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Title	Nutritional Status of Children in Hokkaido Orphanages : Comparison of 1965 and 1960 Data
Author(s)	SANTO, Setsuko
Citation	Journal of the Faculty of Agriculture, Hokkaido University, 56(1), 31-44
Issue Date	1968-09
Doc URL	https://hdl.handle.net/2115/12836
Type	departmental bulletin paper
File Information	56(1)_p31-44.pdf



NUTRITIONAL STATUS OF CHILDREN IN HOKKAIDO ORPHANAGES

—Comparison of 1965 and 1960 data—

Setsuko SANTO

(Department of Agricultural Chemistry,
Faculty of Agriculture, Hokkaido University
Sapporo, Japan)

Received March 27, 1968

I. INTRODUCTION

A nutritional survey of Hokkaido orphanage children in 1960 was reported by MITCHELL and SANTO (1). Subsequently heights and weights for each sex and age group between the ages of 3 and 15 (mostly the same subjects) were reported for the years 1959 to 1964 in 1964 (2). The results of the 1960 survey showed that orphanage children tended to be shorter and lighter than the national or Hokkaido averages for each age group. The food patterns in the 22 orphanages showed that the total protein, vitamin A, riboflavin and ascorbic acid were below 75 per cent of the recommended allowances in several of the institutions. It appeared from the fact that the animal protein was less than 30 per cent of the total protein in half of the institutions that this was probably the most serious nutritional limitation. Now since the food budgets have been increased annually and since the authorities concerned have been giving more attention to the food for the children, the circumstances seemed to warrant a second survey in 1965.

The results of this second survey are reported here in comparison with the 1960 data. The comparative results may be of use for other nutrition guidance and extension teaching. Institutions on limited budgets such as orphanages are not always able to provide optimum nutrition, but if the nutritional status of the children can be improved by careful planning, these children are good subjects for helping to understand what environmental factors may have been responsible for the delayed growth of Japanese youth during the war and for the remarkable increases in stature in recent years. The orphanages are convenient for study because data on their food consumption along with figures on height and weight can be obtained more easily than data on children living in their own homes.

TABLE 1. Physical Status of Children in Hokkaido (1965)

Sex	Age (Yr.)	Hokkaido Average								Orphanage Average								
		Height in Cm.				Weight in Kg.				Height in Cm.				Weight in Kg.				
		No. Exam.	M.V.	S.D.	95% C.L.	No. Exam.	M.V.	S.D.	95% C.L.	N.E.	M.V.	S.D.	95% C.L.	N.E.	M.V.	S.D.	95% C.L.	
Boy	3	146	98.3	4.3	97.6~99.0	138	15.1	1.9	14.8~15.4	26	93.2	5.5	91.0~95.4	26	14.0	2.2	13.1~14.9	
	4	1167	104.3	4.2	104.1~104.5	1100	16.7	1.9	16.6~16.8	46	100.6	4.6	99.2~102.0	46	17.0	2.8	16.2~17.8	
	5	2402	109.0	4.7	108.8~109.2	2246	18.4	2.1	18.3~18.5	34	104.7	5.9	102.6~106.8	34	17.8	3.3	16.6~19.0	
	6	1957	113.3	4.7	113.1~113.5	1957	19.9	2.3	19.8~20.0	33	112.0	6.8	109.6~114.4	33	20.4	2.6	19.5~21.3	
	7	1890	119.4	4.9	119.2~119.6	1890	22.5	3.6	22.3~22.7	40	116.1	5.5	114.3~117.9	40	21.6	3.5	20.5~22.7	
	8	1936	123.7	5.1	123.5~123.9	1936	24.4	3.0	24.3~24.5	56	120.1	6.2	118.4~121.8	56	23.9	2.7	23.2~24.6	
	9	2040	128.1	5.4	127.9~128.3	2040	26.9	3.9	26.7~27.1	62	126.2	6.4	124.6~127.8	62	25.9	3.3	25.1~26.7	
	10	2164	133.8	5.6	133.6~134.0	2164	29.6	4.0	29.4~29.8	75	130.1	6.5	128.6~131.6	75	28.5	3.2	27.8~29.2	
	11	2325	138.2	6.1	138.0~138.4	2325	32.4	4.7	32.2~32.6	99	133.7	6.1	132.5~134.9	99	31.9	4.2	31.0~32.8	
	12	4762	144.8	7.6	144.6~145.0	4762	37.0	6.3	36.8~37.2	114	139.3	6.9	138.0~140.6	114	34.3	5.4	33.3~35.3	
	13	5091	151.8	8.1	151.6~152.0	5091	42.3	7.2	42.1~42.5	137	147.1	7.4	145.9~148.3	137	39.6	6.5	38.5~40.7	
	14	5395	158.1	7.5	157.9~158.3	5395	47.9	7.3	47.7~48.1	130	154.2	7.8	152.9~155.5	130	45.6	6.8	44.4~46.8	
	15	3947	163.2	6.1	163.0~163.4	3947	52.8	6.6	52.6~53.0	47	157.3	8.5	154.8~159.8	47	50.1	7.4	47.9~52.3	
	Girl	3	122	97.0	4.1	96.3~97.7	112	15.4	1.7	15.1~15.7	24	92.2	5.1	90.0~94.4	24	14.2	1.9	13.4~15.0
		4	1047	102.8	4.4	102.5~103.1	1002	16.4	2.0	16.3~16.5	15	97.6	6.1	94.2~101.0	15	16.3	2.6	14.9~17.7
5		2204	108.2	4.4	108.0~108.4	2124	17.6	2.3	17.5~17.7	22	101.9	4.1	101.1~103.7	22	16.4	2.4	15.3~17.5	
6		1732	113.2	5.5	112.9~113.5	1732	19.3	2.4	19.2~19.4	27	108.8	5.4	106.7~110.9	27	18.2	2.8	17.1~19.3	
7		1777	118.6	5.6	118.3~118.9	1777	21.4	2.8	21.3~21.5	31	115.3	5.9	113.1~117.5	32	21.5	3.2	20.3~22.7	
8		1928	123.5	5.8	123.2~123.8	1928	23.6	3.2	23.5~23.7	35	119.8	6.1	117.7~121.9	35	23.2	3.1	22.1~24.3	
9		1927	128.9	6.2	128.6~129.2	1927	26.4	3.6	26.2~26.6	41	127.0	4.6	125.5~128.5	41	26.8	3.1	25.8~27.8	
10		2072	134.9	6.9	134.6~135.2	2072	30.2	4.8	30.0~30.4	50	133.0	7.5	130.9~135.1	50	31.3	6.1	29.6~33.0	
11		2203	140.6	7.1	140.3~140.9	2203	33.9	5.9	33.7~34.1	46	138.3	6.0	136.5~140.1	46	35.0	5.4	33.4~36.6	
12		4519	146.2	6.5	146.0~146.4	4519	38.9	6.2	38.7~39.1	53	143.9	8.1	139.8~144.0	53	39.1	6.5	37.3~40.9	
13		4651	150.1	5.5	149.9~150.3	4651	43.6	6.3	43.4~43.8	58	148.2	5.7	146.7~149.7	58	44.7	7.0	42.9~46.5	
14		4853	152.0	5.2	151.9~152.1	4853	46.8	6.1	46.6~47.0	90	149.8	5.5	148.6~151.0	90	47.9	6.9	46.5~49.3	
15		4194	153.5	4.9	153.4~153.6	4194	49.1	5.9	48.9~49.3	30	151.4	6.5	149.0~153.8	30	49.2	6.3	46.8~51.6	

N.E.; Number of Examinee, M.V.; Mean Value, S.D.; Standard Deviatyyn, C.L.; Confidence Limit.

TABLE 2. Physical Status of Children in Hokkaido (1960)

Sex	Age (Yr.)	Hokkaido Average								Orphanage Average								
		Height in Cm.				Weight in Kg.				Height in Cm.				Weight in Kg.				
		No. Exam.	M;V.	S.D.	95% C.L.	N.E.	M.V.	S.D.	95% C.L.	N.E.	M.V.	S.D.	95% C.L.	N.E.	M.V.	S.D.	95% C.L.	
Boy	3	165	96.2	3.9	95.6~96.8	165	15.2	1.6	15.0~15.4	24	90.4	4.2	88.6~92.2	28	12.9	1.7	12.2~13.6	
	4	1057	102.5	4.3	102.2~102.8	1057	16.5	1.8	16.4~16.6	34	95.4	6.0	93.3~97.5	34	14.4	2.1	13.7~15.1	
	5	3273	107.7	4.5	107.5~107.9	3240	17.8	1.9	17.7~17.9	36	100.5	5.6	98.6~102.4	37	16.4	2.1	15.7~17.1	
	6	2260	111.7	4.7	111.5~111.9	2260	19.1	2.0	19.0~19.2	38	107.3	6.6	105.1~109.5	38	17.8	1.6	17.3~18.3	
	7	2449	117.0	4.9	116.8~117.2	2449	21.2	2.4	21.1~21.3	57	111.9	5.0	110.6~113.2	56	19.3	2.4	18.7~19.9	
	8	2637	122.2	5.1	122.0~122.4	2637	23.4	2.6	23.3~23.5	78	117.4	4.7	116.3~118.5	78	22.3	2.5	21.7~22.9	
	9	2878	126.9	5.4	126.7~127.1	2878	25.8	3.1	25.7~25.9	68	121.9	5.5	120.6~123.2	67	24.0	2.9	23.3~24.7	
	10	3115	131.5	5.4	131.3~131.7	3115	28.3	3.5	28.2~28.4	100	125.4	5.7	124.3~126.5	99	26.3	3.2	25.6~27.0	
	11	3088	136.2	6.2	136.0~136.4	3088	31.1	4.2	31.0~31.2	101	130.8	5.6	129.7~131.9	100	28.8	3.4	28.1~29.5	
	12	6366	141.4	7.0	141.2~141.6	6366	34.7	5.3	34.6~34.8	101	135.1	6.6	133.8~136.4	102	31.3	4.3	30.5~32.1	
	13	5568	147.6	7.7	147.4~147.8	5568	39.3	6.4	39.1~39.5	87	143.1	7.6	141.7~144.5	87	37.0	5.3	36.1~37.9	
	14	4254	154.5	7.6	154.3~154.7	4254	45.2	7.1	45.0~45.4	68	148.3	8.8	146.2~150.4	68	41.5	6.7	39.9~43.1	
	15	8973	160.3	6.3	160.2~160.4	8973	50.7	6.4	50.6~50.8	31	153.0	8.6	149.8~156.2	31	45.8	7.6	43.1~48.5	
	Girl	3	169	95.2	4.7	94.5~95.9	164	14.3	1.5	14.1~14.5	15	87.9	4.9	85.2~90.6	18	12.3	1.5	11.5~13.1
		4	906	101.3	4.0	101.0~101.6	892	15.9	1.7	15.8~16.0	19	94.7	7.0	91.3~98.1	20	14.8	2.0	13.9~15.7
5		2899	106.3	4.3	106.1~106.5	2880	17.2	1.9	17.1~17.3	33	100.1	4.4	98.5~101.7	34	16.8	1.9	16.1~17.5	
6		2218	110.8	4.8	110.6~111.0	2218	18.6	2.1	18.5~18.7	15	105.9	3.2	104.1~107.7	14	18.0	1.7	17.0~19.0	
7		2364	115.9	5.0	115.7~116.1	2364	20.6	2.3	20.5~20.7	41	113.0	5.3	111.3~114.7	43	20.1	2.5	19.3~20.9	
8		2541	121.1	5.3	120.9~121.3	2541	22.7	2.8	22.6~22.8	31	119.1	5.5	117.1~121.1	31	23.6	3.8	21.2~25.0	
9		2658	126.4	5.8	126.2~126.6	2658	25.5	3.3	25.4~25.6	64	121.8	5.9	120.3~123.3	64	24.1	3.1	23.3~24.9	
10		2896	132.1	6.5	131.9~132.3	2896	28.6	4.4	28.5~28.7	72	126.4	5.4	125.1~127.7	71	26.6	3.3	25.8~27.4	
11		2975	138.2	6.8	138.0~138.4	2975	32.8	5.4	32.6~33.0	63	130.6	8.3	128.5~132.7	63	29.8	4.2	28.7~30.9	
12		5957	143.3	6.6	143.1~143.5	5957	37.2	5.9	37.1~37.3	88	136.8	6.6	135.4~138.2	88	34.0	4.8	33.0~35.0	
13		5263	147.6	5.9	147.4~147.8	5263	41.9	6.1	41.7~42.1	58	142.4	8.2	140.2~144.6	58	40.3	7.3	38.4~42.2	
14		4121	149.9	5.3	149.7~150.1	4121	45.6	6.0	45.4~45.8	41	147.9	5.1	146.3~149.5	40	45.1	4.8	43.6~46.6	
15		8375	152.3	5.1	152.2~152.4	8375	48.5	5.6	48.4~48.6	11	149.7	3.0	147.7~151.7	11	49.3	8.7	42.5~55.1	

II. METHODS AND RESULTS

Data on measurements of children in 23 Hokkaido orphanages in April 1965 and food records from each institution (food surveys made on three successive days in May, August, November 1965 and February 1966) were collected. (There were 22 orphanages in 1960 in Hokkaido and 24 in 1965 but unfortunately one of these suffered from a fire in 1965 and all records of the orphanage were lost). The data include 899 heights and weights of boys 3 to 15 years of age and for 523 girls of the same ages on April, 1965. Tables 1 and 2 show the averages for all Hokkaido children (4, 5) and for the orphanage children in 1965 and 1960. The smaller number of children in each age group in the orphanage averages as compared with the averages for all Hokkaido children makes for more irregularities in the orphanage growth picture. Even so it is worthy of note in Fig. I that the increment of increases in heights of the orphanage boys (1960-1965) was greater for every age group than for the Hokkaido average with the exception of one age group. For the girls it was greater in all but 4 of the age groups. In Fig. II weights in 1965 had increased more for the orphanage boys than for the Hokkaido average but the girls showed an irregular picture. The girls from 9 to 14 years in the orphanage group showed a marked increase in both height and weight 1960 to 1965 greater than for the younger girls and even a greater increase than for the boys. It is difficult to interpret such a finding but it may be related to puberty development. In general the increments of change in height would seem to be more significant than the changes in weight.

It is obvious that the orphanage children in 1965 had not yet reached even the 1960 Hokkaido averages for height at each age level, but both boys and girls in the orphanages in 1965 approximate the 1960 Hokkaido averages in weight. The general impression of one visiting the institutions is that they look well nourished but short and stocky. The finding of greater increments of height from 1960 to 1965 for both boys and girls in the orphanages than for Hokkaido children in general testifies to the potential for growth that must be present in these children in that even a slight improvement in nutrition could make a demonstrable change in the realization of their growth potential. These stature changes are apt to continue with gradual improvement in the nutrition.

Evidence from the annual growth statistics indicates that Japanese youth in general are showing an increase in stature which occurred at an accelerated rate after the war (3). These statistics from the orphanages might be

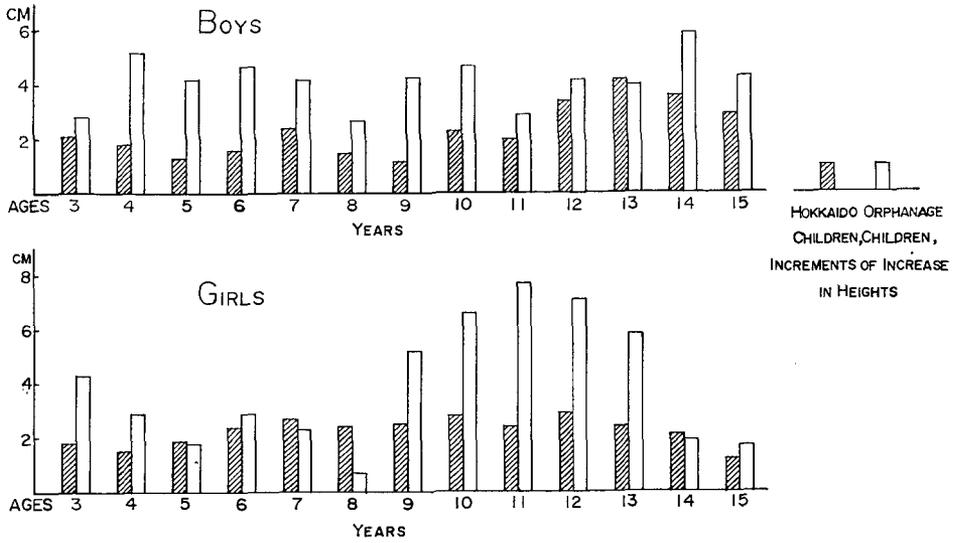


Fig. I. Increments of Increase in Heights of Hokkaido and Orphanage Children 1960-1965

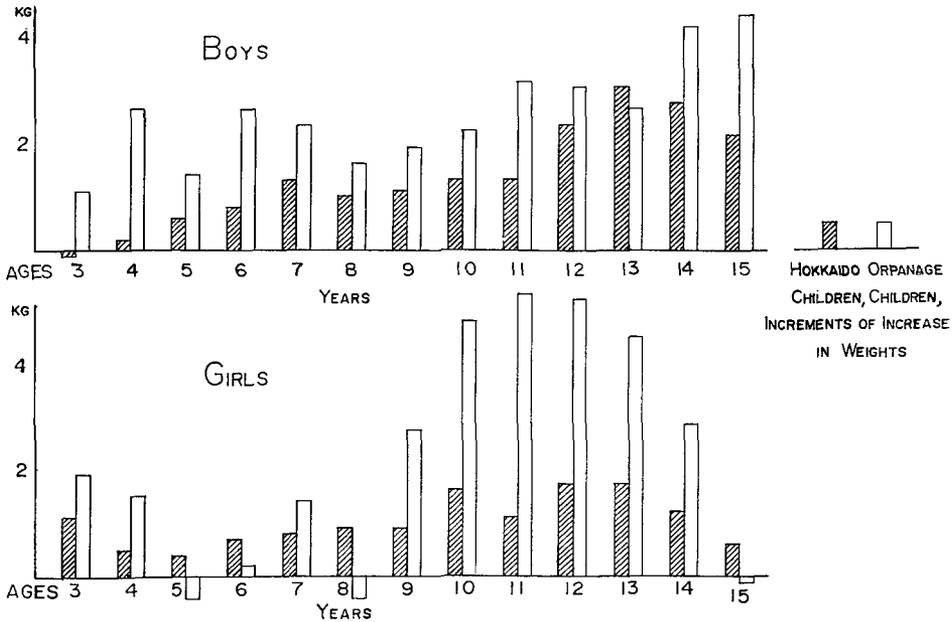


Fig. II. Increments of Increase in Weights of Hokkaido and Orphanage Children 1960-1965

interpreted to show that the orphanage children deprived earlier of the nutritional improvement general in Japan since 1948 are benefiting from the better food now being provided in the orphanages.

To obtain an accurate record of the food intake of the orphanage children was complicated by the fact that school age children from these institutions attend public schools and participate in the regular school lunch. Therefore an attempt was made to combine the data on food served in the institutions for meals eaten by all of the children with data on school lunch served to the school children. At best this could be only an approximation but may be worth reviewing briefly.

The food consumption per child per day was estimated from the data available. The nutrient value of these foods was calculated from food composition tables (6, 7). The recommended dietary allowances for children of each age (8) were applied on a proportional basis according to the numbers of each age and sex in each institution in order to estimate nutrients which should be recommended for each orphanage. The estimated nutrient intake for each institution was then compared with the recommended figure for that institution. The ratio of estimated intake to the recommended is given in Table 3. Since the recommendations are calculated to be generous and not minimum, 80 per cent of the recommendation may be taken as level below which the nutrient supply may be considered inadequate or at least subject to improvement. From Table 3 it would appear that the orphanage food provided adequate calories, iron, riboflavin and niacin in all institutions. The total protein, calcium and thiamine were above 80 per cent of the recommended in all but two or three of the orphanages. The nutrients most often low in the diets were vitamin A and ascorbic acid; vitamin A fell below 80 per cent in 15 and ascorbic acid below 80 per cent in 10 of the orphanages. Special attention is called to two institutions, #18 in which 4 nutrients were below 80 per cent and #19 in which 5 nutrients were low. Future attempts should be made to increase the vitamin A and ascorbic acid intake in several institutions and to improve the food in general in institutions #18 and #19.

While the quantity of protein did not appear to be seriously low in but two of the orphanages (18 and 19) the quality of the protein was questioned because in some of the institutions with the lowest total protein less than a third was derived from animal sources (meat, fish, poultry, milk and eggs). The protein scores in Table 4 were calculated on the basis of the protein derived from each food group (9).

The FAO 1955 (10) method of protein scoring had been used in 1960 for estimating the protein quality of the orphanage diets and was, therefore,

TABLE 3. Ratio of Estimated Nutrient Intake to Recommended Dietary Allowances

Institution	Calories	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid	Mean Value	Standard Deviation
1	1.12	1.09	1.11	1.20	0.97	1.12	1.57	1.41	1.50	1.23**	0.21
2	1.03	1.02	0.91	1.11	0.71	0.91	1.03	1.15	0.76	0.96	0.15
3	1.08	0.94	0.97	1.01	0.75	0.93	1.11	1.09	1.10	1.00	0.12
4	1.09	0.92	0.91	1.07	0.88	1.26	1.29	1.17	1.11	1.08	0.15
5	1.14	1.06	1.27	1.21	1.23	1.27	1.58	1.15	1.61	1.28**	0.19
6	1.10	0.94	1.04	1.13	0.98	0.99	1.31	1.33	1.10	1.10	0.14
7	1.10	0.86	0.76	1.08	0.79	0.94	1.03	1.20	0.99	0.97	0.14
8	1.10	0.97	0.85	1.21	0.71	0.94	1.10	1.32	0.79	1.00	0.20
9	1.25	1.10	1.07	1.34	0.71	1.21	1.25	1.51	1.46	1.21*	0.24
10	1.16	1.05	0.85	1.07	0.85	1.07	1.27	1.34	0.76	1.05	0.20
11	1.10	0.88	1.10	1.28	0.49	0.82	1.13	1.18	0.57	0.95	0.23
12	1.00	0.87	0.90	1.22	0.58	0.78	1.09	1.13	0.73	0.92	0.21
13	1.25	1.03	0.85	1.23	0.77	0.96	1.01	1.59	1.05	1.08	0.25
14	1.07	0.91	0.82	1.00	0.74	0.81	1.02	1.23	0.59	0.91	0.19
15	0.99	0.82	0.82	0.88	0.87	1.02	1.13	0.98	0.82	0.93	0.11
16	1.18	0.92	1.05	1.31	0.81	0.88	1.07	1.23	0.85	1.03	0.15
17	1.25	1.22	1.25	1.54	0.82	1.06	1.47	1.38	1.34	1.26**	0.22
18	0.87	0.77	0.70	0.90	0.67	1.04	1.02	0.89	0.79	0.85**	0.13
19	0.97	0.79	0.74	0.89	0.51	0.75	0.97	1.01	0.40	0.78*	0.21
20	1.15	1.01	1.00	1.13	0.53	1.06	1.12	1.06	0.59	0.96	0.23
21	1.10	0.92	0.96	1.31	0.58	0.95	1.03	1.28	0.78	0.99	0.23
22	1.15	0.95	0.87	0.97	0.61	0.90	1.06	1.28	1.00	0.98	0.18
23	1.03	0.95	0.93	1.08	0.60	1.03	1.04	1.27	0.90	0.98	0.18
Mean Value	1.10**	0.95*	0.94	1.14**	0.75**	0.99	1.16**	1.22**	0.94	1.02	
Standard Deviation	0.09	0.11	0.15	0.16	0.17	0.14	0.17	0.17	0.31		

** Significant at 1% level, * Significant at 5% level.

TABLE 4. Protein Scores and Quality

Institution	I*			II**			Animal Protein Total Protein %
	Protein Score	Limiting Amino Acids		Protein Score	Limiting Amino Acids		
		Sulfur containing	Tryptophan		Sulfur containing	Tryptophan	
1	81	×		80	×		43.9
2	76	×		77	×		35.8
3	78	×		77		×	37.5
4	81	×		79	×		37.1
5	76	×		77	×		42.7
6	79	×		79	×		40.9
7	81	×		80	×		30.1
8	79	×		79	×		37.8
9	77	×		77	×		33.9
10	82	×		81	×		43.7
11	77	×		76	×		34.4
12	82	×		80	×		32.1
13	82	×		79		×	34.8
14	75	×		82	×		33.2
15	80	×		79	×		36.3
16	80	×		80	×	×	32.0
17	82	×		81	×		40.5
18	79	×		77	×		35.2
19	80	×		80	×		35.2
20	83	×		81		×	33.8
21	81	×		79	×		32.5
22	82	×		83	×	×	32.5
23	78	×		78	×		44.2
Mean Value	79			79			36.5
Standard Deviation	2			2			4.2

* According to the Pattern of FAO/WHO in 1965, ** According to the Pattern of FAO in 1955.

used again as a basis of comparison in the present study. The later method developed by FAO/WHO 1965 (11) was also applied to the more recent data. The two methods resulted in the same mean score 79. The average score in 1960 was 73, thus indicating some improvement in the quality of protein in the diets in the five years. There were 5 below a score of 70 and none above 75 in 1960. The 1965 scores were all above 75 and 10 were 80 or above. (A score of 70 is low and below 70 it is almost impossible to make up in quantity for the poor quality).

Food expenditure in 1965 study are shown in Table 5. Food prices used for this calculation are from institutions in the south, central and northern areas of Hokkaido; the data for retail prices are from the North Health Center

TABLE 5. Food Expenditure

Institution	Food Budget (Yen)	School Lunch (Yen)	Milk Expense (Yen)	Budget Total (A) (Yen)	Food (B) Expenditure (Yen)	$\frac{B}{A}$
1	133.00	6.71	10.80	150.51	148.18	0.98
2	133.00	8.76	10.80	152.56	141.76	0.93
3	133.00	16.94	10.80	160.74	142.13	0.88
4	133.00	17.61	10.00	160.61	159.34	0.99
5	133.00	9.00	10.80	152.80	157.91	1.03
6	133.00	3.12	7.00	143.12	141.64	0.99
7	133.00	6.68	10.80	150.48	150.53	1.00
8	133.00	—	7.30	140.30	141.53	1.01
9	133.00	6.82	10.80	150.62	144.41	0.96
10	133.00	2.53	9.00	144.53	129.55	0.90
11	133.00	3.82	7.00	143.82	143.72	1.00
12	133.00	1.28	14.00	148.28	129.43	0.87
13	133.00	—	8.50	141.50	168.20	1.19
14	133.00	—	9.00	142.00	116.86	0.82
15	133.00	13.39	12.80	159.19	127.80	0.80
16	133.00	7.76	10.30	151.06	175.25	1.16
17	133.00	7.12	10.80	150.92	152.52	1.01
18	133.00	16.44	10.80	160.24	121.41	0.76
19	133.00	9.00	10.30	152.30	125.49	0.82
20	133.00	9.55	7.30	149.85	127.79	0.85
21	133.00	—	7.80	140.80	142.19	1.01
22	133.00	2.02	7.30	142.32	127.18	0.89
23	133.00	10.85	10.80	154.65	152.32	0.98
Mean Value	133.00	6.93	11.03	149.70	142.05	0.95
Standard Deviation	0	5.53	1.88	6.58	15.00	0.11

TABLE 6. Percentage of Nutrient Intake from Food Stuff

Food Stuff	Food Energy	Protein	Calcium	Iron	Vitamin (A)	Thiamine	Riboflovin	Niacin	Ascorbic Acid
Rice	44.4	25.7	2.8	10.2	—	27.8	7.8	33.7	—
Barley	3.9	3.4	1.0	3.5	—	5.0	1.8	5.6	—
Wheat	13.7	14.0	2.6	11.9	—	18.2	7.5	6.1	—
Potato	1.5	1.3	0.4	2.0	—	4.6	1.2	3.6	11.5
Sweet potato	0.5	0.2	0.3	0.5	—	1.3	0.3	0.5	4.1
Other starchy roots	0.2	—	0.5	0.1	—	—	—	0.1	—
Sugar	1.6	—	—	0.1	—	—	—	—	—
Confectionaries	6.2	—	5.5	7.2	0.2	0.5	0.5	5.0	—
Fats & oils	3.7	—	—	—	2.9	—	—	—	—
Legumes	5.4	14.6	15.4	27.9	—	7.9	17.6	7.7	—
Fish & shellfish	4.1	17.3	8.4	10.2	22.9	6.8	11.5	18.8	0.1
Meat & poultry	3.3	4.2	0.5	3.4	0.3	6.0	1.6	6.6	0.3
Eggs	1.3	3.5	2.0	4.4	11.1	2.0	5.0	—	—
Milk	6.7	11.2	44.8	2.5	17.3	8.5	36.8	2.4	0.3
Green & yellow vegetables	0.6	4.0	3.2	4.2	38.9	2.4	3.4	1.8	22.2
Other vegetables	2.1	—	8.3	8.4	3.5	8.2	4.5	6.7	51.6
Oranges	0.2	—	0.2	0.1	0.2	0.4	0.1	0.3	3.9
Other fruits	0.9	0.2	0.3	0.7	0.5	0.2	0.1	—	2.5
Fungi	—	—	—	—	—	—	0.1	0.1	—
Seaweeds	—	—	2.8	2.7	0.5	—	0.1	0.7	—

in Sapporo in May 1965 (these data were obtained as a part of National Nutrition Survey in 1965) and wholesale prices from Sapporo during the same season. According to an extremely rough estimate, retail prices are about 30 per cent above wholesale prices. The price of foodstuffs probably purchased in large quantities such as certain vegetables, fruits, fish, meats and candies for the orphanages were calculated at wholesale prices. The cost of 180 cc of milk per child per day differs in the several institutions according to purchase procedures. Except for food budgets determined at the national level, the Hokkaido Prefectural Government has provided an increased food budget for all institutions for children, not only orphanages but also those for infants, for mental and physically handicapped and for delinquent children since 1964. School lunch expense is covered only for children who go to schools where a mandatory school lunch program exists.

The percentage of food nutrients from different food sources is tabulated in Table 6. Since this is an average of all the orphanages studied it does not disclose the ones with the poorer choice of foods. It does tend to show why vitamin A and ascorbic acid were the nutrients most apt to fall short of recommendations, because such a large proportion of calories was derived from grains and because fruits were limited in quantity.

III. DISCUSSION

The physical status of children in Hokkaido orphanages in 1965 is inferior to the average for all Hokkaido children in 1965 but somewhat better than in 1960. The differences between the Hokkaido average and the orphanage average was statistically less in 1965 than in 1960. It seems that environmental factors, especially the food for the orphanage children has begun to approach the quality of the food of children living at home.

The physical status of orphanage children is based on the values obtained by physical examination of individual children. The food intake figures are calculated from the data on food consumption per child per day in each institution without consideration of age and sex and includes plate waste. Also there are many inaccuracies in weighing and estimating food intake. Although it is impossible to relate the physical condition of any group of children to diet exclusively, because of the multiplicity of environmental factors involved, it is important, nevertheless, to consider the status of the children in these institutions at the present time and what steps should be taken next to improve their nutrition.

Dietary recommendations for each institution were calculated by using the "Recommended Dietary Allowances for Japan" (8) and using the average

age of the children as of October 1, 1965 (the 1965 fiscal year is from April 1, 1965 to March 31, 1966) and the percentage of boys and girls in each institution. The ratio of the average nutrient intake to dietary allowance for each orphanage was estimated from the data available and this gives some idea of the adequacy of the food served.

The ratio of animal to total protein improved considerably in five years. In 1960 the average ratio of animal protein to total protein was 29 and it was below 30 in half of the institutions; In 1965 the average ratio was 36 and in no one orphanage was the value below 30. While it may not be entirely valid to calculate protein scores on the limited food data available, nevertheless, the general finding of the relative protein scores for all of the institutions and the same limiting factors makes these figures suggestive of the type of nutritional improvement which might be recommended. The mean protein score for growing children was low in 1960 but more nearly adequate in 1965. Knowing the food sources of nutrients makes it possible to make practical suggestions for improvements. The Prefectural Government is making provision for an egg a day per child beginning April 1968. This will provide a much needed increase in animal protein.

Both national and local budget allowances for the orphanages have made possible the better nutrition in 1965 as compared with 1960. The food budget of the national government for orphanages has been raised annually and 180 cc of milk per child per day has been provided by the Hokkaido Prefectural Government since 1964. This change in local social policy is largely the result of the author's recommendations in 1962. There are very few dietitians in any of the institutions and on dietitian in the Social Welfare Division of the Prefectural Government to serve as a competent authority on nutrition.

Adequacy of diets in the orphanages not only on the budgets but also upon expert planning of expenditures for the best possible nutrition for the children. The shortage of protein of adequate quality and quantity is especially serious for children during adolescence and this was the situation in some of the institutions. The average retail food cost per capita per day for all Hokkaido in 1965 was ¥ 206.31 according to data obtained from the National Nutrition Survey of that year (12). The food budgets for the orphanages in Hokkaido in 1965 was ¥ 149.70. (This takes into account the school lunch costs for children who ate lunch at school). To be sure institutional food may be purchased at wholesale prices; thus the lower figure for the orphanage food may not be as serious as it appears, but there is need for improvement.

The focus of the problem actually should be on the food rather than on the budgets. Where there is no dietitian to advise, a staff member such as

the cook, nurse or manager's wife may be responsible for menus and food purchasing and she may not know how to obtain the best nutrition within the budget. A nutritionist is soon to be appointed to advise the institutions on menu planning and food buying.

IV. SUMMARY

The results of the 1965 survey of heights, weights and food intake of orphanage children in Hokkaido may be summarized as follows:

Although the heights and weights of orphanage boys are still less than for the average of Hokkaido boys, their physical status more nearly approaches that of the Hokkaido average in 1965 than in 1960. In the case of the girls the heights of the orphanage girls while still less than the Hokkaido average are closer than in 1960. There was no significant difference in weight of the orphanage and Hokkaido girls in 1965 while there had been in 1960.

The nutrient value of the food in the orphanages has improved considerably during the five years, 1960-1965 but vitamin A was still low in about two-thirds of the 23 orphanages. Also in a few institutions other nutrients were significantly low in 1965, in spite of the increased budgets.

It is recommended that more nutrition education is needed by those responsible for menu planning and food purchasing in order to improve the food in these institutions.

V. ACKNOWLEDGMENTS

Thanks are due to Dr. Helen S. MITCHELL, Dean Emeritus of the School of Home Economics, University of Massachusetts, for editing the manuscript and making helpful suggestions and to Mr. Kingo MACHIMURA, Hokkaido Governor for his positive cooperation and to Mrs. Hisa MIZUSHIMA, Member of Hokkaido Diet and Prof. Sadaji HOSOKAWA, Hokkaido University, for their interest and valuable advice and to Miss Yasuko HIRAMA for the effort of statistical calculations.

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