its partners are now taking chronic diseases more seriously provides hope that we may be able to shortcut this process.

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NUTRITION IN ASIA

Innovative solutions to nutritional issues in Asia

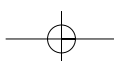
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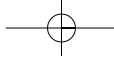
Asian countries are big, medium and small in size, and comprise industrialised and developing countries.¹ Some are in transitional states, reflected in their types of nutritional problems. Industrialised countries are more prone to overnutrition and related diseases, such as obesity, high blood pressure, coronary heart disease, cancer, etc., whereas the majority of nutritional problems in developing countries are malnutrition, such as protein energy malnutrition (PEM), and micronutrient deficiencies especially iron deficiency anaemia, and iodine and vitamin A deficiencies.¹⁻⁴ Furthermore, vitamin B₁, B₂, B₆, and folic acid deficiencies cannot be discounted.^{1,5-10} Some transitional countries are also facing increasing rates of overweight and obesity, which can lead to degenerative diseases such as diabetes mellitus, hypertension, coronary heart disease and some types of cancer.^{11,12}

Food-borne parasitic infections, some of which are very dangerous, are also important problems affecting health, such as liver fluke infection (*Opisthorchis viverrini*), which can associate with some carcinogens, e.g. N-nitroso compounds, and cause cholangiocarcinoma (cancer of the bile canals).^{13,14} Food-borne diseases caused by bacteria and viruses are also of public health importance, especially diarrhoea. Chemical toxins, such as aflatoxins caused by mould growth (*Aspergillus flavus*), are also prevalent in the tropics, since the temperature and humidity are suitable for mould growth in agricultural products that are inappropriately stored after harvest, especially peanuts and corn. 8,9-epoxide, the metabolite product

of aflatoxin B₁, is the ultimate carcinogen, which can cause liver cancer.¹⁵ The other common carcinogens are exogenous nitrosamines formed in cured meats, and/or endogenous nitrosamines, which can be formed in the stomach and small intestine.¹⁶ These various factors highlight the very important issue of food safety, not only at the household level, but also at national and international levels, which can affect food exports. Food contaminant limits should meet international standards, e.g. the World Trade Organization (WTO), CODEX Alimentarius. Diarrhoea caused by unsafe foods can retard the growth of children, especially infants and preschool children, and result in wasting and stunting conditions.¹⁷

There are many other reasons for malnutrition, the majority of which are poverty, production and distribution of foods, lack of nutritional knowledge, and ignorance. Many means of nutrition intervention can be utilised, which should be appropriate and applicable to the place and size of the problem(s).^{1,18} Successful pilot projects have been implemented nationwide; however, national implementation programmes cannot succeed without the advocacy of policymakers, politicians, academia, communities, and the general population. Many projects should start from grassroots level, signifying genuine popular participation, and the utilisation of local resources and traditional knowledge should be emphasised. In addition, modern technologies should be transferred to communities. International organisations are beneficial aids to enlarging functional outcomes.¹⁹ With globalisation,





information technology is an essential tool for reaching broad segments of the population so that nutrition education can be distributed via distance learning, even reaching people in remote areas. The most important innovative solution is to promote nutrition programmes as national programmes in accord with other national programmes aimed at creating a healthy population, which implies physical, mental, social, and spiritual health.²⁰

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