Review

# Food in health security in North East Asia

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Food and health security in North East Asia including South Korea, North Korea, China and Japan was compared. Because this region contains countries with many complex problems, it is worthwhile to study the current situation. With about 24% of the world's population, all North East Asian countries supply between 2400 and 3000 Kcal of energy. Regarding health status, two extreme problems exist. One is malnutrition in North Korea and China and the other is chronic degenerative disease in Japan, South Korea and China. Because quality, quantity and safety of the food supply have to be secured for health security, some topics are selected and discussed. 1) World food price can have an effect on food security for countries with a low food self sufficiency rate such as Japan and Korea; specially, for the urban poor. 2) Population aging can increase the number of aged people without food security. An aged population with less income and no support from their off-spring, because of disappearing traditional values, may have food insecurity. 3) Population growth and economic growth in this region may worsen food problems. Since a quarter of the world's population resides in this region, populations will continue to increase. With economic growth, people will consume more animal products. 4) Climate change generates food production problems. As the progress of industry continues, there will be less land for food and more pollutants in the environment. 5) Political instability will cause food insecurity and conflict will cause problems with regard to food aid.

**Key Words: food security, health security, North East Asia**

## INTRODUCTION

Food security is important in improving and maintaining nutritional status. Thus, food security is an essential prerequisite for health. Ensuring food security is a necessary condition for improving nutritional status, but, it is not sufficient by itself. In many countries with abundant food supplies, a portion of the population can have food security problems.[1,2]

In this paper, food and health security in North East Asia including South Korea, North Korea, China and Japan is compared. Because this region contains countries with many complex and different problems, it is worthwhile to study the current situation as well as problems about food in health security. Since about quarter of world populations reside in this region, the situation in these countries will exert an important effect on the food situation of the world.

To examine Food in health security in North East Asia including South Korea, North Korea, China and Japan, this paper contains first, discussions on the present situation in terms of food supply; second, health status; and lastly, issues concerning food security in those countries.

## PRESENT FOOD SUPPLY SITUATION

With regard to the present food supply situation, food balance sheets for each country were used. Food security can be measured at three levels: the country level, the household level and the individual level.[1] In this paper comparison and discussions will only focus on the country level, because only supply data, food balance sheets, are available for this purpose.

Before we examine the food supply data, population, income and health expenditure for these countries are compared. In terms of global population, one quarter of the world's populations reside in this region. Certainly, China is the biggest country with a population of 1,346 million. Other populations consist of, 127 million, 49 million, and 24 million people for Japan, South Korea, and North Korea, respectively. Japan has a higher population of older people than other countries, since 20% of the total population in Japan is older than 65 years. In other countries less than 10% are older than 65. In terms of gross national income (GNI), Japan ranks first. Total health expenditure on per capita and total health expenditure as % of gross domestic product (GDP) is in the same order as GNI (Table 1).[3-5]

According to the nutrients supply indicated by the food balance sheets, all countries supply between 2400 and 3000 kcal of energy,[3,6,7] which is more than recommend amount. Since energy supply per capita per day for the world, for developed countries and for developing countries from year 2000 to 2002 were 2,790, 3,280 and 2,660 Kcal, respectively, it seems North Korea has a lower energy supply than other countries. Japan and China have similar proportion of starchy and animal foods to

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total energy supply, with about 65% of energy from starch and 20% of energy from animal foods.

South and North Koreans get 14.5% and 5.1%, respectively, of total energy from animal foods (Table 2).[3,6,7] Comparing contribution of energy from animal foods to total energy supplied during 2000 to 2002, the global average was 12%, for developed countries it was 19%, and for developing countries, 10%.[3,8] North Koreans got less energy from animal food than people residing in other countries.

Cereal is supplied at 476 g per capita per year in Japan. This amount is the least among the 4 countries under discussion. Pulse, fruit and egg are supplied in similar amount in Japan and China. Meat is supplied in similar amount in Japan and South Korea. The Japanese consume more fish than people in other countries (Table 3).[3,6,7]

In terms of energy contribution by each food group, cereals take up the largest proportion in North Korea (70.8%) among the four countries. From meat, the Chinese get the largest contribution (15.7%) to the total energy supply (Table 4).[3,6,7]

Amount of protein supplied are 87.9 g for Japan, and

**Table 1.** GNI and Health Expenditure in North East Asia (year 2006)

| | South Korea | North Korea | Japan | China |
|---|---|---|---|---|
| GNI, (US $) | 22,990 | na | 32,840 | 4,660 |
| Total Health, Expenditure on health per capia | 1,487 | 49 | 2,514 | 342 |
| Total Health, Expenditure on health as % of GDP | 6.5 | 3.5 | 7.9 | 4.5 |

**Table 2.** Comparison of the nutrient supply and proportion per capita per day by nation in North East Asia (Year 2005)

| Nation | South Korea | North Korea | Japan | China |
|---|---|---|---|---|
| Quantity (Kcal) | 3,039 | 2,419 | 2,837 | 3,006 |
| Starchy (%) | 70.1 | 87.2 | 65.4 | 66.3 |
| Sweeteners (%) | 5.8 | 1.5 | 7.6 | 4.0 |
| AnimalFood (%) | 14.3 | 5.1 | 20.5 | 20.1 |
| OilsandFats (%) | 1.5 | 0.5 | 0.4 | 0.0 |
| Others (%) | 8.3 | 5.7 | 6.0 | 9.5 |

**Table 3.** Comparison of the food supply per capita per day by nation in North East Asia (Year 2005)

| Nation | South Korea | North Korea | Japan | China |
|---|---|---|---|---|
| Cereals | 596 | 586 | 476 | 520 |
| Starchy Roots | 53 | 197 | 105 | 208 |
| Sweeteners | 343 | 72 | 327 | 213 |
| Pulses | 24 | 123 | 202 | 204 |
| Vegetables | 695 | 416 | 358 | 801 |
| Fruit | 178 | 153 | 160 | 159 |
| Meat | 96 | 29 | 95 | 166 |
| Eggs | 30 | 15 | 51 | 50 |
| Milk | 141 | 23 | 177 | 49 |
| Fishes and Shellfishes | 109 | 14 | 207 | 70 |
| Oils and Fats | 5 | 1 | 1 | 0 |

Unit: g

**Table 4.** Comparison of the energy supply for each food group by nation in North East Asia (per capita per day, Year 2005)

| Nation | South Korea | North Korea | Japan | China |
|---|---|---|---|---|
| Total | 2,831 | 2,378 | 2,579 | 2,873 |
| Cereals | 1,644 (58.1) | 1,683 (70.8) | 1,339 (51.9) | 1,421 (49.5) |
| Starchy Roots | 43 (1.5) | 158 (6.6) | 90 (3.5) | 179 (6.2) |
| Sweeteners | 176 | 36 | 216 | 121 |
| Pulses | 44 | 267 | 428 | 392 |
| Vegetables | 136 | 66 | 62 | 206 |
| Fruit | 83 | 68 | 67 | 69 |
| Meat | 241 (8.5) | 82 (3.4) | 220 (8.5) | 452 (15.7) |
| Eggs | 40 | 19 | 66 | 73 |
| Fishes and Shellfishes | 88 (3.1) | 14 (0.6) | 173 (6.7) | 36 (1.3) |
| Milk | 66 | 8 | 124 | 43 |
| Oils and Fats | 45 | 13 | 12 | 0 |

Unit: Kcal

**Table 5.** Comparison of the protein supply for each food group by nation in North East Asia (per capita per day, Year 2005)

| | South Korea | North Korea | Japan | China |
|---|---|---|---|---|
| Total | 84.6 | 62.7 | 87.9 | 79.2 |
| Cereal | 27.5 (32.5) | 27.9 (44.5) | 21.4 (24.3) | 29.8 (37.6) |
| StarchyRoots | 0.5 | 3.2 | 0.9 | 2.7 |
| Sweeteners | 0.1 | - | 0.1 | 0 |
| Pulses | 9.0 | 17.6 | 11.0 | 5.9 |
| Vegetables | 8.5 | 5.9 | 3.8 | 9.3 |
| Fruit | 0.8 | 0.6 | 0.6 | 0.6 |
| Meat | 15.8 (18.7) | 3.2 (5.1) | 14.0 (15.9) | 17.5 (22.1) |
| Eggs | 3.3 | 1.8 | 6.0 | 5.8 |
| Fishes and Shellfishes | 16.2 (19.1) | 2.2 (3.5) | 23.4 (26.6) | 5.9 (7.4) |
| Milk | 2.5 | 0.3 | 6.5 | 1.6 |
| Oils and Fats | 0.2 | 0.1 | 0.1 | 0.0 |
| Animal Protein | 37.8 (44.7) | 7.5 (12.0) | 50.0 (56.9) | 30.8 (38.9) |

Unit: g (%)

**Table 6.** Some health related statistics in North East Asia (year 2006)

| | South Korea | North Korea | Japan | China |
|---|---|---|---|---|
| Life expectancy at birth, (m/f years) | 75/82 | na | 79/86 | 72/75 |
| Health Life, Expectancy at birth, (m/f years),2009 | 65/71 | 58/60 | 72/78 | 63/65 |
| Probability of dying under five, (per 1000 live birth) | 5 | 55 | 4 | 24 |
| Probability of dying, between 15 and 60 years, (m/f per 1000) | 119/47 | 233/166 | 89/44 | 143/87 |
| Infant Mortality Rate(2005) | 5.3 | 42 | 2.8 | 19 |
| % of infants with low birth weight | - | 7 | - | 2 |

**Table 7.** Top ten cause of death (2002) by nation in North East Asia

| South Korea All cause 275 (100) | | North Korea All cause 204 (100) | | Japan All cause 973 (100) | | China All cause 9135 (100) | |
|---|---|---|---|---|---|---|---|
| Cerebrovascular disease | 46 (17) | Ischamic heart disease | 26 (13) | Cerebrovascular disease | 133 (14) | Cerebrovascular disease | 1652 (18) |
| Trachea,branchus,lung cancers | 16 (6) | Lower respiratory infections | 22 (11) | Ischamic heart disease | 93 (10) | Chronic obstructive pulmonary disease | 1283 (14) |
| Ischamic heart disease | 15 (6) | Cerebrovascular disease | 14 (7) | Lower respiratory infections | 91 (9) | Ischamic heart disease | 702 (8) |
| Diabetes Mellitus | 15 (6) | Hypertensive heart disease | 13 (6) | Trachea,branchus,lung cancers | 56 (6) | Stomach cancer | 415 (5) |
| Stomach cancer | 14 (5) | Perinatal conditions | 12 (6) | Stomach cancer | 50 (5) | Liver cancer | 324 (4) |
| Liver cancer | 12 (5) | Chronic obstructive pulmonary disease | 6 (3) | Colon and rectum cancers | 39 (4) | Trachea,branchus,lung cancers | 321 (4) |
| Cirrhosis of the liver | 11 (4) | Diabetes Mellitus | 5 (3) | Liver cancer | 34 (4) | Perinatal conditions | 272 (3) |
| Road traffic accidents | 10 (4) | Stomach cancer | 5 (3) | Self-induced injuries | 31 (3) | Self-induced injuries | 272 (3) |
| Self-induced injuries | 8 (3) | Violence | 4 (2) | Nephritis and nephrosis | 21 (2) | Tuberculosis | 270 (3) |
| Alzheimer and other dimentias | 7 (3) | Nephritis and nephrosis | 3 (2) | Pancreas cancer | 20 (2) | Lower respiratory infections | 268 (3) |

Unit : per 1000(%)

62.7 g for North Korea. More than 50% of protein in Japan is from animal products. North Koreans get 12.0% of their protein from animal products and 44.5% from cereals (Table5).[3,6,7]

In terms of food supply at the national level, it seems that there are no apparent food security problems in this region, since adequate amount of energy is supplied. But with these data, we can suspect some nutritional problems in this region. It seems both over nutrition and under nutrition might exist, since the range of energy supplied is large; and energy from cereals as well as energy and protein from animal product vary greatly.

## HEALTH STATUS

With health status data, we can find out more about the end point of food supply. Health status is under the influ-

ence of many factors. In addition, food choices people make is determined by many factors. But there are no arguments that nutritional status from what people eat is a major factor for health.[8-10]

In this part of the paper, health status will be examined and begins with health related statistics (Table 6).[3-5] The Japanese have the longest life expectancy as well as healthy life expectancy in the world. Life expectancy for males is 79 years, and for females is 86 years. Among these countries, North Korea has the highest rates of dying under 5 years, infant mortality rate (IMR) and low birth weight. North Korea has an IMR which is 15 times higher than that of Japan.

Japan and South Korea show similar patterns of cause of death (Table 7).[4,5] Some infectious diseases are important cause of death in North Korea. If we take into account the total population, all cause mortality in North Korea is the highest among the four countries.

The prevalence of under nutrition is very low in Japan and South Korea. However, it is 9% in China and is going down as the years go by. On the contrary, in North Korea, the prevalence is high and going up. Data show under nutrition is a serious health problem in North Korea (Table 8).[5,6]

With food supply data, food security at the national level does not have any problems in this region. But with health data, it can be suspected that some food insecurity in China and North Korea exist. Especially for North Korea, food insecurity at the individual level seems to be abundant.

As we see in the first section, in North Korea the contribution of animal product to total energy is the lowest. The recommended range is 55-75, 10-15, and 15-30 for carbohydrate, protein and fat, respectively.[7] All these countries are within recommended range. Even though macro nutrients supplied seems to be adequate, North Korea still has a high prevalence of child malnutrition, (Table 9).

We can conclude that both under nutrition and over nutrition exist in this region. Though there are no apparent problems with regard to food security at national level but not individual level and perhaps household level.

**Table 10.** Comparison of food self sufficiency rate in Japan and South Korea

| Nation | South Korea | Japan |
|---|---|---|
| Year | 2007 | 2005 |
| Cereals | 27.4 | 30.7 |
| Starchy Roots | 98.3 | 79.9 |
| Pulses | 17.1 | 3.5 |
| Vegetables | 90.4 | 63.4 |
| Fruit | 83.5 | 43.9 |
| Meat | 78.2 | 54.9 |
| Eggs | 99.4 | 95.8 |
| Milk | 70.8 | 76.4 |
| Fishes and Shellfishes | 79.1 | 60.8 |
| Oils and Fats | 1.7 | 74.9 |

Unit : %

## ISSUES FOR FOOD SECURITY

For food security, food supply has to be adequate, stable and accessible. Adequate means that supplied food has to be safe, nutritionally adequate and culturally acceptable. Stable means that food supply should be environmentally and socially sustainable, and accessible. For good nutrition, sufficient quantity, good quality and safe food should be available, acceptable and accessible for all.[1,11,12]

Based on these principles, five issues for this region were selected: 1) world food price, 2) aging population, 3) population growth and economic growth, 4) climate change and 5) political instability.

Currently, world food price are rising because of fuel prices and the current financial crisis. Food price has an impact on food security in the world.[13-15] In this region, Japan and South Korea both have low food self sufficiency rates (Table 10). It is 30% only for cereals, the main staple food. Overall these two countries have no current problems with food supply. When we measure food insecurity, it can be measured by inadequate accessibility, subjectively. As indicated by data from the Korean Health and Nutrition Survey, people with low incomes have some problems with regard to food security, as measured by how they feel about food security (Tables

**Table 8.** Prevalence of undernourishment by nation in North East Asia

| | Total population (millions) | Number of people undernourished (millions) | | | Proportion of undernourished in total population (%) | | |
|---|---|---|---|---|---|---|---|
| | 2003-05 | 1990-92 | 1995-97 | 2003-05 | 1990-92 | 1995-97 | 2003-05 |
| China | 1312.4 | 178 | 143.7 | 122.7 | 15 | 12 | 9 |
| People`s Dem. Rep. of Korea | 23.5 | 4.2 | 6.7 | 7.6 | 21 | 31 | 32 |
| Republic of Korea | 47.7 | ns | ns | ns | - | - | - |

**Table 9.** Selected food and nutrition and development indicators in North East Asia

| | Contribution of nutrients to total energy (%) | | | Agriculture in total GDP(2005) (%) | Urban population (%) | Child malnutrition (%) | |
|---|---|---|---|---|---|---|---|
| | CHO | Protein | Fat | | | Under weight | Stunting |
| North Korea | 74 | 11 | 15 | nd | 61 | 23 | 27 |
| China | 61 | 12 | 27 | 13 | 40 | 7 | 11 |
| South Korea | 64 | 11 | 25 | 3 | 81 | nd | nd |
| Japan | 60 | 15 | 25 | - | 66 | - | - |

11).[16] If the food prices are rising, probably, they will have problems for food procurements and psychological problems.

It is possible that rising food price are impacting food security for people in China, and North Korea (Table 12). There is income inequality as measured with the Gini coefficient, which ranges from '0' (represents perfect equality) to '100' (implies perfect inequality).[17] Inequality in terms of dietary energy consumption is measured by both the Gini coefficient and coefficient of variation (CV). Dietary energy consumption varies due to socio-economic levels, sex-age distribution, as well as body weight and physical activity level. These two measures take into account the main components of variation.[17] Compared to South Korea and Japan, inequality of energy consumption is higher in North Korea and China, by Gini coefficient and CV. We can suspect that increasing food prices will cause food insecurity for poor income family in this region, especially, in North Korea and China.

The second issue is the aging population. In South Korea, the population is aging rapidly. The proportions of the elderly aged 65 or over are from 2.9% in 1960 to 9.1% in 2005. In Japan, the figure is as high as 20%. The population pyramid for China also shows the possibility of adapting the aged pattern within 30 to 50 years, as the proportion of the younger age groups decrease over the years.[3-5] Usually in oriental societies, the off-spring takes care of their parents, but now these traditions are disappearing and the social safety net that would take its place has not been fully constructed. Therefore, older people with low incomes and no-support from family are at risk of becoming food insecure.

The third issue is population- and economic- growth. Since one quarter of the global population live in this region, population will increase as the rate of world population increase. In addition the economic growth in this region is increasing more rapidly compared with other regions. South Korea has experienced rapid economic growth during the last 3 decades and shows changes in food supply at the same time (Table 13).[7] According to the data from the Korea Food Balance Sheet, supply of cereal and pulses are decreasing, while all other items are increasing. For example, meats increased four times. Increasing meat consumption means that we have to pro-

**Table 11.** Food security by income level for Korean adult male (2005KNHS)

| | Less than minimum cost of living (MCC) (n=251) | | 100~120% of MCC (n=136) | | 120~150 % of MCC (n=217) | | 150~250% Of MCC (n=741) | | 250~350% of MCC (n=585) | | More than 350% of MCC (n=585) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diet ( Adult male) | | | | | | | | | | | | |
| Adequate amount with variety | 55 | 22.0 | 34 | 26.7 | 61 | 29.8 | 219 | 31.8 | 199 | 36.8 | 301 | 52.9 |
| Adequate amount with not enough variety | 129 | 53.1 | 74 | 55.2 | 123 | 57.6 | 431 | 58.3 | 279 | 58.8 | 263 | 45.7 |
| Could not afford enough food , sometime | 45 | 18.5 | 17 | 13.6 | 22 | 9.4 | 57 | 7.8 | 21 | 3.9 | 4 | 1.1 |
| Could not afford enough food , frequently | 14 | 6.5 | 5 | 4.5 | 5 | 3.2 | 14 | 2.1 | 2 | 0.5 | 2 | 0.3 |
| Diet (Adult female) | | | | | | | | | | | | |
| Adequate amount with variety | 82 | 26.0 | 56 | 29.5 | 72 | 28.8 | 284 | 34.4 | 260 | 40.0 | 338 | 55.2 |
| Adequate amount with not enough variety | 180 | 52.9 | 104 | 56.4 | 159 | 57.2 | 514 | 58.6 | 342 | 55.5 | 293 | 44.2 |
| Could not afford enough food , sometime | 51 | 16.2 | 25 | 12.4 | 32 | 11.6 | 48 | 5.5 | 26 | 4.0 | 2 | 0.4 |
| Could not afford enough food , frequently | 15 | 5.0 | 3 | 1.8 | 7 | 2.4 | 14 | 1.5 | 4 | 0.6 | 2 | 0.2 |

Unit : Freg. %

**Table 12.** Inequality in access to food and income in North East Asia

| | Income | | Dietary Energy Consumption | | |
|---|---|---|---|---|---|
| | year | Gini coefficient (%) | last survey year | Gini coefficient (%) | Coefficient variation |
| North Korea | - | - | 1995 | 14 | 25 |
| South Korea | 2006 | 35 | 1988 | 12 | 21 |
| Japan | 2002 | 38 | 1990 | 11 | 20 |
| China | 2007 | 47 | 1990 | 17 | 32 |

**Table 13.** Chang in food supply in Korea (per capita per day)

| | Cereal | Pulses | Vegetables | Fruit | Meat | Milk | Oil &Fats |
|---|---|---|---|---|---|---|---|
| 1976 | 530.40 | 99.30 | 186.40 | 35.90 | 26.40 | 14.50 | 8.40 |
| 1980 | 505.50 | 58.80 | 329.50 | 44.40 | 37.90 | 29.50 | 13.80 |
| 1984 | 501.60 | 37.70 | 281.10 | 63.10 | 43.60 | 53.20 | 23.10 |
| 1988 | 506.60 | 30.20 | 321.40 | 80.70 | 56.30 | 94.20 | 28.30 |
| 1992 | 480.50 | 34.60 | 369.10 | 106.20 | 74.80 | 94.20 | 38.00 |
| 1996 | 470.60 | 40.30 | 416.90 | 100.90 | 93.20 | 115.10 | 39.40 |
| 2000 | 457.10 | 32.20 | 454.60 | 111.40 | 102.80 | 135.00 | 43.60 |
| 2004 | 420.60 | 34.20 | 429.70 | 114.10 | 101.10 | 147.40 | 48.40 |
| 2006 | 401.20 | 38.20 | 421.90 | 122.10 | 103.90 | 147.70 | 49.20 |

Unit : g

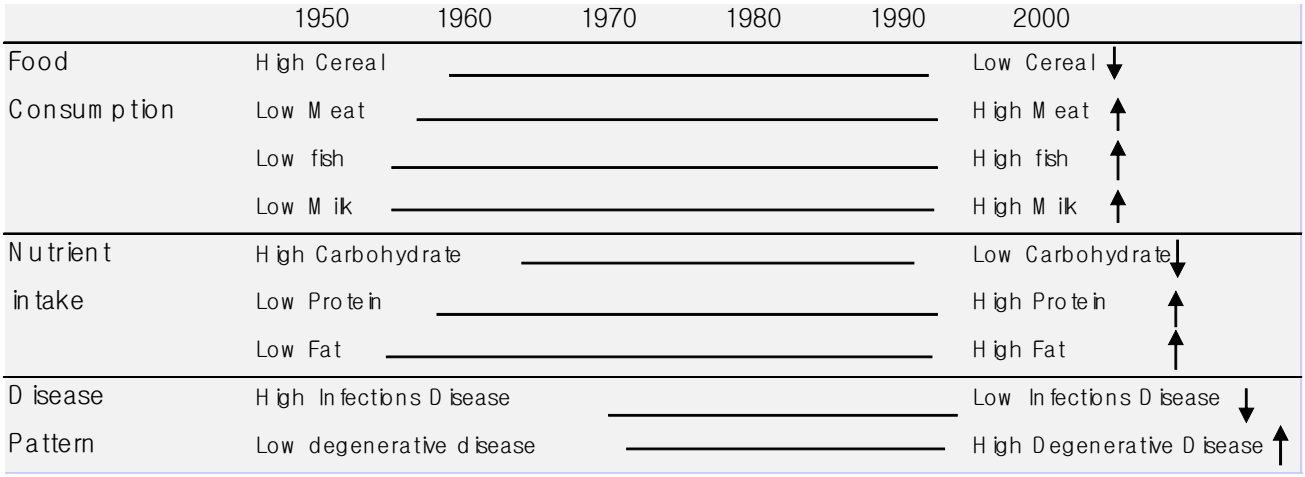


**Fig 1.** Transiion of Food and Nutritional Status in Korea

duce more grains to feed animals. Oils and fats are increasing also. The Korea National Nutritional Survey indicated that Koreans are getting more energy from fat than before. It is not a desirable situation with regard to health. As with other countries, Koreans consume more animal products with increasing income. As a result, protein and fat intake are increasing. Along with other life style change, Koreans experience more chronic degenerative diseases (Figure1). Currently, the Chinese also consume fair amount of meat. We can expect that the Chinese consume more animal product with the improved economic situation. Given a quarter of the world's population resides in Asia, with both population growth and economic growth, people in this region will demand more foods and may result in world food problems and food insecurity in this region.

The fourth issue is climate change. Population growth and industrialization can have big effects on the environment. Since global warming has been causing many problems in agriculture, continuous industrialization in this region will have effect on this region's environment. These will cause problems in terms of food production in both land and water.

The last issue is political instability. The political conflict between North Korea and other countries makes it harder to provide food-aid to North Korea, though it is the third main recipient country of food aid shipments (cereal) in 2003 and 2004 according to FAO statistics.[8]

Food, Nutrition and Health interact. Food security is an important base for nutrition and health. In this region, by statistics, food security at the national level is maintained. From health data, it seems that food security at the individual level is not sustained. For individual food security, monitoring and surveillance of food security should be developed and maintained in this region.

**AUTHOR DISCLOSURES**

The author has no conflict of interest.

**REFERENCES**

1. FAO (Food and Agriculture Organization of United Nations) and WHO (World Health Organization). Theme paper No.1: Improving household food security for ICN (International Conference on Nutrition); 1992.
2. Olson CM. Nutrition and health outcomes associated with food insecurity and hunger. Am Soc Nutr Sci. 1999; 129:521S-524S.
3. FAO (Food and Agriculture Organization of United Nations). Countryprofiles. [cited 2009/7/25]; available from: http://fao.org/countryprofiles/iso3list.asp?lang=en
4. WHO(World Health Organization). Countries. [cited 2009/7/25]; available from: http://who.int/countries/en/
5. UNICEF. (United for Children), Informations by countries and programme. [cited 2009/7/25]; available from: http://unicef.org/infobycountry/index.html
6. FAO (Food and Agriculture Organization of United Nations). The state of Food Insecurity in the World: High food price and food security- threats and opportunity; 2008.
7. KREI (Korea Rural Economic Development Institute). 2007 Food Balance Sheet; 2008.
8. FAO (Food and Agriculture Organization of United Nations). Summary of world food and agricultural statistics, food, Nutrition and Food security; 2005.
9. Ruth RJ, Black MM, Casey PH, Cook JT, Cutts DB, Chilton M, Heeren T, Levenson SM, Meyers AF, Frank DA. Household food insecurity: Associations with at-risk infant and toddler development. Pediatrics. 2008;121:65-72.
10. Hamelin AM, Habicht JP, Beaudry. Food insecurity: Consequences for the household and broader social implications. J Nutr. 1999;129:525S-528S.
11. Shariff ZM, Khor GL. Household food insecurity and coping strategies in a poor rural community in Malaysia. Nutrition RP. 2008;2:26-34.
12. Maxwell DG. Measuring food insecurity: the frequency and severity of "coping strategies". Food Pol. 1996;21:291-303.
13. UNICEF (United for Children). How economic shocks affect poor household and children; 2009.
14. Shrimpton R. Edotorial Food price crisis: What does it mean? What can we do about it? Contact 2008.;186;3-4
15. Schutter OD. Promotion and protection of all human rights, civil, political, economic, social and cultural rights, including the right to development. in WHO; 2008.
16. Shim JS, Oh KW, Nam CM. Association of household food security with dietary intake-based on the third (2005) Korea National Health and Nutrition Examination Survey (KNHANES Ⅲ). Korean J Nutr. 2008;41:174-83.
17. FAO (Food and Agriculture Organization of United Nations). Inequality Of dietary energy consumption distribution. Available from: www.fao.org/fileadmin/templates/ess/.../food../AccessToFoodGini-en.xls:

18. Gonzalez W, Jimenez A, Madrigal G, Munoz LM, Frongillo EA. Development and validation of measure of household food insecurity in urban Costa Rica confirms proposed generic questionnaire. J Nutr. 2008;138:587-92.

Review

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# 東北亞的衛生安全中的糧食議題

本篇文章比較東北亞的糧食及衛生安全，包括南韓、北韓、中國及日本。因為這個區域的國家有很多複雜的問題，所以值得去探討目前的狀況。佔世界人口的 24%，東北亞的國家平均每天提供 2400 至 3000 大卡的熱量給每個人。至於健康狀況，則存在著兩個極端的問題。其中之一是中國及北韓的營養不足，另一方面是日本、南韓及中國的慢性退化疾病。為了保障健康，必須確保糧食供應的品質、量及安全性。選出幾個議題在此討論：1）對於糧食自足率低的國家，如日本和韓國，全球的食品價格會影響其糧食安全性，尤其對於城市中貧窮的居民；2)人口老化，使得缺乏糧食安全的的老人數目亦增加。由於傳統價值觀的日益消失，老化的人口伴隨著較低的收入及沒有後代的供養，可能會產生糧食安全不良的問題；3)在東北亞這個區域，人口及經濟的成長可能使糧食問題更加惡化。四分之一的全球人口居住在這個地區，且人口仍持續地增加。經濟愈發展，人們消費愈多的動物性產品；4)氣候的改變使糧食生產發生問題。當工業持續進展，將使耕種糧食的土地變少，而環境中的污染則增多；5)政治不穩定會導致糧食的不安全性，鬥爭也會使食物援助產生問題。

**關鍵字：糧食安全、衛生安全、東北亞**