Original Article

Section 3: World Health Organization multi-country study on improving household food and nutrition security for the vulnerable

Intrahousehold food distribution: A case study of eight provinces in China

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A longitudinal survey of health and nutrition in China was undertaken in eight provinces (Liaoning, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi, Guizhou). Data were collected in 1989, 1991, 1993 and 1997. The 1991 and 1993 data were used to investigate factors affecting intrahousehold food distribution. The discrepancy score and the ratio of food share to energy share were used to describe food distribution within households. Findings indicated that, in most cases, males had a higher proportion of nutrient intake than females, particularly in the young adult group where men presented with a higher discrepancy score than women for energy and all nutrients observed. The food and nutrient distribution tends to be more favourable to the middle-aged group, although the youngest group, while accepting relatively smaller amounts of cereals, ate much bigger amounts of meat, dairy products and fruits. Household members with higher incomes are more favoured in terms of food consumption and nutrient intake. Household leaders accepted a higher share of energy and nutrients in comparison with other members of the household across all age and sex groups. Administrators and people working in service or trade industries in rural areas are favoured in terms of food distribution relative to farmers and manual workers. Well-educated people accepted a better food allocation than others and those in employment received more nutrients than the unemployed. The 'contribution rule' (individuals who make a greater contribution to the family receive a larger share of the family's food) is discussed and deemed to be applicable in explaining the discrepancy in food distribution and nutrient intake among household members.

Key words: age, discrepancy score, educational level, food share to energy share, head of household, income, intrahousehold food distribution, occupation, sex.

Introduction

It is important to understand intrahousehold food distribution in a community in order to ensure that nutritional intervention programmes are ultimately successful in decreasing the prevalence of malnutrition and improving the nutritional status of the inhabitants. Few studies have been undertaken in China in this field. The present paper is based on the analysis of data collected in 1991 and 1993, in the second and third rounds of the health and nutrition survey of China. It aims to investigate the situation of intrahousehold food distribution in eight provinces, namely Liaoning, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi and Guizhou. Data were collected on household situation, diet, anthropometry measurements and community situations.

Methods

The sample was drawn up using a multi-stage stratified random cluster process, as described elsewhere.[1] Data analysis was performed with SAS version 6.12 (SAS Institute, Cary, NC, USA) and general linear models (GLM) and NPAR1WAY nonparametric test were applied to compare differences between groups.

Two indices were adopted for analysis. These were the discrepancy score (DS)[2] and the ratio of food share to energy share (FS/ES).[3,4] These are defined as follows.

$$DS(X) = \frac{\text{Individual X intake}}{\text{Family X intake}} - \frac{\text{Individual X RDA}}{\text{Family X RDA}}$$

where X is energy or one of the nutrients and RDA is the recommended daily allowance.

The DS is the difference between the percentage of energy or a nutrient that the person consumed and the percentage that he or she should have consumed. A negative score indicates that the person has consumed less than his or her share; a positive score indicates that the person consumed more than his or her share, regardless of the overall amount ingested.

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$$\text{FS/ES (food A)} = \frac{\text{Individual intake of food A/household intake of food A}}{\text{Individual energy intake/household energy intake}}$$

A score for FS/ES < 1 indicates that food A distributed to an individual is less than his or her share, > 1 indicates that food A distributed to an individual is more than his or her share and FS/ES = 1 indicates that food A distributed to an individual is equal to his or her share.

Results

Characteristics of the sample

The sample consisted of 5900 males (49.3%) and 6064 females (50.7%) in 1991 and 5968 males (49.6%) and 6068 (50.4%) females in 1993. The sex composition was very similar in the two rounds of the survey. The proportion of people below 18 years of age in 1991 and 1993 was 31.2 and 29.4%, respectively. The proportion of people aged over 60 years in 1991 and 1993 was 10.2 and 11.5%, respectively. The age distribution of the sample, shown in Table 1, is similar to that of the Chinese population.

The proportion of farmers in the sample declined from 60.1% in 1991 to 55.2% in 1993. In contrast, the proportion of people working in trade or services rose from 8.7% in 1991 to 11.6% in 1993 (Table 2). Perhaps this was because an increasing number of peasants moved from farming to rural industry or commerce as a consequence of the development of the rural economy.[5]

The distribution of the educational level of subjects aged 18–60 years is shown in Table 3. The proportion of those who only attended primary school decreased from 44.3% in 1991 to 25.0% in 1993, while the proportion of people who attended junior and senior school increased. The average income increased markedly between the two survey years and there was a noticeable difference between rural and urban incomes. In 1991, the average annual income was 2343 ± 1835 yuan per capita in urban areas and 1571 ± 1646 yuan per capita in rural areas. By 1993, these figures had risen to 3209 ± 3130 yuan per capita and 1999 ± 2595 yuan per capita, respectively.

Food distribution by age and sex

The following analysis differentiates between urban and rural populations. Subjects were categorized into six age groups, as shown in Table 1, and were also subdivided into male and female groups within the same age groups. As shown in Tables 4 and 5, the 45–59 years age group, as a whole, had positive DS for energy and all nutrients, except for a small negative value for retinol. This indicates that, within the household, this group consumed more food than they should have. All younger groups had negative DS for protein. The 18–44 years age group consumed the lowest proportion of energy in both urban and rural areas. However, the oldest age group consumed the highest energy share, which was much greater than the share they should have had based on their energy requirements. The youngest age group consumed a rather low proportion of the major nutrients but had quite a high share of retinol. The overall picture of DS by age is similar in urban and rural areas and in both the 1991 and 1993 surveys.

There are significant sex differences in DS values for energy and nutrients in all but the 0–4 age group (Tables 4,5). In most cases, males had a better nutrient allocation than

Table 1. Composition of survey samples by age and sex in 1991 and 1993

	1991		1993	
	No. males (%)	No. females (%)	No. males (%)	No. females (%)
Age (years)				
0–4	391 (6.6)	353 (5.8)	282 (4.7)	257 (4.2)
5–9	617 (10.5)	539 (8.9)	655 (11.0)	554 (9.1)
10–17	927 (15.7)	908 (15.0)	927 (15.5)	863 (14.2)
18–44	2533 (42.9)	2728 (45.0)	2522 (42.3)	2722 (44.9)
45–59	854 (14.5)	892 (14.7)	904 (15.1)	964 (15.9)
60+	578 (9.8)	644 (10.6)	678 (11.4)	708 (11.7)
Total	5900 (100.0)	6064 (100.0)	5968 (100.0)	6068 (100.0)

Data show the number of subjects with percentages given in parentheses.

Table 2. Occupation of individuals in the samples aged 16 years and over in 1991 and 1993

	1991	1993
Occupation		
Administration	735 (9.5)	712 (9.2)
Trade/services	674 (8.7)	897 (11.6)
Farmer	4673 (60.1)	4283 (55.2)
Manual worker	1568 (20.2)	1611 (20.8)
Others	105 (1.4)	259 (3.3)
Total	7775 (100.0)	7762 (100.0)

Data show the number of subjects with percentages given in parentheses.

Table 3. Educational level of individuals in the survey samples aged 18–60 years in 1991 and 1993

	1991	1993
Educational level		
Primary school	2664 (44.3)	1153 (25.0)
Junior school	2155 (35.8)	2263 (49.0)
Senior school	1003 (16.7)	1066 (23.1)
College	196 (3.3)	133 (2.9)
Total	6018 (100.0)	4615 (100.0)

Data show the number of subjects with percentages given in parentheses.

Table 4. Discrepancy scores for energy and nutrients by age and sex in 1991

Sex	Urban						Rural						
	n	Protein	Energy	Ca	Iron	Vitamin C	Retinol	*n*	Protein	Energy	Ca	Iron	Vitamin C	Retinol
Age (years)														
0–4														
M	98	–0.65	0.00	–5.96	–3.62	–4.54	14.72	293	–0.40	0.07	–6.69	–3.92	–3.94	10.24
F	76	–0.52	0.05	–5.43	–2.88	–4.02	17.73	277	–0.40	0.20	–7.47	–4.73	–5.49	12.78
All	174	–0.59	0.02	–5.73	–3.30	–4.31	14.72	570	–0.40	0.13	–7.07	–4.31	–4.69	11.47
5–9														
M	154	–0.31	0.30	–4.39	1.46	–2.08	3.58	463	–0.33	0.60	–4.81	–0.22	–1.90	–1.22
F	122	–2.18	–0.79	–5.32	4.05	–2.03	–1.16	417	–0.44	0.64	–4.99	–0.37	–2.29	–3.28
All	276	–1.13	–0.18	–4.80	0.31	–2.06	3.79	880	–0.38	0.62	–4.90	–0.29	–2.09	–2.20
10–17														
M	225	–0.33	0.61	–5.27	0.94	–1.13	1.78	702	0.04	0.91	–5.10	–0.27	–0.01	–0.86
F	214	–1.76	–0.55	–6.17	–5.37	–0.64	–0.42	694	–0.72	0.51	–5.95	–4.82	–1.12	–2.13
All	439	–1.02	0.05	–5.71	–2.14	–0.89	0.70	1396	–0.34	0.71	–5.52	–2.53	–0.56	–1.49
18–44														
M	744	0.47	–0.49	4.39	7.21	2.32	–0.61	1789	0.42	–0.53	5.60	7.87	2.76	1.01
F	811	–0.53	–1.30	0.86	–7.53	0.18	–3.75	1917	–0.71	–1.39	2.33	–5.98	0.40	–2.32
All	1555	–0.05	–0.91	2.55	–0.48	1.20	–2.24	3706	–0.17	–0.98	3.91	0.71	1.54	–0.71
45–59														
M	295	1.92	1.38	2.67	4.86	1.34	2.25	559	0.81	0.44	2.88	4.64	1.17	2.40
F	328	0.29	0.88	0.56	0.91	0.28	–2.14	564	1.26	1.37	0.54	1.68	–0.05	–1.70
All	623	1.06	1.12	1.56	2.78	0.78	–0.06	1123	1.04	0.91	1.71	3.16	0.56	0.34
60+														
M	278	0.22	1.09	1.31	2.53	0.18	0.65	300	0.71	1.64	1.04	1.81	–0.35	1.09
F	311	0.72	1.43	–1.51	–0.84	–2.26	–1.83	333	0.83	1.49	–2.00	–1.37	–2.78	–1.78
All	589	0.49	1.27	–0.18	0.75	–1.11	–0.66	633	0.77	1.56	–0.56	0.14	–1.63	–0.42

Table 5. Discrepancy scores for energy and nutrients by age and sex in 1993

Sex	Urban						Rural						
	n	Protein	Energy	Ca	Iron	Vitamin C	Retinol	*n*	Protein	Energy	Ca	Iron	Vitamin C	Retinol
Age (years)														
0–4														
M	69	0.07	0.10	–4.92	–3.14	–4.31	18.53	213	–1.01	–0.31	–7.55	–4.61	–4.23	8.25
F	52	0.06	0.29	–6.28	–2.39	–3.52	12.50	205	–0.36	–0.03	–6.89	–4.71	–4.95	9.91
All	121	0.06	0.18	–5.50	–2.82	–3.97	16.16	418	–0.69	–0.17	–7.23	–4.66	–4.58	9.07
5–9														
M	163	–0.87	–0.28	–5.30	0.94	–2.74	0.06	492	–0.07	0.74	–4.55	0.19	–1.44	–1.27
F	119	–0.87	0.27	–4.89	0.24	–2.47	0.32	435	–0.74	0.44	–5.19	–0.66	–2.09	–2.92
All	282	–0.87	–0.04	–5.13	0.65	–2.63	0.17	927	–0.38	0.60	–4.85	–0.21	–1.75	–2.04
10–17														
M	226	–0.54	0.29	–5.46	0.98	–0.83	1.87	701	0.00	0.93	–5.69	–0.40	–0.60	–0.58
F	219	–1.93	–0.60	–7.07	–5.15	–1.35	0.53	644	–0.92	0.47	–6.27	–4.98	–1.47	–1.67
All	445	–1.22	–0.15	–6.25	–2.03	–1.09	1.21	1345	–0.44	0.71	–5.97	–2.59	–1.01	–1.10
18–44														
M	737	0.42	–0.54	4.13	6.42	2.44	0.94	1785	0.57	–0.45	5.41	7.58	2.61	2.19
F	789	–0.32	–1.28	1.42	–7.25	0.12	–2.32	1933	–0.84	–1.55	2.21	–6.20	0.27	–1.72
All	1526	0.04	–0.92	2.73	–0.65	1.24	–0.75	3718	–0.16	–1.02	3.75	0.42	1.39	0.16
45–59														
M	258	1.67	1.31	3.12	5.09	1.70	1.07	646	1.00	0.62	2.82	4.74	1.44	1.75
F	320	–0.04	0.68	–0.41	0.51	–0.11	–1.15	644	1.20	1.36	0.16	1.19	–0.27	–2.20
All	578	0.72	0.96	1.16	2.56	0.70	–0.16	1290	1.10	0.99	1.49	2.97	0.59	–0.22
60+														
M	320	–0.16	1.21	0.84	2.11	–0.38	–0.94	358	0.58	1.42	1.11	2.00	–0.35	0.73
F	330	1.07	1.58	–0.65	–0.30	–1.42	–3.07	378	0.58	1.55	–1.87	–1.23	–2.39	–2.58
All	650	0.47	1.40	0.09	0.89	–0.91	–2.02	736	0.58	1.49	–0.42	0.34	–1.40	–0.97

females. This is particularly noticeable for the 18–44 years age group, where men present a higher DS than women for energy and all nutrients in both urban and rural areas, and in both the 1991 and 1993 surveys. This is also true for the 45–59 years age group in the urban population in for these two survey years.

Figure 1 uses the DS for protein as an example to illustrate the disparity in nutritional allocation among different age, sex and area groups.

The results for FS/ES showed that the two youngest age groups consumed a smaller proportion of cereals and vegetables than the older age groups, but a much higher proportion of fruits, meats and dairy products. Women ate more beans, vegetables and fruits than men in almost all age groups in the urban population, but this pattern did not hold in rural areas. Males were given more meat than females in most age groups, particularly in rural areas. This sexual discrepancy in food distribution is less obvious in the urban population and does not hold true for the younger and the elderly age groups in the 1993 survey (Tables 6–9).

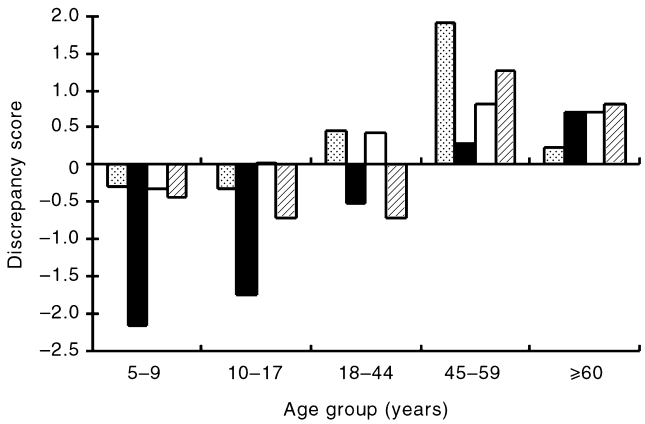

Figure 1. Discrepancy score for protein in 1991. (▨), urban males; (■), urban females; (□), rural males; (▨), rural females.

Food distribution and household leadership

Household leaders are often the main income earners in families. In some cases, the household leader was also the person who distributed food within the household. The 1993 survey showed that males take the leadership in 73.4% and 88.7% of households in urban and rural areas, respectively. Males younger than 45 years of age accounted for the leadership of 30.2% of households in urban areas and 48.8% of households in rural areas. Males aged 60 years and over accounted for 23.4% of household leadership in urban areas and 12.1% in rural areas. Females aged 60 years and over were leaders of 11.6% of households in urban areas and 3.2% of households in rural areas.

Tables 10–12 show the DS for energy and nutrients and also FS/ES for groups between household leaders and non-leaders for a given age and sex group.

Leaders in urban households consumed a higher share of energy and all nutrients except retinol; this was true for both males and females and in the younger and older age groups. In general, rural household leaders also consumed a higher proportion of energy and nutrients, although the older male group had a lower score for energy and the younger female group had a lower score for vitamin C.

The disparity between leaders and non-leaders regarding the allocation of food groups is not so marked as for the DS. Rice and wheat were equally allocated to leaders and non-leaders in all four groups in urban areas and non-leaders consumed a slightly higher share in the four groups in rural

Table 6. Ratio of food share to energy share for various food groups by age and sex in urban areas in 1991

Age (years)	Sex	Food group					
		Rice/wheat	Beans	Vegetables	Fruits	Meats*	Dairy
0–4	M	0.89	1.25	0.86	4.59	1.43	6.13
	F	0.84	1.48	0.83	3.83	1.29	5.99
	All	0.87	1.35	0.85	4.28	1.37	6.07
5–9	M	0.96	1.17	0.94	3.04	1.17	2.73
	F	0.96	1.19	0.99	2.63	1.10	3.80
	All	0.96	1.17	0.96	2.82	1.14	3.30
10–17	M	1.01	0.99	0.92	1.58	1.05	1.60
	F	1.00	1.13	1.02	1.96	1.04	1.53
	All	1.00	1.05	0.97	1.74	1.05	1.56
18–44	M	1.01	1.05	0.97	1.20	0.99	1.17
	F	1.01	1.14	1.06	1.45	0.97	1.35
	All	1.01	1.10	1.02	1.33	0.98	1.27
45–59	M	1.00	1.08	1.00	0.98	1.05	1.50
	F	1.01	1.10	1.09	1.43	0.98	1.79
	All	1.00	1.09	1.05	1.25	1.02	1.65
60+	M	0.99	1.08	1.02	1.13	1.03	2.18
	F	1.01	1.10	1.06	1.34	1.04	2.69
	All	1.00	1.09	1.04	1.23	1.03	2.45

*Includes pork, beef, mutton, fish and eggs.

Table 7. Ratio of food share to energy share for various food groups by age and sex in rural areas in 1991

Age (years)	Sex	Food group					
		Rice/wheat	Beans	Vegetables	Fruits	Meats*	Dairy
0–4	M	0.93	1.48	1.04	4.25	2.03	7.66
	F	0.93	1.13	0.93	4.67	1.97	9.42
	All	0.93	1.31	0.99	4.46	2.00	8.43
5–9	M	0.98	1.14	1.04	2.64	1.27	5.70
	F	0.98	1.21	1.05	2.87	1.23	2.35
	All	0.98	1.18	1.04	2.75	1.25	4.48
10–17	M	1.01	1.10	1.03	2.16	1.04	2.58
	F	1.01	1.04	1.04	1.98	1.05	1.83
	All	1.01	1.07	1.04	2.07	1.04	2.35
18–44	M	1.00	1.07	0.96	0.93	1.05	7.76
	F	1.01	1.07	1.04	1.11	0.98	1.26
	All	1.00	1.07	1.00	1.03	1.01	1.57
45–59	M	0.99	1.12	0.98	0.92	1.11	1.87
	F	1.02	1.12	1.07	1.57	1.04	1.47
	All	1.00	1.12	1.02	1.27	1.08	1.65
60+	M	1.00	1.08	1.00	0.98	1.18	2.12
	F	1.01	1.16	1.06	1.02	1.18	1.94
	All	1.00	1.12	1.03	1.00	1.18	2.04

*Includes pork, beef, mutton, fish and eggs.

Table 8. Ratio of food share to energy share for various food groups by age and sex in urban areas in 1993

Age (years)	Sex	Food group					
		Rice/wheat	Beans	Vegetables	Fruits	Meats*	Dairy
0–4	M	0.91	1.25	1.02	4.05	1.73	7.35
	F	0.92	1.57	0.88	2.78	1.84	6.87
	All	0.92	1.37	0.96	3.69	1.78	7.20
5–9	M	0.98	1.12	0.95	2.33	1.18	3.01
	F	0.97	1.23	0.95	2.84	1.24	4.68
	All	0.98	1.16	0.95	2.54	1.21	3.66
10–17	M	1.00	1.04	0.95	1.49	1.06	1.58
	F	1.00	1.08	1.01	1.87	1.09	2.54
	All	1.00	1.06	0.98	1.70	1.08	2.18
18–44	M	1.00	1.01	0.97	0.96	1.03	1.17
	F	1.00	1.10	1.05	1.30	1.00	1.30
	All	1.00	1.06	1.01	1.15	1.02	1.24
45–59	M	0.99	0.99	0.99	1.03	1.02	1.78
	F	1.01	1.07	1.08	1.24	1.00	1.17
	All	1.00	1.03	1.04	1.15	1.01	1.50
60+	M	1.00	1.07	1.01	1.04	1.01	1.50
	F	1.02	1.12	1.06	1.17	1.03	1.85
	All	1.01	1.09	1.03	1.10	1.02	1.66

*Includes pork, beef, mutton, fish and eggs.

areas. Male leaders consumed a lower share of dairy products in both urban and rural groups. Female leaders consumed a higher share of dairy products in urban areas but a lower share in rural areas. Non-leader females are in a better position with regard to the distribution of fruit and meat (Tables 11,12).

Food distribution and household income

Table 13 shows the income groups, while Table 14 shows the distribution of DS for energy and nutrients by income tertile in urban and rural populations. Income is counted as the per capita average annual income of the household based on the 1993 survey. The high-income group presented a higher DS

Table 9. Ratio of food share to energy share for various food groups by age and sex in rural areas in 1993

Age (years)	Sex	Food group					
		Rice/wheat	Beans	Vegetables	Fruits	Meats*	Dairy
0–4	M	0.94	1.30	0.99	5.48	1.82	13.36
	F	0.93	1.39	0.99	6.92	1.91	9.78
	All	0.94	1.34	0.99	6.36	1.86	10.83
5–9	M	0.98	1.14	1.02	2.23	1.29	2.95
	F	0.99	1.20	1.04	2.29	1.27	2.46
	All	0.98	1.16	1.03	2.26	1.28	2.79
10–17	M	1.01	1.06	1.00	1.96	1.11	2.63
	F	1.00	1.08	1.05	1.68	1.08	2.51
	All	1.01	1.07	1.02	1.81	1.09	2.59
18–44	M	1.00	1.08	0.96	1.08	1.10	1.02
	F	1.01	1.10	1.05	1.14	1.02	1.16
	All	1.00	1.09	1.01	1.12	1.06	1.10
45–59	M	0.99	1.08	0.97	1.27	1.13	1.96
	F	1.02	1.08	1.06	1.35	1.03	1.76
	All	1.00	1.08	1.02	1.31	1.08	1.85
60+	M	1.00	1.05	1.00	1.15	1.15	2.45
	F	1.02	1.05	1.06	1.14	1.10	1.92
	All	1.01	1.05	1.03	1.15	1.13	2.21

*Includes pork, beef, mutton, fish and eggs.

for protein, calcium and iron in urban populations and for those nutrients plus retinol in rural populations.

Cereals are evenly distributed in the three income groups in both urban and rural populations. There are no clear trends linking income with FS/ES for food groups. The FS/ES for beans is associated with income in rural areas, but not in urban areas. The medium income group consumed more vegetables and dairy products in urban areas and more fruits in rural areas. The low-income group had the highest ratio for fruits in urban areas and for meats and dairy products in rural areas (Tables 15,16).

Food distribution and occupation

The survey showed that, in rural areas, administrators had the highest DS for energy and all nutrients in comparison with those in other occupations. In urban areas, administrators had the highest score for energy and all nutrients except retinol, for which they had the lowest score. People working in trade and services were treated well with regard to energy and protein in general and in particular with regard to vitamin C and retinol in rural areas in comparison with farmers and manual workers. Rural farmers consumed an inadequate share of protein, calcium and vitamin C, while manual workers had the smallest share of energy in both urban and rural areas (Table 17).

Table 18 shows the FS/ES for people of different occupations in urban areas. Rice and wheat were equally distributed, the ratios varying from 0.99 to 1.01. Administrators and people working in trade and services had higher FS/ES for beans, fruits and meats. The results were similar in rural areas.

Food distribution and education level

As shown in Table 19, the DS for protein increases with education level. That increase is more regular among the rural population than in urban areas. In general, well-educated people with a college-level education and above consumed a higher share of energy and of some other nutrients.

The FS/ES analysis also showed that cereals are evenly distributed among groups with different educational levels. People with college-level education had a higher ratio for vegetables in urban areas and for beans and meats among the rural population.

Food distribution and employment

Non-employees are in a disadvantageous position with regard to food distribution, as shown in Table 20. They have lower DS for protein, calcium, iron, vitamin C and retinol, although they have a higher score for energy. This may be interpreted as saying that non-employees consumed a poor diet but were not short of staple food.

Discussion

Sex disparities in intrahousehold food distribution have been indicated in many studies.[6,7] Nelson[8] found that nutrient intake as a proportion of the RDA was higher for males than females. Based on a study in Nepal, Gittelsohn[9] concluded that males accepted a preferential food allocation.

The present study shows similar results for China. Males had a better food supply than females in almost all age groups, except the youngest (0–4 years). The FS/ES is higher for females for beans, vegetables and fruits, but food of animal origin is disproportionately given to males. In general, intrahousehold food distribution is in favour of males.

These results clearly reflect the traditional Chinese way of thinking, particularly in the rural population. It is usually accepted that a man should be the leader of the family and should be responsible for supporting the family, while women should be responsible for housework and bringing up the children. Males often have the choice of food prior to food being offered to females in the family.

Table 10. Discrepancy score for energy and nutrients by household leadership in 1993

Age (years)	Leadership	Urban						Rural					
		n	Protein	Energy	Ca	Iron	Vitamin C	Retinol	*n*	Protein	Energy	Ca	Iron	Vitamin C	Retinol
Males															
18–44	Leader	295	0.97	0.26	5.91	8.77	3.26	0.89	1008	1.06	–0.13	7.01	9.40	3.15	2.87
	Non-leader	442	0.06	–1.07	2.94	4.85	1.89	0.97	777	–0.05	–0.87	3.34	5.21	1.92	1.31
45+	Leader	423	0.90	1.33	2.15	3.75	0.73	0.83	824	0.89	0.86	2.45	4.00	1.16	1.39
	Non-leader	155	–0.01	1.04	1.06	2.59	0.05	–2.43	180	0.65	1.12	1.11	2.68	–0.81	1.34
Females															
18–44	Leader	57	0.56	–0.58	3.86	–7.18	0.67	–4.32	81	0.06	–1.09	3.47	–5.64	–0.23	–0.64
	Non-leader	732	–0.39	–1.34	1.23	–7.25	0.08	–2.16	1852	–0.88	–1.57	2.16	–6.22	0.29	–1.77
45+	Leader	202	0.60	1.33	–0.17	0.48	–0.20	–2.82	153	1.08	1.45	–0.08	1.07	–0.18	–2.13
	Non-leader	448	0.50	1.05	–0.69	–0.07	–1.04	–1.81	869	0.95	1.43	–0.68	0.16	–1.21	–2.38

Age is also an important factor influencing intrahousehold food distribution. Nelson[8] stated that intakes of energy and most nutrients by adult males, boys aged 0–10 years (and girls under 5 years of age) were more adequate than the intakes of other groups according to the RDA standard. The present study shows that, in China, middle-aged adults (45–60 years) are in the best position with regard to food distribution. Males aged 18–44 years also consumed a higher proportion of protein, calcium and vitamin C than other groups. The DS for most nutrients was lowest in children aged 0–4 years. However, in terms of FS/ES, the 0–4 years age group presents the highest figure for almost all food groups except for staples. The reason may be that foods of animal origin, such as meat, fish and eggs, are preferentially allocated to this age group, but insufficient amounts of staple foods are consumed at the same time. Staple foods, cereals in the case of China, contain plenty of energy and protein, as well as many other nutrients. The quantity of nutrients that the 0–4 years age group gains from the greater share of animal food is not enough to compensate for the potential loss of nutrients resulting from an insufficient intake of staples. Therefore, the total intake of energy and most nutrients was lower in the 0–4 years age group than in other age groups. The particularly high FS/ES for dairy products in the 0–4 years age group group is likely to be due to the fact that the majority of Chinese view milk as a baby food. In addition to milk and milk powder, few dietary products are consumed in China.

Engle and Nieves[2] observed that, in Guatemala, the proportion of energy intake to RDA for children aged 1–5 years was lower than that of others during mealtimes. Nevertheless, when energy input from snacks was included, no significant differences by age were found. What should be emphasized here is that nutrient intake from snacks must be taken into account when assessing the nutritional status of children.[10,11] However, all foods consumed by household members over a period of 3 days were included in the current analysis. Therefore, the finding that young children have an inadequate share of food should be considered as real and as possibly being a risk factor for their health.

The household leader usually enjoys better food allocation than other members of the household. Engle and Nieves[2] found that male heads of households consumed a relatively higher proportion of the family's protein, while female heads of households consumed a relatively higher proportion of the family's calories. The present study found that both male and female household leaders received relatively more protein and energy in both urban and rural areas. In rural households, leaders of families also had a higher share of protein and a slightly higher share of energy in three of the four groups. The allocation of other micronutrients also indicated that leaders are in a much better position than other members.

Administrators had a better food allocation than manual workers and farmers. This is associated with their steady and higher income. People working in trade and services in rural areas also appeared to be favoured with regard to food distribution. The reason may again be their higher income in comparison with farmers and manual workers.

Household members with a higher educational level are likely to receive better food allocation. Furthermore, the higher the educational level, the higher the individual income and

Table 11. Ratio of food share to energy share for food groups by household leadership in urban areas in 1993

Age (years)	Leadership	Food Group					
		Rice/wheat	Beans	Vegetables	Fruits	Meats*	Dairy
Males							
18–44	Leader	1.00	1.01	0.99	0.85	1.00	1.00
	Non-leader	1.00	1.02	0.97	1.01	1.06	1.30
45+	Leader	0.99	1.02	1.00	1.04	1.02	1.59
	Non-leader	0.99	1.07	1.00	1.02	0.99	2.20
Females							
18–44	Leader	1.00	1.23	1.09	1.04	0.94	1.54
	Non-leader	1.00	1.09	1.05	1.32	1.01	1.27
45+	Leader	1.01	1.04	1.08	1.14	1.02	2.12
	Non-leader	1.01	1.11	1.06	1.24	1.02	1.23

*Includes pork, beef, mutton, fish and eggs.

Table 12. Ratio of food share to energy share (FS/ES) for food groups by household leadership in rural areas in 1993

Age (years)	Leadership	Food Group					
		Rice/wheat	Beans	Vegetables	Fruits	Meats*	Dairy
Males							
18–44	Leader	0.99	1.10	0.96	0.95	1.09	0.86
	Non-leader	1.01	1.06	0.97	1.30	1.10	1.73
45+	Leader	0.99	1.05	0.98	1.20	1.14	1.90
	Non-leader	1.00	1.16	0.99	1.41	1.14	4.84
Females							
18–44	Leader	0.99	1.10	1.02	0.99	0.99	0.00
	Non-leader	1.01	1.10	1.05	1.15	1.02	1.16
45+	Leader	1.01	1.00	1.07	1.35	1.04	1.60
	Non-leader	1.02	1.11	1.06	1.27	1.06	1.91

*Includes pork, beef, mutton, fish and eggs.

Table 13. Income groups

Income level	Urban (yuan)	Rural (yuan)
Low	< 1850	< 780
Medium	1850–3599	780–2099
High	≥3600	≥2100

high-income individuals are likely to make greater contributions to the family. Therefore, they are more likely to be favoured in terms of food allocation.

There are two hypotheses for explaining intrahousehold food distribution. One is the 'contribution rule' (i.e. individuals who make greater contributions to the family receive a higher percentage of the family's food). The other is the 'needs rule' (i.e. those who are considered to have greater

Table 14. Discrepancy score for energy and nutrients by income level in 1993

Income	Urban							Rural						
level	*n*	Protein	Energy	Ca	Iron	Vitamin C	Retinol	*n*	Protein	Energy	Ca	Iron	Vitamin C	Retinol
Low	781	0.17	–0.36	1.67	–0.43	0.64	–0.26	1957	–0.18	–0.76	2.63	0.69	0.69	–0.20
Medium	665	0.12	–0.55	2.73	0.48	1.55	–0.60	1526	0.19	–0.47	3.29	0.74	1.52	–0.07
High	658	0.40	–0.31	2.61	0.76	1.17	–0.94	1525	0.57	–0.21	3.73	1.90	1.47	0.52

Table 15. Ratio of food share to energy share for food groups by income level in urban areas in 1993

Income	Food group					
level	Rice/wheat	Beans	Vegetables	Fruits	Meats*	Dairy
Low	1.00	1.05	1.01	1.47	1.00	1.29
Medium	1.00	1.06	1.04	1.22	1.02	1.50
High	1.00	1.05	1.01	1.00	1.03	1.28

*Includes pork, beef, mutton, fish and eggs.

Table 16. Ratio of food share to energy share for food groups by income level in rural areas in 1993

Income level	Food group					
	Rice/wheat	Beans	Vegetables	Fruits	Meats*	Dairy
Low	1.00	1.05	1.01	1.15	1.08	2.85
Medium	1.00	1.07	1.02	1.21	1.05	1.43
High	1.00	1.14	1.00	1.15	1.06	1.02

*Includes pork, beef, mutton, fish and eggs.

Table 17. Discrepancy score for energy and nutrients by occupation in 1993

Occupation	Urban							Rural						
	n	Protein	Energy	Ca	Iron	Vitamin C	Retinol	*n*	Protein	Energy	Ca	Iron	Vitamin C	Retinol
Administration	431	0.99	0.71	2.40	1.83	1.16	–1.81	281	2.23	1.38	3.38	3.40	1.64	2.80
Trade/services	573	0.71	0.20	1.76	–0.05	0.53	0.40	324	1.29	0.52	2.84	0.59	1.49	0.16
Farmer	283	0.27	–0.21	2.70	0.78	0.86	0.89	4000	0.06	–0.34	2.68	0.78	0.81	–0.18
Manual worker	907	–0.28	–0.48	2.01	0.54	1.02	–1.77	704	0.16	–0.45	3.17	1.83	1.38	–0.18

Table 18. Ratio of food share to energy share for food groups by occupation in urban areas in 1993

Occupation	Food group					
	Rice/wheat	Beans	Vegetables	Fruits	Meats*	Dairy
Administration	1.00	1.08	1.03	1.13	1.02	1.35
Trade/services	1.00	1.06	1.02	1.19	1.03	1.28
Farmer	1.00	1.04	1.01	1.00	1.02	0.00
Manual worker	1.00	1.04	1.02	1.05	1.00	1.65

*Includes pork, beef, mutton, fish and eggs.

Table 19. Discrepancy score for energy and nutrients by educational level in 1993

Education	Urban							Rural						
	n	Protein	Energy	Ca	Iron	Vitamin C	Retinol	*n*	Protein	Energy	Ca	Iron	Vitamin C	Retinol
Primary school	263	0.11	–0.05	2.36	1.68	0.71	0.05	890	0.03	–0.58	3.34	1.49	1.06	–0.15
Junior school	681	0.00	–0.78	2.54	0.29	1.28	–0.92	1582	0.04	–0.76	3.66	1.55	1.59	0.49
Senior school	553	0.48	–0.47	2.36	–0.73	1.37	0.04	513	0.63	–0.23	4.15	2.25	1.59	0.13
College	120	1.25	0.48	3.17	2.11	1.42	–2.90	13	1.70	0.86	1.75	1.01	–0.65	0.06

Table 20. Discrepancy score for energy and nutrients by employment in 1993

Employment	Protein	Energy	Calcium	Iron	Vitamin C	Retinol
Employee	0.27	–0.29	2.79	0.96	1.08	0.06
Non-employee	0.02	0.47	0.1	–0.45	–0.56	–1.84

needs receive a higher proportion of the family's food). Most studies have suggested that the contribution rule may be a better predictor of the food distribution in reality.[2] Household members with earnings are more likely to be more favoured than those without earnings. The former will have a better chance of choosing food at meals. They often eat first, obtaining sufficient food to ensure that they maintain their capacity for earning money or working to provide the food supply for the family.[12–14] Villasenor Favella[15] found that, in the Philippines, girls who earned money obtained more food than girls who did not. Kennedy[16] also found that individual energy intake increased with increasing income. The present study found that high-income groups are favoured with regard to nutrient intake. This may indicate that the contribution rule is more applicable than the needs rule in explaining the pattern of intrahousehold food distribution in China. The sex disparities and the advantage of household leaders, the middle-aged group and employees could all be explained by this rule.

Employees had a higher DS for most nutrients than non-employees, but a lower DS for energy. The reason could be that people aged 60 years and over had a very high DS for energy and the majority of this group were categorized as non-employees. In contrast, farmers have a low DS for energy and they composed a large proportion of the employee group. A combination of these two factors resulted in a higher energy allocation to the non-employee group.

The DS and FS/ES were used to describe food distribution within the family. The FS/ES ratios could have been used to describe both food allocation and nutrient allocation, but they did not take account of RDA standards for different nutrients when assessing nutrient allocation, so the results may have been unreliable. Therefore, the FS/ES ratios were used to assess the distribution of different kinds of foods while the DS was used to describe nutrient distribution. Many studies have shown that food distribution is closely related to dietary and nutritional status.

One important goal of studying intrahousehold food distribution is to ensure that nutritional programmes and poverty alleviation policies are successful in improving the nutritional status of people in poor areas and in increasing the health level of people. It has been argued that food scarcity exacerbates existing disparities in intrahousehold food distribution.[13,17] Therefore, the focus of study should be the population living in poor areas in China. It is of great importance to understand intrahousehold food distribution in these regions in order, finally, to eliminate poverty in China.

The present analysis explored factors affecting intrahousehold food distribution at the individual level, but it only covered a small part of this area of research and was only based on data collected in a limited geographical area. More work is needed to allow for a better understanding of intrahousehold food distribution in China.

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References

1. Zhai FY, Jin SG, Ge K *et al.* Summary report of China health and nutrition survey: An eight province case study. J Hyg Res 1996; 25 (Suppl.): 74–82.
2. Engle PL, Nieves I. Intra-household food distribution among Guatemalan families in a supplementary feeding program: Behavior patterns. Soc Sci Med 1993; 36: 1605–1612.
3. Bouis HE, Pena CL. Inequality in the intrafamily distribution of food: The dilemma of defining an individual's 'fair share'. In: Haddad L, Hoddinott J, Alderman H, eds. Intrahousehold Resource Allocation in Developing Countries. Washington DC: International Food Policy Research, 1997; 179–193.
4. Bouis HE, Novenario-Reese M-JG. The determinants of demand for micronutrients: An analysis of rural households in Bangladesh. In: Food Consumption and Nutrition Division Discussion Paper No. 32. Washington DC: International Food Policy Research, 1997; 24–29.
5. He YJ, Jin SG, Zhai FY, Ma LM. Diversion Trend and Characteristics of Labour Force in Rural China. Chinese Health Nutrition Status in Eight Provinces, vol. 1. Beijing: Beijing Science and Technical Publishing House, 1998; 67–74.
6. Chaudhury RH. Adequacy of child dietary intake relative to that of other family member. Food Nutr Bull 1988; 10: 26–33.
7. Carloni AS. Sex disparities in the distribution of food within rural households. Food Nutr Bull 1981; 7: 3–12.
8. Nelson M. The distribution of nutrition intake within families. Br J Nutr 1986; 55: 267–277.
9. Gittelsohn J. Opening the box: Intrahousehold food allocation in rural Nepal. Soc Sci Med 1991; 33: 1141–1154.
10. Harbert L, Scandizzo P. Food Distribution and Nutrition Intervention: the Case of Chile. Staff Working Paper No. 512. Washington DC: The World Bank, 1982.
11. Dieves I. Maternal food management, intrahousehold food distribution in Guatemala: Culture and behavior. In: Kim WY, Cha LY, Yull LK, Soon JJ, He KS, eds. Proceedings of the 14th International Congress of Nutrition, 20–25 August 1989 Seoul, Republic of Korea. 14th ICN Organizing Committee, 1989; 746–748.
12. Messer E. The household focus in nutritional anthropology: An overview. Food Nutr Bull 1983; 5: 2–12.
13. Pelto G. Intra-household food distribution patterns. Malnutrition: Determinants and consequences. Curr Top Nutr Dis 1984; 10: 285–293.
14. Katona-Apte J. The significance of intra-household food distribution patterns in food programmes. Food Nutr Bull 1983; 5: 35–41.
15. Villasenor Favella RA. A Nash–Mirrlees model of intra-family allocation. Economics of scale in the household production model and intra-family allocation of resource (PhD Thesis). Yale University, CT, USA, 1982.
16. Kennedy E. Determinants of family and preschooler food consumption. Food Nutr Bull 1983; 5: 22–29.
17. Najma R. Effects of food policy on intrahousehold food distribution in Bangladesh. Food Nutr Bull 1983; 5: 30–34.