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Review Article

Secular Trend in Height of Japanese in The Past Century-How to Read Different Sources of Data

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Abstract

In Northeast Asia, Japan suffered severely in WWII but recovered swiftly to the pre-war level in 1955 and kept growing steadily to the level of the Western nations toward the end of the century. South Korea did not suffer much in WWII but the whole nation was devastated by the Korean War (1950-53). Children in Japan started to grow taller at a fast rate since the early 1950s but plateaued in all ages in the end of the 1980s, despite the continued increases in consumption of animal products. Children in South Korea caught up to Japanese peers in height in the mid-1990s and overtook Japanese peers by 3.0 cm in the mid-2000s and then plateaued in the midst of economic prosperity. Based on scant observations of young men's height between the two nations in the pre-war periods, the 3.0 cm differences in height of young men are often attributed to differences in "gene potential in reserve" (Kopczynski) between the two nations.

Arithmetically, those in their 40s in 1950 were in their 30s in 1940 and 20s in 1930, respectively. Men do not grow taller or shrink in mean height after the age of 20 until 49. Japanese government Ministry of Health initiated large scale national health surveys in 1948, which examined the stature of men and women of all ages, from 0 to 1, 2, --, 25, 26~29, 30~39, --up to70~, in addition to nutritional intakes. In this article, the careful identification of mean height of men in their 40s and 50s in 1950 is undertaken, supplementally 50s in 1955 and 1960, in order to arithmetically estimate how tall in height the young men in Japan in their 20s were in 1930 and 1940, pre-war periods. Asians differ from Caucasians in respect to head structure, eye color, hair color, etc. Are Koreans different from Japanese? Are the differences in mean height of late-teens between the two countries observed in the 2000-2010s to be attributed to ethnicity? If young men in Korea proved to be a couple of centimeters taller in mean height than Japanese peers in the prewar years, the evident differences in mean height of late-teens in the mid-2000s should not be attributed to genetics (Review of critical periods, 2022). Reliable data on the mean height of young men in prewar Japan could contribute to scientific anthropological investigations.

Keywords: Height, Japanese, Post-war years, Nutrition Surveys, School Health Surveys

Introduction

Before the end of the war in 1945, most male youths in Japan were subjected to conscript-physical examination at age 20. Statistical data on these conscripts were only available to privileged institutions. The Ministry of Education started in 1900 to publish *School Health Examination Surveys* every school year, including all schools, from primary schools to colleges, by age 6 to 21-2, except a few years during WWII. Before the end of the war, middle schools were not compulsory and percentages of primary school graduates entering middle schools, 1st to 5th grades (under the school system in pre-war years), were less than 30%. The mean height of school children at age 16 years old, 5th graders, as reported should have been slightly upward biased, say by 1-1.5cm. The mean height of freshman to sophomore at colleges, 18 to 20 in age, should have been slightly more upward biased then, because only well-off families could afford to send their children to the higher education (5-6 % of teenage boys in the 1930s).

Japan' Ministry of Health and Welfare initiated *National Health and Nutrition Surveys* in 1946 at the order of the Occupation Forces, to comprehend the near-starvation situation, particularly in urban areas, which covered physical stature along with nutritional intakes [1]. The surveys were conducted twice a year for the first several years, in which physical conditions, height and weight by age, from

1 through 70s were published: 1 to 25 by every year of age, 26-29, 30-39, and so on by multiple year cohorts. The surveys were conducted on any one day, excluding holidays and Sundays in May and/or November, on some 7,000 randomly chosen households, including rural areas nationwide. Nutritional intakes were reported on a simple per capita household basis for a long time and intakes by age groups, 1~6, 7~14, 15~19, 20~29, and so on were published only in 1996 and afterward. Although the survey sample size is large, mean height by every year in age up to 25 fluctuates widely in *Nutrition Surveys*.

In that respect, mean height by grades or age (primary school 1st graders = 6 y-old, middle school 1st graders =12 y-old) in *School Health Surveys* Proved statistically quite stable, due to a huge size of samples but the survey covers only 12 years of age from 6 to 17 y-old [2]. In human biology, "the first years of life" are regarded critical for future adult height, although male children grow another few centimeters in late adolescence in European countries. In the Dutch height growth studies, for example, the data from 1 to 20 years of age are provided (Mori, 2011). In comparing Japan and South Korea in respect of children's height development, the author has been relying mainly on *School Health Surveys* in both countries, mainly due to the same survey format and the easier accessibility. In consideration of "early years of life" and growth in late adolescence (i.e.,18-20), *Nutrition Surveys* may need to be considered, in discussing trends in men's adult height in different countries and periods.

[1]1946-47 Surveys cover only weights. Height was published only in the 1948 issue and on.

[2]Mean height of college students was not published after 1971.

Discussions

Both *National Health and Nutrition Surveys* and *School Health Surveys* cover the entire nation, urban and rural areas. *School Surveys* have drastically reduced the number of selected schools in recent years but even in the year of 2020, the number of selected schools were 7,755 and 695,600 students were examined for stature and 3,345,921 students were examined for health conditions. In respect of sample size, *Nutrition Surveys* are substantially smaller: 2,324 males and 2,697 females in 2019 [3]. *School Surveys* quit examining colleges, commencing in 1972 school years, providing very stable statistics for 6 grades in primary schools, 3 grades for middle schools, and 3 grades for high schools, i.e.,12 age groups, from 6 to 17 years old, but provide no statistics for "earlier years of life", or "first 1,000 days" (A. Deaton, 2007; A. Prentice, et al.,2013), and late adolescents, 18 and 19 years of age, where boys still keep growing in height. *Nutrition Surveys* provide mean height of every year of age from 1 to 25, then 26~29, 30~39, 40~49, --. Boys grow bigger in stature after age 20, but rarely grow taller in height [4].

So, if we group each age groups from 21 to 25 into one age group, 21~25, larger in sample size and stabler in annual variation, we can check if mean height at age 17 in the year 2000 should be reasonable, by comparing it with the average height of those 21~25 in 2005, and as compared to mean height of 26~29 in 2009-10. Mean height of age 17 in 2000 can never be taller than average height of 21 through 25 in 2005. If so, it may be reasonable to surmise that mean height of 17 years old, as reported in *2000 Nutrition Survey* should have been overestimated. As mentioned earlier, *Nutrition Survey* started to publish mean height by age in the 1948 issue. *School Health Survey* was initiated in 1900 and kept publishing mean height of students by age from 6 to 21, except for several years during WWII. Before the war, primary school graduates entering middle school were far less than 50% and middle school graduates moving into higher education were far lower than one half. *School Health Surveys* provide secular trends in height of 18 to 21, in precise detail but should contain significant upward biases, because college students were mostly from the upper-middle or higher-income groups.

In the mid-1920s, male freshmen in college were 160.6 cm and 5th graders in middle school were 158.8 cm, respectively, in mean height, based on *School Surveys*. The author has no idea of how much of the 1.8 cm difference represents age effects from 16 to 17 years and welfare effects from middle to upper middle classes, although he is certain that Japan's late teens should have been lower than 160.6 cm in mean height then [5]. Arithmetically, those in their 40s, 40~49 years old, in 1950, for example, were in their 30s in 1940, and in their 20s in 1930, respectively. One does not grow taller or shrink in height, between one's 20s and the 40s. If mean height of 40s, 41~49, was measured at 160.0 cm in 1950, mean height of 30s in 1940 and 20s in 1930, respectively were the same at 160.0 cm, unless the shorter or the taller in the same generation tended to fade away during the periods in question.

In order to examine the plausibility of the statistical data, already published, say mean height of males in the age group, 26~29, in 1980, reported at 167.24cm, we find the mean height of the 30s, 30~39, in 1990 at 168.65 cm, possibly because the younger segment of the 30s, 30~34, were more than 1.0 cm taller than the older segment, 35~39. Mean height of 25~29 in 1995 was 171.3 cm and mean height of 30~39, is published as 171.0 and 171.6 cm, in 2000 and 2005, respectively. It may be safe to conclude that the cohorts in question were 171.0+0.2-3 cm in mean height during their young adulthood [6]. The author is now pleasantly realizing the usefulness of *National Health and Nutrition Surveys* which could be extrapolated to imply the pre-war year periods, when no nationwide health surveys were conducted, except for *School Health Surveys*. We can use adult height data to infer what height these cohorts reached in the years before 1948, despite the lack of direct data.

[3]No surveys conducted due to the pandemic in 2020. *[4]1945 male birth cohorts increased by 1.6cm in mean height from high school juniors (age 16) to high school seniors (age 17), from 1961

to 1962, whereas 2000 birth cohorts increased only by 0.8 cm from 16 to 17 *(School Survey, 2018).*

In place of conclusion: how tall were the young men in height in pre-war years?

Men rarely grow taller or shrink in height in their 20s through 40s. Men keep their height at their 20 years' birthday for the following some 30 years unchanged to their early 50s even under poor/ rich conditions. If you, 50 years of age in the year of 1950, were 159 cm in height, one can guess that you were 159 cm tall in 1940 and the same in 1930 in height, but cannot tell how tall you were in 1925, when you were 15 years of age, although one can tell how tall you were 25 years old in 1935. This is a simple human arithmetic. As mentioned earlier, *National Nutrition Surveys* provide mean height of both sexes by age, (0), 1, 2, --,19,20, 21, 22, 23, 24, 25, 26~29, 30~39, 40~49, ---, 70~, every year from 1948, 1949 and on. In the case of the May, 1948 survey, the size of samples, by age from 0 to 20, averages 400; 21 to 25, averages 220; 26~30 was 837; 31~40 1,739; 41~50 1,763, --for male subjects.

The size of samples was reduced for later years to average 150 per age for 1 through 15; 80 per age for 16 through 25; 433 for 26~29; 1,034 for age 30~39; 1,040 for 40~49; 671 for 50~59, so forth in the case of male subjects. The practical way to remedy the smaller size of samples is to group age 21 through 25 into 21~25, or 21~29, and take 3 year moving averages over time [7]. Table 1 provides secular trends in average height of male subjects by age, from 6 to 21, derived from *Nutrition Surveys* in the upper branch and those by school grades from 1st grade in primary school (age 6) to 3rd grade in high school (age 17), *School Surveys* in the lower branch, from 1950 to 2015 in 3 year moving averages, respectively. Mean height of high school seniors is 161.7 cm in 1950, 2.7 cm taller than 159.0 cm derived from *National Nutrition Surveys* in the same year. The differences decreased to 1.8 cm in 1960, nearly zero cm in 1980 and 2000 and slightly negative toward the end of survey period, 2015. Judging from the upper branch of the Table 1, *Nutrition Surveys,* Japan's teens seem to grow by some 1.0 cm taller from age 17 to 20, although some statistical errors are involved.

Table 1: Secular Changes in Mean height of Young Japanese Males by Age, Two Major Sources, 1950 to 2015.

(Age/Year)	1950	1955	1960	1965	1975	1985	1995	2005	2015
6	108.4	109.7	110.6	113.2	114.6	115.4	116.1	116.2	116.4
7	113.6	114.9	116.7	118.5	120.8	120.8	121.9	121.6	121.8
8	118.2	117.8	121.5	123.8	126.0	126.5	127.3	127.9	126.9
9	122.7	124.4	126.4	128.5	131.2	131.5	132.9	133.2	134.1
10	126.8	129.1	130.9	133.2	136.3	137.2	138.7	138.3	138.3
11	131.1	133.6	135.8	138.6	140.9	142.9	144.1	144.2	145.4
12	135.8	138.4	141.1	144.5	147.7	149.1	151.3	151.5	152.5
13	141.3	144.2	147.5	151.8	154.9	157.0	158.9	159.4	158.7
14	147.0	151.0	153.8	157.9	161.5	163.5	164.3	164.7	164.2
15	152.6	156.1	158.5	162.3	165.3	166.4	168.3	168.0	166.6
16	156.6	159.5	161.0	164.6	166.5	168.5	169.8	169.4	169.2
17	159.0	160.9	163.1	165.8	167.9	169.5	170.8	171.6	171.7
18	160.4	162.0	162.8	166.0	168.0	169.6	170.9	171.0	171.3
19	161.0	162.3	163.2	165.7	168.8	171.0	172.0	171.7	173.7
20	161.5	161.8	162.4	165.2	167.0	170.7	170.8	170.9	172.5
21	161.9	162.1	162.4	165.3	167.4	170.0	171.2	172.0	171.1

A: Nutrition Surveys (cm).
Sources: Ministry of Health and Welfare, National Health, and Nutrition Surveys, 1949 to 2016.

B: School Surveys (cm)

(Age/Year)	1950	1955	1960	1965	1975	1985	1995	2005	2015
6	108.8	110.3	111.7	113.4	115.2	116.4	116.8	116.7	116.5
7	113.7	115.5	117.0	118.8	120.8	122.1	122.6	122.5	122.5
8	118.5	120.4	122.0	124.0	126.3	127.5	128.1	128.2	128.1
9	122.9	125.1	126.8	128.8	131.4	132.7	133.5	133.6	133.6
10	127.1	129.6	131.6	133.6	136.5	137.7	138.9	138.9	138.9

11	131.2	134.0	136.3	138.6	141.9	143.3	144.9	145.1	145.2
12	135.9	139.1	141.7	144.7	148.6	150.1	152	152.6	152.6
13	141.4	145.2	148.4	151.8	156.0	157.6	159.5	159.9	159.8
14	147.5	151.5	155.0	158.2	162.2	163.8	165.1	165.3	165.1
15	155.0	158.6	161.2	163.5	166.1	167.5	168.4	168.4	168.3
16	159.3	161.6	163.6	165.7	167.9	169.3	170.1	170.0	169.8
17	161.7	163.4	164.9	166.7	168.8	170.2	170.9	170.8	170.7

Sources: Ministry of Education and Sciences, *School Health Surveys*, 1949 to 2016.
B: School Surveys (cm)

Notes: Every year denotes three year moving average, like 1950=average (1949:1951).

Table 2: Secular Trends in Mean Height of Males by Age Groups in Japan, from 1950 to 2018.

Age/Year	1950_3y	1955	1960	1965	1975	1985	1995	2005	2018
1	74.7	76.7	77.8	79.5	80.2	80.4	80.5	80.0	79.3
6	108.0	109.7	110.6	113.2	114.7	115.4	116.1	116.2	115.8
12	135.2	138.4	141.6	144.5	147.5	149.2	151.3	151.5	150.6
17	158.5	160.9	163.1	165.8	168.0	169.5	170.8	171.6	170.9
20	161.3	161.8	162.4	165.2	166.8	170.7	170.8	170.9	170.3
21~25	161.6	162.1	163.0	164.7	167.1	169.8	171.3	171.5	171.7
26~29	161.0	162.1	162.1	163.7	165.8	169.3	170.9	171.5	171.5
30~39	160.3	160.8	161.7	162.7	163.6	167.6	170.2	171.7	171.6
40~49	159.0	159.6	160.0	161.1	162.1	164.6	167.9	170.1	171.3
50~59	157.7	158.2	158.7	159.2	160.5	162.3	164.6	167.4	170.3

Sources: Ministry of Health and Welfare, *National Healthe and Nutrition Surveys*, various issues.
Note: every year represent 3 year moving average, like 1960=average (1959:1961).

Table 2 provides the author's elaborate estimation of mean height of Japan's middle-aged males in their 40s and 50s during the immediate post-war years, 1949~1951. Simply, those in their 40s in 1950 were in their 30s in 1940 and in their 20s in 1930. Those in their 40s in 1955 were in their 30s in 1945 and in their 20s in 1935. It seems statistically safe to conclude that Japanese male youth in their 20s were very close to 160.0 cm in mean height in the mid-1930s, apparently taller than 159.0 cm. When the author was in his late teens in 1950, teens were short around 159 cm, as tall as their fathers. Younger generations grew fast and steadily to 171 cm, 5-7 cm taller than their fathers in the mid-1980s. Japanese teens plateaued in height in the early 1990s and their fathers born after the 1960s have aged to their 50s. Now in the late 2010s, sons are not any taller than their fathers in their 40s and 50s.

Until some years ago, the author held an intuitive belief that the newer generations are taller in mean height than the older ones, i.e., sons are taller than fathers even in the developed societies, including the United States and countries in Northern Europe. In post-war Japan, late-teens were not appreciably taller than their fathers in the immediate post-war period, but in 1970s through 1990, sons in their late-tens were 6 cm taller than their fathers in mean height but toward the end of 2010s, sons are not taller at all than their fathers. Data from Japan's *National Nutrition Surveys* confirm that generations are not the key determinants of human heigh. Based on the 1949 survey, which provides mean height of subjects by urban and rural areas, men in their 30s and 40s in urban areas were 161.0 and 159.5 cm, compared to 159.9 and 158.9 cm for rural peers in the same year, respectively.

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