"The Biological Standards of Living in China during the Maoist Period (1950-76)"
The Biological Standards of Living in China
during the Maoist Period (1950-76)

Roser Alvarez Klee
University of Barcelona

PRELIMINARY DRAFT,
PLEASE DO NOT CITE

Abstract

The aim of this article is to analyze the trend in the biological standards of living in China during the Maoist period and the existent inequality in the country in terms of nutritional status. In order to answer these questions we use the mean height of adult cohorts born between 1950 and 1976 as a measurement of health using the data of the CHNS. Results conclude to three major findings. First, there was a representative increase of the biological standards of living during the Maoist period. However, there was also an increase of the inequality gap between the urban and rural populations, as well as between the male and female populations. Second, we have calculated a height variation of 8.5 cm between the rich and poor regions in China. Third, contrary to previous publications, the Cultural Revolution is the period with highest deterioration of the biological standards of living.
1. Introduction

The establishment of the People’s Republic of China (PRC) in 1949 represented an era of change for the history of China. After the economic decline since the end of the Qing Dynasty in the 19th century and the constant internal conflict in the first half of the 20th century, the main objectives of Mao Zedong was to raise the living standards and overcome inequality nationwide. In order to accomplish such objectives, the Chinese Communist Party (CCP) followed the USSR model and centralized the economy. Therefore, the new Chinese government concentrated on the development of the heavy industry to overtake the British in terms of economic growth, established a land reform and developed the agricultural sector in order to feed its people and support the industrial sector, and finally, established a universal education and health system.

While many of the policies established during this period have been proven to be a failure such as the commune system during the GLF and the education system during the Cultural Revolution (CR), many other positive outcomes can be attributed to this period. In the decade of the 1980s, international health agencies claimed that the nation had taken the path of the epidemiologic transition by reducing communicable diseases, especially since the mid-1970s. The success was attributed to the great improvement in the health system with lower income that any industrialized country in the past, and such accomplishments were described as unique realizations in the developing world.\(^1\) In general terms, outstanding improvements in health were achieved during the Maoist period (1949-76) at a national level. From 1949 to 1976 death rate and birth rate were reduced from 18 per mil to 7 per mil and from 37 per mil to 18 per mil, respectively. Also remarkable results were represented in the decline of child mortality from 138 per mil to 52 per mil and the increase of life expectancy from 44 years to 68 years.\(^2\)

---

2. White (1998)
In this article we use the stature of the Chinese population to measure the standards of living during the Maoist period. The mean height of the population allows us to understand the nutritional status of a certain population. Therefore, as a measure of health, human stature gives us the information not only of the supply to economic inputs, but also its demand.\(^3\) There are two main questions we will respond in this study. First, did the biological standards of living increased during the Maoist period? Second, did the inequality gap narrowed down during this period?

In order to answer these questions we will use the mean height of adult cohorts born between 1950 and 1976. The data is gathered from the China Health and Nutrition Survey (CHNS), which has been conducted in twelve different regions in China since 1989.\(^4\) This allows us to overcome specific problems with data reliability during the Maoist period. As Morgan (1999) points out, “anthropometric techniques provide a valuable insight into economic growth and change during periods of rapid transitions, and in circumstances where conventional data for measurement of economic wellbeing is often missing, of poor quality, or difficult to interpret due to price distortions and difficult to capture non-market effects such as subsidies and public transfers” (p.10). All these features might be applied to the case of China during the Maoist period. In addition, while there are several studies using this kind of indicator to understand the standards of living in China from a historical perspective, only a few studies have concentrated on the specific trend of the Maoist period. Therefore, this article can be interpreted as a complementary study to other publications that have analyzed the Maoist period with traditional economic and health indicators.

\(^3\) Steckel (1995)

\(^4\) This research uses data from China Health and Nutrition Survey (CHNS). We thank the National Institute of Nutrition and Food Safety, China Center for Disease Control and Prevention, Carolina Population Center, the University of North Carolina at Chapel Hill, the NIH (R01-HD30880, DK056350, and R01-HD38700) and the Fogarty International Center, NIH for financial support for the CHNS data collection and analysis files from 1989 to 2006 and both parties plus the China-Japan Friendship Hospital, Ministry of Health for support for CHNS 2009 and future surveys.
The records used in this study conclude to five major findings, most of them confirming past studies in terms of wellbeing. First, there was a representative increase of the biological standards of living during the Maoist period. However, there was also an increase of the inequality gap between the urban and rural populations, as well as between the male and female populations. In addition, we have calculated a height variation of 8.5 cm between the richer regions in China (Beijing and Shanghai) and the poorest areas (Guizhou province). Fourth, the CR is the period with highest deterioration of the biological standards of living. Finally, the comparison of our data to other countries in the world shows that while the inequality gap between China and the Western countries widened in terms of biological standards of living during the Maoist period, the mean heights of the Chinese population surpassed the mean heights of other Asian countries such as Japan and India.

This article is divided in seven sections. Section 2 presents a short history of the health system during the Maoist period. Section 3 exposes the main ideas within the literature review in terms of biological standards. Section 4 describes the sources. Section 5 explains the data selection and the methodology. Section 6 shows the trend in the mean heights of the Chinese populations during the Maoist period. Finally, section 7 gives the conclusions of this article.

2. A short history of the health system in China during the Maoist period

2.1 The Initial Stage (1949-57)

At the time Mao Zedong got into power in 1949, China’s health situation was in precarious conditions. Scarcity of health institutions and unequal distribution of health resources between rural and urban areas left a great
percentage of Chinese population with no access to health welfare. Immediately after the establishment of the PRC, the CCP focused on the development of the state healthcare system based on the communist ideals during the revolutionary era (1927-49), in defense of a public health system determined by epidemic control policies. In November that year, the Ministry of Health (MOH) was established as the organization network of health, with subnational branches at a local level. Labour and government health insurance was assigned in the first years of the 1950s, handing over free health coverage to industrial workers and families, government employees, teachers, and students. Yet, financial constraints of the central government assigned only 1.2 per cent of the national budget to the healthcare sector. The ambiguous system rapidly created congested health services demand and limitations on state financial resources. Ironically, this situation widened the gap between urban and rural areas, living peasants behind.

The central government remained aware of the precarious situation in the rural areas and its own financial restrains. For this, it was of exceptional importance to concentrate on the prevention first policy, which insisted in averting the spread of infectious diseases. Controlling proliferation of epidemics would certainly allow the state to “gain political capital by reducing human suffering”. The means to accomplish the objective relied on the state domination over society, mainly in the countryside, by the use of patriotic health campaigns and mass mobilization to increase health literacy. While at the beginning of the 1950s private health facilities remained present, by the mid-1950s the healthcare system became mostly a matter of the state. The MOH identified 20 communicable diseases, but due to the financial and institutional constrains, only cholera, smallpox, and plague were target as a priority. In addition, by 1957 the fight against schistosomiasis and venereal diseases became a central goal. At the

---

5 Seventy-five per cent of hospital beds and 62 per cent of the senior Western-style physicians were located in urban areas (Huang, 2013: pp. 41). Notice that at this point in time more than 90 per cent of the population was located in the rural areas.
6 Perkins and Yusuf (1984), pp. 135
7 Huang (2013), pp. 44
end of this stage, two thirds of the total counties in China had an epidemic prevention station (EPS) applying communicable disease control (CDC) programs, vaccination, and environmental sanitation and hygiene.\(^8\) While the prevention first policy gained long-run success (for example, the last outbreak of smallpox was in 1960, 20 years earlier than the global eradication),\(^9\) the healthcare system was yet far to tackle the rural population in curative treatments and infectious diseases not targeted by the CDC programs, remaining a latent problematic. Nevertheless, by the end of the initial stage of the healthcare system implementation, Mao had gained popularity among peasants and local officials, to the extent that he felt with enough power to weaken the intervention of the bureaucratic members, as he would understand, in the MOH, gaining total legitimization to supervise sanitary activities in the following years.\(^10\)

2.2. The Great Leap Forward (1958-61)

Policies during the Great Leap Forward (GLF) were basically concentrated in the collectivization of the socioeconomic structure. Setting a commune system in the rural areas, controlled by the political power, clearly changed the social and economic structure of the system, including healthcare. Already in the mid-1950s, some communes in Central China adopted the Cooperative Medical Schemes (CMS), which provided free healthcare for all rural residents. By the end of 1958, all cooperatives had adopted the CMS. Mainly based in a decentralized system, free medical services, financed by county and commune budget, represented an incentive for peasants to completely adopt the collectivization system. The rural public healthcare was supported by two main funds: the commune member’s annual fee and the revenue collected from the agricultural production. The former represented very low revenue and later on was practically non-existent. The latest would only be effective if the primary sector of the economy at a provincial level remained successful; this was

\(^8\) Hipgrave (2011), pp.225
\(^9\) Xu (1994)
not the case and three years after the GLF policies had been implemented, the system had reached a state of collapse.

The prevention first policy remained a focal domain in the public health system during the GLF. One of the most emblematic hygienic campaigns was the four pests, which entailed wiping out mosquitos, flies, rats, and sparrows in order to eliminate schistosomiasis disease as a top state priority. Avoiding much of the technical and professional leadership of the MOH, Chairman Mao proclaimed the mobilization of the rural labor to catch and kill the four pests.\textsuperscript{11} By the end of 1959, fifty per cent of patients suffering from schistosomiasis disease were cured.\textsuperscript{12} However, the Hundred Flowers Campaign in 1956 and the Anti-Rightist Campaign in 1957 “set in motion a bandwagon effect with localities competing for rapid elimination of schistosomiasis”.\textsuperscript{13} The same pattern took place in the agricultural production setback during the period, resulting as one of the main reasons for the GLF Famine.\textsuperscript{14} Low nutritional intake and unprecedented consumption of non-edible goods during the subsistence crisis turned into an increase of disease and starvation, especially in the rural areas. By 1961, the decrease of revenues allocated to health resources could not support the increased demand for medical supply, leading for greater fiscal constrains with clear negative effects to efficiently sustain the healthcare system. National budget also decreased during the period due to the increased investment in the secondary sector in the urban areas, therefore communes and counties could not turn to the central government for financial assistance. To confront the problematic with the welfare fund, local cadres considered increasing peasant’s fees for health access, but levels of poverty at the commune level had reached its peak. In addition, contrary to Mao’s initial objectives, the health gap between the urban and rural areas widened due to intensification of the industrial sector.

\textsuperscript{11} Xu Yunbei (1960), pp.10
\textsuperscript{12} Huang (2013), pp.48
\textsuperscript{13} Idem., pp. 50
\textsuperscript{14} Other reasons attributed to the famine are natural disasters and the elimination of all sparrows in rural areas, which contributed to locust pest. However, main reasons are contributed to political and institutional setbacks in the GLF.
2.3. The Adjustment Stage (1962-65)

After the GLF Famine, state and local governments worked to improve the agricultural system in order to increase food production based on more bureaucratically oriented policies. This was the beginning of the modernization of the primary sector, which would take greater force in the mid-1960s. Collectivization was relaxed; yet, setbacks during the GLF led to Mao’s silence on healthcare issues from July 1960 to August 1964. The subsistence crisis in the previous stage weakened the rural population to engage in massive mobilization on preventive health issues and patriotic hygiene campaigns were discouraged until 1964. During this new stage commune health centers decreased by all regards and the gap between rural and urban areas increased. By 1964, 30 per cent of government healthcare funding was allocated in the urban areas, while only 16 per cent was distributed to the rural areas. In addition, 90 per cent of senior health workers were appointed at or above the county level, living behind residents in the communes, which embraced great part of Chinese population.

2.4. The Cultural Revolution (1966-76)

By the mid-1960s, Chairman Mao felt he was losing political control after leaders such as Liu Shaoqi and Deng Xiaoping had gained political influence with revisionist policies during the adjustment period to overcome the failures of the GLF. In 1964, the coup against Nikita Khrushchev in the USSR alerted Mao that a similar outcome could take place in China. At this point, the loyalty towards its persona became more important than its policies, and Mao concentrated all its power to conserve its leadership. This was the political environment that set for a new stage in China that lasted for ten years: The Cultural Revolution (CR). During this decade, major changes took place in the

---

15 Huang (2013), pp. 54; Hipgrave (2011), pp. 226
16 Ministry of Health (1995)
17 MacFarquhar and Schoenhais (2006), pp. 26
country under political repression, including the healthcare system. By the mid-1960s the confrontation between Mao’s revolutionary views and the MOH bureaucratic prospects went back to the situation of the mid-1950s. At this point, Mao’s major concerns on health issues focused on the existing gap of inequality between the rural and the urban areas and declared the MOH as “Ministry of Urban Lords”.  

Two main measures were established in Mao’s political agenda regarding the health system. The first channel entailed reallocating a great number of professional doctors from the urban areas to the rural areas. The second channel entailed the restructure of the education system of medical technical personnel by reducing the number of years of training from six and eight-year-programs to three-year-programs. Great opposition from MOH came along these measures. Between 1968 and 1973, after the destitution of Liu Shaoqi and Deng Xiaoping in 1967, the MHO had lost all its influence in the policy-making process. Mao’s most engaging health program at the time was the barefoot doctor (BFD) program, established as national policy in 1968. The program was considered an effective measure to solve the problems of doctor scarcity in the rural areas and minimize costs. In 1965, less than 19,000 medical personnel were sent to the countryside; by the end of the period, the figure peaked to 1.8 million. The package, mainly founded by brigades, had a more continuous service and higher population reach than the preventive campaigns in the 1950s. Together with midwives and physicians, the new system had a more bottom-up rather than top-down approach and responded to the failures of the GLF, using fees and other

---

18 Miao Yu (1976), pp. 7; Li Zhisui (1994), pp. 419-20
19 Dobson (1981), pp. 43; Huang (2013), pp. 57
20 Hu Teh-wei (1976); White (1998)
21 The BFD was a peasant who provided basic health care, sanitation, health education, and preventive medicine at a brigade and working team level. Many of the BFD, who received credit for working points on health and agriculture, were urban medical personnel transferred from the urban areas to the rural areas.
22 Wu Chieh-ping (1975), pp.10; Hipgrave (2011), pp. 227
23 Lee (1974)
market mechanisms to prevent over and unnecessary use of the health services. The BFD program remained until the decade of the 1980s.

3. Literature review

3.1. The biological standards of living

The mean height of the population is an indicator used by economic historians since the 1970s in order to understand the dynamics of the wellbeing of a population over time. Human stature allows to measure the net nutrition, taking into account both the inputs to health, such as nutrition and health care, and the demands placed on an individual’s biological system, such as the exposure to disease or the intensity of workload during the years of growth of a population (see the determinants of nutritional status in Figure 1). As Floud et al. (2011) points out, “the nutritional status is a net measure; it represents the energy which has been used for growth once the demand of body maintenance, resistance to disease, play and work have been satisfied”. Therefore, the mean height of a population can be used as an additional indicator to measure the standards of living at a determined location and time, supplementing other evidence such as indexes of real wages, measures of food consumption, and estimates of per capita income.

Adult height is largely determined in the first years of life and during gestation. Specific illness during the growing stage will most likely slow growth. Only a representative improvement in the caloric and nutritional intake will enable a possible catch up in heights in adolescence. The “catch up” stage entails the adolescent years to which an individual is, once again, exposed to potential physical growth. Such growth stage is different among girls and boys;

---

24 Cook (2004); Huang (2013)
25 Baten et al. (2010); Fogel et al. (1983); Komlos (1985; 1989; 1993)
26 Fogel R. et al. (1982); Cole, 2000b; Karlberg 1989; Waterlow 1994
the first, starting at an earlier age. While some studies show that there is significant genetic difference among populations in the world in terms of reaching to the terminal height, most studies show that environmental conditions explain height variations between different populations. This allows for long run analysis in stature across different spatial locations. In sum, human stature, as an indicator of wellbeing, takes into account that some economic activity is non-monetized and, therefore, unmeasured by conventional indicators of living standards.

Figure 1. Determinants of Nutritional Status

3.2. The biological standards of living in China

The records of stature from the Chinese population date back to the 19th century. Most records are taken from the Chinese migrants in Australia, the American continent, and other Asian countries in the mid-19th century and early 20th century, prison registers and railroad archives in the first half of the 20th century, and medical and school records in the 20th century. However, not so many registers are available for the Maoist period. As previously mentioned,

---

most studies on the biological standards of living in China concentrate on the end late Qing Dynasty (1800-1911), the Republican era (1912-1949), and the period after the economic reforms, but little has been published for the Maoist period. Moreover, most publications focusing on the Maoist period have studied the health consequences of the GLF Famine (1959-61) using human stature as a health proxy. Therefore, few articles have investigated the trends from a historical perspective for this period.

There is a general consensus that the mean heights of the Chinese population decreased in the 19th century, especially after 1850, due to the internal turmoil and the foreign intrusion that weakened the national economy.\(^30\) In the first three decades of the 20th century the mean heights of the Chinese population increased with the fall of the dynastic regime and a greater concentration in the industrial sector. However, after 1930 the trend decreased once again due to the economic instability, consequence of the Civil War (1927-49) and the Japanese War (1937-45).\(^31\) The main findings for the Maoist period highlight the improvements in the biological standards of living during the early 1950s, with a rapid deterioration during the GLF.\(^32\) Morgan (1997) points out that the recovery stage will start in the mid-1960s, mainly due to the development in the public health, and not so much in the improvements of the nutritional intake. Indeed, Swekendiek (2016) highlights that the mean height of the children in the 1960s in China were similar to the mean heights of children in Japan and South Korea. The increase of the mean height of the population will result more evident after the economic reforms in the late 1970s, where there is an improvement in the net nutrition of the Chinese population. Indeed, representative increases of the biological standards of living were obvious for most provinces between the mid-1980s and

\(^{30}\) Morgan, 2009; Carson, 2006; Carson, 2007; Baten et al., 2010

\(^{31}\) Morgan, 1997; Wang and Ye, 2005; Carson, 2007; Baten et al. 2010; Ward, 2013

\(^{32}\) Morgan, 1997; Morgan, 2007; Wang and Ye, 2005; Li et al. 2011 ; Gorgens et al., 2010; Zheng and Cheng, 2005
the mid-1990s. However, most studies also display inequality among provinces and a gap between the rural and the urban populations.

4. Sources

The dataset used for the analysis is the China Health and Nutrition Survey (CHNS). Data collection was conducted by the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute for Nutrition and Health (NINH, former National Institute of Nutrition and Food Safety) at the Chinese Center for Disease Control and Prevention (CCDC). The survey was designed to examine the effects of the health, nutrition, and family planning policies and programs implemented by national and local governments and to see how the social and economic transformation of Chinese society is affecting the health and nutritional status of its population. The survey has been periodically conducted since 1989 until today. The last survey was directed in 2015, however available data to the public ends in 2011. This includes data for nine provinces and three major cities: Jiangsu, Henan, Hubei, Hunan, Guangxi, Guizhou, Shandong, Liaoning (missing in 1997 survey), Heilonjiang (added in 1997), Beijing, Shanghai, and Chongqing (all three cities included in 2011). All these locations vary in geography, economic, and demographic standards. Such variety makes this sample representative for China as a whole, regardless covering only 50 per cent of the total provinces in the country (see Figure 2).

---

33 Morgan, 2000; Chen, 2000
34 Zhai et al., 2004; Morgan, 2000; Shen et al., 1996; Li et al., 2011; Swekendiek, 2016
The survey, which includes records on health, nutrition, economic, and education indicators, is based on a sample of approximately 7,200 households and 30,000 individuals. Most of these individuals have been surveyed periodically in each of the years when the study was conducted. However, not all survey years record the same individuals. These may be explained by two reasons. First, withdraw of an individual from the sample either because of migration or death. Second, the late incorporation of the individual in the sample due to improvements in the survey, the incorporation of new members in the household, or the inclusion and withdraw of provinces and cities in the sample for the past 25 years. The survey includes both children and adults.

5. Data selection and Methodology

Numerous researchers have used this dataset to conduct great range of studies on the nutritional and health status of Chinese population. However, most of these studies focus on the welfare conditions in recent decades. Only selected literature gives a historical perspective, studying the population born between
1956 and 1964 in order to investigate the effects of the Great Leap Forward Famine (1958-61). Therefore, contrary to previous publications, we use these data to investigate the biological standards of living during the Maoist period. In order to collect great number of observations, we use the data gathered in every survey conducted from 1989 to 2011.

We first select all adult individuals in the sample from 1989 to 2011 age 21 to 50 years old. We use this age range considering that individuals younger than 21 years may still be in the growing phase and individuals older than 50 years may be on the shrinking stage.35 Other studies consider the growth stage of stature to end at age 22, and therefore only individuals over 23 years are included in the analysis. However, in addition to the literature that supports age 21 to be the benchmark for growth, we should also consider that not all ethnic groups have the same growth stages. For this, we have revised the records of heights and found no variation of stature between individuals at age 21 and age 23, meaning that the growth stage within this dataset ended at age 21. This selection allows us to create birth cohorts from 1939 to 1990. However, in order to focus in the Maoist period we use mainly the cohorts born between 1949 and 1978.36 Also, while China’s Communist Party (CCP) got into power in October 1949, we set the starting year of our analysis in 1950, in order to leave out of the analysis those individuals that were conceived during the last year of the Republican era.

35 Bogin (1999); Tanner (1989)
36 While a comparative analysis of the Maoist period with prior and after periods is relevant, we have decided to concentrate on the study of the Maoist period in this article and leave the comparative study for future research. Only when comparing the different provinces, we have also included the records for the Republican era and the immediate period after the Economic Reforms. We have two explanations to support this decision. First, we have seen anomalies in the data recorded in the 1997 and 2000 surveys for cohorts born between 1982 and 1990 (see Appendix, Figure A). Contrary to other birth cohorts and surveys conducted in other years, these birth cohorts are individuals that have only been measured either in 1997 or in 2000. As Figure A in the Appendix shows, there is a decline of 14 cm and 20 cm respectively, from the mid-1980s to the end of this decade. This pattern is not shown in the remaining surveys, where in fact most birth cohorts born between 1980 and 1990 have been measured at least twice from 1989 to 2011. The pattern in the remaining surveys show an upward trend that corresponds with the findings in other studies, which show an increase in the mean height of children measured after the economic reforms in 1978 (Morgan, 1999). Therefore, this data deserves forward analysis for future interpretation. It is worth notice, that for cohorts born before 1982, there are no anomalies when comparing heights data for each survey individually (see Figure A in Appendix). The second explanation is due to the objective of this article, which entails the investigation of welfare mainly during the Maoist period. However, it is worth highlighting that from 1939 to 1949 the mean height of the Chinese population increased by 2,4 cm and from 1939 to 1976, it increased by 5 cm.
As previously mentioned, our sample includes all 9 surveys (1989-2011). This allows us to include as many observations as possible, comprising the ones excluded and included in later years. We only include adult population and any individual who has no height record is deleted from the dataset. Also outliers are removed from the sample (heights lower than 140 cm and higher than 200 cm). Because many of the individuals documented in the sample have been measured in some or all surveys, we delete any repeated observations. In the case we detect different height records for the same individual over the years, we consider it as a typographical error and we use the measure most frequently logged over the years. In the case the recorded height measurement has a great variation over time, we discharge the possibility that the individual has grown or shrink over the years based on previous explanations. Therefore, we take the latest measure recorded in the sample, assuming that the measuring procedure and recording of the data have improved over the years.

After the data selection process, our sample sums a total of 13,885 observations, including height records for over 6,000 males (46.4 per cent of the sample) and over 7,000 females (53.6 per cent of the sample) (see Table 1). Rural population represents 62 per cent of the sample and urban population represents 38 per cent. Notice the mean height difference of 2.2 cm between urban and rural population in the Summary Statistics displayed in Table 1, anticipates an inequality gap between both populations during the period under study. With the exception of Beijing, Shanghai, and Chongqing, each province represents about ten per cent of the total sample. Why the three administrative cities represent no more than three per cent of the sample is explained by the late incorporation of these cohorts into the CHNS survey. As expected, both Beijing and Shanghai have the highest mean height recorded in the sample (166.8 cm and 165.6 cm, respectively).\(^{37}\) Finally, a one-way ANOVA and a Tukey post-hoc test are conducted to determine if the mean height of the different populations (urban/rural, male/female, provinces) is significantly different over time.

\(^{37}\) Notice that for both cities (and Chongqing), birth cohorts are from 1961 to 1978
Table 1. Summary statistics

<table>
<thead>
<tr>
<th>Settlement</th>
<th>Observations</th>
<th>Share from total sample (%)</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>5308</td>
<td>38,2</td>
<td>163,5</td>
<td>8,2</td>
<td>140</td>
<td>193,6</td>
</tr>
<tr>
<td>Rural</td>
<td>8577</td>
<td>61,8</td>
<td>161,3</td>
<td>8</td>
<td>140</td>
<td>189</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6440</td>
<td>46,4</td>
<td>168</td>
<td>6,3</td>
<td>142,1</td>
<td>193,6</td>
</tr>
<tr>
<td>Female</td>
<td>7445</td>
<td>53,6</td>
<td>157,1</td>
<td>5,7</td>
<td>140</td>
<td>178</td>
</tr>
<tr>
<td>Province</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beijing</td>
<td>470</td>
<td>3,4</td>
<td>166,8</td>
<td>8,1</td>
<td>145</td>
<td>193,6</td>
</tr>
<tr>
<td>Liaoning</td>
<td>1410</td>
<td>10,2</td>
<td>164,6</td>
<td>7,5</td>
<td>140</td>
<td>187,4</td>
</tr>
<tr>
<td>Heilongjiang</td>
<td>1185</td>
<td>8,5</td>
<td>164,9</td>
<td>7,9</td>
<td>144,7</td>
<td>189</td>
</tr>
<tr>
<td>Shanghai</td>
<td>372</td>
<td>2,7</td>
<td>165,6</td>
<td>8</td>
<td>146</td>
<td>185,2</td>
</tr>
<tr>
<td>Jiangsu</td>
<td>1406</td>
<td>10,1</td>
<td>162,8</td>
<td>8</td>
<td>140</td>
<td>186</td>
</tr>
<tr>
<td>Shandong</td>
<td>1364</td>
<td>9,8</td>
<td>164,4</td>
<td>7,6</td>
<td>140</td>
<td>190</td>
</tr>
<tr>
<td>Henan</td>
<td>1448</td>
<td>10,4</td>
<td>162,6</td>
<td>7,8</td>
<td>140</td>
<td>186,5</td>
</tr>
<tr>
<td>Hubei</td>
<td>1327</td>
<td>9,6</td>
<td>161,3</td>
<td>7,8</td>
<td>141</td>
<td>186</td>
</tr>
<tr>
<td>Hunan</td>
<td>1421</td>
<td>10,2</td>
<td>161,2</td>
<td>7,6</td>
<td>140</td>
<td>185</td>
</tr>
<tr>
<td>Guangxi</td>
<td>1449</td>
<td>10,4</td>
<td>159,1</td>
<td>7,5</td>
<td>140</td>
<td>186,5</td>
</tr>
<tr>
<td>Guizhou</td>
<td>1625</td>
<td>11,7</td>
<td>157,9</td>
<td>7,8</td>
<td>140</td>
<td>183,2</td>
</tr>
<tr>
<td>Chongqing</td>
<td>408</td>
<td>2,9</td>
<td>159,8</td>
<td>7,5</td>
<td>140,1</td>
<td>179,4</td>
</tr>
<tr>
<td>Total sample</td>
<td>13885</td>
<td>100</td>
<td>162,2</td>
<td>8,1</td>
<td>140</td>
<td>193,6</td>
</tr>
</tbody>
</table>

6. Trends in adult heights (birth cohorts 1949-76)

6.1. Chinese mean heights in an international comparison (1930-80)

Previous to the analysis of the data for the Maoist period, we have made a comparative analysis of our data with other sources previously published. Notice in Table 2 that data of mean heights for China in Clio Infra database is much higher in comparison to the new data used in this article. Based on the
information given by Clio Infra, the figures in this database are taken from different sources (not always specified) and correspond only to male population. In this article, we have compared the figures with our data considering total population (China**) and only male population (China***). In either case, the mean heights shown in our database are much lower. The Clio Infra database shows that the increase of the mean height in China between 1940 and 1980 is 4,1 cm. Based on the CHNS data, the increase during the four decades is also 4,1 cm when considering total population, and 5,7 cm when considering only male population. During the Maoist period, the comparison with the Clio Infra database suggests a variation between 2,7 cm and 7,6 cm in the decade of the 1950s, 2,7 cm and 7,7 cm in the decade of the 1960s, and 1,5 cm and 8 cm in the decade of the 1970s. While the tendency seems to be the same, the difference between both databases advocates for new interpretations, which will be given in the following paragraphs.

Table 2. Mean heights of male population in different countries (1930-1980)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>174,1</td>
<td>177,5</td>
<td>178,7</td>
<td>182,2</td>
<td>182,3</td>
<td>182,7</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>173,9</td>
<td>174,9</td>
<td>176</td>
<td>176,9</td>
<td>177,1</td>
<td>176,8</td>
</tr>
<tr>
<td>Italy</td>
<td>168,1</td>
<td>169,3</td>
<td>171,3</td>
<td>173</td>
<td>174,1</td>
<td>174,5</td>
</tr>
<tr>
<td>Japan</td>
<td>161,4</td>
<td>162,6</td>
<td>163,6</td>
<td>165,7</td>
<td>166,8</td>
<td>171,7</td>
</tr>
<tr>
<td>Spain</td>
<td>165,2</td>
<td>166,3</td>
<td>170,8</td>
<td>174,2</td>
<td>175,2</td>
<td>175,6</td>
</tr>
<tr>
<td>India</td>
<td>163,7</td>
<td>164,1</td>
<td>163,5</td>
<td>163,9</td>
<td>164,3</td>
<td>164,4</td>
</tr>
<tr>
<td>Russia</td>
<td>167,9</td>
<td>169</td>
<td>172</td>
<td>173,6</td>
<td>177</td>
<td>177</td>
</tr>
<tr>
<td>China*</td>
<td>166,5</td>
<td>167,4</td>
<td>169,2</td>
<td>170</td>
<td>170</td>
<td>171,5</td>
</tr>
<tr>
<td>China**</td>
<td>-</td>
<td>158,0</td>
<td>161,6</td>
<td>162,3</td>
<td>162</td>
<td>162,4</td>
</tr>
<tr>
<td>China***</td>
<td>-</td>
<td>163,7(a)</td>
<td>166,5</td>
<td>167,3</td>
<td>168,5</td>
<td>169,4</td>
</tr>
</tbody>
</table>

Sources and Notes: Clio Infra for all countries, including China* (there is no specifics about this data, but we assume it refers only to male population) **Author’s own calculation of total population based on CHNS data; ***Author’s own calculation of male population based on CHNS data; (a)In order to have enough observations, the calculation is based on the height of individuals born in 1939 and 1940

See references and sources cited at Clio Infra (2013)
Next, we compare the mean heights in different countries in order to understand the position of China at an international level in terms of health.\textsuperscript{39} Previous studies indicate that the improvements in health in Europe begun in the second half of the 19\textsuperscript{th} century and the beginning of the 20\textsuperscript{th} century and the epidemiological transition spread after World War II.\textsuperscript{40} The figures displayed in Table 2 show a clear inequality gap in terms of nutritional status between the European and the Asian continent throughout the 20\textsuperscript{th} century. While both regions improved the health conditions, in terms of mean heights, the development in Europe seems to be higher than in Asia; From 1940, where we have data for all countries, to 1980 the mean heights of the male population in Europe increased by 7.5 cm, while in Asia increased by 5.7 cm.\textsuperscript{41} Therefore, the inequality gap between both continents was higher in the 1980s (7.4 cm) than in the 1940s (5.6 cm), although the decade with greater inequality gap in terms of health is in the 1970s (10.2 cm).

Within Asia, the records displayed in Table 2 show that during the Maoist period, the mean heights of the male population in China were always higher than in India and Japan. In the case of India, the inequality gap in terms of health increased all along the second half of the 20\textsuperscript{th} century. Indeed, the height difference between both countries in the 1950s was 3 cm, while in 1980 reached 5 cm. In the case of the variance between China and Japan has an inverse order, meaning that the inequality gap was reduced from 1950 (2.9 cm) to 1970 (1.7 cm). However, in 1980 the mean heights of the male population in Japan are 2.3 cm higher than in China, widening the inequality gap once again. This is explained by the great increase of the Japanese heights between 1970 and 1980 (4.9 cm).

\textsuperscript{39} For simplification, we only gathered the information for five European countries and three Asian countries. Also notice that, because there are no specifics about the sources for China in the Clio Infra dataset, the comparative analysis will be based on the data for male population from the CHNS dataset (which is representative nationwide, as previously mentioned) and the data of male population from the Clio Infra dataset for the remaining countries.
\textsuperscript{40} Deaton, A. (2015)
\textsuperscript{41} It is worth noticing that some studies attribute the difference between some Asian and European countries to the change in nutritional patterns and the “milk hypothesis”. For further explanations see Bogin (1999), p. 277-81
6.2. China

The trend in the mean height of the total population in China during the Maoist period shows a positive slope (see Figure 3). However, the increase is only of 1 cm \( (P = 0.000) \); the mean height of the cohort born in 1950 is 161.6 cm and the mean height of the cohort born in 1976 is 162.6 cm.\(^{42}\) While this findings corroborate the health improvements during the period, along with other health indicators described in Section 1, we are to say that the Maoist period is characterized by stages of strong fluctuations and stagnation. The minimum points are registered in 1951 (160.3 cm) and 1954 (160.4 cm), both years hit by great floods nationwide. On the other hand, the maximum points are in 1962 (162.8 cm) and 1963 (163.0 cm). During both years, there was also a representative increase of fertility rate, reflecting the social and economic recovery after the failure of the GLF. Indeed, all mean heights of cohorts born within the recovery stage from 1962 to 1965 are above 162.0 cm.

Figure 3 shows that the period of the CR is featured by total stagnation and even a representative decrease in the beginning of this phase, known as the more severe stage in terms of political repression \( (P = 0.001) \). This is an important finding because previous literature has highlighted that, while the CR was represented by political turmoil and backwardness in terms of education, the incorporation of the barefoot doctors was described as a story of success within the health system. The evidence in this article proves otherwise. Indeed, the mean height during this period is very similar to the mean heights of the cohorts born during the catastrophic period of the GLF. Also, notice that the mean height of the total population will not surpass 163.0 cm until the beginning of the new economic reforms in 1978.

\(^{42}\) While the victory of the Communist Party was in October 1\(^{st}\), 1949, we do not consider this year representative for the Maoist period. On the other hand, while the new economic reforms were not implemented until 1978, we chose 1976 as the end of the Maoist period after the death of Mao Zedong in September 9\(^{th}\) of that year.
6.3. Urban and Rural

One of Mao’s greatest objectives in terms of health and education was to narrow the inequality gap between the urban and the rural population. However, past publications show that there was an inverse tendency, meaning that the gap between the urban and the rural population indeed widened during the Maoist period. The evidence in our dataset coincides with these conclusions. Figure 4 shows how the mean height of the urban population during the Maoist period is always higher than the mean height of the rural population. Not only so, but we capture the gap between the urban and the rural population widened in terms of nutritional status from 1,9 cm in 1950 to 3,5 cm in 1976. That is because while the mean height of the urban population increased by 2,1 cm during the Maoist period, the mean height of the rural population increased by only 0,5 cm.
During the GLF (1958-61), the inequality gap between rural and urban stature narrowed in. Notice the scissors effect during this period, where the mean height of the urban population decreased by 3.3 cm and the mean height of the rural population increased by 1.2 cm. It has been well documented that the great famine of the late 1950s and early 1960s had greater effect on the rural population than in the urban population. How can we explain then the invers effect in terms of nutritional status? An array of studies shows that the urban population also suffered from the famine, however the mortality rate was lower than in the rural areas. We assume then, that the survivors in the rural areas during the GLF Famine were physically stronger and with better health than the survivors in the urban areas. Such assumption is portrayed in Figure 4, where in 1961 the mean height of the rural population was indeed 1.1 cm higher than the urban population.

Also, notice that during the CR the mean heights of the urban and rural population suffered a period of stagnation, especially for the initial stage from 1966 to 1969. During this period, we still capture inequality of the biological
standards of living between the rural and the urban areas, contrary to the aims of Mao Zedong’s policies. So, did the BFD system had any positive effects on narrowing the inequality gap between the urban and the rural areas after its implementation in 1968? Indeed, in the early 1970s, the inequality gap between the urban and the rural areas did narrowed down to 1.7 cm. However, not only was the tightening of the gap not representative, but also, as shown in Figure 4, we do not attribute this effect to the improvements of the biological standards of living in the rural areas, but to its deterioration in the urban areas.

### 6.4. Gender

Based on the anthropometric measures used in this study, there is evidence of health improvements for both male and female populations during the Maoist period. From 1950 to 1976, the mean height of the male cohorts increased by 3.0 cm and the female cohorts increased by 2.1 cm ($P= 0.00$) (see Figure 5). On the other hand, the gender inequality gap also increased. While the gender difference is 11.6 cm in 1950, twenty-six years later, the gender difference reached 12.5 cm. This is an important aspect because during the Maoist period there was a great emphasis in improving the conditions for the female population in terms of education and health. While different social programs were established, such as the universal education system and the midwives campaign, it appears that the impact was not so evident in terms of gender inequality in the biological standards of living.
Moreover, the greatest inequality gap is to be found during the initial stage of the CR (1967-69). Indeed, we seem to have a tendency of improvement of the mean height of the male population by 1.5 cm, while there is a decrease of the mean height of the female population by 0.5 cm, yet only statistically significant for the later. On the other hand, during the GLF Famine (1958-60), gender inequality narrows to nearly 10.0 cm. The explanation to such trend relies on the negative effects of the famine in terms of health and nutrition to both male and female.

6.5. Provincial trends

During the Maoist period, most regions improved their biological standards of living. The growth of the mean height of most provinces was ranged between 0.4 cm and 0.6 cm, however it has been tested not to be statistically significant for Shanghai, Chongqing, and Beijing we have no data for the period prior to the GLF, which may lead to an unbiased conclusion when comparing the rest of the regions, and, therefore, statistically insignificant.

With the exception of Shanghai and Beijing, where the mean heights of the population decreased by 0.4 cm and 4.3 cm, respectively ($P = 1.00$). Notice that for Shanghai, Chongqing, and Beijing we have no data for the period prior to the GLF, which may lead to an unbiased conclusion when comparing the rest of the regions, and, therefore, statistically insignificant.
significant. Meanwhile, Heilonjiang, Jiangsu, and Hunan provinces increased the mean height of the population above the national average, by 2.0 cm ($P = 0.03$), 1.6 cm ($P = 0.099$), and 2.5 cm ($P = 0.00$) respectively (see Figure 6). This brings to the conclusion that, while the health of the population in China, in terms of the mean height, had a significant increase in the different stages of the Maoist period ($P = 0.00$), so did the inequality gap among the different provinces ($P = 0.00$).

Figure 6. Mean Heights of birth cohorts born between 1939 and 1984 by province

We depict a pattern in terms of low and high biological standards of living among the different regions. In general terms, Guizhou province has the lowest rates in terms of mean heights. Notice that during the whole Maoist period the human stature in this province is never higher than 158.2 cm. On the other hand, as expected, Beijing and Shanghai are the regions with higher biological standards, where the mean height of the population are higher to 165.5 cm for most of the period. Therefore, we capture an inequality gap between the worse-off and better-off regions of 8.5 cm ($P = 0.00$). Also, notice that Liaoning, Heilonjiang, and Shandong provinces, while do not reach levels as a high as
Beijing and Shanghai, the mean height of the population is above the mean height at a national level.

In terms of the comparison between provinces and periods, we should draw two conclusions based on the records on Figure 6. First, there is a misleading increase of the biological standards of living during the GLF \( (P=0.068) \). As previously mentioned in this article, the period of the GLF was one of the periods with greatest failures in the economic and welfare terms. Why there is a general improvement of the mean heights of the population between the initial stage and the GLF stage relies on the great mortality rate in the different provinces during the famine years (see Figure B in Appendix for an indication of the infant mortality rate per province). As mentioned in section 5.3, the survivors of this famine represented a share of the population with strong health who were able to survive the terrible environmental conditions of the time. Also notice that the regions with higher levels of the biological standards of living during this period are Beijing (170,1 cm) and Shanghai (168,5 cm), where there were greater economic and welfare benefits.

Second, we see a general deterioration of the biological standards of living during the CR. Most of the provinces declined in human stature during the worse years of the CR (1966-69) \( (P=0.001) \). The most affected were Shandong, Hubei, and Guangxi, where the mean heights of the populations decreased by 1,6 cm, 1,7 cm, and 1,5 cm respectively. Also Henan, Heilongjiang, Jiangsu, and Hunan deteriorated in terms of health, while Liaoning and Guizhou suffered a period of stagnation. On the other hand, Beijing and Shanghai were mostly affected in the second stage of the CR (1970-76), where the mean height of the population decreased by 1,7 cm and 0,6 cm. However, in the first half of the 1970s we see and invers effect to the remaining regions, where the biological standards of the population ameliorated, yet with no statistical significance \( (P=0.365) \).
If we compare the biological standards of living during the Maoist period to the previous and after periods, we find general improvements. On the one hand, from the late Republican era (1939-48) to the initial stage of the Maoist period (1949-57) all provinces increased the mean height of the population, with the exception of Hunan province. The growth in human stature ranged from 0,5 cm Jiangsu province, to 3,3 cm in Hubei province. As for the comparison between the end of the CR (1970-76) and the beginning of the economic reforms period (1977-81), we find that most regions increased significantly their biological standards of living ($P=0,00$). Figure 6 shows that, while the increase of the mean height for most provinces ranged between 0,4 cm and 1,0 cm, the mean height in Beijing and Jiangsu province had an increase above the national average by 1,8 cm and 1,7 cm respectively. On the other hand, Guizhou and Shanghai remained with no change in the human stature.

7. Conclusions

In this article we have analyzed the trends of the biological standards of living during the Maoist period. Several conclusions can be drawn for our analysis. First, we depict a significant increase of the mean height of the Chinese population during the Maoist period. Indeed, the mean height of the male population during the Maoist period is higher than in other Asian countries, such as Japan and India. Therefore, we corroborate previous assessments of health with traditional health indicators. To whether the policies of Mao Zedong were effective in overcoming inequality is less optimistic. Our data shows that the inequality gap between the urban and the rural areas, and among regions was statistically significant. Also the gender inequality gap in terms of health increased during this period. Finally, the historical trend depicts the early stage of the CR as a deterioration of the biological standards of living.

The findings in this article open the door to new research questions: Which are the most significant determinants to explain the increase of the
biological standards and the inequality gap during the Maoist period? And, did the increase of the biological standards of living of the Chinese population during the Maoist period had a positive effect on the economic improvements in China after 1978?

8. Appendix

Figure A. Mean heights by wave CHNS
Figure B. China’s Infant Mortality Rate by Province (1950-85)

References


Clio Infra (2013) [https://www.clio-infra.eu/Indicators/Height.html#](https://www.clio-infra.eu/Indicators/Height.html#) [Last access October 2017]


services in the People’s Republic of China”, *International Journal of Health Services*, Vol.6, No. 2 (p. 239-49)


Li Rui (1995) *Li Rui “zuo” wenxuan* [Selected Anti-leftist Works of Li Rui]. Beijing: Zhongyang bianyi chubanshe

Li, Zong, Zhang, and Zhu 2011, p. 4-6 (see ref. Swekendiek 2016 p. 700-701)


of the Great Leap Forward Famine, 1959-61”. Asia Pacific Economic and Business History Conference, University of Sydney, 12-14 February 2007


*Human Mortality Database*. University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany). Available at www.mortality.org or www.humanmortality.de (data downloaded on [date]).


Xu Yunbei (1960) *Kaizhan weida de renmin weisheng gongzuo* [Launch a movement for great people’s health work], *Hongqi* [Red Flag], (6)


Wu Chieh-ping (1975) “For workers, peasants, and soldiers”, *Peking Review*, Vol. 8 (February)

Yu Miao (1976) *Counterattack the right-est rehabilitation wind in the health sector* [Fanji weisheng zhanxian de youqing fanan feng], *Red Flag* [Hongqi] (4)