

# INEQUALITY AND WELL-BEING IN IBERIAN AND LATIN AMERICAN REGIONS SINCE 1820. NEW APPROACHES FROM ANTHROPOMETRIC HISTORY

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To John Komlos, pioneer and promoter of anthropometric history

## Introduction

After four decades of research in anthropometric history, the use of human stature to measure changes in standards of living and inequality has become widespread among economic historians (Blum, 2013; Galofré-Vilà, 2018). In close collaboration with economists, physical anthropologists and biologists, economic historians have shown that stature and other bodily measures, such as weight, robustness, and corporal mass, have been influenced by environmental and socio-economic determinants over long periods of time and across different geographies. Adult height is a good proxy of human welfare, to the extent that it correlates with health, longevity, nutrition, and economic growth, and inform about the evolution of net-nutritional status and biological wellbeing for different social classes, ethnic groups, and sub-groups within the population (Komlos and Kelly, 2016).

Anthropometric history is a well-established discipline in Iberian and Latin American regions. The need to have alternative measures of the standard of living in order to explore the past evolution of economies and societies when conventional indicators were not available has been an important consideration among researchers.<sup>1</sup> In an effort to reconstruct historical series of stature, scholars of the region have produced over a hundred studies that combine insights from history, economics, medicine, biology, and physical anthropology. In the last fifteen years, the anthropometric history literature has increased remarkably with important findings

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<sup>1</sup> Literature on Ibero-American anthropometric history can be seen in Meisel and Vega (2007), Martínez Carrión (2009), Baten and Carson (2010), and López-Alonso (2016).

about the long-term biological living standards. In some cases, scholars established quite ambitious goals, such as reconstructing the evolution of heights from the late-colonial period to the new era of globalization, delineating clear trajectories of health and nutrition. We know the main features of the variations of heights during the last two centuries and the regional; we know also that social and ethnic differences were substantial. It is not the occasion here to provide a detailed description of the findings made during these two decades<sup>2</sup>. Therefore, this introductory essay only highlights the main contributions of this volume and briefly discusses the meaning of its findings in the recent Ibero-American anthropometric history.

### 1. Contributions of this volume

This special issue of *RHE-JILAEH* is a good example of the vitality shown by anthropometric history in the region. With new data of human heights for the contemporary period, between 1820 and 1990, fifteen scholars examine two key questions: a) the long-term evolution of biological welfare; and b) the existence of inequalities in net-nutrition in six countries: Spain, Argentina, Brazil, Chile, Colombia, and Mexico.<sup>3</sup>

For Spain, Antonio D. Cámara and his associates use a huge database (N = 358,253) to discuss both problems: the evolution of biological well-being; and the question of inequalities in net-nutrition. Concerning the first issue, they find that the stature of Spaniards suffered almost no change between 1840 and 1889, after which there were three decades of increasing heights (1890–1919), a process that was interrupted by a setback in the 1920s. Then followed a period of continued improvement in biological welfare, extending from 1930 to 1964. The authors considered this the time of Spain's "great leap forward," a period in which the average Mediterranean Spaniard gained 5 cm in height. Concerning the second issue, the authors present evidence of differences among socio-economic categories as well as estimates of coefficients of variation (CV), a method used by Quiroga and Coll (2000). They find that nutritional inequalities, as measured by CVs, declined in 1880–1919; went up in the early 1920s (1920–1924), then stagnated till 1944, afterwards showing rising inequality. Height inequalities related to education tended to increase over time. In short, in the 19th century, stagnation in average heights coincided with an

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<sup>2</sup> Recent reviews of the literature on Spain and Latin America, respectively, in Martínez-Carrión et al. (2018) and López-Alonso (2016).

<sup>3</sup> For Spain, see Cámara, Martínez-Carrión, Puche and Ramon-Muñoz (2019); Argentina, Salvatore (2019a); Chile, Llorca-Jaña, Araya, Navarrete and Droller (2019); Brazil, Franken (2019); Colombia, Meisel, Ramirez and Santos (2019); Mexico, López-Alonso and Vélez-Grajales (2019).

increase in inequality, while in the 20th century, a long-term increase in average heights corresponded to declining interpersonal net-nutrition inequality. In the 20th century, two counter-vailing tendencies affected the relationship heights/ inequality: on the one hand, there was an improvement and stabilization of environmental conditions (food and diseases); but on the other hand, there were increasing inequalities in heights associated with education.

Manuel Llorca-Jaña and associates present new data (N = 3,282) on the stature of recruits in 19th century Chile. They find that average stature declined from the 1820s to the 1880s, and that after that, there was stagnation of heights. The data shows important differences in stature according to social status, region, and race. The authors attribute the 19th century decline and stagnation of heights in Chile to three factors: the worsening of the sanitary and disease environment; the process of rapid urbanization; and the increase in social inequality.

For Mexico, Moramay López-Alonso and Roberto Vélez-Grajales estimate the evolution of male and female heights in Mexico for the birth cohorts 1951 to 1986, using a large sample constructed from two national health surveys (2000 and 2006). They find a moderate increase in the stature of Mexicans: an overall improvement of 2.0 cm for women and 2.5 cm for men. Contrasted with the strong economic growth and industrialization of post-1950 Mexico, these stature gains seem modest. Following the tradition of the post-revolutionary state, the Mexican government was committed to social welfare. In the postwar period, large funds were channeled to protect the peasant economy and the urban poor, and to improve public health. Why then, the authors ask, was the improvement in biological welfare so mediocre? They argue that income inequalities prevented sufficient social mobility through education. During the 20th century, people move into cities, life expectancy and education were on the rise; nonetheless, persistent inequalities “stunted the growth of average Mexicans”. The delayed demographic transition that generated high dependency rates added difficulties to efforts for getting people out of poverty.

Adolfo Meisel-Vega and associates have built an enormous database (N = 225,000) for Colombia, from data recovered from judicial background certificates. They use this evidence to present a general picture of the evolution of average heights in Colombia from 1920 to 1990. Unlike Mexico, Colombians attain in the 20th century remarkable improvements in biological wellbeing (4.1 cm for women; 5.8 cm for men). Many factors contributed to this achievement: an increase in real income and food provision as well as significant improvements in health, education and public services, sanitation in particular. During the 20th century, Colombians achieved a significant decline in infant mortality and a parallel increase in life expectancy. Secondly, the authors find important differences in

stature in relation to gender, education, occupation, health condition, region of birth, and access to public services. Thirdly, the authors run tests for Beta and Sigma convergence. They found a slow process of Beta convergence among departments (the shortest districts growing faster than the taller districts); while the stature CV tended to fall during the period 1950–1990. This reduction of net-nutritional inequality across districts and among persons was the product of economic growth under the conditions of industrialization, urbanization, and the state provision of basic services, in particular water and sewage.

For Argentina, Ricardo Salvatore resorts to a combination of datasets drawn from military, electoral, and prison records to estimate indicators of the evolution of net-nutrition inequality between 1875 and 1951. The author uses two indicators to evaluate the long-term evolution of inequality: a) the coefficient of variation of heights in different samples; and b) the stature difference between the top 20 and the bottom 20 of the height distribution. Both indicators point in similar direction. During the period of export-led growth, inequality was either stable or declining; whereas the combination of import-substitution industrialization with a process of rapid urbanization produced a rise in inequality, particularly during the period 1916–1951. Salvatore attributes this second result to the combined effect of interior migrations, industrialization, and the concentration of population in a few metropolitan cities. The so-called “Williamson intuition”—that industrialization enhances the salary range, creating income inequality—is extended in this case to the terrain of nutrition and health. Perhaps Argentina became more unequal in terms of biological wellbeing after 1930 because of the greater dispersion of earnings produced by industrialization.

Daniel Franken estimates the evolution of average heights in Brazil from 1850 to 1950, using a quite large database taken from military and passport records. He concludes that there were increase in stature over the long-run, yet these gains were quite uneven across region. During the 1850–1889-period there was stagnation in average heights. This was followed by a period of substantial growth in stature (3 cm) during 1880–1910. After this, average stature fell and then recovered. Over the long-run (1880–1950) the total increase of stature was greater than 5 cm. These were the results attained using the sample of military recruits. The passport sample (pertaining to city of Rio de Janeiro) showed stagnation of heights between 1875 and 1900 followed by growth in the first two decades of the 20th century. Comparing military with passport evidence, Franken infers that there must have been a convergence of stature among different social classes. The author attributes this improvement in biological welfare to hygienic reforms carried out during the First Republic (1890–1930), and to the rapid economic growth provided by the “coffee boom” first and by industrialization later, both in the southern states. State efforts to improve

the nutrition of children and the sanitation of cities paid up in better health in the long-run. Yet at the end of this process, there remained significant regional disparities in heights: recruits from the Northern and Northeastern states were much shorter than those born in the Southern and Southeast states.

## 2. Significance of Findings

The articles presented in this volume both re-affirm previous findings about the evolution of average heights and, more generally, of biological welfare and present new findings on the question of net-nutrition inequality.<sup>4</sup> One can summarize this finding by saying: the 19th century was a time of stagnation in average stature; while the 20th century was a time of important, though uneven improvements in biological wellbeing. Throughout the contemporary period, regional and socioeconomic differences have been significant and, although they have diminished with the advances achieved during the twentieth century, the inequality of biological welfare persists even within the developed regions.

Concerning the first issue, the contributions clearly indicate that during most of the 19th century—until the 1880s or 1890s—there was a long stagnation if not decline in biological welfare. This appears clear in the cases of Chile (stagnation during 1820–40, decline 1840–50, stagnation afterwards until 1890), Spain (stagnation 1840–1875, slow improvement 1875–1890), and Brazil (stagnation 1850–1900 with minor ups and downs). These findings coincide with what we know about 19th century Spain (Martínez Carrión, 2016), Mexico (López-Alonso, 2012; López-Alonso and Vélez-Grajales, 2017) and Peru (Twrdek and Manzel, 2010; Baten, Pelger and Twrdek, 2009). Something different seem to have occurred in Argentina, with some evidence pointing to improvements in heights in the period 1810–1835 (Salvatore and Baten 1998) and other evidence showing a long stagnation of stature between 1850 and 1892 (prisoner's data, Salvatore, 2007, 2019b). To complicate matters, the city of Buenos Aires showed strong improvements of health and nutrition during the period 1860–1900.

In the 20th century, the biological standard of living improved in Argentina, Mexico, Colombia, Chile, and Spain due to different forces:

<sup>4</sup> Earlier contributions to the anthropometric history of the region include: Salvatore and Baten (1998); Salvatore (2004); Meisel and Vega (2005, 2007); Frank (2006); Salvatore (2007, 2009); Baten, Pelger and Twrdek (2009); Martínez-Carrión (1994, 2009); Quiroga (2001), Salvatore, Coatsworth and Challú (2010); Twrdek and Manzel (2010); Challú (2010); Grajales-Porras and López Alonso (2011); López-Alonso (2012); among others. In addition to economic historians, numerous contributions made since the 1970s by physical anthropologists stand out. An early review can be seen in Bogin and Keep (1999).

more rapid export-growth, industrialization, urbanization, state provision of sanitation services (vaccination, clean water, sewage, and food control). This improvement seems to have shown different timing and intensity according to the country.

In Spain, except for a decline and stagnation in 1915–1944, the 20th century brought about a significant increase in average heights. As a result, the stature of Spaniards grew 7.6 cm over the century, 4.7 cm attained in the post-1945 period. According to Cámara et al. two processes impacted negatively the biological wellbeing of Spaniards in the 20th century: the Civil War (1936–39) and the “years of hunger” that coincided with the consolidation of the Franco regime. These shocks impacted the cohorts born during the 1920s in their adolescent years. This paper reaffirms the importance of child malnutrition in stunting during the 1940s and contributes to the puzzle of the fall of the stature of the recruits during Franco’s autarky. The anthropometric history generally assumes that the first years of life are crucial for adult height and minimize the impact of the adolescent environment on growth. However, this and some previous studies suggest that the adverse environmental conditions of individuals who experienced puberty between 1936 and 1950 in Spain could have a greater negative impact than was thought in adult final height.<sup>5</sup>

Colombia presents an almost unique success story in which important modernizations in the economy translated into significant improvements in biological wellbeing. As Meisel-Roca and associates show, the stature of Colombians made important gains during the 20th century (4.1 cm for women; 5.8 cm for men). This growth in average heights started in the mid-1930s and continued almost uninterrupted until the end of the century. Authors attribute this significant improvement in health and nutrition to the effect of growing real income and food intake, the provision of public services (aqueducts), and the significant expansion in education and health services. These results are consistent with a Historical Index of Human Development (HIHD) prepared by Jaramillo, Meisel and Ramírez (2018).

After a first decade of improvement, Brazil showed stagnation of stature in the 1910s and 1920s. Then in the 1930s and 1940s average stature grew, but at a slow pace. According to Franken’s estimates, mean stature grew in Brazil 2.0 to 2.7 cm between the 1900 and the 1950 birth cohorts. This result appears modest in relation to the overall growth of the Brazilian economy (per capita GDP grew at rates of 2.5 to 3.5% during this period) and also in relation to the activism demonstrated by state functionaries in matters of public health, particularly during the first two decades of the First Republic. It is not clear then if the wealth generated by the coffee

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<sup>5</sup> Recent historical studies emphasize puberty as a decisive phase in the growth process, see Beekink and Kok (2017); Cañabate-Cabezuelos and Martínez-Carrión (2017); Depauw and Oxley (2018).

boom first and then by the industrialization of Sao Paulo translated in an overall improvement of human welfare.

A similar deception results from the story of Mexico, examined by López-Alonso and Vélez-Grajales. During the period 1951–1986 Mexicans made modest gains in stature (2.0 cm for women; and 2.5 cm for men). This mediocre results in health and nutrition contrast with the rapid growth of the Mexican economy between 1940 and 1981 (GDP growth rates ranged from 4.8 to 5.6%). More importantly, the post-revolutionary state established certain social policies and institutions that later became the basis of a modern welfare state. Yet the limited coverage of the system undermined the egalitarian and redistributionist objectives of policy-makers. Also, persistent social inequalities related to education put a limit to upward social mobility and the reduction of poverty.

For Argentine, the longest series of heights available cover from 1901 to 1943 (army recruits) and from 1885 to 1959 (prisoners). (Salvatore, 2004; and Salvatore, 2019a) Both series show long-term improvements in biological wellbeing; prisoners gained 1.0 cm, while recruits gained 2.3 cm. Again, we find here a situation of meager stature gains in a rich economy producing food for exports followed by an industrialization process since the early 1930s. Here also, there was a Hygienist elite promoting sanitation and health policies that managed to substantially reduce infant mortality rates by the early 1940s. A richer, nation-wide database presented here gives a more comprehensive view of nutrition and health wellbeing in the first half of 20th century Argentina. Our new estimates produce a similar result: in the five regions of the country, stature grew on average 2.6 cm from 1916 to 1951. The city of Buenos Aires was perhaps the only district that made significant gain during this period: stature increased there 4.5 cm.

With regard to the question of net-nutrition inequality, this volume's contributions bring new insights as well as new approaches. In anthropometric history one could measure three types of inequality: a) the overall inter-personal inequality, measured by the Coefficient of Variation or similar indicators; b) regional inequalities, measured by absolute differences from the mean or from the leading district, and also through the estimation of Beta convergence; and c) social inequalities as reflected in stature differences by level of education, occupation, or skills. The most relevant articles in this regard are those on Spain, Argentina, and Colombia.

The article on Argentina used two measures: CVs of heights; and difference in height between the top 20 and the bottom 20 of the height distribution. Both indicators point into the same direction. In times of export-led growth there was declining or stable levels of inequality; while during import-substitution industrialization there was a dispersal in purchasing power among families that resulted in higher CVs and a greater height gap between the top 20 and the bottom 20. This study proves the validity of the second estimator, which in the case of Argentina produces

differences of 16 to 18 cm. As the article makes clear, this gap has increased over time systematically between 1916 and 1951.

The article on Colombia resorts to Beta convergence tests to prove that over the long-run, height disparities across districts tended to decrease. So much was this the case that the Andes district (the shortest in stature at the beginning) ended up being the tallest district. In the case of Colombia there was also Sigma convergence; meaning that the CV tended to fall over time. Hence, Colombia appears as a unique case, both in terms of long-term gains in stature, and with regard to the decline of regional disparities. Meisel-Roca and associates also show that other differences were significant: differences in gender, education levels and skills. Regarding gender, the authors estimate a difference of 5.3 to 5.5 cm between the stature of men and women; yet find that is gap grew over time. Being close to 8.5 cm in 1921, the difference rose to 12 cm by 1990. Regarding educational achievement, the authors find that people with primary school are 2.5 cm tall than illiterates; and people with secondary school 3.2 cm taller. Differences in stature related to skills were 1.8 cm in 1921 increasing to 2.1 cm by 1990.

The article on Spain suggests that mean stature and the CV are related but not in the way we imagine. Higher levels of stature (over 165 cm) correspond to lower levels of inequality (lower CVs); while at lower levels of stature (under 165 cm) the inter-personal dispersion is greater (higher CVs). This results in an L-type, non-linear curve. If this is so, one must expect that the improvement of health and nutrition (leading to higher stature) should correspond to a decline in net-nutrition inequality. This seems to the case for Spain, but not for Argentina, where increasing heights over time are associated with higher nutrition inequality, at least for certain regions. For Spain, data suggest that the inequality was significantly high after the liberal reforms, until the 1870s. Although later declined and remained lower in the twentieth century, inequality rebounded somewhat during the years of Francoist autarchy, reaffirming the results of recent studies (Ayuda and Puche, 2017; Cañabate and Martínez, 2017, 2018). Cámara et al. use indicators of the top and the bottom 1 percentile in relation to the mean to show a difference of 15 cm above the mean for the top 1 percent and 15 cm below the mean for the bottom 1 percent. This difference seems stable over the long-run. In addition, the authors produce evidence that show clearly that greater levels of education are associated with higher stature. In this case, students are systematically taller than literate workers, and this in turn always taller than illiterate persons<sup>6</sup>.

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<sup>6</sup> Neither Salvatore nor Cámara et al. deal here with regional disparities. They have done research on this matter in other articles. See Salvatore (2009); and Martínez-Carrión and María-Dolores (2017).

In short, these six articles add new evidence that either confirm some earlier findings or introduce more certainty about trends in human welfare in Spain and Latin America; and, to the extent that they provide meticulous measures of net-nutrition inequality in the long-run, these contributions push ahead into a new line of research. The findings refer still to the “larger” countries in Ibero-America, yet they indicate both the terrain that Anthropometric history has so far covered; and the issues and questions that still remain open or undeveloped.

Scholars have made so far important and influential contributions to the field of anthropometric history in Ibero-America. Yet, there are some areas of research, some regions, and some questions that remain obscure and need further research efforts. In terms of estimation of trends in average stature, we need more work on the early and middle 19<sup>th</sup> century, and for some countries, we still lack basic information for the second half of the 20<sup>th</sup> century. Studies on trends of female heights and ethnic groups with sources available for the second half of the 20<sup>th</sup> century are also required<sup>7</sup>. Furthermore, wages may not be the main component in the structure of family income among the subordinate sectors (Moraes and Thul, 2018), we need to find additional records of stature and other measures of well-being for the colonial period, at least for the second half of the 18<sup>th</sup> century<sup>8</sup>. The expansion of our research agenda should also be geographical: we need to incorporate into the comparison the five nations of Central America, the major island nations of the Caribbean, and to know more about countries that at this point remained under-investigated, among them Ecuador, Bolivia, Paraguay and Uruguay. Nonetheless, the contributions of this volume and recent research on anthropometric history provides answers and raises questions that show that the Iberian and Latin American regions have much to add to the debates about the impact of economic and social processes on human welfare, living standards and inequality.

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<sup>7</sup> See, respectively, Challú and Silva-Castañeda (2016); and Acosta and Meisel (2013);

<sup>8</sup> Recent papers, see Dobado and García (2017); Llorca et al., (2018).

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