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Secular Changes in Child Height in Japan and South Korea: Consumption of Animal Proteins and "Essential Nutrients"

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Abstract

Child height in Japan and South Korea increased dramatically over the past half century. At age 17 - 18 years, male students in Japan were 2 cm taller in the 1960s through 1970s, still barely taller in the 1980s than S. Korean students, but by the early 1990s they ceased to grow any taller in height, whereas their Korean peers kept increasing in height to overtake their Japanese peers by 3 cm in the mid-2000s. Economic growth was rapid in both countries, but S. Korea some two decades behind Japan. Per capita GDP in Japan was four times that in S. Korea in the mid-1980s and twice in the early-2000s. Food consumption increased conspicuously in both countries, with per capita net supply of animal products in Japan noticeably exceeding that in S. Korea in the early-2000s. However, per capita total caloric intake has been a few hundred kcal/day greater in S. Korea than in Japan since the end of 1970s, mainly from cereals. In particular, S. Koreans have consumed nearly twice as many vegetables as Japanese after the early 1980s. What may deserve attention is that Japanese youth, as compared to their older generations, drastically reduced their consumption of fruit and vegetables in the mid-1970s, whereas their S. Korean counterparts have maintained their consumption of these produce. These contrasts in food consumption patterns may have contributed to the differences in child height development in the two countries.

Keywords

Child Height, Animal Proteins, Fruit and Vegetables, Japan, South Korea

1. Introduction

National income, which enables people to purchase animal proteins, is regarded as a key determinant of adult heights [1] [2]. Japan and South Korea made rapid

economic progress since the end of WW II, with S. Korea some two decades behind Japan due to the Korean War (1950-53) which devastated the country. Per capita GDP (in 2010 U.S. Dollars) in Japan increased from $8608 in 1960, to $25,489 in 1980, and eventually to $42,170 in 2000. That in S. Korea also increased steadily, but remained considerably behind Japan, at $944, $3700, and $15,104 over the corresponding period [3]. Accordingly, per capita daily caloric intake from animal products increased from 251 kcal in 1961 to 537 kcal in 1980 and 604 kcal in 2000 in Japan, whereas that in S. Korea also increased from 56 kcal, to 212 kcal, and eventually to 447 kcal over the same period [4]. As is shown in greater details in **Table 2** and **Table 3**, Japan's per capita intake of animal products was nearly twice as large as that in S. Korea in 1990, for example.

Based on national school health examinations conducted with similar methods both in Japan and S. Korea [5] [6], school boys at age 17 - 18 years in Japan were 166 cm in mean height in the early 1960s, 2 - 3 cm taller than their Korean peers, 170 cm in the 1980s, 1 cm taller than in Korea, but ceased to grow taller in height around 1990. Their Korean pees kept growing taller in height, overtaking Japanese boys by 3 cm in the mid-2000s, as shown in greater detail in **Table 1**.

Intakes of animal proteins alone likely cannot explain the differences in child height development between the two countries over the past half century from 1960 to 2010. A genetic difference between Japanese and Korean population, however, is not easy to establish. The observed differences in child height development between Japan and S. Korea do not appear to be greater than those observed between different regions in the same country [7] [8]. Also, [9] "Growth status of Korean schoolchildren in Japan", states that Korean children born and raised in Japan are very similar, in height and weight by age, to Japanese children, based on *school health surveys* conducted in Tokyo and Osaka in the end of the 1970s and found taller in height and heavier in weight than their counterparts in S. Korea at the same time.

2. Data

2.1. Child Height in Japan and South Korea

School Health Examination Statistical Surveys [5] [6][1], which provide stature by age from 1st graders in elementary school (6 years old[2]) to senior students in high school (17 years old[2]) have been conducted by the Ministry of Education every year since 1900 in Japan, except for a few years during WW II. Similar government surveys have been conducted in S. Korea since 1960. In view of the fact that the ratios of girls enrolled in high school for higher education in the 1960s

[1]In our previous studies, the data provided in [17] were used, which furnish child height by age from 1 to 20 years, in 1965, 1975, 1984, 1997, and 2005 in S. Korea. Accordingly, the similar data in the same years, 1965, 1975, 1984, 1997, and 2005, based on [18], were employed.

[2]Depending on the month when the school surveys conducted, actual age of 1st graders in elementary school was 6 years + some months old.

and 1970s were substantially lower in S. Korea than in Japan [10], there is a possibility that statistics pertaining to mean height of girls in high schools in

Table 1. Secular changes in mean height of Jp. and Kr. school boys by age, from 1960 to 2010.

(a)

Mean height of Jp. school boys: 3 year moving averages (cm)											
Age/year	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
6	111.9	113.4	114.5	115.2	115.7	116.4	116.8	116.8	116.7	116.7	116.7
7	117.2	118.8	120.0	120.8	121.3	122.1	122.5	122.6	122.4	122.5	122.6
8	122.2	124.0	125.4	126.3	126.8	127.5	128.0	128.1	128.1	128.2	128.2
9	127.0	128.8	130.3	131.4	132.0	132.7	133.3	133.5	133.5	133.6	133.5
10	131.8	133.6	135.2	136.5	137.2	137.7	138.5	138.9	139.0	138.9	138.8
11	136.5	138.6	140.4	141.9	142.8	143.3	144.4	144.9	145.3	145.1	145.0
12	142.1	144.7	147.0	148.6	149.5	150.1	151.5	152.0	152.8	152.6	152.4
13	148.7	151.8	154.0	156.0	157.1	157.6	158.9	159.5	160.1	159.9	159.7
14	155.3	158.2	160.5	162.2	163.3	163.8	164.6	165.1	165.5	165.3	165.1
15	161.5	163.5	164.7	166.1	167.0	167.5	167.9	168.4	168.6	168.4	168.3
16	163.8	165.7	166.9	167.9	168.8	169.3	169.6	170.1	170.1	170.0	169.9
17	165.1	166.7	167.9	168.8	169.6	170.2	170.5	170.9	170.9	170.8	170.7

Notes: 1965 = average (1964: 1966), for example. Sources: [5].

(b)

Mean height of Kr. school boys: 3 year moving averages (cm)											
Age/year	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
6	111.0	111.9	112.9	114.1	116.4	116.7	117.7	119.0	120.2	121.0	121.8
7	114.9	115.2	117.6	119.7	121.6	122.5	123.0	124.7	125.9	126.8	127.7
8	119.0	119.3	121.5	123.8	126.6	127.5	128.3	130.0	131.2	132.2	133.2
9	123.5	123.4	126.0	128.6	131.4	133.7	133.3	135.0	136.5	137.9	138.5
10	128.0	127.5	130.3	133.2	135.6	137.2	138.3	140.0	141.9	143.1	143.9
11	131.6	131.4	134.5	137.4	140.7	142.1	143.7	145.7	147.9	149.4	150.4
12	140.3	141.8	143.7	144.4	146.3	148.2	149.7	152.0	154.8	156.9	158.0
13	144.5	145.3	148.1	150.4	152.7	154.8	156.0	159.0	161.8	163.6	164.4
14	149.5	150.1	152.3	155.9	159.4	161.0	162.3	164.7	167.0	168.3	169.0
15	155.6	159.0	160.9	163.7	164.4	165.5	166.3	168.3	170.5	171.6	171.8
16	161.2	161.9	163.9	165.6	167.0	167.9	168.3	170.3	172.1	172.8	173.1
17	163.3	163.8	166.1	167.2	168.4	169.4	169.7	171.0	172.9	173.7	173.7

Sources: [6].

(c)

Differences in mean height of school boys between Jp. and Kr., 1960 to 2010: using 3 year moving averages (cm)											
Age/year	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
6	0.9	1.5	1.6	1.1	−0.7	−0.3	−0.9	−2.2	−3.5	−4.3	−5.1
12	1.8	2.9	3.2	4.2	3.2	1.9	1.8	0.0	−2.0	−4.3	−5.6
17	1.8	2.9	1.8	1.6	1.2	0.8	0.8	−0.1	−2.1	−2.9	−3.0

Sources: compiled by the author.

the earlier period of our investigation may not represent the entire population. That is the reason why this paper focuses on school boys for the comparative analyses of child height between Japan and S. Korea.

The school health surveys in both countries do not cover infants from 1 to 5 years of age and near-adults from 18 to 20 years of age. In the arena of human biology, the first two years of life, or 1000 days, including pregnancy, are crucial periods for future adult height [11] [12] [13] [14]. Analyzing the secular changes in child height in Japan and S. Korea since 1965, [15] states, "Most of the height increment seen in adults had already accrued by age 1.5 years" (p. 12). Thus, the data used here which lack the height development for infants from 1 to 5 years may carry some limitations. On the other hand, the school health surveys in both countries are based on very large nationwide samples conducted every year from 1960 to 2015.

Statistics pertaining to mean height by age groups fluctuate from year to year, particularly in S. Korea, possibly because statistics published in the survey reports depict mean height of school children only in Seoul in some years and averages of a few major districts in other years and also the months when the surveys were conducted may have varied from year to year. In order to smooth the annual fluctuations, we employed 3 year moving averages for all age groups. **Table 1** provides secular changes in mean height of school boys in Japan by age (from 6 to 17 years old) in Japan and in S. Korea, by 5 year intervals from 1960 to 2010. With possible statistical errors disregarded, at age 16 - 18 years, school boys in Japan were 3 cm taller than S. Korean boys in the 1960s and still slightly, say, 1 cm taller in the 1980s. Japanese boys ceased to grow any taller in the early 1990s and onward, whereas S. Korean boys kept growing in height onward to overtake their Japanese peers by 3 cm in the mid-2000s and ceased to grow any taller since then.

Based on the statistics pertaining to mean height of children from 1 to 20 years of age, mentioned above, Mori presumed that S. Korean children, in accordance with their ethnic traits, tend to grow faster during their late adolescent years than their Japanese peers [7] [16]. Cole and Mori, however, based on the same data, analyzed by SITAR, concluded that most of the increment in height seen in adults had already accrued by age 1.5 years, either in Japan or S. Korea, as mentioned above. To determine a child growth curve, it is preferable to take the cohort aspects into consideration. A child born in 1960, for example, aged to 11 years old in 1971 and 20 years old in 1980. Using these birth cohorts, the magnitude of growth in height from 6 to 17 years has been nearly constant at 55 cm, almost the same for both Japanese and S. Korean school boys, over the 1960 to 2010 (**Figure 1**).

To reprise Cole and Mori, most of the height increment seen in senior boys in high school had already accrued by 1st graders in elementary school, age 6 years.

Based on the data provided in **Table 1**, mean heights of male 1st graders in elementary school in Japan and S. Korea from 1960 to 2010 are compared, to prepare **Figure 2**, which clearly demonstrates that at age 6 years, Japanese boys

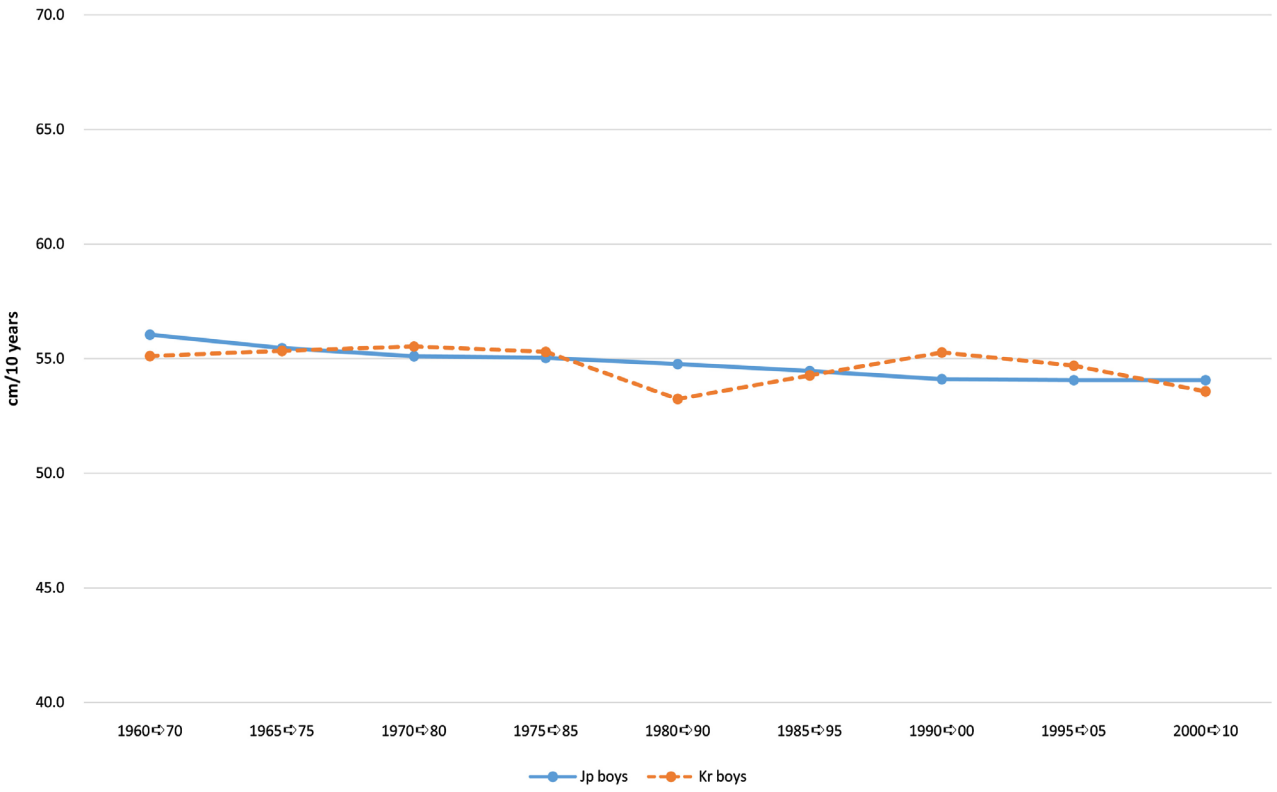

Figure 1. Changes in height growth velocity from 6 to 17 yr old, by cohorts, Jp. and Kr. school boys, from 1960 to 2010.

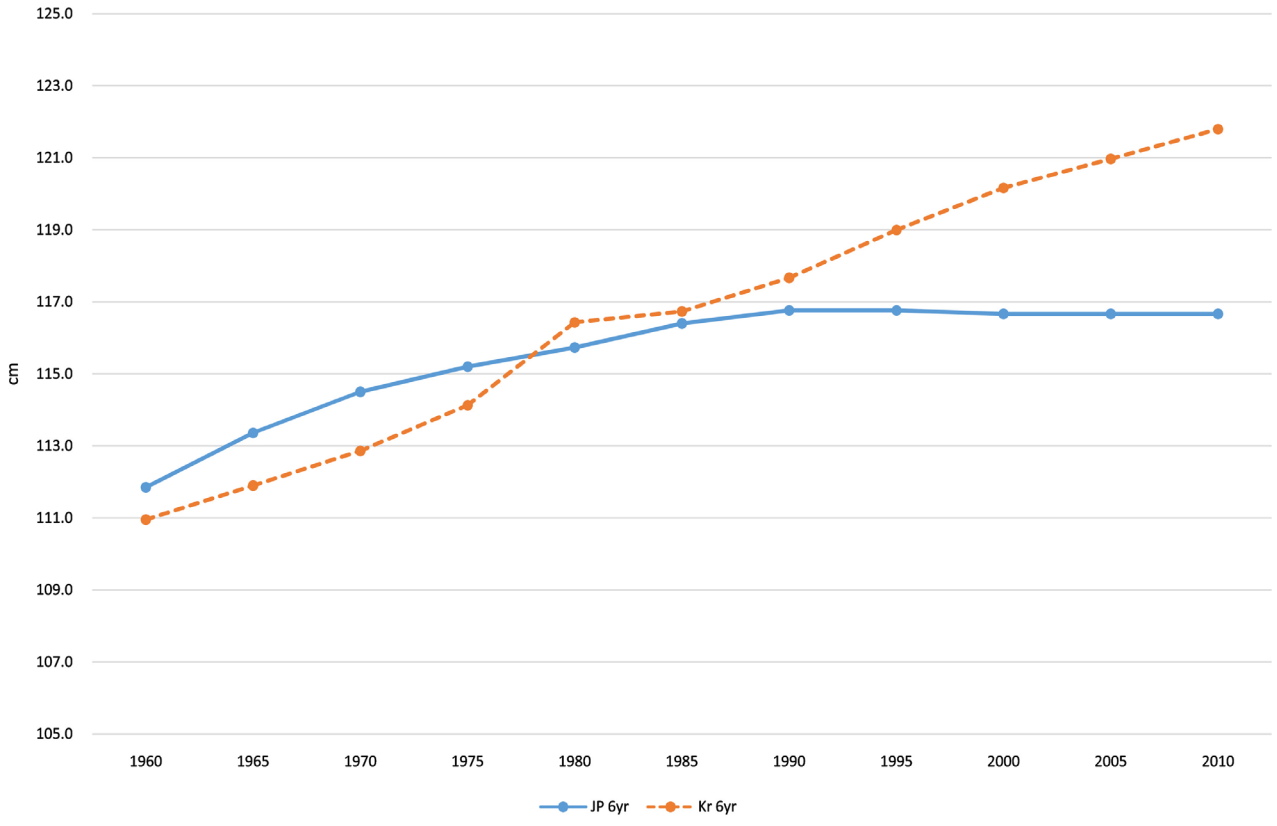

Figure 2. Changes in mean height of 1st graders in elementary school, Jp. and Kr. boys, 1960 to 2000.

were 112 cm in 1960 and grew steadily to 115 cm in 1975, 1 cm taller than Korean boys, and then grew more slowly to 116.8 cm in 1990 and leveled off afterward, whereas S. Korean boys grew more sharply from 111 cm in 1960 to 117.7 cm, 1 cm taller than Japanese boys in 1990, and still kept growing afterward to 121.8 cm, 5 cm taller than Japanese boys in 2010.

2.2. Food Consumption in Japan and South Korea

This article will try to explore underlying environmental factors, particularly food supply, ("inputs to health", [1]) which may have given rise to distinct differences in secular changes in child height development between Japan and S. Korea since 1960 presented above.

Culturally, Japanese and Koreans share basically the same dietary patterns, *i.e.*, *shushoku* (staple foods) and *fukushoku* (side dishes). Traditionally, they take principal energy from rice, noodles and/or bread with *miso*-soup and a small amount of *okazu* (side dishes), composed of fish/meats mixed with large amounts of vegetables in their diet. As their standards of living improved, they first increased both *shushoku* and *fukushoku*and then gradually increased *fukushoku* at the sacrifice of *shushoku*, rice in particular. This tendency of dietary changes is more pronounced in Japan than in S. Korea: more concretely, per capita net supply of meat + eggs and fish was 63.9 and 71.1 kg/year, respectively in Japan, as compared to 47.6 and 50.1 kg/year in S. Korea in 1995, for example, whereas that of cereals was 122.9 kg/year in Japan, as compared to 168.5 kg/year in S. Koreain the same year (Table 3). In term of daily individual caloric intakes, S. Korea's have been a few hundred kcal/day greater since the mid-1970s than Japan's (Table 2). Traditionally, Asians do not drink much milk, as compared to

Table 2. Changes in per capita caloric intakes, from vegetal and animal products: Japan and South Korea, 1961 to 2010.

(kcal/day)

	Grand Total		Vegetal Products		Animal Products	
	Jp.	Kr.	Jp.	Kr.	Jp.	Kr.
1961	2525	2141	2274	2085	251	56
1965	2620	2367	2289	2293	331	74
1970	2737	2816	2314	2712	423	103
1975	2716	3106	2252	2939	464	167
1980	2798	3025	2261	2812	537	212
1985	2861	2951	2281	2679	580	272
1990	2948	2956	2332	2636	616	320
1995	2920	3022	2294	2609	626	413
2000	2899	3094	2296	2647	604	447
2005	2829	3102	2242	2630	586	472
2010	2685	3281	2135	2746	550	535

Sources: [4].

most Europeans. However, Japanese consumed (in terms of net supply) 86.2 kg/year of milk in 1995, substantially more than Koreans who consumed 48.8 kg/year of milk[3] in the same year (Table 3).

On the other hand, S. Koreans have consumed substantially more vegetables than Japanese since the mid-1970s, *i.e.*, per capita net supply of vegetables in S. Korea was 222.3 kg/year, as compared to 116.6 kg/year in Japan in 1995, for example. People in Korea did not eat much fruits many years ago. Per capita net supply of fruit in S. Korea was 5.2 and 9.8 kg/year, respectively in 1961 and 1965, as compared to 29.7 and 39.0 kg/year, respectively in Japan in the same years. Per capita consumption (=net supply) of fruit in S. Korea steadily increased to 14.6 kg/year in 1975 and to 69.6 kg/year in 1995, whereas that in Japan hit the peak in 1975 at 61.9 kg/year and then gradually declined to 53.2 kg/year in 1995 (Table 3). As will be discussed in detail in the subsequent section, children and young adults in Japan began to reduce their fruit consumption radically in the mid-1970s. Young people in Japan also reduced their consumption of vegetables, not to the extent of fruit, though.

3. Discussion

Comprehensive surveys of daily nutritional intakes, by major food groups, both in terms of kcal/capita and grams/capita have been conducted since the end of WW II in Japan, whereas a national health and nutrition survey [21] was first conducted in 1998 in S. Korea, followed by the second one in 2001, and the third one in 2005. In comprehending trends and differences in food consumption between Japan and S. Korea since 1960 onward, official nutrition surveys cannot meet our needs for this paper. This is the reason why we relied on [4] for the basic information concerning changes and differences in food consumption between Japan and S. Korea over the past half century, as presented in the preceding section. Regrettably, however, we used national per capita net food supply (as proxy for consumption) for the entire population, not for the growing children, in particular.

Japan's Nutrition Surveys [18] started to publish per capita food intakes by age groups in 1995 for the first time, while we may need the age-wide data for the period three decades up to 1995.

Japan's Bureau of Statistics has conducted household income and expenditure surveys [22] of approximately 8000 households across the nation, with 1/6 of the subjects replaced each month every year since 1950. [22] publishes the survey results by goods and services, such as rice, --, beef, pork, ---, fresh fruit, coffee, --, gasoline, eating-out, including expenditures for school lunch, at sushi restaurants, etc. in major cities across the country and by income classes of households. Starting in 1971, [22] published expenditures on major goods and services

[3]Per capita net supply (kg/year) of milk, excluding butter, for Republic of Korea seems to be extraordinarily under-calculated, particularly for the period after the mid-1980s, as compared to the estimates provided [19].The author calculated per capita supply of milk, excluding butter in kg/year by dividing total domestic supply as providedin [4] in 1,000 tons/year by total populationavailable also from [20].

Table 3. Changes in per capita net supply of selcetd product groups in Japan and S. Korea, 1961 to 2010.

(kg/year)

Cereals	Japan	S. Korea	Meat + Egg	Japan	S. Korea
1961	157.8	176.8	1961	16.8	5.5
1965	153.3	184.6	1965	24.6	7.1
1970	144.3	217.8	1970	34.1	9.2
1975	142.4	235.3	1975	39.2	11.8
1980	134.2	199.3	1980	46.7	19.7
1985	133.3	190.7	1985	50.8	25.5
1990	129.5	168.6	1990	57.3	33.7
1995	122.9	168.5	1995	63.9	47.6
2000	120.4	160.3	2000	64.8	57.3
2005	115.1	146.1	2005	65.9	59.9
2010	111.2	149.0	2010	66.7	70.1
Vegetable	Japan	S. Korea	**Milk***	Japan	S. Korea
1961	96.8	75.7	1961	26.2	0.7
1965	119.6	82.3	1965	40.7	3.4
1970	126.8	104.0	1970	53.5	3.8
1975	121.3	147.7	1975	53.6	5.3
1980	122.6	197.9	1980	73.7	12.9
1985	119.5	181.7	1985	79.1	25.8
1990	116.7	200.6	1990	81.8	42.1
1995	116.6	222.3	1995	86.2	48.8
2000	112.8	235.7	2000	84.0	54.0
2005	107.8	215.8	2005	79.9	54.9
2010	98.9	196.5	2010	74.0	52.8
Fruit	Japan	S. Korea	**Fish**	Japan	S. Korea
1961	29.7	5.2	1961	50.7	13.2
1965	39.0	9.8	1965	51.6	17.6
1970	53.9	12.3	1970	60.2	18.4
1975	61.9	14.6	1975	66.6	39.0
1980	55.6	23.2	1980	65.0	41.3
1985	51.9	35.2	1985	69.7	47.3
1990	50.2	47.0	1990	71.4	46.4
1995	53.2	69.6	1995	71.1	50.1
2000	51.4	69.6	2000	67.3	46.9
2005	60.3	76.1	2005	60.4	53.8
2010	49.1	67.6	2010	52.6	56.7

Sources: [4]. Note: *Derived by total domestic supply/population, provided in [20].

(prices paid and quantities, in the case of goods) by age groups of household head (HH). In the case of foods, eating-out has been on the increase lately and thus [22] does not cover most of the actual consumption of selected food items. In the case of meat, for example, FIES is estimated to cover about half of total meat consumption [23], 60% - 80% of fresh fruit [24], and 50% - 60% of vegetables [25].

Focusing just on at-home consumption of selected food products, individual consumption by age groups can be derived from [22] data classified by HH age groups, by means of the TMI model which explicitly incorporates family age composition by HH age groups [26].

M. Blum states, "The central determinants of human stature is the protein-intensity of a nation's diet. Populations consuming larger amounts of animal protein reach higher average height levels than countries with less animal protein consumption. However, a high consumption of animal proteins alone does not result in increasing body heights if the overall consumption of calories and other essential nutrients is insufficient" [2], p. 21). The author is inclined to contend that this may apply to the comparative case of child height developments between Japan and S. Korea over the past half century since the early 1960s. Ishibashi, based on the comprehensive analyses of large samples of [22] panel data since the early 1980s, Japanese youth have been consuming more meats than the older adults [27] [28]. In Japan, vegetables are believed to regulate bowel movements and fruit is called *mizikashi* (jelly desert), implying fruit consumption has nothing to do with essential nutrients. The author, however, suspects that children in Japan consumed insufficient "essential nutrients" noted by M. Blum, due to the drastically reduced consumption of fruit and vegetables[4] in the recent few decades.

[29], Ministry of Agriculture drew public attention to the widespread tendencies of *wakamono no kudamono-banare* (steering away from fruit by the young), in the 1980s and the early 1990s by displaying household fresh fruit purchases classified by HH age groups divided simply by the number of persons contained in each group. [30] designed a quadratic programming model to derive individual at-home consumption of selected food products by age from FIES, classified by HH age groups, which was statistically refined by [26].

Table 4 and **Table 5** demonstrate that Japanese youth used to eat as much fruit and vegetables as older adults in the early 1970s but began to reduce their consumption of these products in the early 1980s, while the older adults kept constant their produce consumption at high levels: for example, nearly three times higher than young people's consumption in the case of vegetables and more than five times in the case of fruit in 2000.

[4]A few recent empirical studies report that consumption of fruit and vegetables contributes to greater bone mineral accrual/density in post-menopausal females [31] [32] and also in young and adolescent children [33] [34] [35] [36]. As shown in Appendix Table 1, S. Korean youth in their 20s and 30s consume as much vegetables and fruit as the older adults in the end of 1990s and the early 2000s [37]. In the presence of robust cohort effects in food consumption [38] [39], S. Korean children are supposed to consume as much vegetables and fruit as adults in the 1980s and 1990s.

Table 4. Changes in per capita at-home consumption of fresh fruit by age groups, 1971 to 2010 in Japan.

Age/year	1971	1980	1985-86	1990	1995-96	2000	2010
0 - 9 yo	36.3	26.5	15.2	8.9	4.7	2.3	2.4
10 - 19	45.6	30.5	20.1	14.9	9.4	5.7	4.4
20 - 29	48.3	31.5	23.4	16.8	15.1	11.8	9.8
30 - 39	46.1	43.8	36.6	30.4	23.6	21.8	14.8
40 - 49	51.0	52.6	48.5	44.9	37.2	33.4	20.5
50 - 59	54.4	59.9	56.6	54.0	50.5	48.5	32.1
60 - 69	44.5	58.5	61.1	62.0	58.7	60.7	53.3
70+	41.2	54.2	59.6	60.3	62.1	65.8	58.8
Grand ave.	45.6	41.6	36.4	33.8	31.5	31.1	27.7

Sources: derived from [22] by the authors, using the TMI model. Notes: Estimated by 5 year age intervals first, which were simply averaged into 10 year intervals.

Table 5. Changes in per capita at-home consumption of fresh vegetables by age groups, 1971 to 2010 in Japan.

Age/year	1971	1980	1985-86	1990	1995-96	2000	2010
0 - 9 yo	44.8	33.7	27.3	23.0	20.2	18.3	17.5
10 - 19	62.2	51.1	44.7	38.8	36.0	30.0	30.6
20 - 29	67.8	56.1	52.5	45.5	46.2	40.8	37.6
30 - 39	68.5	65.6	60.2	54.3	52.3	49.8	45.7
40 - 49	77.4	80.3	78.2	71.7	67.3	62.0	54.7
50 - 59	89.0	90.5	91.9	84.0	83.7	82.3	66.2
60 - 69	87.5	93.3	99.0	91.2	91.0	94.0	80.8
70+	71.0	80.0	89.4	80.1	81.3	86.9	81.5
Grand ave.	67.1	63.6	62.4	58.3	59.0	57.2	55.4

Sources: the same as **Table 4**. Notes: the same as **Table 4**.

4. Conclusions and Future Research Recommendations

At age 17 - 18 years, Japanese school boys were 2 - 3 cm taller in mean height in the 1960s through 1970s, barely 1 cm taller in the 1980s than their Korean peers and they ceased to grow any taller in and around 1990, whereas Korean boys kept steadily growing in height to overtake their Japanese peers by 3 cm in the mid-2000s and ceased to grow any taller since then.

After the end of WW II, Japan and South Korea made rapid and steady economic progress, with S. Korea some two decades behind Japan due to the Korean War (1950-53). As the economy grew, food consumption remarkably improved both in quantity and quality. Particularly, intake of animal-sourced products increased conspicuously in the two countries. Yet, animal product supply per person in Japan was considerably greater, as much as 30% higher, than S. Korea in the mid-1990s.

Increases in animal protein products alone cannot explain the differences in

growth patterns of child height between the two countries. However, S. Koreans have been eating twice as many vegetables as Japanese on average and their per capita fruit consumption soared very rapidly since the mid-1970s, surpassing that of Japanese in the mid-1990s. Meanwhile, Japanese youth reduced their fruit and vegetable consumption from the mid-1970s on. This "steering away from fruit and vegetables" by Japanese youth could have contributed to the stagnation of child height growth since the early 1990s, and deserves scientific investigation.

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Conflicts of Interest

The author declares no conflict of interest.

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Appendix

Table A1. Per capita daily intakes of fruits and vegetables by age groups in South Korea, 1998 and 2001.

(1) 1 - 6 years old infants				(gr/day)
Food groups	1998		2001	
	g	SE	g	SE
Fruits	167.9	10.0	179.6	9.1
Vegetables	81.6	4.1	85.1	3.8
(2) 7 - 14 years old children				(gr/day)
Food groups	1998		2001	
	g	SE	g	SE
Fruits	201.9	10.4	197.7	9.7
Vegetables	190.6	7.0	183.1	4.6
(3) 15 - 19 years old adolescents				(gr/day)
Food groups	1998		2001	
	g	SE	g	SE
Fruits	192.2	13.7	169.6	13.1
Vegetables	227.8	6.0	234.2	7.1
(4) 20 - 29 years old adults				(gr/day)
Food groups	1998		2001	
	g	SE	g	SE
Fruits	220.4	11.4	208.6	12.1
Vegetables	299.8	6.8	297.0	6.7
(5) 30 - 39 years old adults				(gr/day)
Food groups	1998		2001	
	g	SE	g	SE
Fruits	228.8	9.8	227.0	10.4
Vegetables	345.5	6.5	361.7	7.1
(6) 40 - 49 years old adults				(gr/day)
Food groups	1998		2001	
	g	SE	g	SE
Fruits	202.9	8.5	222.4	12.4
Vegetables	360.6	9.4	369.1	7.8
(7) 50 - 59 years old adults				(gr/day)
Food groups	1998		2001	
	g	SE	g	SE
Fruits	189.7	11.2	235.4	12.6
Vegetables	337.5	7.9	349.1	8.8
(8) 60 - 69 years old adults				(gr/day)
Food groups	1998		2001	
	g	SE	g	SE
Fruits	158.6	11.6	210.2	14.1
Vegetables	306.6	8.4	355.9	10.1