CHAPTER 4

THE NUTRITION TRANSITION IN DEVELOPING COUNTRIES

H. H. Esté Vorster and Lesley T. Bourne

Outline

• Meaning of the nutrition transition
• Factors that influence the nutrition transition
• Dietary changes during the nutrition transition
• The double burden of disease
• Biological responses to diet
• The double danger of early undernutrition
• The formulation of public health policy
• Monitoring, measuring, and assessing the nutrition transition

Outline

At the completion of this chapter you should be able to:
• Explain what is meant by the nutrition transition
• Describe the stages of the nutrition transition
• Describe the key dietary changes at the different stages of the nutrition transition
• Discuss how investigating the nutrition transition helps us to better understand the emergence of nutrition-related chronic diseases of lifestyle
• Suggest programmes that need to be implemented to counter the emergence of nutrition-related chronic diseases of lifestyle

Abbreviations

CDL Chronic diseases of lifestyle

NR-CDL Nutrition-related, chronic diseases of lifestyle
1. INTRODUCTION

The nutrition transition is defined as changes in dietary patterns and nutrient intakes of individuals, families, groups of people, or whole populations when their food environment and other circumstances change. It is usually accompanied by an epidemiological transition, which is a shift from a pattern of high prevalence of malnutrition-related infectious diseases to one of increases of the nutrition-related, chronic diseases of lifestyle (NR-CDL). The environmental or circumstantial changes usually associated with the nutrition transition are urbanization, modernization (when people adopt modern “Westernized” lifestyles), and acculturation (when people forsake traditional cultures to adopt new lifestyles and beliefs). We live in a changing world, and the way we respond to these changes will influence our health. Moreover, changes in our external environment are intricately interlinked and often unavoidable.

In this chapter, the forces responsible for the changes in the food “environment,” how people respond to these changes, and how the changes in eating patterns and nutrient intake influence health and well-being are explored. Because access to affordable, nutritious, and safe foods is a human rights issue, the chapter will also focus on the role and responsibilities of the different sectors in ensuring an environment in which healthy and safe food choices are possible and affordable. This includes recommendations for appropriate policies and programmes to steer the present nutrition transition in low- and middle-income countries into a positive direction.

2. A CONCEPTUAL FRAMEWORK TO UNDERSTAND THE NUTRITION TRANSITION

2.1 Factors that Influence the Nutrition Transition

Figure 4.1 illustrates a framework for understanding the complex, interlinked causes of the nutrition transition. To steer the nutrition transition in a positive health direction, it is necessary to understand all the factors influencing our food choices and our responses to changing diets.

Figure 4.1: Factors influencing the causes and consequences of the nutrition transition.
2.2 The Nutrition Transition and the Food Environment

The five historical patterns and changes during the nutrition transition have been described as follows by Caballero & Popkin (2002) and by Popkin (2002, 2012).

1. Collecting of food. Hunter-gatherers ate a diet high in carbohydrate and fibre, and low in fat.

2. Famine. At this stage there were periods of acute scarcity of food and little dietary variety. These changes are related to a shift towards settlements and the adoption of a lifestyle based on farming. At first, foods mainly consisted of crops, but later also included livestock and poultry.

3. Receding famine. As farming developed, there was increased consumption of fruit and vegetables and less reliance on staple foods. The consumption of fruit, vegetables, and animal protein increased, while starchy staples become less important in the diet.

4. Nutrition-related chronic diseases of lifestyle (CDL). This period is characterized by an increased availability of inexpensive, ultra-processed, energy-dense foods high in fat, cholesterol, and refined carbohydrates. This is also referred to as a “Western” diet.

5. Behavioural change. Here we see the emergence of a “new,” prudent, healthy dietary pattern based on scientific knowledge of the relationships between diet and health, as well as the benefits of increased physical activity.

Modern technology has created a world that is becoming “smaller”: globalization of countries, markets, economies, multinational companies, and individuals (see Friedman, 2005), accompanied by international trade agreements, changes in agriculture (e.g., development of genetically modified foods), the influence of the food industry (developing and marketing of new products), and the media (promoting specific products), have collectively created a food environment in which a huge variety of good-tasting, palatable “healthy” and “unhealthy” foods are available, often during all seasons.

Unfortunately, social inequality – due to widespread poverty, wars, dictatorships, bad governance, and unfair trade policies – has resulted in a situation in developing countries where poor people are not benefiting from globalization (see Chapter 27). Moreover, many are concerned that globalization and overconsumption are threatening the environment and the ability to provide healthy and safe food for future generations. The food industry, largely responsible for the marketing of high-fat, sweet, “good-tasting,” or palatable convenience foods, products, drinks, and snacks, is at present endeavouring to include a health agenda in the development of new functional food products. However, their motives, ethics, and contribution to “fairness, equity and a better future” for all are often questioned (Monteiro et al., 2010).

Different populations are at different stages of the nutrition transition. Indeed, different groups of people in the same population can be at different stages. In developing low- and middle-income countries, we see a situation where poverty and underdevelopment in rural areas often gives rise to hunger. This places some groups in the patterns of famine and receding famine. Yet at the same time, urbanization in the same countries has resulted in the pattern of CDL in many individuals and groups. In developed countries, there is promising evidence that some individuals and groups are moving towards the behavioural change pattern during which a more prudent and healthier diet is adopted. The major objective of food-based dietary guidelines (FBDGs) is to promote a prudent, balanced diet that places all people within a population in this behavioural change stage or pattern (Vorster, 2001).

Figure 4.1 also shows that food behaviours or our dietary choices in this changing food environment are influenced by psychological strengths, knowledge of healthy diets, education, food culture, and what we can afford. These factors should therefore be addressed in planning intervention policies and programmes to improve the diet of individuals and populations.

2.3 Dietary Changes During the Nutrition Transition

We now examine more closely the dietary changes typically seen during the nutrition transition in developing countries (Popkin, 2002). Similar patterns are seen around the world. Urbanization, as well as modernization of lifestyles in both urban and rural areas, has resulted in a dietary pattern characterized by increased intake of total and saturated fat, refined carbohydrates and added sugar, and of total and animal-derived protein.
Conversely, there is a decreased intake of total carbohydrate, plant protein, and fibre. In many instances the recommended micronutrient intakes are not met, resulting in a “hidden hunger” where apparently healthy, even overweight and obese people, eating a Westernized diet, suffer from some micronutrient deficiencies. The end result of these changes is the Western diet, characterized by a high intake of fat (>30% of total energy), saturated fat (>7% of total energy), and salt (>6 grams/day), but a low intake of dietary fibre (<20 grams/day) and phytochemicals, combined with an energy intake that exceeds energy needs (as dictated by physical activity). A dominating feature of this diet is “overnutrition” due to an excessive supply of macronutrients.

As an example of a developing country, nutrient intake changes observed in South Africans over the past fifty years are described here. These data illustrate the dietary changes typically seen during the nutrition transition. In order to show trends in per capita consumption, food balance sheets for the years 1962 and 2001 are presented in Figure 4.2 (FAO, 2004). This shows the amounts of energy from the different macronutrients as well as total energy available for the South African population. While food balance sheets present total amounts of food available, they do not reflect the variations between the different socio-demographic subgroups. As has been seen in both international and local studies, over the 40-year period the available protein and fat supplies have increased. While this suggests that overall food security has improved, the trend in the macronutrient profile of available foods is in the direction that is likely to increase the risk of chronic diseases. Meanwhile, the per capita available energy supply has increased by about 12%. This is especially significant as changes to lifestyles, such as greater availability of buses and cars, meant that people had less need to engage in physical activity.

![Figure 4.2: Trends in dietary energy supplies of South Africans, 1962 and 2001.](image)


Similar trends were identified in black adults, aged 19 to 44 years, living in Cape Town (Bourne, 1996). The data were stratified by the percentage of life spent in an urban environment. Figure 4.3 shows that with increased urban exposure, reported intake of carbohydrate as a percentage of total energy decreased from 68% to 58%, while fat increased from 23% to 30%. Protein intake was relatively stable; however, a higher proportion of it was from animal sources. Total fibre intakes decreased from 20.7 to 16.7 grams per day (not shown in the figure). These shifts reflect the adoption of an increasingly Western diet.
There are important differences within the various South African population groups. Figure 4.4 compares the macronutrient intake of adult white urban males (aged 15 to 64 years), black urban males (aged 19 to 44 years), and black rural males (aged 20 to 65 years). The figure indicates that the white population consumes a Western diet (Wolmarans et al., 1988), while the rural black population follow a traditional dietary pattern (Steyn et al., 2001). By contrast, the urban black population has an intermediate diet (Bourne, 1996). The mixed-ancestry population (Steyn et al., 1985) and Indian population group (Wolmarans et al., 1999) consume diets that are culturally distinctive but reflect Western macronutrient profiles, placing people in these groups at risk of chronic diseases and in the NR-CDL stage of the nutrition transition.

### 3. THE NUTRITION TRANSITION AND HEALTH

The Western diet, through various mechanisms, increases the risk of nutrition-related CDL. Therefore, eating a typically Western diet results in an increased risk of obesity, hypertension, ischaemic heart disease, stroke, the metabolic syndrome, type 2 diabetes, and some types of cancer.

#### 3.1 The Double (or Dual) Burden of Disease

In low- and middle-income countries, in recent years, there has been a great deal of urbanization and economic development. Following this, the nutrition transition has been rapid and intense. The result is that CDL, especially obesity, hypertension, cardiovascular disease, and type 2 diabetes, emerged in the higher socio-economic groups before the battle against undernutrition and infectious disease in the lower socio-economic groups had been won. This co-existence of CDL (in adults) and infectious diseases (mostly in children) is known as the **double burden of disease**. A particular feature of this is that the onset of CDL in the adult population occurs at a younger age than in developed populations who experienced the nutrition transition many years ago. Also, the consequences and mortality from CDL are more pronounced in populations who are presently experiencing the double burden. A possible explanation is that in countries experiencing the double burden, undernutrition induces early foetal and infant programming, which then confers an extra vulnerability for CDL in later life when these “programmed” individuals are exposed to a Western diet.

In many low-income countries, the HIV/AIDS pandemic added another dimension on top of the double burden of disease; this is therefore a “triple burden of disease.” Tragically, it is often countries with limited resources that have to cope with this.
3.2 Biological Responses to Diet

The way people biologically respond to a changing diet as they move from a rural, traditional diet to a Western one has been the subject of intense research.

As noted above there is evidence that individuals who were previously exposed to undernutrition during foetal life or infancy have an increased vulnerability to CDL when they eat Western diets as adults. This “early origins of adult disease” hypothesis (Barker, 1992, 2012) is now better – but not totally – understood and accepted. It appears that as a result of this undernutrition during early life, biological processes are somehow reprogrammed so that many years later, in adult life, the person is especially vulnerable to the effects of overnutrition.

The variation in biological responses to the nutrition transition, both within and between populations, helps explain the variation in the prevalence of the resultant CDL. The possible reasons for these differences are summarized in Box 4.1. It is important to realize that despite these differences in response to dietary changes, we have no reason to question the established relationships between nutrition and health. For prevention of CDL, an optimal diet should be promoted at the population level. This optimal nutrient composition – with balanced intake of energy and macronutrients, and adequate intake of micronutrients – can be achieved with many different traditional and culturally acceptable foods.

3.3 The Double Danger of Early Undernutrition

Early undernutrition poses a double danger to human health. First, as discussed above, there is the danger of increased risk of CDL during adulthood. Second, babies and infants who are nutritionally compromised have a greater risk for physical and mental (cognitive) underdevelopment (Grantham-McGregor et al., 1999). This is often termed “decreased human capital.” Adults who grow up in such a situation are unable to “build a better life” and escape poverty. The consequence of this is an intergenerational poverty-malnutrition cycle.

These serious negative consequences of early undernutrition have profound implications for nutrition policy and programmes.

This emphasizes the importance of:

- good or optimal nutrition of women in their reproductive years and during pregnancy to prevent low-birthweight babies
- good nutrition during infancy and childhood to prevent stunting
- adherence to a healthy, balanced, optimal, and prudent diet during adulthood to prevent CDL

Figure 4.4: Macronutrient distribution as percentage of total daily energy.

Sources: Wolmarans et al., 1989, for white population; Bourne, 1996, for urban-dwelling black population; Steyn et al., 2001, for rural black population.
Box 4.1: Possible Explanations of Differences in CDL Prevalence and Type

<table>
<thead>
<tr>
<th>Suggested mechanism</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Genetic differences between individuals (and populations) regarding risk factors for specific CDL</td>
<td>1. Familial hypercholesterolaemia due to a founder effect: increased ischaemic heart disease</td>
</tr>
<tr>
<td>2. Genetic differences in response to specific nutrients and dietary changes</td>
<td>2. Salt sensitivity → hypertension; obesity, diabetes, and insulin resistant genes</td>
</tr>
<tr>
<td>3. Time span of the nutrition transition</td>
<td>3. Foetal and infant programming for adult disease more pronounced if the transition is rapid, over one or two generations</td>
</tr>
<tr>
<td>4. Food environment: Types of foods and nutrients available influence nutritional status.</td>
<td>4. The presence of trans-fatty acids because of changes in manufacturing of margarine</td>
</tr>
<tr>
<td>5. Cultural and environmental influences on coping mechanisms (may be a modulator, not a determinant, of response to diet)</td>
<td>5. Passive versus active coping and changes during acculturation will determine, for example, “resistance” to hypertension. Effects on response to diet not known.</td>
</tr>
</tbody>
</table>

4. THE FORMULATION OF PUBLIC HEALTH POLICY

Chapter 13 expands on the relationship between specific foods, dietary components, and their relationship with CDL. Based on this we can formulate recommendations for the optimal diet to prevent CDL. The goal is to steer the nutrition transition into a positive direction. There are many different food combinations or diets that can lead to an optimal nutrient intake. There are ample opportunities, therefore, to promote diets that are traditional, culturally acceptable, available, and affordable.

This section focuses on those factors in the food environment that are potentially modifiable. Based on this, we suggest policies and programmes that can potentially reduce the negative effects of the nutrition transition. Several of the topics looked at here are explored in more depth in later chapters.

4.1 A Double Burden of Nutrition-related Diseases

Many developing countries are experiencing a double burden of morbidity and mortality from both infectious diseases related to undernutrition as well as CDL related to overnutrition (Steyn K et al., 2006). Tragically, this situation is further exacerbated by the HIV/AIDS pandemic and the high prevalence of other infectious diseases, such as tuberculosis and malaria (Bradshaw et al., 2006). These rapid and complex changes in the food environment have created a complex situation, including: the co-existence of macronutrient overnutrition and micronutrient undernutrition in the same individual; the presence of overweight and obese mothers and caregivers in households with stunted children (Doak et al., 2002; Steyn NP et al., 2006); and the inequity in the nutritional status of different population groups.

This complex situation creates many challenges to the development of policies and programmes. These need to take into account and confront those factors which are responsible for the movement from receding famine to CDL. One major factor is poverty, which leads to a reliance on inexpensive staple foods that are energy dense but have a poor content of micronutrients (MacIntyre et al., 2002).

But to eradicate hunger and move away from undernutrition all proximal and distal contributing factors – such as food insecurity and poverty, lack of access to health services, disease, unhygienic environments, and lack of education – should be addressed in holistic, integrated programmes involving all relevant sectors of governance. Particular attention must be given to the intergenerational vicious cycle between undernutrition and poverty. This should be addressed by programmes that simultaneously tackle the causes and consequences of undernutrition and poverty. Programmes and policies should address these problems and promote appropriate behavioural change in a culturally sensitive manner.
4.2 Food and Nutrition Rights and Responsibilities

The fundamental human right of access to affordable, safe, and nutritious food is embedded in the constitution of many countries (see Chapter 1). This right, as well as the signing of many international agreements to alleviate poverty and hunger (ACC/SCN, 2000), place a responsibility on governments to ensure food and nutrition security at a household level. Governments, through appropriate policies and programmes, must ensure a food environment in which healthy, prudent dietary choices are possible and affordable. Individuals have the responsibility to make these healthier choices but can only do so if they are educated and empowered with the information and knowledge about the relationship between diet and health.

4.3 The Role of the Food Industry and Related Sectors

The food industry is often accused of creating an environment in which healthy choices are not promoted. For example, marketing and advertising of products such as sugar-rich beverages and fat-rich snack foods for children are thought to contribute to childhood obesity, a growing international health problem (Proctor, 2007). Also, some food production and packaging processes, aiming to reach “upmarket,” sophisticated consumers, are not always compatible with protection and conservation of our physical environment and the world’s natural resources. There is evidence of a voluntary movement in some multinational food companies to produce and market healthier foods and products, although the motive and effectiveness of this is often questioned. Local, national, regional, and international governance could and should do much more to ensure sustainable, affordable, and healthier food environments. This may require regulatory approaches that counteract the heavy marketing of convenient ready-to-eat foods that are high in fat, sugar, and salt to promote a pattern of optimal intakes, referred to as the behaviour change phase (or stage) of the nutrition transition.

4.4 Culture and Traditional Foods

Migration and Westernization of peoples in developing countries have been characterized by an explosion of CDL, often at a relatively early age (Popkin, 2002). Promotion of the consumption of traditional foods and retention of cultural eating patterns are known to partially prevent this transition. However, there are several barriers to this solution, including availability of these traditional foods.

One way to promote increased consumption of traditional foods is to commercialize their production and marketing. Modernization and Westernization are characterized by a transition in taste and access to convenience foods. A huge educational effort is therefore needed to convince people in transition that their traditional food cultures are compatible with palatable diets, good health, and low risk of CDL.

4.5 Some Examples of Programmes: A Glance at South Africa

Some governments, such as that of South Africa (through the Department of Health), have already introduced important policies and programmes to address the double burden of disease. The food-based dietary guidelines are an important user-friendly tool for promoting optimal nutrition, while the Integrated Nutrition Programme focuses on dealing with the development and consequences of undernutrition. Feeding schemes have been introduced in schools attended by nutritionally vulnerable children. Additionally, micronutrient fortification of wheat flour and maize and iodization of salt have been introduced, while at primary-health facilities, supplementation with vitamin A and iron have been enforced. Breast-feeding initiatives have been strengthened by increasing the number of hospitals that are officially designated as “baby friendly.” These programmes and policies focus on all stages of the life cycle in various ways. However, the promotion of physical activity, particularly at schools, remains a huge challenge.

The South Africa Department of Health has also developed policies and strategies to prevent and treat CDL in the country (Kotzenberg, 2006), supporting the recommendations of the World Health Organization (WHO/FAO, 2003; Yach & Hawkes, 2004) and the approach of the South African Medical Research Council (Steyn K et al., 2006) to follow an integrated model in which diet, physical activity, and other lifestyle and behaviour changes are addressed holistically. These factors should form part of any intervention activity aimed at minimizing the negative effects of the nutrition transition in Africa.
DISCUSSION QUESTIONS AND EXERCISES

Consider the nutrition situation in your country or community, but only if you live in a developing country and you have reliable nutrition data available to you. Alternately, use the data presented here on South Africa. This chapter broadly characterized the five stages of the nutrition transition.

1. Discuss and identify ranges of macronutrient intakes as percentage of energy that are associated with the following stages:
   a. Receding famine
   b. Nutrition-related chronic diseases of lifestyle (NR-CDL)
   c. Behaviour change

2. Discuss and list dietary recommendations that will allow a population to proceed from receding famine and from NR-CDL stages to the optimal, behaviour change stage.

3. Discuss and list other lifestyle changes needed to put the majority of the population at the last, optimal stage of the nutrition transition.

4. Discuss and list additional interventions that could be implemented by appropriate government departments to optimize nutritional status and prevent NR-CDL.

REFERENCES


ADDITIONAL RESOURCES

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