

## Original Article

# Overview of nutrition reference and dietary recommendations in Japan: application to nutrition policy in Asian countries

Melissa K Melby PhD, Megumi Utsugi PhD MPH RD, Miki Miyoshi RD MPhil RPHNutr, and Shaw Watanabe MD PhD

National Institute of Health and Nutrition, Tokyo, Japan

The nutritional needs of Asian populations have changed dramatically in the last century. The role of nutrition, not only in preventing diseases associated with deficiency, but also in preventing lifestyle diseases such as cardiovascular disease and cancer, has become increasingly clear. Japan established the world's first nutrition institute almost 100 years ago, and initially focused on combating malnutrition and food insecurity. The current focus is prevention of lifestyle diseases, and along with revised dietary reference intakes, Japan has launched a program of *Shokuiku* (eating education) for children and families. As developing countries are simultaneously facing continuing undernutrition and increasing obesity and lifestyle diseases, collaboration in research and programs is urgently needed to prevent disease through nutrition intervention. This symposium and the Asian network are initial steps toward integrating nutriology into Asia-wide nutrition-based public health research and programs such as Japanese *Shokuiku* (eating education).

**Key Words:** Japan, nutrition reference, public health, epidemiology

## ESTABLISHMENT OF NUTRIOLOGY (NUTRITIONAL SCIENCE) IN JAPAN

Following World War II, the increased life expectancy of Japanese resulted not only from improvements in sanitation, but also from improvements in diet. During the *Meiji* and *Taisho* eras (1868-1926), beriberi and tuberculosis were the major endemic diseases in Japan. In order to prevent these diseases through nutrition, Dr. Tadasu Saiki established the world's first nutrition institute in 1914. The institute was nationalized in 1920 as the Imperial State Institute for Nutrition. It subsequently became the National Institute of Health and Nutrition (NIHN), and has made significant contributions to the nutritional improvement of the nation for more than 85 years.

In the early 20<sup>th</sup> century, rice, miso soup and pickles constituted the typical diet in Japan. The institute endeavored to promote a well-balanced diet by reducing rice intake and increasing protein and fat intake. Food security concerns in part motivated studies of applied nutrition that included study of foods for use during famine and discovery of new foods. Dr. Saiki played a crucial role as a pioneer in establishing "nutrition" as an academic discipline in its own right, making theoretical as well as applied contributions to improve the diet of the population, including the training of dietitians and nutrition education.

Dr. Saiki, the 'father of nutrition' in Japan, established science-based nutrition, or nutriology, in 1910 and in 1926 wrote a report entitled "Progress of the Science of Nutrition in Japan" for the League of Nations.<sup>1,2</sup> The concept of nutriology covered nutrients in food, alterations by cooking, and bioavailability in the body. It was

an integrated theory for improving public health through nutrition, including consideration of socio-economic policies and covering the continuum from the kitchen to the table to the body (Fig. 1). He described the importance to nutrition research in accounting for the interdependence of physiological and economic aspects of nutrition, while also recognizing the socioeconomic inequalities that exist in all populations, which he referred to as the 'social aspect'. After identifying the natural products best able to meet physiological requirements, and selecting those that also meet the requirements of the national economy, the goal was to design a 'food code' or dietary recommendations based on social considerations that would optimize nutrition for the greatest number of people in Japan.

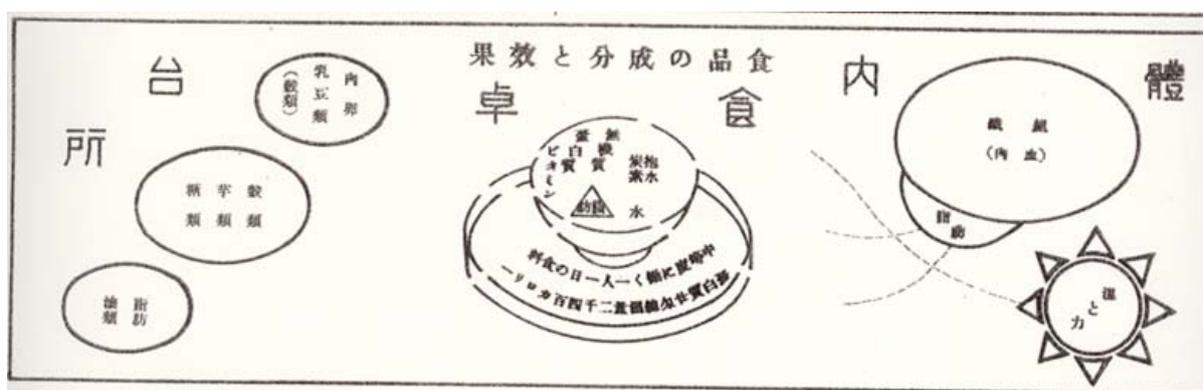
Highlights of Japanese nutritional science research featured in the report included data on basal metabolism, body surface area, metabolic changes during fasting and improvements of physical conditions of malnourished children. Studies of digestibility and physico-chemical properties of rice under various processing conditions, other grains such as millet and buckwheat, and vitamins in Japanese foods and animal feed, and finally a rat study of gastric carcinoma in relation to diet also were included. Dr. Saiki and colleagues determined the energy requirements for Japanese and created food composition tables,

**Corresponding Author:** Melissa K. Melby, PhD, Nutrition Education Program, National Institute of Health and Nutrition, 1-23-1, Toyama, Shinjuku, Tokyo, 162-8636

Tel: +81-3-3203-5418; Fax: +81-3-5155-0573

E-mail: melby-m@nih.go.jp

Manuscript accepted 16 January 2008.



**Figure 1.** Integrated theory for improving public health through nutrition by Dr. Saiki<sup>1</sup>. Figure 1 illustrates the flow of food components, which starts from obtaining food items and cooking. Then, when we eat meals on the table, nutrients can be taken into one's body, which will bring physiological effects and improve one's health.

which permitted analysis of nutritional intake.

Based on research on energy metabolism, they developed nutrition standards, which constituted the basis for the recommended dietary allowances (current “Dietary Reference Intakes”) first established in 1970.

Under the order of General Headquarters Supreme Commander for the Allied Power (GHQ/SCAP) during the post-WWII U.S. occupation of Japan, the Institute conducted several food consumption and national nutrition surveys to estimate nutrient intake and provide data for the food distribution program to respond to the post-war food shortage.<sup>3</sup> Utilizing post-war food aid from the USA, dietary improvement campaigns like “Eat foods from three colors” were implemented, and Japan overcame the problems of malnutrition.

In addition, there were two well-known programs by the graduates of Saiki Nutrition School: (1) the “Use frying pan for cooking once a day” and (2) “Kitchen car” cooking classes conducted throughout the country to teach people how to use flour, dairy products, oil, meat,

sausage and eggs in cooking.<sup>4</sup> While undernutrition and infectious disease (e.g. tuberculosis) were significant public health problems in Japan before 1960, the nutritional situation greatly improved with rapid economic growth and nutrition education and programs.

**RECENT EPIDEMIC OF OBESITY IN JAPAN AND ASIA AND INCREASE IN LIFESTYLE-RELATED DISEASES**

In the 1980s, paralleling the growth in the economy, the Japanese population’s waistline also increased. By the 1980s, obesity and overweight, rather than undernutrition, had become significant problems for many segments of the Japanese population,<sup>5,6</sup> leading to an increase in lifestyle-related diseases (e.g. diabetes, hypertension, and cardiovascular diseases).<sup>7</sup> An examination of the historical changes in the recommended dietary allowances (RDAs), which describe adequate dietary intake for 97-98% of the population,<sup>8</sup> provides some insight into this transition.

As seen in Table 1, the 2005 RDAs for energy intake

**Table 1.** RDAs for energy and protein intake by children in Japan (1940-2005)

	Institute of Health Sciences		Committee of food inspectors on nutrition standards		Dietary Reference Intakes	
	1940*		1944*		2005	
	M	F	M	F	M	F
Energy (kcal)						
0~1	850	850	600	600	650	600
1~3	1,200	1,200	1,250	1,250	1050	950
4~5	1,460	1,460	1,450	1,450	1400	1250
6~8	1,690	1,570	1,700	1,700	1650	1450
9~11	1,880	1,740	1,900	1,900	2300	2150
12~14	2,160	2,030	2,200	2,100	2650	2300
15~20	2,500	2,100	2,100	1,700	2750	2200
Protein (g)						
0~1	35	35	30	30	15	15
1~3	50	50	40	40	20	20
4~5	60	60	45	45	25	25
6~8	70	65	50	50	35	30
9~11	80	70	65	65	50	50
12~14	90	85	75	70	60	55
15~20	100	90	75	70	65	50

\* Recommendation of introducing school lunch (Joint message by Ministry of Education, Ministry of Health, Ministry of Agriculture. (December 11, 1946)

by children aged 9-20 years old are considerably higher than the 1940 RDAs, although the RDAs for protein intake have decreased to approximately 50-70% of the 1940 RDAs.<sup>8</sup> Prior to the war, protein malnutrition was common and thus recommendations for protein intake were high. The 2005 RDAs for protein represent recommended intake for a healthy, well-nourished population. However, the 2005 RDAs for energy intake were estimated average requirements (see Sasaki, this volume) and may be overestimates, given the decreasing activity levels and trends toward overweight and obesity in much of the Japanese population. The additional energy consumed, derived primarily from excess fats and carbohydrates, may be responsible in part for the increased numbers of obese children and may foreshadow an obesity epidemic in Japan.<sup>9</sup> It is important to clearly distinguish between RDAs (population based data for assessment by nutritionists and other scientific professionals) and dietary guidelines (for use by dietitians and the general population to achieve individual health and nutrition).

Similar changes have been observed worldwide over the past 20 years, with a marked shift to diets high in saturated fat, added sugar and refined foods affecting disease trends in many countries, especially in developing countries. Projections for causes of death suggest that while progress is being made in preventing and treating infection, pregnancy-related problems and injuries, lifestyle diseases such as cardiovascular disease and cancer will continue to be the major causes of death in developed countries and also will become major causes of death in developing countries.<sup>10</sup> Currently, a growing number of developing countries face "the double burden of malnutrition": the persistence of undernutrition along with the rapid rise of overnutrition and chronic diseases.

#### PREVENTION OF DISEASES THROUGH GOOD DIETARY HABITS

The latter half of the 20<sup>th</sup> century witnessed a paradigm shift concerning nutrition with a focus on overconsumption and an increase in lifestyle-related diseases displacing undernutrition as the primary nutritional concern and challenge facing nutrition scientists and public health workers. At the beginning of the 21<sup>st</sup> century, dramatic increases in obesity and associated lifestyle related diseases have led to health programs ranging from the global to local levels. The World Health Organization (WHO) launched the WHO Global strategy on Diet, Physical Activity and Health in 2004.<sup>11</sup> In Japan, one of the primary aims of the 10 year national plan for health promotion 'Health Japan 21' promotes maintenance of appropriate body weight (obesity control and prevention of thinness brought about by dieting in young women).<sup>12</sup> However, as the midterm report documents, with an overweight prevalence of 29.0% in males aged 20-60 and 24.6% in females aged 40-60, Japan is far from reaching its targets of an overweight prevalence of less than 15% and 20% in men and women respectively.<sup>13</sup> From 1950 to 1980, energy intake stayed relatively constant but energy derived from fat more than tripled (7.7% to 23.6%) and then leveled off.<sup>14</sup> It is especially noteworthy that while fat from all sources increased, animal-derived fat increased by almost 4-fold.<sup>14</sup> Although the economic burden of life-

style-related diseases is already high and increasing, financial resources for public health prevention efforts fall far short of those needed to avoid epidemics of metabolic-syndrome related diseases.

In response to these disturbing trends, governments throughout the world have produced various food guidelines (Fig. 2). Ideally these guidelines should reflect countries' cuisines and socio-economic situation, and be tailored to their populations' needs. Indeed, the design and visual image of the Food Guides often reflects a country's culture (e.g. *koma* in Japan, pagoda in Korea and China, pot in Guatemala).<sup>15</sup> However, most of these guidelines have been modifications of the nutritional guidelines developed in the US, which in turn reflect both nutritional science and food industry influence as they were produced primarily by the Department of Agriculture.<sup>16</sup> Now, there is an urgent need to develop a Nutrition Network in Asia so that nutritional scientists can collaborate by exchanging information and data on their commonalities and differences to create nutrition guidelines that reflect the rich food histories of their cultures and meet the varied needs of their populations. Drawing on the healthy traditional food and dietary patterns of Asia, and as an outgrowth of a conference series, "Public Health Implications of Traditional Diets," jointly organized by Harvard School of Public Health, a United Nations World Health Organization/Food and Agriculture Organization (WHO/FAO) Collaborating Center, and Oldways Preservation Trust in 1993, the traditional healthy Asian Diet Pyramid (Fig. 3) provides an example of a nutritional guideline that incorporates both the healthy nutritional history of Asia as well as clinical and epidemiological nutritional-science informed dietary recommendations.<sup>17</sup>

In Japan, the 2000 Dietary Guidelines for Japanese were established jointly by the Ministry of Health, Labour and Welfare (MHLW); the Ministry of Agriculture, Forestry and Fisheries (MAFF); and the Ministry of Education, Culture, Sports, Science and Technology (MEXT). In 2005 in order to disseminate the information more widely to the general population, a Japanese Food Guide "Japanese Food Guide Spinning Top" (Fig. 4) was produced jointly by MHLW and MAFF.<sup>18</sup> It was intended to be used not only as a tool for nutrition education at the community level, but also for food system industries, and representatives were involved from the early stages of its creation. Also in 2005, the Basic Act on *Shokuiku* (in Japanese, *shoku* means 'eating' and *iku* means 'growth/education') promoted the introduction of the "Japanese Food Guide Spinning Top" food and nutrition education for children, as well as for their families.<sup>19</sup>

There is a long history of integrated or holistic approaches to nutrition in Japan. *Shokuiku* is one component of the traditional 4-prong approach to health that also includes an emphasis on knowledge, virtue and physical well-being. The 2005 *Shokuiku* Act and its associated programs integrate eating education in the home/family, school, and local community (government, non-profit organizations, companies, etc). This integration is believed to be essential to achieve significant behavioral changes on an individual and social level. Effective confrontation of the epidemic of obesity and lifestyle

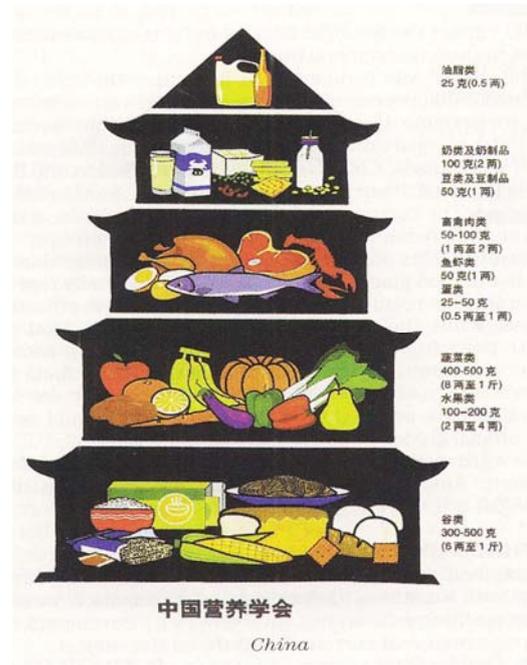


Figure 2. Food pyramids from around the world

**The Traditional Healthy Asian Diet Pyramid**

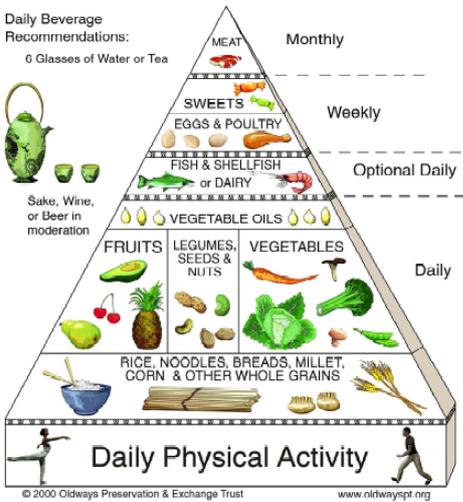


Figure 3. Traditional healthy Asian diet pyramid

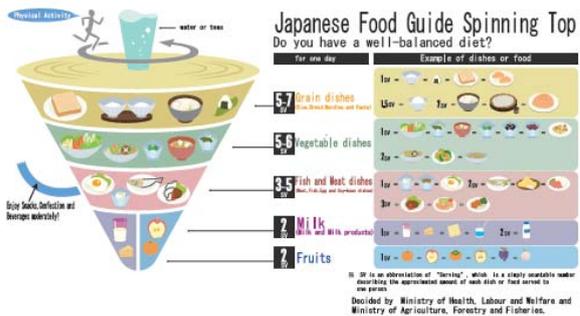


Figure 4. Japanese food guide spinning top

diseases cannot be achieved with narrowly focused programs, but requires an integrated approach such as that embodied in *Shokuiku*.

**WHAT IS OUR GOAL?**

Japan currently has the longest life expectancy rates in the world (mean of 85.33 years for women in 2003).<sup>20</sup> Yet with increasing rates of lifestyle diseases, life expectancy

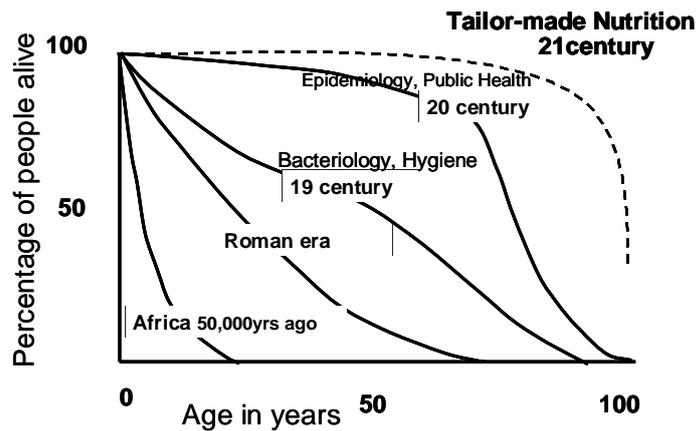


Figure 5. Elongation of life in human history

and quality of life are likely to decrease. Our aim is to extend life expectancy and enhance quality of life through tailor-made nutrition and public health education (Fig. 5). We aim to educate and train nutrition professionals that can provide information and guidance utilizing Dietary Reference Intakes (DRIs) and Nutrition and Food Guidelines but also be tailored to each individual's needs, thereby promoting health among the entire population.

#### AUTHOR DISCLOSURES

Melissa K Melby, Megumi Utsugi, Miki Miyoshi and Shaw Watanabe, no conflicts of interest.

#### REFERENCES

1. Saiki T. Nutrition. Tokyo: Eiyosha (Nutrition Co.), 1966.
2. Saiki T. Progress of the Science of Nutrition in Japan. Geneva: League of Nations, 1926.
3. National Institute of Health and Nutrition Japan. History of the National Nutrition Survey in Japan (Japanese) Accessed 21 Jan 2008 at: [http://www.nih.go.jp/eiken/chosa/kokumin\\_eiyou/about\\_kokugen.html](http://www.nih.go.jp/eiken/chosa/kokumin_eiyou/about_kokugen.html)
4. Association for Improvement of Nutrition. History of major activities (Japanese) Accessed 5 Feb 2008 at: <http://www.fukyukai.jp/>
5. Japanese Cabinet Office. National Economic Accounting 2003 (in Japanese), 2004.
6. Yoshiike N, Seino F, Tajima S, Arai Y, Kawano M, Furu-hata T, Inoue S. Twenty-year changes in the prevalence of overweight in Japanese adults: the National Nutrition Survey 1976-95. *Obes Rev.* 2002;3(3):183-90.
7. WHO. Public Health Policy and Approaches for Noncommunicable Disease Prevention and Control in Japan: a case study. Japan: WHO Centre for Health Development, 2006.
8. Sasaki S. Dietary Reference Intakes for Japanese (2005): The report from the scientific committee of 'Dietary reference intakes for Japanese - recommended dietary allowance', 2005.
9. Matsushita Y, Yoshiike N, Kaneda F, Yoshita K, Takimoto H. Trends in childhood obesity in Japan over the last 25 years from the national nutrition survey. *Obes Res.* 2004; 12(2):205-14.
10. WHO. Obesity: Preventing and Managing the Global Epidemic. Geneva: World Health Organization, 2000.
11. WHO. Global Strategy on Diet, Physical Activity and Health. Geneva: World Health Organization, 2004.
12. Yoshiike N, Kaneda F, Takimoto H. Epidemiology of obesity and public health strategies for its control in Japan. *Asia Pac J Clin Nutr.* 2002;11 Suppl 8:S727-31.
13. Japanese Ministry of Health, Labour and Welfare. Midterm evaluation report of Health Japan 21, 2006.
14. Kida K, Ito T, Yang SW, Tanphaichitr V. Effects of Western diet on risk factors of chronic diseases in Asia. In: Bendich A, Deckelbaum R, eds. Preventive Nutrition: The Comprehensive Guide for Health Professionals. Totowa, NJ: Humana Press, 1997: 523-535.
15. FAO. Food Guidelines by country. Accessed 7 Nov 07 at: [http://www.fao.org/ag/agn/nutrition/education\\_guidelinescountry\\_en.stm](http://www.fao.org/ag/agn/nutrition/education_guidelinescountry_en.stm)
16. Nestle M. Food Politics: How the food industry influences nutrition and health. Berkeley: University of California Press, 2002.
17. Oldways Preservation & Exchange Trust. The Traditional Healthy Asian Diet Pyramid, 2000. Accessed 16 Oct 07 at: [http://www.oldwayspt.org/asian\\_pyramid.html](http://www.oldwayspt.org/asian_pyramid.html)
18. Japanese Ministry of Health, Labour and Welfare. About "Japanese Food Guide Spinning Top" Accessed 7 Nov 07 at: <http://www.mhlw.go.jp/bunya/kenkou/eiyou-syokuji.html>
19. Yoshiike N, Hayashi F, Takemi Y, Mizoguchi K, Seino F. A new food guide in Japan: the Japanese food guide Spinning Top. *Nutr Rev.* 2007;65(4):149-54.
20. Japanese Ministry of Health, Labour and Welfare. Summary of Vital Statistics: Japanese Ministry of Health, Labour and Welfare, 2003. Accessed 12 March 2005 at: <http://www.mhlw.go.jp/english/database/db-hw/populate/pop4.html>