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# School Children's Height in Beijing

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## 1. Introduction

This joint report by a group of noted human biologists in Beijing examines secular growth of school boys and girls, 7 to 17 years of age, in Beijing, over the half century, 1955 to 2010, by 10 year interval, based on derived data from published researches for the period of 1955 to 1975 and Chinese National Surveys of Students Constitution and Health for the rest of the period. The report places the greatest concerns on statistical developments in height and weight and accrued BMI among children in Beijing, with little interest on "inputs to health", such as school lunch programs, gymnastic programs and so force, and to the reviewer's regret, changes in per capita consumption of selected food products, such as meat, milk, vegetables by age groups of children, 0~4, 5~9, 10~14, 15~19(Mori, 2022[3]).

As shown in Table 1, as transcribed from Table 1, EHB, with SD omitted, the average height of 17-year-old boys reached 175.4 cm in 2010, not quite that of their American counterparts (176.3 cm) but greater than that of 17-year-old boys in European countries lying along roughly the same latitude as Beijing, such as France (174.1 cm), Italy (174.48 cm) and Spain (175.3 cm), and significantly taller than those in Japan (170.7 cm) and South Korea (173.4 cm) (Mori, Cole and S. Kim, 2021[4]) As for the 17-year-old girls in the study, the trend was the same, with one exception: there was no significant difference between their average height and that of their American counterparts(p.214).Female late teens in Beijing proved not shorter in mean height than their American peers in 2010(p.214).

Those boys in age 17 were 168.7 cm in 1975, 0.1 cm shorter than in 1965; those girls in 14-15 years of age in 1975 were slightly shorter than in 1965, for example, consequences of the Great Famine, caused by the Great Leap Forward (1958-60). On the other hand, children in all ages in 1985 are substantially taller than those in 1975, either sex, partially reflecting "compensatory growth" (p.215, left column; Mori, 2018[5]). The reviewer won't argue. As mentioned at the outset, the data for the period, 1955 to 1975 were derived from published researches. In analyzing the growth development of urban children's height in China, C. Tian and JIC Ye, 2013[6], classified urban China into three groups, Group I (coastal big cities), II (other big cities), and III (moderate and small cities). Beijing is included in Group I, which is known for the better socioeconomic development than the rest of city groups.

Table 2, based on FAOSTAT food balance sheets [7]*1, demonstrates that per capita supply of cereals, meat & fish, egg & milk, vegetables & fruit, in terms of kg/year, changed from 131.4, 15.9, 4.5, 52.6 in 1973 to 174.3, 22.4, 7.0, 76.3 in 1983, with animal products increased only slightly in China between the early 1970s and the early 1980s, as compared to the later periods. Seemingly large increments in children's height by age groups between 1975 and 1985 should have come from inconsistent data sources to unignorable extent.

*1 FAOSTA started publishing food balance sheets in 1961.

**Table 1:** Secular changes in height by age and sex of children in Beijing (cm)

| Age (year) | 1955 mean | 1965 mean | 1975 mean | 1985 mean | 1995 mean | 2005 mean | 2010 mean |
|---|---|---|---|---|---|---|---|
| Boys | | | | | | | |
| 7 | 118.6 | 120.3 | 123.0 | 124.8 | 124.8 | 128.2 | 129.5 |
| 8 | 121.8 | 123.6 | 127.5 | 128.6 | 131.1 | 133.7 | 135.0 |
| 9 | 127.3 | 129.4 | 132.0 | 135.0 | 136.3 | 139.3 | 139.8 |
| 10 | 132.5 | 134.4 | 135.6 | 139.9 | 141.9 | 145.0 | 146.2 |
| 11 | 135.8 | 138.1 | 139.9 | 144.5 | 147.9 | 151.5 | 150.3 |
| 12 | 142.4 | 143.4 | 146.1 | 150.2 | 153.6 | 158.1 | 159.6 |
| 13 | 148.0 | 149.5 | 152.0 | 159.4 | 162.8 | 164.5 | 165.8 |
| 14 | 155.5 | 156.7 | 158.1 | 166.6 | 167.8 | 170.4 | 171.7 |
| 15 | 161.0 | 162.2 | 163.7 | 170.4 | 171.0 | 172.5 | 174.9 |
| 16 | 165.3 | 166.0 | 168.0 | 171.6 | 172.5 | 173.5 | 174.8 |
| 17 | 166.7 | 168.8 | 168.7 | 173.1 | 173.4 | 173.5 | 175.4 |
| Girls | | | | | | | |
| 7 | 117.9 | 119.1 | 121.9 | 122.9 | 124.6 | 126.4 | 128.1 |
| 8 | 121.1 | 122.3 | 126.8 | 128.4 | 130.0 | 132.8 | 133.1 |
| 9 | 126.3 | 127.7 | 131.3 | 133.5 | 136.6 | 137.8 | 138.8 |
| 10 | 131.8 | 133.0 | 137.4 | 140.3 | 141.7 | 145.8 | 146.1 |
| 11 | 136.2 | 139.0 | 142.8 | 147.8 | 148.3 | 151.1 | 152.1 |
| 12 | 143.1 | 145.0 | 148.9 | 152.8 | 153.3 | 156.2 | 158.0 |
| 13 | 149.0 | 150.9 | 152.4 | 158.3 | 158.9 | 159.2 | 160.8 |
| 14 | 152.5 | 154.8 | 154.4 | 159.2 | 160.2 | 160.2 | 161.6 |
| 15 | 153.8 | 156.9 | 156.8 | 159.7 | 160.8 | 161.6 | 162.3 |
| 16 | 155.6 | 157.2 | 158.7 | 160.7 | 160.1 | 160.9 | 163.4 |
| 17 | 156.7 | 158.0 | 157.7 | 161.1 | 160.8 | 162.6 | 162.6 |

Sources: R. Lu et al./E.H.B. 21, p.212.

## 2. Points of Interest

It is widely taken that Asians should be appreciably shorter genetically in height than Europeans (Gerald J. van den Berg et al.,2011[8]). In the end of the 19th century, the Dutch, the currently the world tallest, the young men at 183 cm, were recorded 167 cm, only 1.5 cm taller than the French counterparts (Mori, 2022, FNS [9]). The average Indonesian young men are 161.5 cm in 2010(Mori, South East Asia, 2022[10]). As we will see below, Indonesia is substantially lower than China, South Korea and Japan in respect of per capita supply of meat-fish, milk-eggs, vegetables-fruit in 2000~2010 (Table 2).

What is concerned in the leading countries lately in Asia is obesity: should children eat more animal products, without reducing cereals, they would grow bigger, not taller in height but heavier in weight (Tables 3). In S. Korea,17-year-old boys were 173.0 cm in height, 65.3 kg in weight in 2000, 173.8 cm in height, 68.1 kg in weight in 2010, and 173.7 cm in height and 71.1 kg in weight in 2017, accompanied by steadily increasing BMI from 21.8, 22.6 and 23.4, accordingly. On the other hand, in the case of children in Beijing, 17-year-old boys were 173.4 cm in height and 63.4 kg in weight in 1995, 173.5 cm and 67.6 kg in 2005, and 175.4 cm and 66.8 kg in 2010, resulting in 21.1, 22.4, and 21.7 in BMI, accordingly.

The report attributes these stable BMI in the case of children in Beijing to the city government's guidance in promoting physical activities in and out school. The reviewer has come across reports on prohibition of soft drink vending machines on the public-school campuses to successfully keep children away from sugar-rich products in several cities in US. The audience should be impressed to realize that China has been very low in per capita consumption of sugar: one tenth that of USA and one fifth that of South Korea in 2010 (Table 4). A boy, 70kg in weight, consumes approximately 350 kcal, when he jogs half an hour. Per capita supply of sugar, 368 kcal/day in South Korea in 2010, should be equivalent to running about 5 km/30 minutes. If one takes one or two cans of naturally sweetened soft drinks, without matching physical exercises, increases in BMI will be natural outcomes. Soft drinks are more than good for thirsty throat but most effective in putting up body weights. Encouraging various sports in and out school curriculums should be accompanied by sufficient dressing facilities for students.

As the economy expands, food consumption tends to increase, animal products, in particular. Japan and South Korea have successfully met the increasing demands for meat and milk in two

ways: importing feed grains and finished products; meat and dairy products from overseas. China is very large in population: 1,062 million in 1985 and 1,360 million in 2010, as compared to 120 and 127 million (Japan) and 40.5 and 48.5 million (S. Korea), respectively. As shown by Table 5, China has managed to feed their people, without heavily relying on imports from overseas. Administrators and farming communities in China should be congratulated for their achievements in successfully keeping high and robust self-sufficiencies in the basic food supply.

## 3. Supplemental Comments—Growth Examined in Practice: Cross-Sectional vs Longitudinal

One born in 1978, for example, grew to one year old in 1979, 7-year-old in 1985, --, 17-year-old in 1995. To determine growth from 7-year-old to 17-year-old, say in 1995, it is preferable to compare 17-year-old in 1995 with 7-year-old in 1985, following the same birth cohort. In practice where students' health examination surveys take place every 10 years, longitudinal data are not available. In most developed/stabilized countries, including Japan, no big differences accrue, whether longitudinal data or cross-sectional data applied. The reviewer suspects, however that unmissable differences might accrue, in two approaches in the case of China, rapidly expanding socio-economic societies (Mori, Growth Charts-Curves, 2022[11]). What the reviewer could suggest is simple: compare 7-year-old in 1975 with 17-year-old in 1985, diagonally, tracing the same birth cohort, born in 1968. In human biology, the importance of "early years of life" is emphasized in determining future adult height (Cole and Mori, 2017; A. Deaton, 2007[12;13]).

**Table 2:** Changes in per capita supply of major food products (kg/year)

| | China | Indonesia | S. Korea | Japan |
|---|---|---|---|---|
| Cereals | | | | |
| 1963 | 108.9 | 106.2 | 177.6 | 159.0 |
| 1973 | 131.4 | 140.8 | 233.7 | 143.5 |
| 1983 | 174.3 | 165.3 | 195.1 | 131.3 |
| 1993 | 164.9 | 176.5 | 165.2 | 126.7 |
| 2003 | 154.8 | 173.4 | 149.7 | 116.0 |
| 2008 | 149.2 | 179.8 | 144.0 | 111.0 |
| meat&fish | | | | |
| 1963 | 11.3 | 13.9 | 19.2 | 60.3 |
| 1973 | 15.9 | 14.1 | 40.7 | 89.6 |
| 1983 | 22.4 | 18.7 | 62.8 | 98.8 |
| 1993 | 46.1 | 26.5 | 85.3 | 109.2 |
| 2003 | 73.0 | 31.2 | 103.5 | 110.3 |
| 2008 | 85.1 | 36.2 | 115.4 | 101.8 |
| egg&milk | | | | |
| 1963 | 4.5 | 3.6 | 4.5 | 44.8 |
| 1973 | 4.5 | 4.6 | 7.8 | 69.6 |
| 1983 | 7.0 | 9.6 | 20.1 | 86.8 |
| 1993 | 15.8 | 8.4 | 29.4 | 101.8 |
| 2003 | 32.7 | 12.4 | 38.9 | 98.7 |
| 2008 | 46.4 | 15.4 | 37.6 | 94.0 |
| vege&frut | | | | |
| 1963 | 68.7 | 39.4 | 82.6 | 148.0 |
| 1973 | 52.6 | 47.4 | 121.2 | 187.5 |
| 1983 | 76.3 | 43.3 | 224.1 | 174.2 |
| 1993 | 149.4 | 55.3 | 266.3 | 166.2 |
| 2003 | 322.2 | 85.3 | 285.7 | 163.3 |
| 2008 | 378.4 | 102.8 | 294.2 | 157.8 |

Sources: FAOSTAT, Food Balance Sheets.

Notes: each year 3 year moving average, like 1963=averae(1962:1964).

**Table 3:** Secular Changes in BMI, S. Korea and Japan, 1970-2017

| **S. Korea** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Boys _age | (cm) | (kg) | **1970** | (cm) | (kg) | **1980** | (cm) | (kg) | **1990** |
| years old | height | weight | BMI | height | weight | BMI | height | weight | BMI |
| 6 | 112.9 | 19.3 | 15.3 | 116.8 | 20.6 | 15.5 | 118.0 | 21.0 | 15.4 |
| 12 | 143.7 | 36.7 | 17.8 | 146.6 | 36.8 | 17.3 | 150.0 | 41.0 | 18.3 |
| 17 | 165.9 | 56.6 | 20.5 | 168.9 | 58.6 | 20.7 | 170.0 | 61.0 | 21.2 |
| Boys_ age | (cm) | (kg) | **2000** | (cm) | (kg) | **2010** | (cm) | (kg) | **2017** |
| years old | height | weight | BMI | height | weight | BMI | height | weight | BMI |
| 6 | 120.1 | 23.3 | 16.2 | 121.8 | 24.9 | 16.7 | 120.4 | 24.2 | 16.7 |
| 12 | 154.9 | 47.4 | 19.8 | 157.9 | 51.7 | 20.7 | 157.3 | 52.2 | 21.1 |
| 17 | 173.0 | 65.3 | 21.8 | 173.7 | 68.1 | 22.6 | 173.7 | 71.1 | 23.4 |
| **Japan** | | | | | | | | | |
| Boys_age | (cm) | (kg) | **1970** | (cm) | (kg) | **1980** | (cm) | (kg) | **1990** |
| years old | height | weight | BMI | height | weight | BMI | height | weight | BMI |
| 6 | 114.2 | 20.6 | 15.8 | 115.8 | 20.8 | 15.5 | 116.8 | 21.5 | 15.8 |
| 12 | 146.5 | 38.1 | 17.8 | 149.8 | 41.4 | 18.5 | 151.4 | 43.5 | 19.0 |
| 17 | 167.6 | 58.1 | 20.7 | 169.7 | 60.6 | 21.0 | 170.4 | 62.0 | 21.4 |
| Boys _age | (cm) | (kg) | **2000** | (cm) | (kg) | **2010** | (cm) | (kg) | **2017** |
| years old | height | weight | BMI | height | weight | BMI | height | weight | BMI |
| 6 | 116.7 | 19.2 | 14.1 | 116.7 | 21.4 | 15.7 | 116.5 | 21.4 | 15.8 |
| 12 | 152.9 | 45.4 | 19.4 | 152.4 | 44.1 | 19.0 | 152.7 | 44.0 | 18.9 |
| 17 | 170.8 | 62.6 | 21.5 | 170.7 | 63.1 | 21.7 | 170.6 | 62.6 | 21.5 |

Sources: Calculated by the author, using School Health Survey data.

**Table 4:** Per capita supply of sugar in China, Indonesia, Japan, S. Korea, and USA, 1963~2017 (kcal/

| | China | Indonesia | Japan | S. Korea | USA |
|---|---|---|---|---|---|
| 1963 | 22 | 107 | 186 | 17 | 509 |
| 1973 | 33 | 112 | 293 | 89 | 585 |
| 1983 | 60 | 152 | 313 | 168 | 541 |
| 1993 | 55 | 137 | 302 | 292 | 612 |
| 2003 | 66 | 160 | 285 | 343 | 651 |
| 2008 | 67 | 134 | 269 | 330 | 578 |
| 2010 | 66 | 169 | 246 | 368 | 580 |
| 2017 | 73 | 247 | 244 | 451 | 598 |

Sources: FAOSTAT, Food Balance Sheets, Old methodology and New one for 2010~2017.
Notes: 3 year averages, like 1963=average(1962:1964).

**Table 5:** Changes in dependency on imorts: cereals, meat, milk, and (vege+fruit): China, Japan and S. Korea, 1965~2010 (%)

| | China | Japan | S. Korea |
|---|---|---|---|
| cereals | | | |
| 1965 | 4.5 | 46.5 | 11.8 |
| 1975 | 1.9 | 64.0 | 31.1 |
| 1985 | 2.1 | 73.7 | 52.4 |
| 1995 | 5.6 | 76.1 | 67.7 |
| 2005 | 1.7 | 79.7 | 74.8 |
| 2010 | 1.4 | 79.0 | 77.6 |
| meat | | | |
| 1965 | 0.0 | 9.6 | 0.0 |
| 1975 | 0.0 | 16.3 | 7.3 |
| 1985 | 0.0 | 16.3 | 2.6 |
| 1995 | 0.6 | 43.6 | 18.3 |
| 2005 | 0.8 | 49.9 | 31.5 |
| 2010 | 1.2 | 47.9 | 30.8 |
| milk | | | |
| 1965 | 0.1 | 20.1 | 86.6 |
| 1975 | 0.0 | 17.7 | 12.3 |
| 1985 | 4.4 | 23.5 | 6.4 |
| 1995 | 2.8 | 23.1 | 9.6 |
| 2005 | 3.2 | 19.4 | 17.0 |
| 2010 | 8.3 | 19.0 | 21.3 |
| | | veg+fruit | |
| 1965 | 0.1 | 3.2 | 0.0 |
| 1975 | 0.2 | 7.5 | 0.2 |
| 1985 | 0.0 | 10.5 | 1.0 |
| 1995 | 0.1 | 24.6 | 7.8 |
| 2005 | 0.3 | 34.8 | 12.7 |
| 2010 | 0.5 | 33.2 | 16.0 |

Sources: FAOSTAT, Food Balance Sheets.

**Supplementary Table:** Average Caloric Supply from Animal Products and Cereals: China, USA, Japan ans S. Korea (kcal/day).

| | China | S.Korea | Japan | USA |
|---|---|---|---|---|
| | animal products | | | |
| 2000 | 508.0 | 449.0 | 600.3 | 1020.7 |
| 2005 | 588.0 | 475.0 | 577.7 | 1047.0 |
| 2010 | 681.7 | 544.7 | 549.0 | 993.0 |
| | Cereals | | | |
| 2000 | 1545.3 | 1491.3 | 1117.0 | 837.3 |
| 2005 | 1460.7 | 1371.3 | 1078.7 | 808.3 |
| 2010 | 1436.0 | 1412.3 | 1046.0 | 801.3 |

**Brief Supplements**

Authors are all medical researchers. One of their greatest concerns lies understandably in the worldwide tendency of children's overweight. The reviewer came across a short statement, p.215, left-hand column, the 2010 *China Health and Nutrition Survey* showed that over the previous eight years Beijing's residents decreased their consumption of oil, animal products, and cereals by 33.7%, 27.6%, and 15.4%, without modifying their consumption of vegetables and fruit (Beijing Municipal Government, 2014). The drastic reduction of animal products, in particular, is not confirmed by FAO's *food valance sheets*, attached. In the realm of human biology, animal protein should be one of the key determinants of adult height. The reviewer assumes that the authors of the report may not disagree.

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