

Nutrition transition in China: the growth of affluent diseases with the alleviation of undernutrition

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Since 1950, the annual GNP in China increased from 104 to 1401 Yuan per capita, while household real purchasing power quadrupled. In addition, food production and distribution also rose. China's improved standard of living has brought about several health changes: a reduction in diseases of poverty (high infant mortality, communicable disease, nutritional deficiency), the doubling of life expectancy from 35 years in the 1950s to 67 (male) and 71 (female) years, but it has increased diseases of affluence, such as obesity and cardiovascular disease. The three leading causes of death in China today are cancer, cerebrovascular disease, and myocardial infarction, while deaths from tuberculosis and acute infectious illness are markedly reduced. About 60 million of the population suffer from hypertension and a quarter that number has diabetes. Because China is a vast territory with different levels of development and types of diet, pockets of nutritional deficiency remain; about 35 million people are undernourished. While most of the population receive sufficient macronutrients to satisfy the Chinese RDA, they frequently lack micronutrients. Childhood rickets and iron deficiency anaemia are prevalent in rural regions and close to half of the children under three years of age in the autonomous regions and provinces suffer from these conditions.

Chinese diets are changing. They are becoming more westernised and people are consuming more food of animal origin. This is most noticeable in cities where, in 1988, fat accounted for 30% of the caloric intake (up from 26% in 1981). In urban areas about 10% of woman and 5% of men are now obese. China is encouraging citizens to eat a variety of foods along more traditional lines, with plant foods constituting the bulk of intake, and a lesser amount of food of animal origin. In 1993, the State Council approved a national position paper entitled "Outlines for China's Food Structure Reform and Development in the 1990s". The government hopes that this will lead to a healthier national diet by the year 2000.

Introduction

In the past four decades, China's GNP increased from 104 Yuan per capita per year in 1952 to 1401 Yuan in 1991, and the household real purchasing power increased more than 4 times in the same period. In conjunction with this rapid economic development, the living conditions and health status of Chinese inhabitants has improved measurably, particularly in recent years¹. Affluent diseases are emerging as a public health problem in the urban population while undernutrition is being alleviated in the poor rural areas.

Table 1. The major food production in China (million tons)

Year	Grains	Vegetable oil	Meat products	Seafood	Fruits
1949	113.18	2.56	2.20	0.45	1.20
1962	150.00	2.00	1.94	2.28	2.71
1965	194.53	3.63	5.51	2.98	3.24
1970	239.96	3.77	5.97	3.18	3.75
1975	284.52	4.52	7.97	4.41	5.38
1980	320.56	7.69	12.05	4.50	6.79
1985	379.11	15.78	17.61	7.05	11.64
1990	446.24	16.13	25.14	12.37	18.74
1991	435.29	16.38	27.23	13.51	21.76

Source: 1992 Statistical Yearbook of China

Presented at: The conference on healthy eating, aspartame and chronic non-communicable disease. In Beijing and Shanghai, 1994

In the past four years, policies have been successfully executed by the government to promote food production. Food production has increased significantly during this period, and the change is particularly evident in the past ten years (Table 1). The average per capita food consumption of people has also increased significantly from 1952 to 1991 (Table 2).

With the increase in food consumption, a change of dietary pattern and nutritional status of the Chinese population has been observed. The first nationwide nutrition survey was conducted in 1959. The survey covered 20 provinces, 4 autonomous regions and 2 municipalities. A total of about 1.5 million subjects were studied. The main nutritional implications were identified as follows:

1. The average energy intake was 8611 kJ and the protein intake was 57 g per capita per day. Food from plant sources contributed 89% of the dietary protein.
2. Undernutrition and rickets seriously affected children, especially in rural areas. The prevalence of stunting in pre-school children ranged from 19% to 42%, and that of rickets ranged from 15% to 80%.
3. Severe nicotinic acid deficiency (pellagra) was found in Xinjiang Autonomous Region, Northwest China.
4. Dietary intake of riboflavin was inadequate, accounting for 40-60% of the Chinese RDA.

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Table 2. The major food consumption of Chinese people (kg/capita/year)

Year	Grains	Vegetable oil	Meat products	Poultry	Egg	Seafood	Total animal food	Sugar	Wine
1952	197.67	2.10	6.84	0.43	1.02	2.67	10.96	0.91	1.14
1957	203.06	2.42	6.19	0.50	1.26	4.34	12.29	1.51	1.37
1962	164.63	1.09	3.01	0.38	0.77	2.96	7.12	1.60	1.14
1965	182.84	1.72	7.31	0.36	1.42	3.33	12.42	1.68	1.30
1970	187.22	1.61	6.84	0.32	1.32	2.94	11.42	2.06	1.51
1975	190.52	1.73	8.35	0.35	1.63	3.26	13.59	2.26	2.18
1980	213.81	2.30	11.99	0.80	2.27	3.41	18.47	3.83	3.41
1985	251.69	5.08	15.15	1.56	4.93	4.84	26.48	5.57	7.61
1990	238.80	5.67	18.37	1.73	6.27	6.53	32.9	4.98	11.63
1991	234.50	5.89	19.23	1.98	7.10	6.79	35.1	4.98	11.93

Source: 1992 Statistical Yearbook of China

Changing dietary patterns

The second nationwide nutrition survey was carried out in 1982, in selected areas from 27 provinces, municipalities and autonomous regions. This survey showed the nutritional status of the Chinese population in 1982 was greatly improved compared to the 1950s. The average energy intake was 10387 kJ per capita per day, meeting the Chinese RDA. The protein intake was 67 g per day, accounting for 95% of the Chinese RDA. Deficiency diseases were rarely found in the general population, and undernutrition problems had been solved in general². Since the mid 1980s, the changes in dietary pattern have become more apparent than the amount of food intake. Data from the State Statistical Bureau (SSB) showed that the daily per capita energy intake in urban households increased gradually and reached 9163 kJ in 1983 and then remained stable. In the rural population, it progressively increased before 1984 and then stabilised around 10,814 kJ³. But considerable differences in fat intake between urban and rural areas existed. The share of energy intake from grain decreased year by year in the 1980s. In urban areas, the fat energy accounted for 26% of the total energy in 1981 and 30% in 1988. For rural residents, fat energy intake provided only 13-15% of the total (Table 3).

Table 3. Dietary intake of energy, protein and fat in China between 1978-1989 (per capita per day)

Year	Energy (kJ)		Protein(g)		Fat (g)	
	Urban	Rural	Urban	Rural	Urban	Rural
1981	8728	10107	60	62	61	35
1982	8849	10287	61	63	64	37
1983	9163	10433	63	64	70	39
1984	9137	10814	62	66	70	41
1985	8661	10559	61	64	65	42
1986	9096	10730	64	65	71	43
1987	8970	10822	62	65	72	45
1988	9054	10789	63	65	71	43
1989	-	10881	-	67	--	44

Source: Ge K. Y., Zhang S. M.: Indicators and Assessment of Nutritional Status in China (in press)

Improvement of food consumption will benefit the nutritional status of the Chinese. Over the last four decades, the total mortality rate, infant mortality rate (IMR) and maternal mortality rate (MMR) of the Chinese decreased dramatically. The total mortality rate declined

steadily from 20 per 1000 in 1949 to 6.5 per 1000 in 1989¹, the IMR was decreased from about 250 per 1000 in the early 1950s to 34.7 per 1000 in 1981⁴, and the MMR from 15.0 to 0.95 per 1000 during the same period⁵.

The current mean birth weight of full term new-borns in mainland China is 3.21-3.31 kg for males and 3.11-3.21 kg for females, which are similar to values observed for Chinese in Taiwan and the overseas Chinese in the USA. A large scale survey in 1987 revealed the prevalence of low birth weight (less than 2500 g) was 9.0% on average. The low birth weight (LBW) rate was 6.2% in 1989, which is between the average of developed and developing countries⁶ (Table 4).

Table 4. Birth weight** and incidence of low birth weight*

	N	Male			Female		
		Birth weight (kg)		LBW %	Birth weight (kg)		LBW %
		Mean	SD		Mean	SD	
Mainland China	31443	3.31	0.44	2.3	3.19	0.43	3.4
Mainland China	3594	3.21	0.37	--	3.12	0.34	--
Mainland China	3060	3.22	0.38	--	3.11	0.34	--
Mainland China	890	3.31	0.39	--	3.21	0.35	--
Taiwan	5513	3.30	0.41	1.9	3.20	0.39	2.4
US	90189	3.35	0.42	1.2	3.25	0.40	2.3

* Birth weight less than 2500 g

**Infants of low birth weight were excluded

Source: Ge KY, Zhang SM: Indicators and Assessment of Nutritional Status in China (in press)

Two large-scale surveys on anthropometry were carried out in 1975 and 1985. The 1975 survey covered 274,000 subjects from 0 to 18 years old. The 1985 survey added another 200,000 children. A significant improvement in growth and development was identified both in urban and suburban children. On average, the weight of urban and suburban children was about 3% more and the height was 1-2% more in 1985 than in 1975. For example, the weight of five year old children increased by 0.4 kg, and height by 1-2 cm in ten years⁷. The life expectancy increased from 35 years in the 1950s to 67 for male and 71 for female in 1985. In comparison with Asian countries and some developed countries, the GNP of China is the lowest but the mortality rate is in the middle range (Table 5).

Table 5. Comparison of mortality and GNP per capita among several countries in 1989

	Infant Mortality Rate	Under 5 Mortality Rate	Total Mortality Rate	Life Expectancy at Birth	GNP per capita per year
	1/1000	1/1000	1/1000	Year	(US\$)
Pakistan	106	162	12	57	350
India	96	145	11	59	340
Indonesia	73	100	9	61	440
Philippines	44	72	8	64	630
China	31	43	7	70	330
Sri Lanka	27	36	6	71	420
USA	10	12	9	76	19840
UK	8	10	12	76	12810

Source: UNICEF: The State of the World's Children, 1991

At the same time, the dietary pattern of the Chinese population has changed. Peoples' diets have become more westernised, especially in large and medium sized cities. Two nutritional surveys in middle aged and elderly residents were carried out recently in the East District of Beijing. It was found that dietary fat energy accounted for more than 30% of the total energy. The average egg consumption was 19.5 kg per capita per year in 1989, about one egg per day. Correspondingly, the cholesterol intake reached 400 mg per day, which exceeds the limit of 300 mg suggested by WHO⁸ (Table 6).

Table 6. The dietary pattern of residents aged 35-75 (the East District of Beijing, 1989)

	Male			Female		
	35-44	45-59	60-75	35-44	45-59	60-75
Energy (kJ)	12306	11113	10252	8698	9282	8383
Protein %	11.9	11.9	12.0	12.4	12.1	12.0
Fat %	29.5	30.3	29.5	32.6	30.3	30.7
Protein	87	79	73	64	64	60
% from animal*	28.8	28.2	29.6	33.0	27.8	30.5
% from legume	4.9	6.6	5.0	5.2	4.9	5.9
Fat (g)	96	89	80	75	71	68
% from animal*	48.8	45.7	45.2	43.6	41.5	41.0
Cholesterol (mg)	475	427	431	436	379	412
Salt (g)			12.5			
Calcium (mg)	564	576	591	451	539	519

* Unpublished

Table 7. Prevalence of chronic disease in the east district of Beijing

Disease	Prevalence
Hypertension	13.4
Coronary heart disease	4.06
Stroke	1.26
Diabetes	1.16
Cataract	0.48
Tumour	0.35
Other	11.51
Total	32.22

Yan Diying et al.: China Disease Surveillance Vol 5 11, p 174-1990

The accumulated prevalence of non-communicable diseases was 32.2% of the total (Table 7). Based on surveys conducted in Beijing from 1986 to 1990, the prevalence of overweight and obesity among middle-aged

and older women was as high as 50%⁹ (Table 8). An observation on the body mass index (BMI) of 13,327 subjects over twenty years old showed that 4.2-5.3% of males and 8.9-14.7% of females were overweight or obese; urban females were most affected⁶. Thus, the disease pattern in China is shifting towards that of affluent societies. While the diseases of poverty are decreasing, the diseases of affluence are increasing.

Table 8. The distribution of body mass index in surveyed subjects

Sex	Age group (year)	Body mass indices %		
		<20	20-23.9	>24
Male	35-44	12.2	57.1	30.7
	45-59	16.2	47.5	36.3
	60-74	13.2	43.8	43.0
Female	35-44	15.5	55.2	29.3
	45-59	8.7	38.2	53.1
	60-74	11.3	45.0	43.7

Source: Bai J et al: Proceeding of Second Nutritional Scientific Conference, Chinese Nutrition Society, p 101,1991

Morbidity and mortality

Based on the estimation of the Ministry of Public Health, cancer, cerebrovascular disease and ischaemic heart disease are now the three leading causes of death (Table 9). On the contrary, the mortality of acute infectious diseases and tuberculosis decreased significantly, especially in urban areas. Chronic diseases accounted for more than 70% of the total mortality. A national daily death toll of 13,000 people was attributable to chronic diseases. It was estimated that there are 60 million cases of hypertension and 15 million diabetes patients in China. The premature death attributable to chronic diseases accounted for 63% of the potential years of life lost¹⁰.

Table 9. The mortality rate of cancer, hypertension, coronary heart disease (CHD) and cerebrovascular disease (CVD) in China (1/100,000)

Year	Acute Infection	Cancer	Hyper- tension	CHD	Diabetes	CVD
1957	56.60	36.9	-	-	-	-
1962	25.02	40.92	-	-	-	-
1975	34.32	111.49	-	27.35	3.59	-
1980	4.39	113.41	-	38.55	-	135.35
1985	2.59	113.86	-	37.84	-	117.52
1986	1.67	114.69	-	37.20	5.64	114.48
1987	-	131.98	5.51	44.15	6.92	125.88
1988	1.49	119.12	4.40	44.88	7.01	116.58
1990	1.15	128.03	6.00	47.48	8.12	121.84
1991	-	101.39	7.20	46.20	-	116.48
1992	-	125.76	8.82	51.29	9.65	122.69

Source: Annual Report of National Health Statistics

It is also known that China is not equally developed geographically due to the vastness of territory and the differences in circumstances. A comprehensive survey was conducted in selected urban, rural, pastoral and fishing areas during 1986-1990 covering about 2000 people aged 45-75 years. The results showed that the dietary pattern in different areas to be quite discrepant. In the pastoral area, the consumption of meat and milk was the highest but soybean was almost not eaten. The herdsmen consumed

80% of their dietary fat as animal fat. Vitamin C intake of herdsmen was almost zero. The prevalence of hypertension and coronary heart disease was highest in herdsmen and lowest in fishermen^{11,12}.

Micronutrients in the diet

Though remarkable progress has been made nationally in food supply and nutritional status of the people, undernutrition is still a problem for about 35 million people as estimated in 1990, and some deficiency diseases are prevalent among people in different regions. Iron deficiency anaemia is common in children. Investigations conducted in the 1980s reported that the average prevalence of anaemia in pre-school children in 24 provinces, autonomous regions, and municipalities was 35.3%¹⁰. In 1982, data collected from 12 provinces indicated a prevalence rate of 55% in 32,940 subjects¹⁰. The prevalence of anaemia in the 2nd and 3rd trimester of pregnant women was 34.3% and 36.0%¹³ (Table 10).

Table 10. Prevalence of iron deficiency anaemia of pre-school children and pregnant women (1984-1989)

Age	(%)
Pre-school children:	
6 months	47.0
1 year	41.8
2 years	21.0
3 years	9.4
4 years	16.0
Average (under 7)	35.3
School children	
7-12 years	43.4
Pregnant women	
2nd trimester	34.3
3rd trimester	36.0

Source: Research team for developing the strategy and goal of preventive health care by the year 2000 in China.

Rickets is one of the main diseases affecting children in China. From surveys done from 1977 to 1987 in 26 provinces and autonomous regions of China, the prevalence averaged 40.70% among 184,901 children under three years old, but was higher in the north than in the south (Table 11). The prevalence rate of congenital rickets in some northern countries ranged from 2.9% to 3.7% of the new-borns. Therefore, pregnant women should not be ignored in the effort to prevent and control rickets of children (Table 12).

Table 11. Prevalence of rickets in children below 3 years of age in China during 1977-1983

Area	Number of subjects	%
North China	103,439	49.39
Middle China	48,395	33.11
South China	33,067	24.64
Total	184,901	40.70

Source: Guan Q. et al.: The Outline of National Rickets Survey, Monograph on the Prevention and Control of Rickets (part one) p 25-26, 1984

Iodine deficiency is widespread throughout the country except for Shanghai. It has long been an important health

problem in China. At present, there are 400 million people living in areas identified as iodine deficient. So far, 6 million people are known to suffer from endemic goitre and 0.2 million people suffer from cretinism. In recent years, some evidence has indicated that there are still problems with neonates with mild hypothyroidism and school children with mild mental retardation. Fifty percent of this underdevelopment in children can be attributed to sub-clinical cretinism in iodine deficient areas where iodised salt has been provided for more than 10 years. The Chinese government is planning to wipe out iodine deficiency by the year 2000¹⁵.

Table 12. Prevalence of congenital rickets of neonates in some counties

Area	Number of subjects	%
Zhao-Zhou, Hei-Long-Jiang	73	12.3
Ji-Cheng, Shan-Xi	101	33.7
Daili, Shan-Xi	101	11.9
Jian-Li, Hubei	104	7.1
Yang-Suo, Guang-Xi	102	2.9

Time of Observation: Jan 1988 - Jan 1989. Source: Report of MCH demonstration counties, Department of MCH Demonstration Countries by the Ministry of Public Health (unpublished)

In the early 1950s, vitamin A deficiency was a severe nutritional problem in China. With economic development and the progress of medical care and public health services in rural areas, symptoms and signs of vitamin A deficiency have been greatly reduced. In the 1960s, the incidence of xerophthalmia decreased to below 0.7%. In recent years, there are only scattered reports, primarily of cases in the winter. Most of these patients are in the stage of conjunctiva xerosis¹⁶. It is evident that clinical vitamin A deficiency is not common in China. However, serum vitamin A levels below 20 µg/L were observed in about 30% of pre-school children in rural areas¹⁰ (Table 13). A vitamin A supplementation study showed that the risk of diarrhoea and respiratory infections in the control group were 2.3 and 3.4 times higher respectively¹⁷. These results suggest that the resistance to infections decreased in children with subclinical vitamin A deficiency.

Table 13. Prevalence of low serum vitamin A* concentration of pre-school children (1988-1989)

Area	%
Beijing	21.4
Lai-yuan, Heibei	33.5
Jiang-Xi	27.1
Ji-Xian, Tian-Jing	39.3

* < 20 µg/dl Source: Research team for developing the strategy and goal of prevention health care by the year 2000 in China

Children's health

Body weight and height of children also have been observed to vary with the level of economic development of a society. A large scale survey was conducted on more than 90,000 pre-school children in 1987 by a joint effort of the SSB and the Ministry of Public Health (Tables 14, 15, 16). Children whose height for age was below the third

percentile (NCHS reference) were 7.5-31.2% in urban areas and 18.8-56.7% in rural areas. Children whose weight for age was below the third percentile were 6.4-27.4% in urban and 12.2-47.0% in rural areas. Children who were identified as "wasting" were less than 5% in most survey sites. The educational level of parents was closely related to the growth of children¹⁸.

Table 14. Percentage of children under 3rd percentile in 9 provinces (height for age, NCHS reference standard)

Province	Urban		Rural	
	Male	Female	Male	Female
Zhe-Jiang	9.14	7.50	24.59	21.37
Shang-Dong	12.42	9.88	19.43	18.79
Yun-Nan	13.15	10.96	56.19	55.50
Hei-Long-Jiang	13.98	12.13	31.69	29.16
Hubei	14.46	11.36	34.61	33.38
Nei-Mong-Gu	16.94	13.48	29.83	26.37
Guang-Dong	23.98	18.30	56.70	49.37
Ning-Xia	25.92	21.36	35.91	33.90
Si-Chuan	31.15	36.69	53.90	50.61

Source: Ge KY et al: Indicators and assessment of nutritional status in China (in press).

Table 15. Percentage of children under 3rd percentile in 9 provinces (weight for age, NCHS reference standard)

Province	Urban		Rural	
	Male	Female	Male	Female
Shang-Dong	6.37	6.79	12.24	12.25
Zhe-Jiang	7.1	8.22	16.32	14.57
Hei-Long-Jiang	10.32	9.4	17.5	17.09
Nei-Mong-Gu	12.88	11.85	17.86	17.92
Hubei	13.95	12.63	22.85	22.87
Ning-Xia	17.32	18.73	19.41	19.67
Yun-Nan	20.93	20.18	45.27	46.98
Si-Chuan	25.93	22.71	34.48	33.52
Guang-Dong	27.4	24.5	42.32	45.11

Source: Ge KY et al: Indicators and assessment of nutritional status in China (in press).

Table 16. Percentage of children under 3rd percentile in 9 provinces (weight for height, NCHS reference standard)

Province	Urban		Rural	
	Male	Female	Male	Female
Shang-Dong	1.84	2.02	2.15	1.82
Hei-Long-Jiang	2.15	1.42	2.72	2.16
Nei-Mong-Gu	2.51	3.35	2.82	1.52
Hubei	3.05	4.03	3.72	3.41
Zhe-Jiang	3.19	3.14	2.59	2.26
Si-Chuan	3.68	2.71	4.22	3.30
Ning-Xia	4.37	3.56	3.32	2.14
Yun-Nan	8.11	7.72	6.67	5.84
Guang-Dong	9.23	6.83	8.50	7.84

Source: Ge KY et al: Indicators and assessment of nutritional status in China (in press).

In 1985, more than 400,000 school children aged 7-18 years were sampled from all over China (excluding Tibet and Taiwan) for a physical and health status study. There was a considerable gap between the survey findings and the NCHS reference value of height for age and weight for

age; the older the subjects were the bigger the difference. The difference between urban and rural school children was also significant¹⁹ (Tables 17,18).

Table 17. Comparison of height for age of Chinese students with NCHS reference standard

Age (year)	Urban				Rural			
	Male		Female		Male		Female	
	N	Dif (cm)	N	Dif (cm)	N	Dif (cm)	N	Dif (cm)
7	8560	-0.32	8559	-0.35	8546	-4.06	8538	-3.91
10	8557	-2.01	8559	-2.05	8560	-5.98	8561	-6.96
13	8558	-2.84	8558	-3.72	8557	-8.12	8557	-7.54
16	8559	-5.83	8557	-4.60	8557	-9.65	8557	-7.32
18	8324	-7.11	8159	-5.55	8523	-10.03	8437	-7.62

Source: Zhang J et al: Research on the constitution and health of Chinese students, p. 1113-1128; 1988

Table 18. Comparison of weight for age of Chinese student with NCHS reference standard

Age (year)	Urban				Rural			
	Male		Female		Male		Female	
	N	Dif (kg)	N	Dif (kg)	N	Dif (kg)	N	Dif (kg)
7	8560	-2.33	8559	-0.24	8546	-2.56	8538	-2.21
10	8557	-3.21	8559	-4.50	8560	-4.87	8561	-6.36
13	8558	-4.73	8558	-4.90	8557	-7.51	8557	-6.36
16	8559	-8.88	8557	-7.75	8557	-10.54	8557	-7.45
18	8324	-12.44	8159	-7.01	8523	-13.13	8437	-6.01

Source: Zhang J et al: Research on the constitution and health of Chinese students, p. 1113-1128; 1988

Since 1989, an intervention study on chronic diseases has been conducted in Beijing on a sample size of 86,877 people over 15 years. Blood pressure control, body weight control, reduction of dietary fat and salt intake and control of smoking were selected as the strategies for intervention. During the two year intervention period, 75% of the hypertensive subjects had their blood pressure placed under control. The salt intake was reduced to 9.9 g in the intervention group but remained 12.8 g in control group. The difference is statistically significant ($P<0.01$). The dietary behaviour of the population was shifting towards a healthier diet as well²⁰.

Table 19. Changes of prevalence of malnutrition by age group between 1986 and 1989 (according to the Chinese reference standard)

Age Group (y)	Number of children		Under weight		Stunting		Wasting	
	86	89	86	89	86	89	86	89
<0.5-	774	594	10.0	8.9	17.2	18.2	2.3	2.4
0.5-	1050	1094	14.7	13.6	22.7	23.1	3.9	3.4
1.0-	1090	1033	14.7	12.6	30.7	33.2	4.3	2.7**
2.0-	1637	1635	14.7	13.2	38.6	36.8	1.5	2.0
3.0-	1681	1436	8.9	8.4	36.7	33.8	0.8	1.0
4.0-	1604	1267	9.0	7.3	38.7	33.3**	1.2	1.3
5.0-6.0	1233	1153	7.5	7.7	34.1	33.6	1.5	1.2

** $p<0.01$ Source: Chang Y et al.: Nutrition status of pre-school children in comparatively poor rural areas and the results of three intervention programs. J Hygiene Research 1:23,1994 (in press)

From 1985-1989, a project for monitoring and improving the nutritional status of pre-school children was carried out in 18 poor rural sites covering about 10,000 children (Table 19). During four years of intervention, the

percentage of wasting in the susceptible children under one year decreased from 4.3% to 2.7%. The percentage of stunting in four year old children decreased from 38.7% to 33.3%. The difference was statistically significant. A comparison of the prevalence in 1986 and 1989 revealed that there was a statistically significant decrease of anaemia during the 4 year period in all groups (Table 20). A second phase of this project is on-going, covering a total of 100 counties throughout the 27 provinces and autonomous regions of the country²¹.

Table 20. The prevalence of anaemia in rural pre-school children (percentage of children with Hb < 11.0 g/dl)

Year	Prevalence in different age groups(y)				
	<0.5	0.5-	1.0	2.0-	3-5
1986	57.5	62.3	49.9	37.7	28.4
1987	51.8	60.2	45.5	33.7	25.8
1988	39.6	54.2	42.6	28.3	18.8
1989	33.2	51.0	41.4	27.5	17.6

Source: Chang Y et al: Nutrition status of pre-school children in comparatively poor rural areas and the results of three intervention programs. *J Hygiene Research* 1:23, 1994 (in press)

Deficiency disease

The current representative Chinese diet provides enough macronutrients to meet the requirements as stated in the Chinese RDA (Recommended daily allowance). Nevertheless, the common Chinese diet is still relatively poor in riboflavin, vitamin A, calcium and zinc. It should be pointed out that although the provision of adequate food, in general, is no longer a problem in China, energy and protein insufficiency may still be a problem in some remote and poor areas. Nutritional deficiencies still exist and are regarded as the main concern in China. At the

same time, the disease pattern is shifting from more acute infectious diseases to more non-communicable chronic conditions. Diseases of affluence and poverty exist simultaneously in the country. The government has implemented poverty relief policies by providing food and technical assistance for the development of these poor areas so as to further decrease the morbidity and mortality of the "diseases of poverty". On the other hand, a recognition of trends toward the westernisation of the diet in some city populations has led to the formulation of policies to encourage maintenance of the traditional Chinese dietary pattern, in which plant food constitutes the main body of the diet with a moderate amount of animal food, and also to increase the variety of food.

Diet in the future

China is making a big effort to promote a healthier diet at the national level. The document entitled "Outlines for China's Food Structure Reform and Development in 1990s" was approved by the State Council in February, 1993. This program aims to regulate food production and supply at the national level, to maintain the basic pattern of the Chinese diet and to absorb useful information provided by other countries. The document sets targets for the annual per capita consumption of major food by the year 2000 as follows: grain 213 kg (8 kg as bean products), meat 25 kg, eggs 10 kg, milk 6 kg, aquatic products 9 kg, fruits 23 kg, vegetables 120 kg, edible oils 8 kg and sugars 8 kg. The daily supply of energy, protein and fat is close to the world average. In addition, a "State Advisory Committee for Food and Nutrition" was formally established to provide advice and counselling on the implementation of the program.

Nutrition transition in China: the growth of affluent diseases with the alleviation of undernutrition

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Asia Pacific Journal of Clinical Nutrition (1995) Volume 4, Number 3: 287-293

中國居民營養變遷：營養不足下降，「富裕型」疾病上升

摘要

四十年來中國國民經濟總產值從 1952 年的每人 104 元增加到 1991 年的 1401 元。同期間家庭的實際購買力增加了 4 倍多。隨著食物生產與消費的增長及生活水平的提高，在衛生方面也發生了明顯的改變：嬰兒死亡率降低，傳染病及營養不良減少；預期壽命增加一倍，從五十年代的 35 歲增至男性 67 歲和女性 71 歲；但富裕型疾病如肥胖、心血管病等明顯增加。當前中國死因排序的前三位是腫瘤、腦血管病和冠心病，而由結核及急性傳染病所致死亡顯著下降。由於發展不平衡，某些地區仍有營養不良，約波及 3500 萬人口。絕大多數人群的宏量營養素的攝入已達到中國的營養素供給量標準，但他們的微量營養素攝入量卻往往不足。兒童佝僂病及缺鐵性貧血在農村較普遍，約有半數 3 歲以下的兒童受累。

中國膳食中的動物性食物的比重正在增加，尤其在城市人口中有明顯的西方化趨勢。米白脂肪的熱能 1981 年佔總熱能的 26%，到 1988 年上升為 30%。城區 10% 的成年女性和 5% 的男性肥胖。中國提倡保持以植物性食物為主的膳食特點，在農村中應適量增加動物性食物。1993 年國務院發佈了「中國食物結構改革發展綱要」，希望促使全國人民在 2000 年能攝取更為合理的膳食。

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