

# Nutritional Management Implemented at School Lunch Programs in Japan Based on the Changes in Criteria for Provision of School Lunches

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## ABSTRACT

**Objective:** This study aimed to ascertain the philosophy and utilization of the current dietary reference intakes of school lunch programs in terms of nutritional management and indicate the role thereof by examining the changes in nutritional management implemented on the basis of the School Lunch Act enacted in 1954.

**Methods:** We summarized the role of nutritional management of school lunches by carefully examining the information required for nutritional management through an examination of the history, laws, results of surveys serving as indicators of nutritional management reforms, revisions in nutritional management of school lunches and the circumstances surrounding those revisions, survey reference materials on current nutritional management of school lunches, and a search of the literature, including previous researches regarding changes in nutritional management of school lunches in Japan from World War II to the present.

**Results:** The School Lunch Act was enacted following the World War II for the purpose of indicating basic nutritional standards and standard dietary composition tables relating to nutritional management, and nutrition and meal plans have since been implemented on the basis thereof. The menu contents of school lunches have been periodically revised based on survey results accompanied by changes in Japanese eating habits, and menu plans have been devised in consideration of incorporating a diverse range of foods and regional characteristics, with school lunches incorporating more than one-third of those nutrients unlikely to be consumed in the home each day.

**Conclusion:** The nutritional management of school lunches in Japan following the World War II has been revised in response to the changing times based on the School Lunch Act. The dietary pattern of school lunches in Japan established as full meal consisting of staple food, milk and an accompanying dish. Nutritional Standards were set to higher standard values than one-third of the daily energy requirement and one-third or more of the daily nutrient intake based on the actual circumstances surrounding the schoolchildren. Menu controls were developed by suitably combining a diverse range of foods while considering such factors as regional characteristics based on the Nutritional Standard values and contribute to the daily dietary intake status of schoolchildren.

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**Key words:** nutritional management, dietary reference intakes for Japanese, Criteria for Provision of School Lunches, standard dietary composition table, menu controls

## I. Introduction

Nutritional management currently implemented at school lunch programs in Japan is based on the Criteria for Provision of School Lunches<sup>2)</sup> of the School Lunch Act<sup>1)</sup>. Meal plans were developed to promote the health of students and are implemented as a part of school education in order to develop a foundation for students to remain healthy throughout their lives.

The nutritional standards for nutritional management were first implemented in Japan at the time of the resumption of school lunches following the World War II (1946), targeting children suffering from malnutrition due to food shortage. Although school lunch programs spread throughout the country primarily for the purpose of nutritional supplementation, due to the absence of unified policies and well-defined legal grounds, implementation of school lunch programs was difficult<sup>3)</sup>. Therefore, the

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School Lunch Act was enacted in 1954<sup>1)</sup> as a legal measure for the implementation of school lunch programs. This served to organize the school lunch implementation system and was implemented as a part of the educational curriculum. With regard to nutritional management, the average recommended dietary allowances were established to improve the nutritional status of elementary schoolchildren. Moreover, complete school meals were provided based on the following dietary pattern: bread, milk, and accompanying dishes. The School Lunch Act was also applied to junior high school students in 1956<sup>4, 5)</sup>. The average recommended dietary allowances of school lunches were revised according to the revised version of the “recommended dietary allowances for Japanese”<sup>6)</sup> improve the nutritional status of elementary school students. Nutritional management of school lunches have greatly contributed to the improved posture of schoolchildren after World War II<sup>7)</sup> and has fulfilled the role of nutritional supplementation.

With increased food supply, poor eating habits among children have led to the development of obesity and earlier onset of lifestyle-related diseases<sup>8, 9)</sup>. Furthermore, after establishing the diet and nutrition teacher system<sup>10)</sup> and the enactment of the *Shokuiku* Basic Act<sup>11)</sup> in 2005, society as a whole placed greater importance on the promotion of

*shokuiku* through health education. The “recommended dietary allowances for Japanese (6th revision; 2000~2004)”<sup>12)</sup>, which served as the reference values for satisfying nutrition levels, were replaced by “dietary reference intakes for Japanese (2005~2009)”<sup>13)</sup>, which indicated the intake ranges to prevent the occurrence of health problems. In view of these changes, the School Lunch Act was revised in 2008<sup>14)</sup>. The Criteria for Provision of School Lunches were also revised from average recommended dietary allowances to Nutritional Standards<sup>15, 16)</sup>. These were followed by a partial revision of the Criteria for Provision of School Lunches in 2015<sup>2)</sup>.

In this manner, the nutritional management of school lunch programs in Japan is currently supported within the framework of the School Lunch Act<sup>1)</sup>. Moreover, rather than merely supplementing nutrition, it serves to enhance and develop school lunches as part of the educational curriculum by promoting health/nutrition education currently positioned as an important issue in Japan.

Hence, this study attempted to ascertain the philosophy and utilization of current Nutritional Standards in terms of nutritional management and indicated the role of nutritional management at school lunch programs in Japan based on the changes in the nutritional management of school lunches in Japan after World War II.

Table 1 Research Relating to Nutritional Management in School Lunches and Cited References

Research contents of nutrition management after World War II	The adopted references
1 Nutrition management at school lunch restart (around 1946)	Changes in the Nature of the Nutritionist Profession in Post-War School Lunches in Japanese <sup>3)</sup> A 15-year history of school lunches <sup>17)</sup> The History of School Lunch Services (in Japanese) <sup>18)</sup>
2 Regulations on the smooth operation of school meals (1954~2013)	Order for Enforcement of School Lunch Act <sup>1)</sup> Partial revision of Criteria for Provision of School Lunches in School Lunch Act <sup>2, 4, 30)</sup>
3 As a guide for revising the nutritional management of school lunches of revised publications required for the nutritional management of Japanese serving (1970~2008)	Revision of the recommended dietary allowances for Japanese <sup>6, 12, 20, 21)</sup> Revision of the dietary reference intakes for Japanese <sup>12, 22, 23)</sup> National Health and Nutrition Survey Report <sup>24)</sup> <i>Shokuiku</i> Basic Act <sup>11)</sup> Dietary reference intakes for Japanese (2010 version) formulation study meeting report <sup>33)</sup>
4 Describing the revisions and background of the nutritional management of school lunches · Average recommended nutritional quantity and nutritional standards for school lunches · Standard dietary composition table	Partial revision of the Criteria for Provision of School Lunches in School Lunch Act <sup>2, 4, 30)</sup> Meal contents of school lunches (Ministry of Education, Culture, Sports, Science and Technology: Notification) <sup>5, 15, 26, 28, 31-33)</sup> Formulation of the School Lunch Intake Standards (Report) (2008) <sup>34)</sup> 2005 Survey Report on the Dietary Status of School Children <sup>35)</sup> 2007 Fact-Finding Survey of the Eating Habits of School Children <sup>36)</sup>
5 Basic materials in nutrition management of school meals currently in use · Criteria for Provision of School Lunches (2013) · Nutritional intake status of school lunches · Implementation status of school lunch	Formulation of the School Lunch Intake Standards (Report) (2011) <sup>37)</sup> Partial revision of the Criteria for Provision of School Lunches (notification) <sup>2)</sup> Nutrition Report of School Lunches (2012~2015) <sup>38)</sup> 2007 Fact-Finding Survey of the Eating Habits of School Children <sup>36)</sup> Previous studies on nutritional intake status of school lunches <sup>40-42)</sup> Summary of the results of a survey on the implementation status of school lunches <sup>43)</sup> School Health Education Division: Health Diagnostic Manual for School Children (Revised Edition) <sup>44)</sup> Utilization Status of Regional Products and Local Cuisine in School Lunches <sup>45-52)</sup> Status of School Lunch Programs Overseas <sup>53-57)</sup>

## II. Methods

In this study, a review was made on the preceding information acquired after searching for literatures related to the reference intakes utilized in the nutritional management of school lunches to summarize the role of nutritional management. A description of research relating to nutritional management in school lunches and cited references are indicated in Table 1.

## III. Results

### 1. Changes in nutritional management based on the Japanese School Lunch Act

The School Lunch Act was enacted in 1954 for a smooth implementation and management of school lunch programs in Japan<sup>1)</sup>. The Criteria for Provision of School Lunches were provided for nutritional management, and the average recommended dietary allowances for each schoolchild per meal and the standard dietary composition table were indicated<sup>1, 2)</sup>. School lunches were implemented based on those standards. As social conditions in Japan began to change with time, eating habits in Japan along with the physique of schoolchildren also changed<sup>7)</sup>, and the Criteria for Provision of School Lunches were revised to accommodate these changes<sup>2, 4, 16)</sup>. In addition to indicating the following factors behind those revisions, the course of revisions of the average recommended dietary allowances (current Nutritional Standards) are shown in Table 2, and that of the standard dietary composition table are shown in Table 3.

### 2. School lunches targeted at providing nutritional supplementation (1946~1995)

School lunches in Japan were resumed in 1946 in the form of supplementary meals consisting of non-staple foods only provided twice a week for the purpose of promoting growth and maintaining the health of schoolchildren suffering from malnutrition due to food shortages following the World War II, and indicated calorific values and schoolchildren<sup>3, 17)</sup>. In 1950, school lunches were supplemented with skim milk and flour<sup>3, 17)</sup>, resulting in the provision of full meals made up of three dishes: bread, milk, and an accompanying dish. The “proliferation and promotion of school lunches” indicated both the “minimum standards for full meals (per meal per schoolchild)

at the nutrient level along with the “minimum standards for school lunch ingredients for full meals” at the food level as the first dietary standards used in Japan<sup>3, 17, 19)</sup>. The drafting of Japan’s first dietary standards was performed by nutritionists and indicated the needs not only at the nutrient level, but also at the food level<sup>19)</sup>.

In 1952, although the flour used to prepare school lunches was fortified with vitamins B<sub>1</sub> and B<sub>2</sub> to address malnutrition among schoolchildren caused by vitamin deficiencies, the implementation of school lunch programs was difficult due to the absence of unified policies and well-defined legal grounds<sup>3)</sup>. Hence, the School Lunch Act was enacted in 1954<sup>1)</sup>, which prompted the establishment of a legal system that was implemented on the basis of its educational significance. With regard to the nutritional management of school lunches, the School Lunch Act enforcement regulations recommended three types of meal patterns: full meals (bread, milk, and accompanying dish), supplementary meals (milk and accompanying dish), and school milk programs (milk only)<sup>1)</sup>. With regard to the Criteria for Provision of School Lunches and implementation of school lunches, the average recommended dietary allowances and standard dietary composition table were indicated for each schoolchildren per meal based on full meals<sup>1)</sup>. Meal plans consisted of bread for the staple food combined with milk and accompanying dish<sup>1)</sup>. The reason behind the use of bread as a staple food was that since there was rice shortage in Japan following World War II, an American relief organization known as Licensed Agencies for Relief in Asia donated relief supplies consisting mainly of wheat<sup>3, 17-19)</sup>. In addition, the use of milk began after receiving skim milk donations from the United Nations Children’s Fund<sup>3, 17-19)</sup>.

In 1956, school lunches were served five times a week during lunchtime on elementary school days<sup>1)</sup> and were expanded to include junior high schools, and the average recommended dietary allowances were indicated for each student per meal<sup>4, 5)</sup>. The average recommended dietary allowances were revised as necessary in compliance with the recommended dietary allowances for Japanese (1970~2004)<sup>6, 12, 13, 20, 21, 23)</sup>, which established the reference intakes to avoid malnutrition and replenish the nutrient levels of schoolchildren. Although the physiques of schoolchildren continued to demonstrate the measured values that surpassed those before the war through the

Table 2 Changes in the Nutritional Standards of School Lunches

Name	Average recommended dietary allowances of school lunches																
	1954			1956			1962			1971			1986			1995	
Year.	Child	Student	Child	Student	Child	Student	Child	Student	Child	Student	Child	Student	Child	Student	Child	Student	
Age	6-11	12-14	6-11	12-14	6-8	9-11	6-8	9-11	6-7	12-14	6-7	12-14	6-7	12-14	6-7	12-14	
Energy (kcal)	600	800	600	800	600	700	600	700	590	850	590	820	590	820	640	820	
Protein (animal protein) (g) <sup>†</sup>	25 (10)	30 (12)	25 (10)	30 (12)	23 (10)	30 (13)	23 (10)	30 (13)	22	36 (15)	22	29	22	25	29	32	
Fat (g) <sup>§</sup>	7 g	10 g	7 g	10 g	10 g	17 g	17 g	20 g	25-30%	24 g	25-30%	25-30%	25-30%	25-30%	25-30%	25-30%	
Sodium (salt equivalent) (g) <sup>  </sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	≤4	≤4	
Calcium (mg)	600	800	600	800	300	400	300	400	240	500	240	430	275	290	370	430	
Iron (mg)	-	-	-	-	-	-	-	-	3	-	3	4	3	3.2	3.5	4	
Vitamin A (unit: IU) <sup>††</sup>	2,000	2,500	2,000	2,500	750	1,000	900	1,100	600	1,100	600	750	600	675	750	880	
Vitamin B <sub>1</sub> (mg)	0.7	0.8	0.7	0.8	0.6	0.7	0.5	0.6	0.7	0.7	0.37	0.4	0.37	0.4	0.46	0.51	
Vitamin B <sub>2</sub> (mg)	0.8	0.9	0.8	0.9	0.6	0.6	0.6	0.7	0.51	0.8	0.51	0.63	0.51	0.55	0.63	0.7	
Vitamin C (mg)	20	25	20	25	30	40	19	20	22	22	22	22	22	22	22	27	
Dietary fiber (g)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.9	6.4	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	8.2	

  

Name	Average recommended dietary allowances of school lunches						The school lunch Nutritional Standards <sup>†</sup>									
	2003			2008			2013			2013			The school lunch Nutritional Standards <sup>†</sup>			
Year.	Child	Student	Child	Student	Child	Student	Child	Student	Child	Student	Child	Student	Child	Student	Child	Student
Age	6-7	8-9	9-11	12-14	6-7	8-9	9-11	12-14	6-7	8-9	9-11	12-14	6-7	8-9	9-11	12-14
Energy (kcal)	580	650	730	830	560	660	770	850	530	640	750	820	300	350	400	450
Protein (g)	21	24	28	32	16	20	25	28	20	24	28	30	20	24	28	30
Range of protein (g)	-	-	-	25-30%	-	-	-	-	16-26	18-32	22-38	25-40	-	-	-	-
Fat (%)	≤3	≤3	≤3	≤3	<2	<2.5	<2.5	<3	<2	<2.5	<2.5	≤3	<2	<2.5	<2.5	≤3
Sodium (salt equivalent) (g) <sup>  </sup>	300	330	350	400	300	350	400	420	300	350	400	450	300	350	400	450
Calcium (mg)	-	-	-	-	320	380	480	470	-	-	-	-	-	-	-	-
Calcium target amount	3	3	3	4	3	3	4	4	2	3	4	4	2	3	4	4
Iron (mg)	120	130	150	190	130	140	170	210	150	170	200	300	150	170	200	300
Range of vitamin A (μgRE)	-	-	-	-	130-390	140-420	170-510	210-630	-	-	-	-	-	-	-	-
Vitamin B <sub>1</sub> (mg)	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.3	0.4	0.5	0.5	0.3	0.4	0.5	0.5
Vitamin B <sub>2</sub> (mg)	0.3	0.4	0.4	0.5	0.4	0.5	0.5	0.6	0.4	0.4	0.5	0.6	0.4	0.4	0.5	0.6
Vitamin C (mg)	20	20	25	25	20	23	26	33	20	20	25	35	20	20	25	35
Dietary fiber (g)	5.5	6.5	7	8	5.5	6	6.5	7.5	4	5	6	6.5	4	5	6	6.5
Magnesium (mg)	60	70	80	110	70	80	110	140	70	80	110	140	70	80	110	140
Zinc (mg)	2	2	2	3	2	2	3	3	2	2	2	3	2	2	2	3

<sup>†</sup> Since these values represent the average values of the entire country, they are applied after determining the actual circumstances surrounding the health status and lifestyles of schoolchildren at each school. In addition, since the conditions in local communities differ throughout the country, fact-finding surveys in each region, including National Health and Nutrition Surveys, are required to be conducted and implemented corresponding to the circumstances in each region.

<sup>‡</sup> Values for protein shown in parentheses indicate animal protein.

<sup>§</sup> Lipids are indicated in gram (g) units (1954-1971).

<sup>||</sup> 25% to 30% of the total energy intake from school lunches (1986-2013).

<sup>††</sup> Sodium is indicated in gram (g) units as the salt equivalent.

<sup>†††</sup> Vitamin A is indicated in international units (IU) (1954-1995).

A dash "-" is indicated in cases reference values have not been set. References (5, 15, 26, 28, 31-34, 37)

Table 3 Standard Food Composition Tables for School Lunches

Year:	(unit: g)															
	1954				1995				2003 • 2008				2013			
	Bread, milk, and accompanying dishes		Bread, milk, and accompanying dishes		Bread, milk, and accompanying dishes		Rice, milk, and accompanying dishes		Staple food, milk, and accompanying dishes†		Staple food, milk, and accompanying dishes†		Staple food, milk, and accompanying dishes†			
Meal style of school lunch	Per child	Per child	Per meal	Per child	Per child	Per meal	Per child	Per child	Per meal	Per child	Per child	Per meal	Per child	Per meal		
Division	6-11	8-9	9-11	12-14	6-7	8-9	9-11	12-14	6-7	8-9	9-11	12-14	6-7	8-9	9-11	12-14
Age	6-11	8-9	9-11	12-14	6-7	8-9	9-11	12-14	6-7	8-9	9-11	12-14	6-7	8-9	9-11	12-14
Rice	-	-	-	-	70	80	100	110	42	48	60	66	50	70	90	100
Fortified rice	-	-	-	-	0.21	0.24	0.3	0.33	0.13	0.14	0.18	0.2	0.15	0.21	0.27	0.3
Flour	100	65	75	85	-	-	-	-	20	23	26	30	40	50	70	80
East	2	1.4	1.6	2.1	-	-	-	-	0.5	0.57	0.65	0.75	1	1.25	1.75	2
Salt	1.7	1.1	1.3	1.5	1.7	-	-	-	0.4	0.46	0.52	0.6	1	1.25	1.75	2
Bread,	-	1.9	2.3	2.6	3	-	-	-	0.7	0.8	0.91	1.1	1.4	1.75	2.45	2.8
Shortening	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Margarine	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sugar	3	1.9	2.3	2.6	3	-	-	-	0.7	0.8	0.91	1.1	1.4	1.75	2.45	2.8
Skim milk	-	1.9	2.3	2.6	3	-	-	-	0.7	0.8	0.91	1.1	1.4	1.75	2.45	2.8
Skim milk	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Milk	-	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206
Flour and flour products	4	4.5	5	6	8	2.5	3	3.5	4	5	7	9	4	5	7	9
Potatoes and starch	26	36	40	45	50	36	40	45	50	32	38	42	44	26	30	34
Sugar	3	2.5	3	3.5	4	2.7	3	3.4	4	3	3	4	4	3	3	4
Soybeans and soy products	-	15	16	17	20	23	25	27	35	-	-	-	-	-	-	-
Pulses	4.5	-	-	-	-	-	-	-	-	5	6	6	6	4.5	5	6
Beans products	14	-	-	-	-	-	-	-	-	15	20	21	22	14	16	18
Seeds	2	1	1	1	1.5	1.5	1.5	2	2.5	3.5	3.5	3.5	2	3	3.5	3.5
Green and yellow vegetables	19	23	25	30	35	23	25	30	35	19	23	27	35	19	23	27
Other vegetables	60	55	60	70	80	55	60	70	80	60	70	75	82	60	70	75
Fruits	30	32	35	40	45	32	35	40	45	30	32	35	40	30	32	35
Mushrooms	3	-	-	-	-	-	-	-	-	3	4	4	4	3	4	4
Alga	2	1	1	1	1.5	1.5	1.5	2	2	2	2	2	2	2	3	4
Seafoods and shellfish	13	10.5	12.5	14.5	18.5	13.5	15.5	18.5	20.5	13	16	16	21	13	16	19
Small fish with bone	-	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	3	3	3	4	3	3	3.5
Meat	13	16	18	21	24	14	16	18	20	12	15	17	19	13	15	17
Egg	5	6	8	9	11	10	12	13	15	6	8	8	14	5	6	8
Dairy products	3	2.3	2.5	3	4	3	4	5	6	3	4	5	6	3	4	5
Oils and fats	2	4	4.5	5	5.5	4	4.5	5	5.5	3	3	3	4	2	3	3

† The "Standard Food Composition Tables for School Lunches (per child per meal)" indicated in a report on the establishment of school lunch dietary reference intakes are prepared by converting the target intake levels per month to values per meal and are to be applied flexibly while taking into ample consideration the health of individual schoolchildren and the actual state of their lifestyles and other factors.

A dash "-" is indicated in cases reference values have not been set.  
References (5, 15, 26, 28, 31-34, 37)

1970s, indicating the significance of the role played by school lunches, in the 1980s, the average body weights of schoolchildren were higher than their average height<sup>7, 8)</sup>. As a result, in terms of the recommended dietary allowances for Japanese (3rd revision, 1985-1989)<sup>20)</sup>, the energy intake of the Japanese exceeded the required amount by 10%.

### 3. School lunches targeted at improving nutrition (1996-2013)

The Criteria for Provision of School Lunches were partially revised<sup>4)</sup> in 1995 based on the recommended dietary allowances for Japanese (5th revision; 1995-1999)<sup>21)</sup>, and the percentage energy from fat in energy of school lunch was indicated on the basis of excessive fat intake leading to obesity and cardiovascular disease. In addition, new target values for dietary fiber and sodium (salt equivalent) were indicated based on the child's health problems<sup>21)</sup>. The use of standard dietary composition table was separately indicated for "small fish with bone," for the "seafood" category, as a source of calcium and trace nutrients<sup>5)</sup>. The Criteria for Provision of School Lunches were partially revised<sup>33)</sup> in 2003 based on the recommended dietary allowances for Japanese (6th revision; 2000-2004)<sup>12)</sup>, and the units for vitamin A were changed from international units (IU) to weight units (retinol equivalent;  $\mu\text{g}$ )<sup>33)</sup>. In addition, the reference standard values for magnesium and zinc were added based on the deficiencies of these elements. In the standard dietary composition table, the "soybeans and their products" category was divided into "beans" and "bean products" to recognize the traditional Japanese food and beans as a source of vegetable protein<sup>33)</sup>.

Examples of problems affecting the eating habits of schoolchildren are unbalanced meals, skipping breakfast, obesity, and early-onset lifestyle-related diseases<sup>7-9)</sup>. Moreover, following the establishment of the diet and nutrition teacher system<sup>10)</sup> and enactment of the *Shokuiku* Basic Act<sup>11)</sup> in 2005, promotion of *shokuiku* through health education was needed due to several social factors, and the School Lunch Act was revised in 2008<sup>14)</sup>. As regards the Criteria for Provision of School Lunches, since the recommended dietary allowances for Japanese were changed to dietary reference intakes for Japanese<sup>13)</sup>, the average recommended dietary allowances of school lunches were renamed to Nutritional Standards<sup>15, 16)</sup>. These Nutritional

Standards were established based on the dietary reference intakes for Japanese (2005-2009)<sup>13)</sup> and was indicated in a notification regarding the "meal contents of school lunches"<sup>15)</sup>. Energy levels were calculated based on a physical activity level of 1.75. A new target calcium intake was indicated as children receive insufficient amounts of calcium at home<sup>34-36)</sup>. A reference value of Vitamin A was set due to the range<sup>15, 35)</sup>. This was set at 33% to 3times 33% of recommended dietary allowance (RDA). In 2013, a portion of the Criteria for Provision of School Lunches was revised<sup>2)</sup> based on the viewpoint of preventing lifestyle-related diseases of the dietary reference intakes for Japanese (2010-2014)<sup>23)</sup>. Nutritional management is currently performed based on the Criteria for Provision of School Lunches.

### 4. Current nutritional management of school lunches in Japan

#### 4.1 Nutritional management based on the Criteria for Provision of School Lunches

The current nutritional management of school lunches complies with the partially revised Criteria for Provision of School Lunches of 2013<sup>2)</sup>. In the implementation of this nutritional management, menu controls are devised and school lunches are provided, which are oriented toward the substantiation of the contents of school lunches based on the Nutritional Standards after having ascertained the actual circumstances surrounding schoolchildren<sup>37)</sup>. According to the results of the school lunch implementation survey in 2015<sup>43)</sup>, school lunches were provided in 99.1% of elementary schools (of which 98.5% were full meals, 0.3% were supplementary meals, and 0.3% were school milk programs) and in 88.1% of junior high schools (of which 82.6% were complete meals, 0.4% were supplementary meals, and 5.2% were school milk programs), with full meals consisting of "staple food, milk, and an accompanying dish" accounting for nearly all school lunches.

#### 4.2 Utilization methods introducing the philosophy of the Dietary Recommended Intakes for Japanese at school lunches

To make improvements based on the concepts of Plan (menu controls), Do (provision of meals), Check (monitoring), and Action (evaluation), it is important to implement nutritional management based on the PDCA cycle<sup>2, 23, 25, 37)</sup> to determine and implement menu controls

by utilizing the dietary recommended intakes for Japanese (2005~2009)<sup>23)</sup> at school lunches. Since it is especially necessary to determine the actual status of schoolchildren and accurately understand their characteristics to develop menu controls, the procedure based on the dietary recommended intakes for Japanese (2005~2009) is indicated below<sup>2, 23, 25, 37)</sup>.

(1) Status of ascertaining the characteristics of schoolchildren as described

Distributions of gender, height, weight, and physical activity level of schoolchildren were determined<sup>25, 37)</sup>. The method for assessing obesity, which was developed based on the school health statistics survey, was used for calculating the standard weight based on gender, age and height<sup>44)</sup>.

The physical measurement values utilized in the case reference materials such as schoolchildren medical examinations can be accessed<sup>25, 37)</sup>. If such materials cannot be obtained, the reference materials of a different group presumed to have similar characteristics are used as a reference. Surveys are repeated at predetermined intervals and attempts are preferably made to optimize management and improve content. In cases where schoolchildren are in their growth period and continue to change, the most recent characteristics are ascertained as much as possible, and that information can be used to review meal plans and create menus. In addition, if changes in the physical characteristics of schoolchildren with mild obesity are observed, it is necessary to change the contents of menu controls and even the menus for the same schoolchildren<sup>25, 37)</sup>. Moreover, it is desirable to use the biochemical data from clinical tests as necessary<sup>25, 37)</sup>.

(2) Method used to evaluate Nutritional Standards

Fact-finding surveys are performed to evaluate not only school lunches, but all meals in a day<sup>25, 37)</sup>. Data regarding the contribution of school lunches are preferably obtained<sup>25, 37)</sup>. If these information are difficult to obtain, school lunches are only evaluated, and the evaluations are carried out by assessing a portion of the students in a school year. In addition, information obtained for other similar groups can be used instead<sup>25, 37)</sup>.

The nutritional management status of schoolchildren can be ascertained by conducting fact-finding surveys targeted at all meals in a day and comparing the resulting dietary intake with the indicators of dietary reference

intakes<sup>25, 37)</sup>. However, in the case of school lunches, it is realistically difficult to ascertain the dietary intake by conducting surveys that include meals served at home for all participants. Thus, dietary surveys are conducted for multiple days on a portion of the group, followed by a separate investigation of the distribution of energy and nutrient intake levels for school lunches and meals served at home and then applying those results to other target groups. Dietary intake surveys are repeated at predetermined intervals, and an evaluation is then made as to whether or not the resulting information is appropriate<sup>25, 37)</sup>.

(3) Determination of menu controls

Nutrient levels are determined<sup>37)</sup> and menu controls for schoolchildren using dietary reference intakes for Japanese<sup>25)</sup> based on the information obtained from schoolchildren dietary status<sup>34)</sup> and meal status surveys<sup>39)</sup>.

In the case of providing lunches only as in the manner of school lunches, it is desirable to ascertain the energy and nutrient intake of the group to which meals are provided<sup>25, 37)</sup>, determine the proportions of energy and major nutrients provided by those meals, and determine the meal plans for the purpose of satisfying those proportions. Although the results of other similar groups may be used as a reference when it is difficult to ascertain the energy and nutrients intake of schoolchildren, adequately understanding the differences in characteristics among schoolchildren and interpretation of those results are handled carefully. Moreover, it is desirable to provide energy and nutrient levels that take into consideration avoiding inadequate and excessive intake of energy and major nutrients while keeping in mind the individual differences in the quantity and quality of breakfast, dinner, and snacks not provided<sup>25, 37)</sup>.

(4) Creation of scheduled menus

Specific scheduled menus are created based on menu controls determined in advance<sup>25-37)</sup>.

Adjustments and contrivances are preferably made to provide amounts considering the characteristics of the schoolchildren. Accommodations are preferably made both flexibly and realistically so that all of the meals provided are consumed<sup>25, 37)</sup>.

(5) Quality control of school lunches and provision of meals

Meals that have been prepared based on suitable quality

control are provided in accordance with the scheduled menus<sup>25, 37</sup>.

It is ideal that school lunches should be completely consumed. To accomplish this, instead of merely providing meals, contrivances should be made to ensure that meals are completely consumed<sup>25, 37</sup>.

#### (6) Determination of dietary intake

The actual amount of food consumed by schoolchildren are determined<sup>25, 37</sup>.

There are many cases in which determination of dietary intake is limited to school lunches only and it is not possible to determine the distribution of customary dietary intake per day. To determine the intake levels of children receiving school lunches, a dietary survey is conducted<sup>25, 37</sup>. It is desirable to extract a predetermined number of schoolchildren receiving school lunches, investigate the amounts of leftovers for each food category (such as staple food, main dish, or side dishes), and then estimate the energy intake and major nutrients intake based on those results. Investigations on the amount of leftovers of each group can also be conducted. If the amounts of leftovers from individual dishes for each group are investigated as well, the actual dietary intake of schoolchildren can be estimated to a certain degree<sup>25, 37</sup>.

#### (7) Review of menu controls

The menu controls can be confirmed and reviewed by determining the dietary intake for certain periods of time and reviewing their contents in consideration of the status of physical measurement values<sup>25, 37</sup>.

Dietary intake surveys are repeated at predetermined intervals. The resulting information is correlated with the dietary reference intakes for Japanese and, by comparing with the physical measurement values of schoolchildren, is evaluated as being suitable or unsuitable and whether or not improvements are to be made; if available, specific measures are devised and utilized in subsequent menu controls. However, the evaluation of school lunches for an entire group can help screen those individuals who have insufficient or excessive dietary intakes. Although high-risk schoolchildren, such as those who are excessively obese or thin based on their physical measurement values, those exhibiting changes that are considerably different from the growth curve, or those who consume extremely low or high amounts of school lunches, can be accommodated on an individual basis, with respect to the overall

school lunch program; by improving the operations while taking into account the physical measurement values, improvements can be considered to be effective if the percentages of high-risk schoolchildren decrease each year<sup>25, 37</sup>.

Kitade et al.,<sup>42</sup> stated that the amount of energy provided for conducting nutritional management can be set in consideration of schoolchildren growth provided accommodations can be made for acquiring physical measurement values and other necessary data. In addition, although there were no large differences between the median value of the amount of energy determined and the value of the Nutritional Standards for any of the age groups, individuals with varying median values were identified. Moreover, estimated energy requirement (EER) calculated for schoolchildren were observed differences between April and September accompanying growth, thereby indicating the need to re-calculate the EER twice a year.

#### 4.3 Philosophy and utilization of Nutritional Standards

Since Nutritional Standards are obtained by calculating the desirable nutrition levels to ensure the promotion of health and *shokuiku* among schoolchildren based on the results of dietary surveys and in line with the philosophy of the dietary reference intakes for Japanese (2005-2009)<sup>23</sup>, the following describes the philosophy and utilization of Nutritional Standards established on the basis thereof<sup>2</sup>:

##### (1) Determination of actual eating habits of schoolchildren

Two survey results were used to ascertain the actual eating habits of schoolchildren.

A 3-day fact-finding survey of the eating habits of schoolchildren<sup>36</sup> was conducted in the form of a dietary survey and activity survey on days when school lunches were served among second graders (aged 7-8 years), fifth graders (aged 10-11 years), and junior high school second year students (aged 13-14 years) at schools serving lunches throughout the country. This survey was conducted to identify the amount of energy and nutrients provided by school lunches.

Surveys on the dietary status of schoolchildren<sup>39</sup> were conducted to ascertain the role played by school lunches by accurately determining the proportion of daily nutrients intake accounted for by school lunches. The participants consisted of fifth graders (aged 10-11 years) and



junior high school second year students (aged 13-14 years) from urban and rural areas selected throughout the country. The survey contents consisted of the names of dishes, names of food consumed, and amounts of food consumed (intakes) during breakfast, lunch, dinner, and snack for 2 days, on Fridays when school lunches were served and on Saturdays when school lunches were not served.

(2) Basic philosophy behind the establishment of Nutritional Standards (2013) based on the actual circumstances<sup>37)</sup>

The estimated energy requirement was calculated based on the level of physical activity determined through fact-finding surveys, which identified the standard body weight from the average height by gender and age as indicated in the school health statistics<sup>44)</sup>, and the energy was based on one-third of the EER. Since the results of fact-finding surveys<sup>36)</sup> and the values of the dietary reference intakes for Japanese (2011~2014)<sup>23)</sup> yielded decreasing values, a physical activity level of 1.65 was used for ages 6 to 7 years and a value of 1.7 was used for ages 8 to 14 years.

The range for percentage of energy from protein was set at 12% to 20% based on the 15% of the total energy intake in consideration of the actual state of adequate intake that exceeds the RDA<sup>36)</sup>.

The percentage of energy from fats was set at 25% to 30% of the total energy intake from school lunches from the viewpoint of preventing lifestyle-related diseases in consideration of problems with obesity and elevated blood cholesterol levels, which resulted from excessive fat intake<sup>25, 37)</sup>.

Sodium (salt equivalent) intake was set at less than 33% of the age-based average of the tentative dietary goal for preventing life-style related diseases (DG)<sup>37)</sup>.

A reference value was only set for calcium due to the changes in the EER and the RDA for dietary reference intakes for Japanese (2005 edition)<sup>23, 25)</sup>. This was set at about 50% of the RDA due to the shortage of supplementation at home<sup>25, 37)</sup>.

Iron intake was set at 33% of the RDA. Due to the decrease consumption of iron-rich food at home or due to the insufficient amount of iron obtained from school lunches, it was necessary to make contrivances when creating menus in an attempt to ensure adequate con-

sumption<sup>25, 37)</sup>.

Vitamin A intake was set at 33% of the RDA for school-children, but was changed to 40% of the recommended daily amount based on the actual shortages of vitamin A in the diet of students. Intake levels of vitamins B<sub>1</sub> and B<sub>2</sub> were set at 40% of the RDA, while intake of vitamin C was set at 33% of the RDA<sup>25, 37)</sup>.

Dietary fiber was set at about 8 g per 1,000 kcal in line with the changes in the DG for persons aged 18 years and over<sup>25, 37)</sup>.

Magnesium intake corresponding to 50% of the RDA and zinc intake corresponding to 33% of the RDA were deemed to be suitable values<sup>25, 37)</sup>.

Since these amounts represent the average values for the entire country, they were applied after determining the actual circumstances surrounding the health status and lifestyles of schoolchildren at each school. In addition, since the conditions in local communities differ throughout the country, fact-finding surveys in each region, including National Health and Nutrition Surveys<sup>24, 43, 47)</sup>, are required to be conducted and implemented corresponding to the circumstances in each region.

#### 4.4 Philosophy and utilization of Standard Dietary Composition Table<sup>37)</sup> in school lunches

Specific reference values were not indicated in standard dietary composition tables of the partially revised 2013 Criteria for Provision of School Lunches. Those matters indicated to be taken into consideration for utilization consist of taking into consideration the standard values of Nutritional Standards and the need to give consideration so that meals suitably combine a wide range of diverse foods. Standard dietary composition tables were thought to preferably allow the provision of school lunches considering the actual circumstances and food culture of each region by preparing the standard dietary composition tables for each region based on the composition of food groups provided in each region<sup>2)</sup>.

On the contrary, based on the Formulation of the School Lunch Intake Standards (Report) of 2011<sup>35)</sup>, contents examined based on actual circumstances<sup>2, 37)</sup> are indicated as "Important matters in the provision of guidance relating to menu creation, food preparation, and foods for each category on the Standard Dietary Composition Tables." In addition, desirable "standard dietary composition tables for school lunches (per child per meal)"<sup>37)</sup>

are indicated in Table 3. The following indicates the philosophy and utilization method of surveys for determining the actual circumstances<sup>36, 39)</sup> and standard dietary composition tables based on the Formulation of the School Lunch Intake Standards (Report) of 2011<sup>37)</sup>.

(1) Determination of actual circumstances and utilization in food intake

Standard dietary composition tables<sup>37)</sup> are set based on the school lunch nutrition reports<sup>38)</sup> and the actual state of school lunches. The school lunch nutrition reports<sup>38)</sup> are conducted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) as surveys that target elementary schools, junior high schools, and collective kitchen to enhance diet by determining the actual circumstances relating to meals served at school lunches. The survey contents include nutrient intake status and the intake status according to the types of food used, and the survey is conducted for 5 days, every June and November each year.

Since the contents of these reports merely indicate the national average, the standard dietary composition tables based on the food used in each region, such as the use of local products, are prepared by adequately determining the actual state of local food utilization from the results of the National Health and Nutrition Surveys<sup>24, 43, 47)</sup>. In addition, sufficient considerations are given to the practical application of the Japanese diet and passing on the traditional Japanese food culture after having ascertained the conditions in each region and the actual state of eating habits at home<sup>2, 37)</sup>.

(2) Philosophy and utilization of Standard Dietary Composition Tables<sup>37)</sup>

Table 3 presents the “standard dietary composition tables for school lunches (per child per meal)” based on the “Formulation of the School Lunch Intake Standards (Report)” of 2011<sup>37)</sup> and the dietary reference intakes for Japanese (2010~2014)<sup>23)</sup>. Since the standard dietary composition tables are prepared by converting the target intake levels of food used in school lunches each month to values per meal, these tables are applied flexibly while taking into account the health of individual schoolchildren and the actual state of their lifestyles as well as the actual circumstances in the region<sup>37)</sup>. In addition, matters that need to be considered when consuming full meals comprised of “staple food, milk, and an accompanying dish”

are as follows<sup>37)</sup>.

In 2008, although staple foods such as rice were provided three times a week and flour products were provided twice a week<sup>35)</sup> the provision rice and bread was still indicated in 2013 without stipulating the number of times these type of staple food were served<sup>37)</sup>. With regard to the dietary fiber intake, it was considered desirable to use a certain percentage of germinated brown rice, whole rice, or barley. In 2008, the amount of staple food was reduced in response to a decrease in the standard amount of energy owing to the decrease in physical activity levels<sup>35)</sup>.

Milk is provided in each meal as a source of calcium during the growth period<sup>1, 2)</sup>. According to the results of surveys such as the schoolchildren dietary status survey<sup>40, 41)</sup>, there was a considerable shortage of calcium in the diet on days when school lunches were not served, and milk was considered to fulfill the important role of replenishing calcium that was lacking in meals served at home. Furthermore, the aggressive use of milk, formulated milk, milk products, and small fish in regions where meals served at home contain less calcium were taken into consideration<sup>2, 37)</sup>.

Accompanying dishes are indicated in the following manner for each food group<sup>37)</sup>. Although potatoes are a source of dietary fiber, intake was reduced by about 20% since the reference intake for dietary fiber was decreased<sup>25, 35)</sup> and less amount was consumed<sup>37)</sup>. Although the amount of beans used was indicated separately from bean products, intake was reduced by about 10% to 15% at elementary schools only since the reference intake for dietary fiber was decreased and less amount was consumed<sup>37)</sup>. However, since beans are a source of dietary fiber and in consideration of passing on the food culture focusing on bean consumption, efforts to consume beans are made by making contrivances to the menu. Although nuts and seeds are good sources of iron and dietary fiber, due to the low amount consumed<sup>35)</sup>, intake was slightly decreased for elementary schoolchildren aged 6 years and those aged below 9 years<sup>37)</sup>. Although green, yellow, and other vegetables are not classified as green and yellow vegetables and other vegetables in the Japanese Standard Food Composition Tables (2010)<sup>45)</sup>, they are indicated separately for school lunch times and guidance relating to food, such as subjects relating to foods. Furthermore, although the upper limit values for

vitamin A are indicated in Dietary Reference Intakes for Japanese (2010 edition)<sup>25)</sup>, since excessive intake of  $\beta$ -carotene and other forms of provitamin A is not known to be harmful, it is not necessary to refrain from consuming yellow and green vegetables<sup>37)</sup>. However, when creating menus, efforts are made to use a diverse range of foods to prevent the unbalanced use of food materials such as using the same food material for the main dish, side dish, and soup<sup>37)</sup>. Efforts are made to consume fruits since they are important source of vitamin C and dietary fiber<sup>37)</sup>. Mushrooms are a source of dietary fiber, and their intake has not been changed since they are suitably consumed in each age group. Although seaweeds are a source of iron and dietary fiber, efforts are made to consume these foods by making contrivances to menus<sup>37)</sup>. Seafood is suitably consumed as a main dish. It is necessary to consider intake of *n*-3 fatty acids such as eicosapentaenoic acid and docosahexaenoic acid when considering the amount of fish used<sup>25)</sup>. Although the amount of small fish with bone used is set separately from seafood since small fish are a source of calcium and as part of the Japanese food culture, efforts are made to promote the intake of small fish with bone by making contrivances to menus<sup>37)</sup>. Meats are preferred by schoolchildren and are frequently used as main dish<sup>38)</sup>, and are consumed at about 1.5 times the reference values of the Standard Dietary Composition Tables for School Lunches<sup>37)</sup>. Hence, to prevent the onset of lifestyle-related diseases, caution is taken to ensure that meat is not consumed so as to promote a preference for high-protein, high-fat foods.

In addition, to enrich the contents of school lunches<sup>2,37)</sup>, considerations were made in the creation of menus so that the school lunch menus can be used as teaching materials for *shokuiku* and indications were made to accommodate schoolchildren with food allergies, while also indicating the role of school lunches as part of the educational curriculum<sup>2,37)</sup>.

#### IV. Discussion

This study has presented a literature search on the philosophy and utilization of current Nutritional Standards (2013)<sup>2,37)</sup> in nutritional management taking into account the changes in nutritional management of school lunches in Japan after World War II.

The three points that came into view as a result of examining the changes in nutritional management are as follows.

Firstly, with the enactment of the School Lunch Act (1954)<sup>1)</sup> and the establishment of a school lunch implementation system, the Criteria for Provision of School Lunches demonstrated a dietary pattern of “bread, milk, and an accompanying dish” in the form of a full meal for the purpose of improving the nutritional status of schoolchildren. This combination was established as the pattern of school lunches in Japan and exists today in the form of “staple food, milk, and an accompanying dish.”

Secondly, the average recommended dietary allowances (Table 2) and standard dietary composition tables (Table 3) for school lunches were indicated in 1954 to develop menu controls, and those levels were established to identify the amount of nutrients required for nutritional supplementation of schoolchildren and the amounts of suitable foods used in line with nutritional requirements<sup>1)</sup>. This approach of giving consideration to both nutrients and food levels from the initial stages of establishment served as the origin of nutritional management in Japan.

Thirdly, a portion of the Criteria for Provision of School Lunches is revised as necessary as the dietary reference intakes for Japanese is revised every 5 years. After dealing with the health issues of each age group, school lunches are thought to have led to the improvement of the posture of schoolchildren by fulling the role of nutritional supplementation. This is continuing even at present and the approach of the 2013 Nutritional Standards in particular is indicated in the Formulation of the School Lunch Intake Standards (Report) of 2011<sup>37)</sup> as being in line with the philosophy of the PCDA cycle<sup>25)</sup> advocated in the dietary reference intakes for Japanese (2010)<sup>23)</sup>.

The above three points also consider nutritional management within the framework of the School Lunch Act enacted in 1954, and school lunches that began with nutritional supplementation have continued until the present<sup>2)</sup> while having undergone repeated partial revisions corresponding to health issues at each based on dietary reference intakes for Japanese<sup>6,12,20,21,23)</sup>.

Next, although Nutritional Standards at the nutrient level are indicated in the notification of the partial revision of the Criteria for Provision of School Lunches (2013) currently in use<sup>2)</sup>, the guideline is indicated to “give ample

consideration to regional circumstances and the passing on of Japanese food culture” without indicating specific standard dietary composition tables at the food level. On the contrary, the standard dietary composition tables were examined and indicated based on the Formulation of the School Lunch Intake Standards (Report) of 2011<sup>37)</sup>. The question is why the standard dietary composition tables were not announced when the partial revision of the Criteria for Provision of School Lunches (2013) was reported<sup>2)</sup>. One possible reason behind this is the “giving of ample consideration to regional circumstances and the passing on of Japanese food culture.” There were differences in the products (regional products) and food culture throughout Japan as reflection of Japan’s climate and natural features<sup>46)</sup>. According to reports on the utilization status of regional products in school lunches of 2013<sup>47)</sup>, there were differences in the utilization rates of regional products; the major regional products consisted mainly of fresh vegetables followed by rice, fruits, and potatoes<sup>48)</sup>. Rice in particular, which is Japan’s staple food, may be intentionally purchased locally<sup>48)</sup>, and there were differences in the number of times rice-based school lunches were served throughout the country<sup>47)</sup>. In addition, there were differences in the number of times rice-based school lunches are served since the menus of these school lunches are intimately patterned from the Japanese food culture such as their local cuisine<sup>49-52)</sup>. Hence, since regional differences were considered to play a significant role in the continuation of regional products and food culture used in school lunches, instead of indicating the nationwide uniform standard dietary composition tables, it is thought to be desirable to flexibly accommodate this situation by taking into account the regional differences.

Next, the Criteria for Provision of School Lunches (2013)<sup>2)</sup> currently in use have been established to provide one-third of the daily energy requirement and one-third or more of calcium and vitamins among the major nutrients. According to surveys conducted on days when school lunches were served and on days which they were not served, intakes of calcium and vitamin B<sub>1</sub> were reported to be higher on days when school lunches were served, and intakes of dairy products and vegetables were also reported to be higher<sup>40)</sup>. Furthermore, according to other surveys, the intake levels of all nutrients were reported to be higher, with the exception of fat and vitamin B<sub>1</sub><sup>39)</sup>. In

addition, according to a survey based on the presence or absence of school lunch programs, junior high school students at schools who were under school lunch programs were reported to demonstrate high intakes of calcium, vitamins, and dietary fiber, while junior high school students at schools who were not under school lunch programs were reported to have lower intakes of milk and vegetables<sup>39)</sup>. According to the results of these fact-finding surveys, the effects of the approach and utilization of Criteria for Provision of School Lunches were confirmed by evaluating at the nutrient level and food group level. In addition, since the Criteria for Provision of School Lunches<sup>2, 37)</sup> were established based on the actual state of schoolchildren, the presence or absence of school lunch programs is thought to have an effect on the daily dietary intake status of schoolchildren.

Looking at the nutritional management implemented at school lunch programs of other countries, those countries that have set standards at the nutrient level were Japan, the United States (US), Great Britain, and South Korea, while those countries that have set standards both at the nutrient level and food level were the US and Great Britain. Those countries that set distribution ratios that correspond to the actual circumstances for the daily distribution of standard values were Japan and Great Britain, while those countries that set standard values to one-third of the daily level were the US and South Korea. Whether students eat school lunches or not, those countries where the right to select school lunches lies within the individual or parent consisted of the US and Great Britain, while those countries where that right is governed by local authorities consisted of Japan and South Korea<sup>53-56)</sup>. In addition, in some foreign countries, meals are provided at a cafeteria using a selection system, while vegetables and fruits are served in a salad bar and are selected by students themselves<sup>57)</sup>. In the case of a selection system, differences in dietary intake are thought to occur depending on the selection method. On the basis thereof, nutritional management for school lunches was found to vary according to the conditions in each country and is not considered to be uniform. In recent years, the nutrient intake among children were not considered satisfactory and was found to cause the occurrence of health problems such as obesity and lifestyle-related diseases. In the US and Great Britain, the prevalence of obesity is high even

among children, and although this number is much lower in Japan, obesity countermeasures were reported to be necessary<sup>8, 9)</sup>.

Considering the changes in nutritional management at school lunch programs in Japan, the nutritional management suitable for each period has been cultivated according to a legal format provided by the School Lunch Act<sup>1, 2)</sup>. At present, menu controls are implemented based on the actual circumstances surrounding the schoolchildren and the Nutritional Standards that adopt the approach of ingestion of nutrients within a desirable range<sup>2, 37)</sup>. The ideal nutritional management is based on the complete consumption of meals provided in accordance with the menu controls. To accomplish this, health/nutrition education is important to convey the intentions of menu controls to schoolchildren.

## V. Conclusion

The philosophy and utilization of current Criteria for Provision of School Lunches in nutritional management can be organized and summarized into the following three points as related to the role of nutritional management in consideration with the changes in nutritional management at school lunch programs in Japan:

1. Criteria for Provision of School Lunches were established under the School Lunch Act to improve the health issues of schoolchildren<sup>1, 2)</sup>.
2. Nutritional Standards were set to higher standard values than one-third of the daily energy requirement and one-third or more of the daily nutrient intake based on the actual circumstances surrounding the schoolchildren<sup>2, 23, 37)</sup>.
3. Menu controls were developed by suitably combining a diverse range of foods while considering such factors as regional characteristics based on the Nutritional Standard values and contribute to the daily dietary intake status of schoolchildren<sup>2, 23, 36, 37, 40)</sup>.

## Conflict of Interest

This study does not contain matters constituting a conflict of interest.

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