

## Original Article

# 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

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Increasing efforts are being made to address, in public health policy (PHP), both the persistence of nutritional deprivation in economically disadvantaged communities, and the increase in so-called 'chronic disease' (abdominal obesity, diabetes, cardiovascular disease, certain cancers, osteoporosis, arthritides, and inflammatory disease) in communities at all stages of economic development. The problems in the 'chronic disease' descriptor are that its origins may be as early as conception, rather than during the postnatal lifespan, or even in previous generations; it may appear abruptly or slowly; and it may be amenable to environmental and behavioural intervention well into its course and in older age groups. It is also not necessarily 'non-communicable', a qualifier often used for 'chronic disease' (chronic non-communicable disease or CNCD) and often has inflammatory features, for example the inflammatory marker C-reactive protein is a predictor of macrovascular disease and ischaemic events and can, in part, be prevented in the affected by influenza vaccination. The nexus between immuno-deficiency, inflammatory processes and nutritional status which is characteristic of 'infective' and food-borne illness, is also more and more evident in 'chronic disease'. It may be more helpful to consider chronic disease as 'eco-disease' with its environmental and behavioural contributors, and to regard that which is clearly nutritionally dependent as 'eco-nutritional disease'.

**Key words:** arthritides, cancer, cardiovascular disease, chronic disease, deficiencies, diabetes, eco-disease, eco-nutrition, environment, healthy longevity, inflammatory disease, life-cycle, malnutrition, obesity, osteoporosis, phytochemicals, public health policy (PHP).

### Chronic disease

By 'chronic disease' we generally mean that kind of disease which may or may not be abrupt at the time in its expression, but whose impact lasts longer than days or weeks and which may be recurrent, as well as lasting. It is exemplified by obesity (especially abdominal obesity), the macrovascular diseases (MVD) (of medium and distributing arteries) and the consequences of ischaemia on end organs (like heart, brain, kidney, reproductive organs, and limbs), impaired fasting glycaemia (IFG) and diabetes, certain cancers (notably lung, breast, colorectal, prostate and skin), osteopenia and osteoporosis with fracture, the arthritides (especially osteoarthritis) and impaired cognition and dementia. These may be manifest in communities, irrespective of income, although they are generally first in evidence in high-income communities with demographics relatively more aged. Whilst chronic diseases have characterized older, more affluent people, they are increasingly affecting younger people (especially insofar as obesity and its consequences

are concerned) and the socio-economically disadvantaged, notably communities in transition.<sup>1–5</sup>

There has been a tendency to refer to these diseases as 'non-communicable', as though they were unrelated to infectious disease. Increasingly, it is recognized that chronic disease may have infective contributors: viral in obesity;<sup>6,7</sup> bacterial and possibly viral<sup>8</sup> in atherosclerosis;<sup>9</sup> and inflammatory processes in most. Indeed, risk factors for atherosclerotic macrovascular disease now include inflammatory markers like ESR (erythrocyte sedimentation rate) and C-reactive protein (CRP) which may be a more potent risk factor than lipoproteins.<sup>7,8,10–13</sup>

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'Over-nutrition' was thought to presage chronic disease, and 'under-nutrition' infective disease, but now we know this is not so clear-cut. Both may alter immune function unfavourably with various health consequences for infective and non-infective illness. Under-nutrition may predispose to 'chronic disease' (as well as communicable disease) and include that of amino acids (like arginine, important for arterial function),<sup>14</sup> micronutrients (like vitamins B<sub>6</sub>, B<sub>12</sub> and folic acid leading to homocysteinaemia, thrombosis and arterial damage)<sup>15</sup> and phytochemicals (which are required from a spectrum of foods for at least their antioxidant, if not other, properties to protect tissues from chronic disease<sup>16</sup>), as described above. However, it should be observed that even under-nutrition of the protein-energy malnutrition (PEM)-kind, or reflected in growth retardation, is rarely short-lived and usually chronic.

Operationally, 'over-nutrition' often represents positive energy balance on the basis of physical inactivity, rather than over consumption (although this may of course, occur because of eating pattern, large serving size, or high food-energy density).

These various considerations have led to the over-arching health policy advice by organizations like Nutrition Australia (the Australian Nutrition Foundation) for 'Optimal Health through Physical Activity and Food Variety' (<http://www.nutritionaustralia.org>).

### Burden of chronic disease

The Burden of Chronic Disease is mainly comprised of:

- malnutrition (which may extend from conception to old age)
- immuno-deficiency and recurrent infection
- cardiovascular disease (CVD)
- neoplastic disease
- metabolic, especially cumulative positive energy balance
  - over-fatness with insulin resistance
- loco-motor disease
  - osteoporosis
  - sarcopenia (reduced skeletal muscle mass)<sup>17</sup>
- arthritis
- CNS disease
  - mood

- cognition
- stroke.

An increased ability to measure disability and the burden of disease and how it affects healthy longevity is now reflected in Disability-Adjusted Life Expectancies (DALES).<sup>17</sup> The top and bottom 10 countries are shown in Table 1.

Food Based Dietary Guidelines<sup>19,20</sup> acknowledge the importance of incorporating the best available nutrition science and evidence into identifiable food cultural settings for health advancement. This is now progressing at the community, national and international levels. Such guidelines encourage both food adequacy and the use of quality food and food patterns which are safe and nutritious (generally nutrient-dense and low in energy density).

A wide range of factors, other than genetic, play a role in the development of chronic disease and its contribution to DALES:

- food
- physical activity
- inflammatory processes
- substance abuse (tobacco, alcohol, medication)
- social factors
- economic factors.

The role of physical activity (both aerobic and strength-training)<sup>18,21,22</sup> is of crucial importance to public health as it:

- allows adequate and appropriate food and nutritive substance intakes, without over-fatness
- discourages substance abuse (like smoking and with alcohol)
- encourages social activity
- enhances CNS function (cognition and mood)
- helps maintain reserve capacity (cardio-respiratory, loco-motor)
- reduces certain neoplastic disease processes (colon cancer, breast cancer, prostate cancer)
- provides eco-system contact with, amongst other benefits, engagement with nature, and appreciation of sustainability.

For these, and other reasons, regular physical activity increases survival and compresses morbidity towards the end of longer lives.<sup>23</sup>

**Table 1.** The leading and most disadvantaged disability-adjusted life expectancies (DALES)<sup>17</sup>

Top 10		Bottom 10	
Member state	DALE (years)	Member state	DALE (years)
Japan	74.5	Ethiopia	33.5
Australia	73.2	Mali	33.1
France	73.1	Zimbabwe	32.9
Sweden	73.0	Rwanda	32.8
Spain	72.8	Uganda	32.7
Italy	72.7	Botswana	32.3
Greece	72.5	Zambia	30.3
Switzerland	72.5	Malawi	29.4
Monaco	72.4	Niger	29.1
Andorra	72.3	Sierra Leone	25.9

**Table 2.** Public health policy targets related to community development

Community development	Target
In Education	Maternal literacy
In Health	Culture and Beliefs
	Physical activity
	Social activity
Economic	Governance
	Democracy
Environmental	Sustainable food supply
	Safe and healthy precincts and accommodation

The growing interest in inflammatory processes in chronic disease, for which C-reactive protein is an indicator<sup>8,9,24,25</sup> raises the prospect that food with anti-inflammatory properties (containing, for example n-3 fatty acids, salicylates and the rosmarinic acid family of compounds in, respectively, fish and flaxseed, certain fruits, and culinary herbs)<sup>26,27</sup> may be an option in chronic disease prevention.

Marmot has identified a sense of personal control<sup>28,29</sup> as important in protection against chronic disease. More broadly, social activity<sup>30</sup> and social networks<sup>31,32</sup> are consequential.

The Food Habits in Later Life (FHILL) study of the IUNS, point to the ongoing importance of food culture, social activity and physical activity, along with substance abuse in later life.<sup>33</sup>

#### The sources of chronic disease — eco-nutritional disease

The problem with the term ‘chronic disease’ is that it says nothing about aetiology or pathogenesis.

When considering the major importance of food (its variety and the requirement for biodiversity), movement (in safe, pleasurable and sustainable precincts) and the required ‘environmental buffer zones’ to minimize the risk of known and emerging transmissible pathogens, the logic of describing chronic disease as ‘eco-nutritional disease’ becomes apparent.<sup>34,35</sup> Even dependence on substances like tobacco and alcohol is less likely where the environment itself provides fulfilling and less stressful experiences.<sup>34</sup>

#### Public health policy (PHP)

In the formulation of PHP, there are a number of considerations:

- (1) That there be a focus on community development and this includes:
  - education programs
  - health programs
  - economic initiatives
  - environmental strategies.

A persuasive example of these considerations would be education (traditional and formal) about the value of food (and plant medicinals) and physical activity (including gardening) to contribute to health programmes in ways more cost-effective than patented drugs, and offering sustainable environments.

- (2) That there be targets for PHP which would favour community development (Table 2).
- (3) Eco-nutrition can provide a Framework for PHP. Here the dynamic of ‘Health ↔ Environment’ is operative and encourages a sustainable food supply for physically active people.
- (4) Newer technologies have much to offer PHP. They include:
  - bio-technology
  - food technology
  - information technology
  - biomedical engineering.

#### A PHP re-format for sustainable community development

The key elements of future PHP, leading to successful ageing, will be that it:

- takes account of antecedent generations
- starts at conception
- requires healthy environments
- recognize that women are pivotal
  - their economic status, literacy and health
- includes the whole community
- takes a whole-of-life and whole community approach to chronic or eco-disease so that sustainable solutions may be found for well-being, health and survival.

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