

Ethnic Groups and Anthropometric
Differences in Colombia

Por: Karina Acosta, Adolfo Meisel

Núm. 731
2012

Borradores de ECONOMÍA



ta - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Col



Ethnic Groups and Anthropometric Differences in Colombia

Karina Acosta and Adolfo Meisel *

Banco de la República (Central Bank of Colombia), Centro de Estudios Económicos Regionales
CEER,

Centro Calle 33 #3-123, Cartagena, Colombia.

E-mail addresses: kacostor@banrep.gov.co and amesiero@banrep.gov.co

Abstract

Using data from the 2010 Colombia Demographic and Health Survey and of the National Survey of the Nutritional Situation in Colombia (ENDS-ENSIN), we analyzed the evolution of the height for the Colombian birth cohorts in the period 1946-1992 by ethnic groups defined through self-classification. We find that there are statistically significant differences in height between the ethnic groups considered. Those who identified themselves as Afrocolombians have greater average height than the indigenous group and are also taller than those who don't identify themselves as belonging to either of these two groups. This latter category was denominated in the survey as *others*. We also find that the height gap between afros and *others* became smaller during the time period under study. Moreover, the results suggest that the Colombian indigenous group has a higher potential for growth in 'biological well-being' if their socioeconomic status improves.

JEL Classification: I12, I14, N36, Z13.

Keywords: anthropometry, ethnicity, biological well-being.

* The findings and opinions expressed in this article are those of the authors and do not necessarily represent those of the Banco de la República or those of its board of Directors. The authors benefitted from the comments by Haroldo Calvo and the member of the Regional Economic Research Center (CEER) of the Colombia Central Bank.

I. INTRODUCTION

Height is one of the characteristics that better reflect people's material well-being. Although potential height is genetically determined, a person needs good nutrition, good health, and good living conditions during his/her growth years, 0 to 18, in order to reach potential height.¹

This paper studies the evolution of height of Colombians born between 1946 and 1992. The analysis covers the main ethnic groups in the country. For this purpose we have used a sample of anthropometric information for 92,953 individuals included in the National Survey of the Nutritional Situation in Colombia (ENDS-ENSIN, 2011). The survey contains very useful information for the anthropometric analysis of height and its determinants.

The field of anthropometric has evolved since the end of the 1970s thanks to a group of North American social scientists, led by the economic historian Robert W. Fogel.² In association with colleagues from the biological sciences, these researchers helped create this new discipline, which studies height as a way to objectively understand the level of biological wellbeing of populations, both in the present and in the past.

¹ Richard Steckel (1995) has characterized the growth stages of humans in different periods. He points out that the fastest growth stage occurs during childhood and slows irregularly during the pre adolescent stage. Finally, the speed of growth increases during adolescence and reaches around half of that reached during childhood. It then stabilizes at zero during maturity. See Richard Steckel, "Stature and the Standard of Living", *Journal of Economic Literature*, Vol. XXXIII. December, 1995.

² Robert W. Fogel, *The Escape from Hunger and Premature Death, 1700-2100: Europe, America, and the Third World*, Cambridge University Press, USA, 2004.

Only a small number of people reached their potential height before the XVIII century because almost all of the world's population suffered from high levels of malnutrition. During the XIX century, the spread of the Industrial Revolution had a positive impact on the quality of life for most individuals, which resulted in an increase in the average height of northern Europeans and North Americans. This secular trend of increased height started to spread to other regions of the world during the XX century, including developing countries.³

The first anthropometric study in Colombia was published in 1992. Using a sample of 14,103 observations with information from the national ID card statistics, Ordóñez et al. (1992) found that there was an increase in height of 7.0 cms. for men and 8.7 cms. for women between 1910 and 1970.⁴

After 2007, Adolfo Meisel and Margarita Vega published a number of anthropometric history papers using also data from the national ID cards, with over 9 million observations, as well as from passports.⁵ They found a sustained increase in height in those cohorts born between 1905 and 1985. The increase was about 8.96 cms. for men and 8.95 cms. for women. In addition, there was a

³ For a survey of the anthropometric literature since 1994 see, Richard H. Steckel, "Heights and Human Welfare: Recent Developments and New Directions", *Explorations in Economic History*, 46, 2009. The following volume collects recent anthropometric work for Latin America: Ricardo D. Salvatore, John H. Coatsworth, and Amilcar E. Challu, *Living Standards in Latin American History, Height, Welfare, and Development, 1750-2000*, DRCLAS, Harvard University Press, USA, 2010.

⁴ Antonio Ordóñez, Gustavo Ramírez y Doris Polanía, "La estatura y el desarrollo económico y social en Colombia", *Informe Final*, Fedesarrollo, Bogotá, 1992.

⁵ Adolfo Meisel Roca, Margarita Vega, "The Biological Standard of Living (and its convergence) in Colombia, 1870-2003, A Tropical Success Story, *Economics & Human Biology*, Volume 5/1, March, 2007; Adolfo Meisel Roca y Margarita Vega, *La calidad de vida en Colombia, Antropometría histórica, 1870-2009*, CEER, Banco de la República, Cartagena, 2007; Adolfo Meisel y Margarita Vega, "Stature of the Colombian Elite Before the Onset of Industrialization, 1870-1919", Ricardo D. Salvatore, John H. Coatsworth, and Amilcar E. Challu, *Living Standards in Latin American History, Height, Welfare, and Development, 1750-2000*, DRCLAS, Harvard University Press, USA, 2010.

pronounced convergence in the interpersonal differences of height. Height growth in men occurred throughout all regions of the country. The increase for women happened across all departments, except for San Andrés Island, which showed a slight decrease towards the end of the 20th century.

This paper examines the evolution of height by ethnic groups in Colombia, an analysis that has not been attempted previously. The ENDS-ENSIN collected information in 2010 which allowed self-identification of ethnic groups or the decision of not being identified in any of the groups listed in the survey. The latter group of people, as well as those self-identified as gypsies,⁶ we shall call *others* and will therefore be a residual rather than an ethnic category.

This work analyses the height of *others* and of the two categories which proved to be significant in the sample, indigenous and Afrocolombians. It should be noted that these categories are social constructions and are therefore arbitrary. In other words, they do not belong to a clearly delimited group from a genetic or phenotypic standpoint. We cannot define them as a biological reality but rather as a social reality. This idea is in accordance with the contemporary anthropological current that denies the existence of races as a biological fact and points out the arbitrary nature of all taxonomies in this manner.⁷ This is not to say that belonging to socially constructed categories, such as the indigenous and Afrocolombian, does not correspond to a social reality that may have positive and negative consequences upon the interactions with other members of society.

⁶The gypsy group is very small and represented only 0.1% of the total sample.

⁷ Matt Cartmill, "The Status of Race in Physical Anthropology", *American Anthropologist*, Vol. 100, No. 3, Sep. 1998.

The paper has the following structure: section two gives a brief explanation of the database used, as well as the definition of the variables presented in subsequent sections. The third part analyses the evolution of height in indigenous, Afrocolombian, and others and differentiates them in quintiles, defined according to the socioeconomic situation of each family. Next, we present econometric estimates of the determinants of height. The last section concludes.

II. Data

The data used in this paper comes from the National Survey of Demography and Health (ENDS, in Spanish) and the National Survey of Nutritional Situation (ENSIN, in Spanish), conducted in 2010 for the same sample and published in 2011. Although the first survey on the Colombian nutritional situation was undertaken in 2005, we do not use that information because it did not include a key variable for our purposes: ethnic distinctions. In addition, 2010 ENDS-ENSIN features a much larger sample of 50,670 households. The surveys covered a total of 258 municipalities (out of 1023 in Colombia) in 32 departments (states), a representative sample of all six geographic regions of the country.⁸

The surveys include people from 0 to 64 years of age, for which we can also identify gender, ethnic group, and socioeconomic status. In this paper we will only consider people between 18 and 64 years of age. As mentioned before, the growth period in humans extends approximately until the age of 18.⁹ This may cause a

⁸Amazonía and Orinoquía, Atlántica, Bogotá, Central, Oriental, and Pacífica.

⁹For a detailed analysis of the growth process see, Stanley J. Ulijaszek, Francis E. Johnston, and Michael A. Preece. The Cambridge Encyclopedia of Human Growth and Development. p.195

downward bias since height tends to decrease after the age of 42 due to the compression of the vertebrae. However, this is compensated by the fact that shorter people tend to have a higher mortality rate (Monasterio et al., 2010). The data shows evidence of a very slight fall in height with age, as we will observe in the next section. Nevertheless, we were unable to isolate these two effects.

Given the age boundaries we have established for this study, the sample consists of a total of 92,953 individuals, of which 39,546 are men and 53,407, women.

The 2010 ENDS-ENSIN survey identified the ethnicity of each household member by asking if the person recognized himself/herself as belonging to a specific ethnic group.¹⁰ The options included: indigenous, gypsy or rom, raizal (from San Andrés Island), palenquero (from San Basilio), or black/mulato/Afrocolombian/Afrodescendent.¹¹

The data was sufficient to obtain a significant number of individuals for the Afrodescendent and indigenous groups, even though the survey makes it clear that it does not attempt to provide representative samples of ethnic groups. This is the reason why this document restricts the ethnic classifications presented to only

¹⁰ Encuesta Nacional de Demografía y Salud (ENDS) 2010. Capítulo III, p. 58.

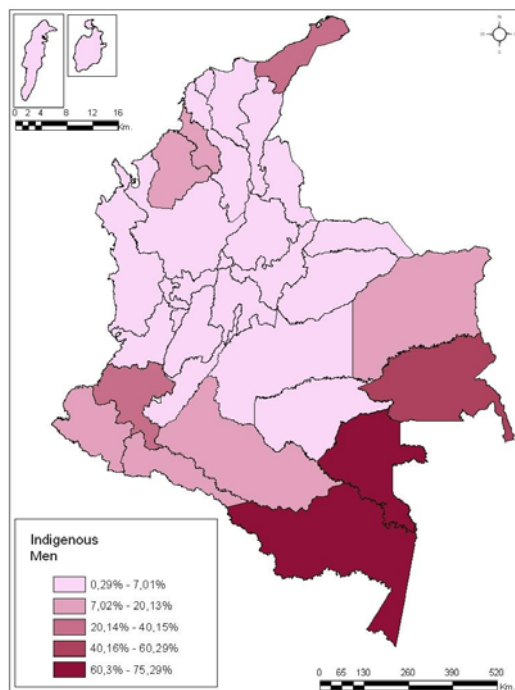
¹¹ A raizal is someone who is a Colombian of African ancestry, was born in San Andres y Providencia department, and speaks the local Caribbean English. Moreover, according to UNESCO (2005), "The Palenque de San Basilio was one of the fenced communities called palenques, which were founded by escaped slaves. Thus, Palenqueros are the member of this community and their decedents in the seventeenth century. Of the many palenques that existed in former times, only the one of San Basilio has survived until the present day and developed into a unique cultural space. The village of Palenque de San Basilio, with a population of about 3,500 inhabitants, is located in the foothills of the Montes de María, southeast of the regional capital Cartagena (Colombia)".

three: indigenous, Afrocolombians (which include raizals and palenqueros from San Basilio), and others (which includes all those who did not identify themselves as belonging to the other two groups).

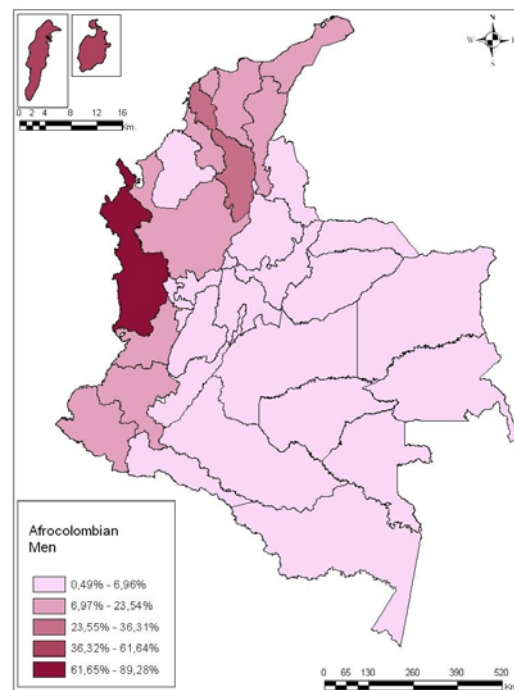
The distribution of genre is somewhat similar throughout all ethnic groups across Colombia. The participation of ethnic groups in the sample is larger than in the national censuses of population. Maps 1, 2, 3, and 4, show that there are distinct

MAPS

1. Proportion of indigenous men

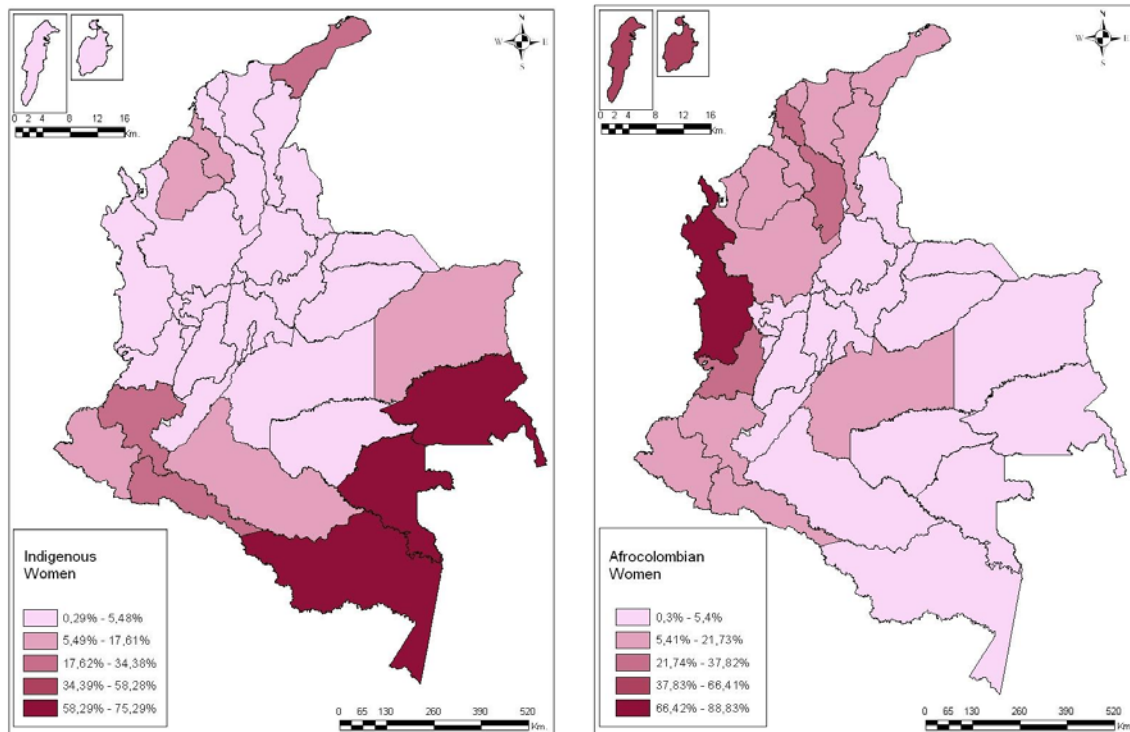


2. Proportion of afrocolombian men



3. Proportion of indigenous women

4. Proportion of afrocolombian women



Source: Authors' estimations based on ENDS-ENSIN (2010).

geographical patterns for the presence of ethnic groups. Afrocolombians are mostly concentrated in Chocó and San Andrés. However, they are also present throughout the Colombian Caribbean and Pacific Coasts.

On the other hand, indigenous people have a different distribution in the territory. This group is mainly located in the northern area of the country, in the Guajira peninsula, and, in the south, in the Amazonía region, and in Cauca. Although the maps show larger proportions of this population in the shaded areas, ethnic groups

continue to be minorities and, as such, are at a disadvantage in many aspects compared to the rest of the Colombian population.¹²

This survey contains relevant and new information because, as mentioned in the ENSIN document, it is the first time that approximations of the nutritional situation of these groups are included.¹³

III. Inter-ethnic differences in stature

The evolution of height in Colombia from the end of the 1940s to the early 1990s was characterized by a moderate growth rate, with minor fluctuations. This was true for both men and women. Table 1 shows that the annual growth rate of height during this period was positive for all ethnic groups and genders. To obtain the growth rate we compared the average height of those born in the first five years of our period of analysis (1946-50) with that of the last five years (1987-92). The most significant finding in Table 1, which is confirmed by other evidence, is that 'others' is the group with the highest growth rate during the period.

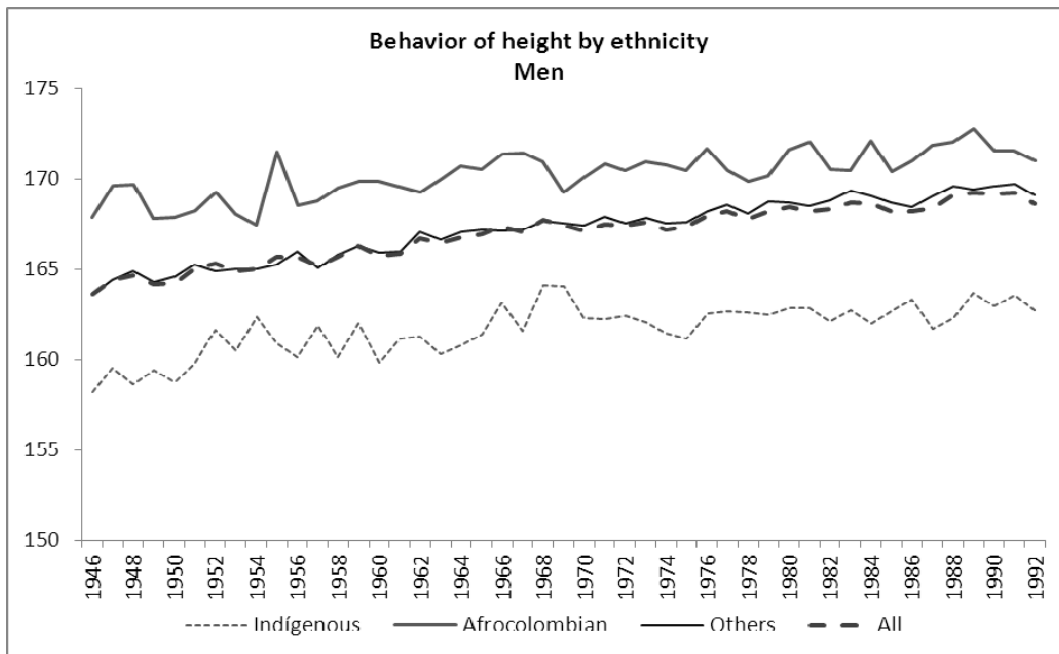
Table 1. Growth rate of height for the group aged 18-23 vs 60-64, 1946-1992.

	Indigenous	Afrocolombian	Others
Men	2,3%	2,0%	3,3%
Women	2,8%	2,9%	3,7%

¹² For a study of the economic disadvantages that the indigenous group has to deal with, see Romero, J. (2010). "Educación, calidad de vida y otras desventajas económicas de los indígenas en Colombia".

¹³ National Survey of Nutrition Situation in Colombia (ENSIN 2010).p.37.

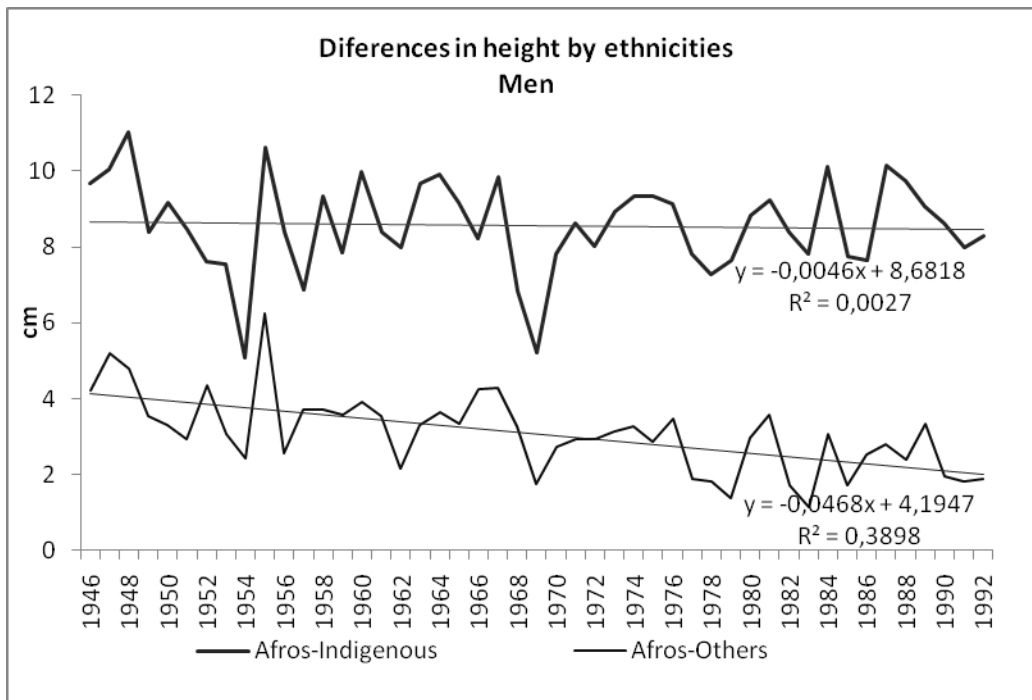
Figure 1. Colombia: Behavior of male height by ethnic origin, 1946-1992.



Source: Authors' estimations based on ENSIN 2010.

In Figure 1, it is evident that the average heights of Afrocolombians and of members of the indigenous group are very different. For all the years of the sample, Afrocolombian men who were born between 1946 and 1992 were taller than indigenous and 'others' born in the same period. Furthermore, when we analyze the differences in centimeters by ethnicity, the average difference between Afros and indigenous was about eight centimeters. Also, this difference remains stable over time, as is shown in Figure 2 (the coefficient for the trend is not statistically significant in this case).

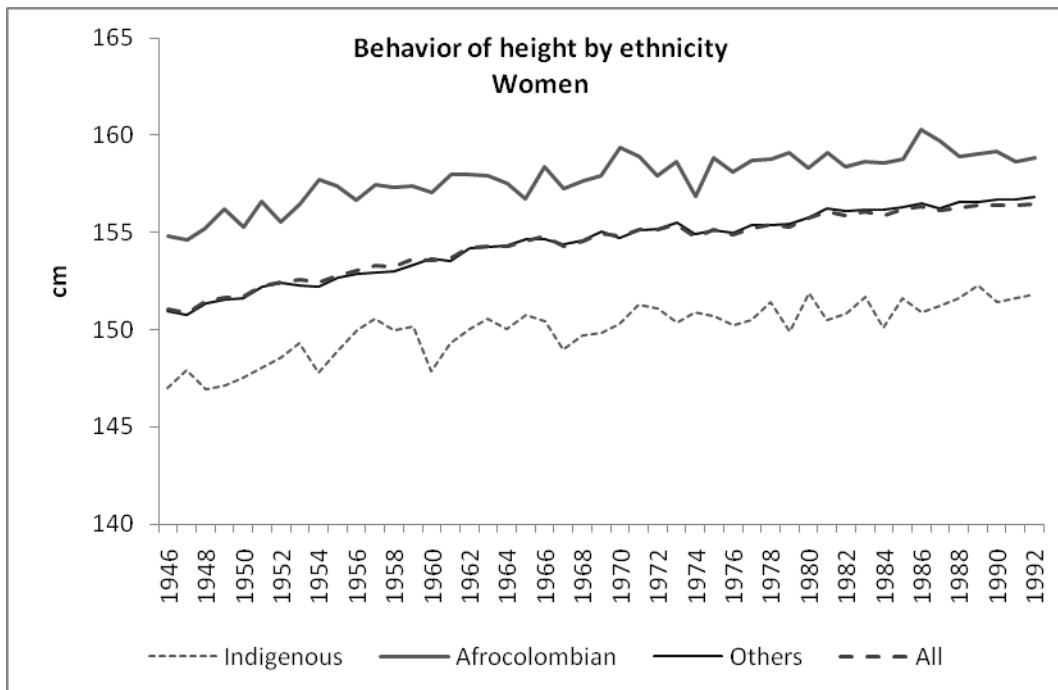
Figure 2. Colombia: Differences in male height by ethnic origin, 1946-1992



Source: Authors estimations based on ENSIN 2010.

In contrast, stature differences between Afros and 'others' have a decreasing trend which is statistically significant. For those born near 1946, the difference in height between Afros and 'others' was almost 4 cm. In contrast, for those born near 1992 this difference was reduced to half of what it was in the late 1940s.

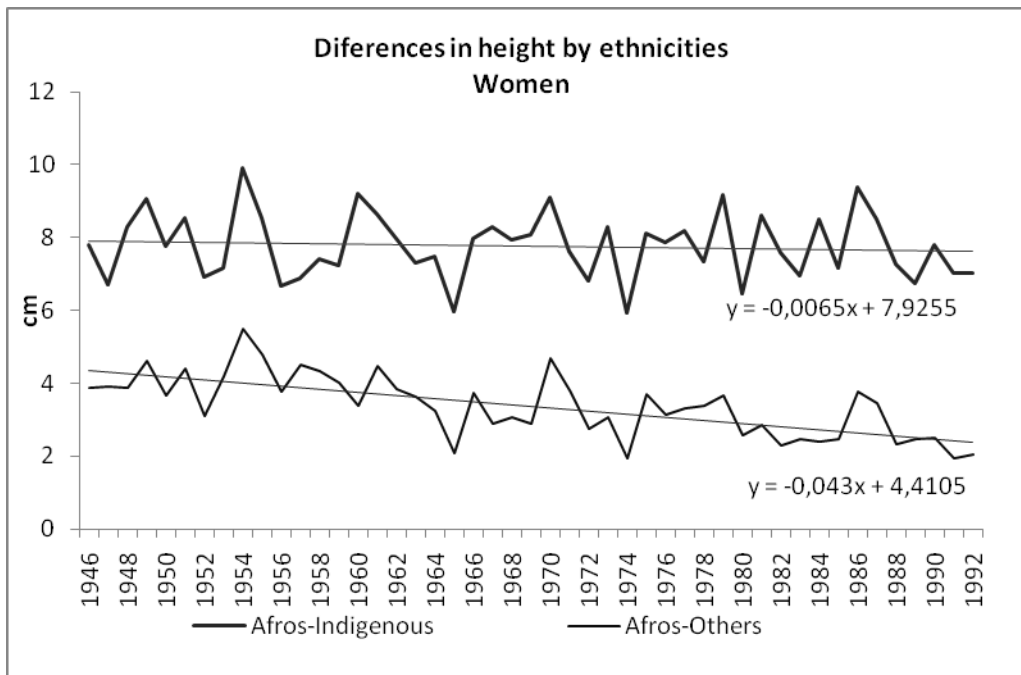
Figure 3. Colombia: Behavior of female height by ethnic origin, 1946-1992.



Source: Authors estimations based on ENSIN 2010.

Results for women do not differ from those for men. The three ethnic groups have the same trend in height. Similarly, the difference between Afro and indigenous remained more or less constant, but with minor fluctuations (see Figure 4). However, the differences between Afros and others declined during this period. The slope coefficient in the gap of the stature is -0.043 and is significant at 99%.

Figure 4. Colombia: Differences in female height by ethnic origin, 1946-1992.



Source: Authors estimations based on ENSIN 2010.

Table 2 shows average height for men in the different categories we have mentioned, according to the wealth index quintile. The ENDS-ENSIN survey does not include household income and expenditures. For evaluating socio-economic status, ENDS-ENSIN included an index of wealth calculated by the method of principal components and classified the sample by quintiles. Quintil 5 is considered the richest one, while quintil 1 is considered the poorest.

Table 2. Average height by wealth quintiles (centimeters).

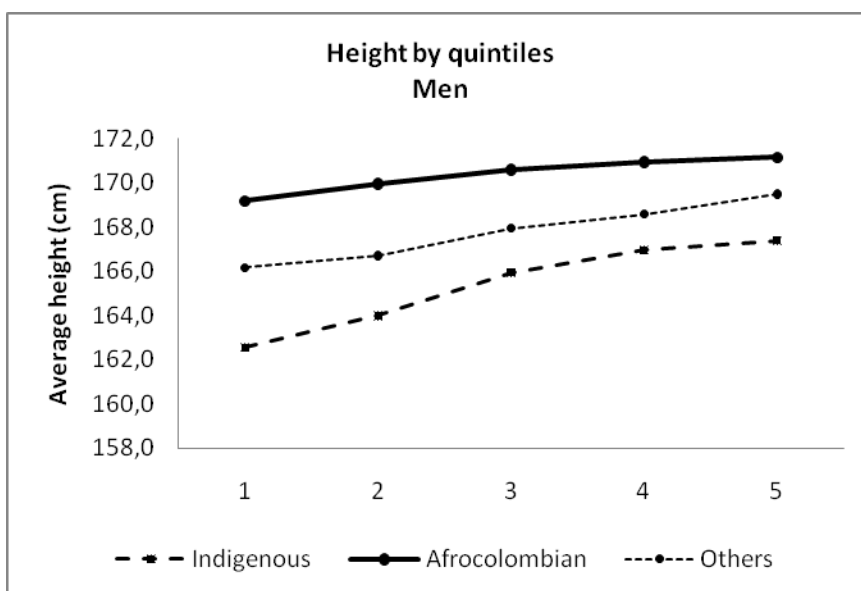
	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Men						
Indigenous	162,6	164,0	166,0	167,0	167,4	4,8
Afrocolombians	169,2	170,0	170,6	170,9	171,2	2,0
Others	166,2	166,7	168,0	168,6	169,5	3,3
Women						
Indigenous	150,4	152,0	153,4	153,5	154,9	4,5
Afrocolombians	157,3	157,2	157,7	158,0	158,2	0,9
Others	153,8	154,3	155,0	155,3	155,8	2,0

Source: Authors estimations based on ENDS-ENSIN 2010.

Across categories and gender, for both men and women, the higher the quintile the higher is the average stature. However, the biggest change in height between the lower and higher quintiles is for indigenous and 'others', in that order. The average height of indigenous men increases 4.8 centimeters from the first to last quintile. In Afros and 'others', the increase is 3.3 and 2.0 centimeters, respectively.

The largest difference in height among ethnic groups by quintiles corresponds to quintile one. Here the difference between indigenous and Afros is 6.6 centimeters. That gap is reduced as living conditions improve, reaching a difference of 3.7 centimeters in quintile five.

Figure 5. Male height by ethnic group and quintile, 2010.

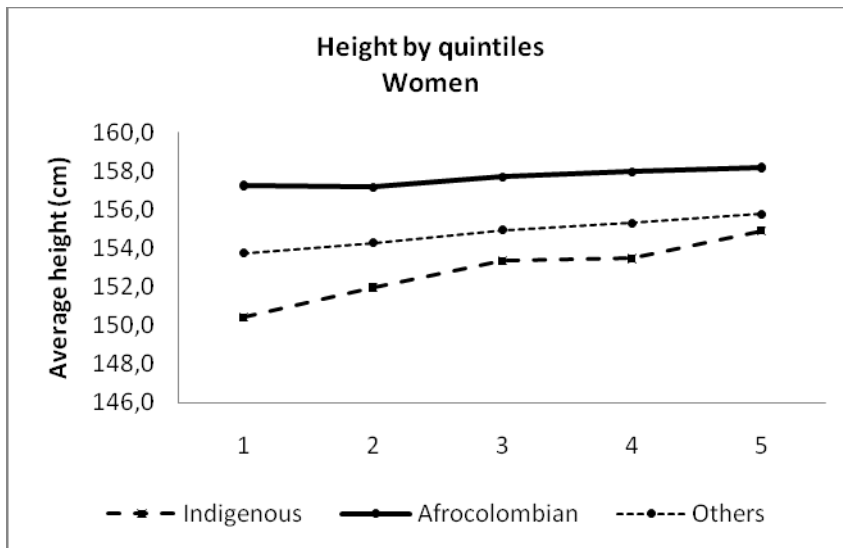


Source: Authors' estimations based on ENDS-ENSIN 2010.

The biggest difference for men, by ethnic origin and quintile, is between Afrocolombians of quintile five and indigenous of quintile one: 8.6 cms. The difference reflects specific characteristics of ethnic groups, as well as the importance of living conditions.

For women, differences in height, according to quintiles and ethnic groups, are smaller than those observed for men. For example, for indigenous women grouped in quintile one and five, the difference is 4.5 centimeters. While in the case of others and Afros the difference is just 2.0 and 0.9 centimeters, respectively. Moreover, just as in the case of men, the major difference according to these classifications is 7.8 cm between indigenous women in quintile one and Afro-Colombians in quintile five. As can be observed, this gap is smaller in the case of women compared to men.

Figure 6. Female height by ethnic group and quintile



Source: Authors' estimations based on ENDS-ENSIN 2010.

These observations so far are consistent with the findings of Komlos (2010) in his analysis of ethnicity and gender for the population of the United States. He argues that the gap in height between blacks and whites is higher among low and medium income groups, where whites are 2 centimeters taller on average. Although this evidence is clear in the case of women, it is not so for men. Additionally, in the same study Komlos found an increase in inequality between white and black women that is not evident among men. This is an aspect in which Komlos's findings differ from our results. Although we use different ethnic distinctions, in Colombia, as we have shown, there is a positive trend towards the reduction of the gap between ethnic groups, especially among Afrocolombians and the group we have called others.

IV. Econometric Analysis

A. The differences in the stature between generations, ethnicity and living conditions

Stature depends on living conditions as well as genetic factors. Other variables that determine adult stature that have been found in the anthropometric literature are access to tap water, gender, and the food security of the household.

In particular, access to tap water over the years of physical growth, usually between 0 and 18 years old, but especially over the first three years of life, is one of the most important variables in terms of the impact on stature. Access to drinking water of good quality is important because it reduces the risk of gastrointestinal illnesses that do not allow the body to process food adequately. This is especially crucial during the first three years of life.¹⁴

Gender is also an important determinant of height. The difference in stature between adult men and women is nearly 10 centimeters. This is a gap that is observed around the world and throughout time.

In our linear regression model the dependent variable is the height in centimeters of men and women between 18 and 64 years of age. We use the total sample data of 36,926 individuals.

Among the independent variables we include gender; access to tap water, measured as a cluster level share; generational groups, since during the last

¹⁴Richard H. Steckel, "Height and human welfare: Recent developments and new directions", *Explorations in Economic History*, 46, 2009, p. 8.

century Colombia has experienced a secular trend towards increased stature,¹⁵ age, grouped into three dummies: 18-30, 31-40, 41 -50; and, finally, the degree of household food security (HFS).

To measure HFS the survey makes a composition of various items that ask about household food supply, the budget constraint that limits acquisition of food, the reduction of the amount of food available, the deterioration of the quality of food and having experienced hunger by some household members because of the lack of food. Given this information, we distinguish four categories of food security: secure, where the household has food welfare; mild insecurity, where there is little security and any reduction in access to food causes concern among some members about its availability; moderate insecurity, where adults have experienced hunger, but most children do not suffer this condition; finally, severe insecurity, where the household has a chronic lack of food and all members, including children, if any, have experienced hunger.

Regressions were estimated for each ethnic category and 'others' in order to assess whether the explanatory variables have the same effect in all three groups. The results are presented in Table 3.

¹⁵ Meisel, A. y Vega, M. (2007), *La calidad de vida en Colombia, Antropometría histórica, 1870-2009*, CEER, Banco de la República, Cartagena.

Table 3. Height estimations model.

Dependent variable:	Ethnic classifications								
	Indigenous			Afrocolombian			Others		
Gender (Man=1)	12,52	39	***	12,38	49,59	***	12,87	125,1	***
Access to tap water	2,42	6,33	***	0,61	2,25	**	0,16	1,33	
<i>Generation</i>									
Age 18-30	1,54	3,25	***	2,25	6,39	***	3,91	26,86	***
Age 31-40	1,70	3,32	***	1,97	5,48	***	2,89	19,07	***
Age 41-50	1,04	1,99	**	1,40	3,73	***	2,00	13,06	***
<i>Food security</i>									
Secure	2,90	5,27	***	0,62	1,35		1,89	5,84	***
Mild insecurity	2,09	4,05	***	0,18	0,4		1,27	3,83	***
Moderate insecurity	2,42	4,72	***	-0,34	-0,72		0,97	2,8	***
R²	0,4998			0,4696			0,523		
Observations	6001			5114			25811		
Model	$Height_i = \beta_0 + \beta_1 M_i + \beta_2 W_i + \beta_3 G_i + \beta_4 S_i + \mu_i$								

Source: Authors' estimations based on ENDS-ENSIN 2010.

Note: Absolute values of t-statistics are in parentheses. Significant at 10% *, significant at 5% **, significant at 1% ***. M_i is a binary variable which takes the value of 1 if the gender is male; W_i represents the cluster percentage of people who have tap water; G_i represents the individual's generation; S_i groups the household food security variables; and μ_i denotes standard errors of the unobserved variables.

The results suggest that the difference in height by gender remains constant among different ethnic groups. The dummy variable for males shows a nearly constant effect of about 12.5 centimeters in the three ethnic categories. This confirms the fact that men are taller than women, even when controlling for other variables that measure the social environment and access to adequate food.

The results also suggest that tap water is an important determinant of height for the indigenous group and Afrocolombians, but not for the others. It might be argued that the measure of tap water is imprecise, since what most affects height is the consumption of water during the first years of life, especially from 0 to 3 years of age. However the survey does not have information on the latter, so we used current access to drinking water. However, as can be seen, the results show statistically significant patterns in the indigenous and Afro group models. In this regard, Galvis and Meisel (2010) found that social mobility in Colombia is imperceptible. They found a high correlation between the Index of Unsatisfied Basic Needs (NBI) for the period of 2005 and those observed twenty years earlier. In addition to poor mobility over time there is also regional persistence of poverty, better known as “spatial poverty traps”.

As to the “generations” groups, the results are robust with respect to one fact: the new generations are taller. The reference group in the regressions is the range 50-64 years old, so that the results should be compared with it.

Globally all signs reported for groups g1 (18-30 years), g2 (31-40 years) and g3 (50-64 years) are positive and significant. As shown in Figures 1 and 2, the latest generations reach greater heights. However, this improvement is not uniform across ethnic groups. Comparing the coefficients for the younger generation (g1) in the different estimates, we find that the lower value is for the indigenous group (1.54), followed by the group of Afro-Colombians (2.25) and finally “others” (3.91). These values tell us that there is a significant increase for the age group between

18 and 30 with respect to the last generation (50-64 years). In other words, the ethnic group with less growth in height is the indigenous, while 'others' had the greatest improvement in height.

An analysis within ethnic groups shows that the coefficients of the generations, g1, g2 and g3, also point to the disadvantage of the indigenous group. The differences in the coefficients between these groups show that, while for 'others' and Afro-Colombians there was a sustained increase in height, this did not happen for the indigenous group. Furthermore, the height of the indigenous group had a reduction of 0.2 centimeters between g2 to g1. In short, the indigenous group has major disadvantages over time in relation to height, which is evident when it is compared with other ethnic classifications.

As mentioned above, access to adequate food and general living conditions are important determinants of stature. To analyze this we used a measure of household food security. We believe that this variable also reflects individuals' living conditions.¹⁶ The reference group is that facing severe food insecurity, so that all binary variables related to food safety should be compared with that group. The coefficient points to a significant and positive effect of adequate nutrition on height

¹⁶ The results using a wealth index of the household were not significantly different.

The food safety coefficients were not significant for the Afrocolombian group. In other words, there are no significant differences in stature between Afrocolombians who report an adequate level of nutrition and those who do not. The evidence is different for indigenous and the group of 'others', which show significant differences in the food security status of the family to which a person belongs. As can be observed, in the case of indigenous people, to be part of a food-safe family makes people 3 cm taller than those who are part of families with severe food insecurity. The same is observed for 'other', but the difference here is 1.8 cm. Thus, there is great potential for growth when people belonging to the indigenous group face better nutritional conditions.

In several regions of Colombia indigenous people live with severe food insecurity, which is reflected in high levels of malnutrition, stunting, and obesity. There is even evidence that the highest rates of stunted growth occurs in regions where there is a greater concentration of indigenous people.¹⁷ For example, the Embera indigenous group, who mainly inhabit the department of Choco, shows a severe nutritional crisis. In the past two decades, the nutrition of the Embera people has been affected negatively by territorial consequences of the colonization process and the armed conflict affecting Colombia.¹⁸ As a result, their average energy consumption was only 1578.6 calories per day. Even worse, at least 50% of the population does

¹⁷Acosta, K. (2012). La desnutrición en los primeros años de vida: un análisis regional para Colombia. Documentos de Trabajo sobre Economía Regional, Centro de Estudios Económicos Regionales (CEER), No.160. Banco de la República, Cartagena.

¹⁸Javier Rosique, Maria Teresa Restrepo, Luz Mariela Manjarrés, Aida Galvez y Johana Santa, "Estado nutricional y hábitos alimentarios en indígenas embera de Colombia", Rev. Child Nutrition, Vol. 37, No. 3. September, 2010, pp.270-271.

not even reach that level.¹⁹ Anthropometric data show that 77.1% of those between 10 and 19 years of age have short stature for their age (83.0% for men and 69.4% for women)²⁰.

It is noteworthy that in the classification of 'other', there is an increase in height to the extent that the security of household food increases. The data shows that moving from moderate to severe food insecurity causes an increase in stature of 0.28 cm, and from mild insecurity to be secure, 0.63 more centimeters. Additionally, the highest change within the indigenous group occurs when individuals move from having mild to moderate insecurity, where the increase in height is 0.8 cm.

The results seem to support the findings of Thaner Eveleth (1976) who, when referring to the interaction between genes and environmental influences concludes that "Two geno-types which produce the same adult height under optimal environmental circumstances may produce different heights under circumstances of privation".²¹

¹⁹Ibíd., p.273.

²⁰Ibíd., p. 275.

²¹Cited by Steckel (1995).

Although it is not clear that indigenous or others have the same genetic characteristics, it does appear that when people self-classified as indigenous are exposed to better conditions they show a marked improvement in height.

B. Econometric analysis of the differences of the stature using anthropometric information of parents

In the previous section we presented estimations which relate living conditions of different generations and their height. However, given the importance of intergenerational influences in height through genetic endowment and the socioeconomic status of the household, we ran some regressions with the father and mother as independent variables for the different ethnic groups.²²

As expected, potential growth is closely associated with ancestry. This is true not only for the obvious factor linking genetic transmission across generations, but also because the living conditions of parents affect the growth of children (adequate food, health and social environment in general).

Table 4 shows that, once we include the stature of both parents, the explanatory power of the independent variables on height for the three ethnic groups is about 0.70. In other words, the origin and quality of life of parents (genotype and

²²Sahn,& Alderman (1997). "On the determinants of nutrition in Mozambique: The importance of age specific effects". *World Development*.577–88.

economic conditions) are strongly associated with the biological quality of life of their children (meaning height as a measure of biological well-being).

Table 4.

Dependent variable: height	Ethnic classifications							
	Indigenous	Afrocolombian	Others					
Gender (Man=1)	11,75	22,56	*** 12,77	26	*** 12,83	66,77	***	
Mother's height	0,48	8,62	*** 0,45	11,96	*** 0,41	25,48	***	
Father's height	0,38	7,58	*** 0,48	11,21	*** 0,34	22,43	***	
<i>Food security</i>								
Secure	3,50	4,07	*** -1,43	0,62	1,85	3,81	***	
Mild insecurity	3,78	4,71	*** -1,55	-0,66	1,51	3,08	***	
Moderate insecurity	1,69	1,82	* -0,68	-0,75	0,36	0,63		
R²	0,7214		0,6799		0,667			
Observations	775		633		4519			
Model	$Height_i = \beta_0 + \beta_1 M_i + \beta_2 MH_i + \beta_3 FH_i + YS_i + \mu_i$							

Source: Authors' estimations based on ENDS-ENSIN 2010.

Note: Absolute values of t-statistics are in parentheses. Significant at 10% *, significant at 5% **, significant at 1% ***. In the model specification: M_i is a binary variable which takes value of 1 if the gender is male; MH_i represents the mother's height; FH_i represents the father's height; S_i grouped the household food security variables; finally, μ_i denotes standar error of the unobserved variables.

Including the height of the father and the mother considerably reduces the number of observations in the sample due to constraints in the surveys. This happens because the only way to identify the height of the father and the mother is if they are present in the household. Given this condition, we were not able to include age

groups that were incorporated before, because we did not identify enough individuals over 30 years old with the information we needed for the estimations.²³

Comparing the coefficients of the size of both parents among the ethnic groups, we found that the stature of the mother explains more variation of height in the case of indigenous people, while the stature of the father has greater explanatory power for Afrocolombians. Each additional centimeter in the mother's height within the indigenous groups implies 0.48 cm more in height for the offspring, while for Afros and 'others' the increase is of 0.45 cm and 0.41 cm, respectively. In the case of the father, each additional centimeter of height improves the stature of the offspring by 0.48 cm, indigenous in 0.38 cm, and others in 0.34 cm. Additionally, food security remains crucial in explaining height and nutritional conditions are more important in the case of indigenous.

V. Conclusions

The anthropometric characteristics of Colombian ethnic groups have not been widely studied. The main reason has been the lack statistically representative data. In this paper we discussed the recent evolution in height of the main ethnic groups, defined according to self-classification. We used the survey data ENSIN-ENDS (2010), which first produced anthropometric data for Colombia classified by ethnic groups. In this regard, we stress the importance of including ethnic

²³ It should be stressed that results are to be interpreted with caution because they could be biased, especially due to omitted variables that we do not observe.

distinctions in these surveys, because this allows, among other positive things, the study of gaps concerning the nutritional status of minorities.

The data shows that for Colombians born between 1946 and 1992 there is a positive trend and a continuous rise in height. For the total sample, those born in the last five years (1987-1992) reached about five additional centimeters compared with those born in the first half of the period under study (1946-1950). However, the analysis by ethnic groups shows different growths patterns. The data reveals that the group 'others' (those who do not want to classify themselves in any group) had higher growth rates compared to Afro and indigenous, 3.3% for men, and 3.7% for women.

Additionally, it could be said that, regardless of gender, Afrocolombians are the tallest group, followed by 'others' and indigenous. While the gap between Afros and 'others' has been diminishing over time, this is not the case with the gap between Afros and indigenous, which is, on the whole, constant, with small fluctuations.

Living conditions and nutritional status are clearly associated with stature. People that have better living conditions are, on average, taller than those in the bottom of the distribution. Likewise, those who have food security are generally taller than those with severe insecurity. In the latter category fall households where all members feel they have experienced hunger because of lack of food.

Although this situation can be generalized to all ethnic groups, indigenous is the group which could have the best improvement in height with an adequate food

supply. The results are consistent with the fact that indigenous is the group that presents the highest height potential.

Finally, the initial estimates used in this paper explain almost 50% of the variation in height in the different ethnic classifications. Among the explanatory variables we included gender, access to tap water, age group, and household food security. Together, these variables were significant and allowed us to check the hypothesis of the importance of living conditions on observable physical characteristics, such as height.

In a second set of estimations, we included the height of parents as the best approximation of the intergenerational association of biological well-being. Such specification explains about 70% of the variation in height for all ethnic classifications. This is one of the main findings of this paper. In previous research, such as that of Meisel and Vega (2007), it was not possible to identify the stature of parents or self-classification in ethnic groups, as we were able to do here.

In conclusion, there is clear evidence of the importance of the living condition of parents on their children's height. However, this does not mean that we can ignore that personal conditions are also a significant determinant of height, regardless of the ethnic group of the individual.

vi. Bibliography

Acosta, K., 2012. La desnutrición en los primeros años de vida: Un análisis regional para Colombia. *Documentos de Trabajo sobre Economía Regional*, Centro de Estudios Económicos Regionales (CEER), No. 160. Banco de la República, Cartagena.

Cartmill, M., 1998. "The Status of Race in Physical Anthropology", *American Anthropologist*, Vol. 100, No. 3, Sep.

Eveleth, P. & Tanner, J. *Worldwide variation in human growth*. Cambridge: Cambridge U. Press, 1976. Second ed., 1990.

Galvis, L. A. & Meisel, A., 2010. Persistencia de las desigualdades regionales en Colombia: Un análisis espacial. *Documentos de Trabajo sobre Economía Regional*, Centro de Estudios Económicos Regionales (CEER), No. 120. Banco de la República, Cartagena.

ICBF, 2011. Encuesta Nacional de la Situación Nutricional en Colombia 2010. Bogotá D.C., Agosto.

Komlos, J., 2010. The recent decline in the height of African-American women. *Economics & Human Biology*. Volume 8, Issue 1, 58–66.

Meisel, A. & Vega, M., 2007. "The Biological Standard of Living (and its convergence) in Colombia, 1870-2003, A Tropical Success Story, *Economics & Human Biology*, Volume 5, Issue 1, 100–122.

Meisel, A. & Vega, M., 2007. La calidad de vida en Colombia, Antropometría histórica, 1870-2009, CEER, Banco de la Republica, Cartagena.

Meisel, A. & Vega, M., 2010. "Stature of the Colombian Elite Before the Onset of Industrialization, 1870-1919". In Ricardo D. Salvatore; John H. Coastworth; Amílcar E. Challú. (Org.). Living Standards in Latin American History: Height, Welfare, and Development, 1750-2000. Cambridge, Massachusetts: Harvard University Press.

Monasterio, L. M.; Noguero, L. P.; Shikida, C. D., 2010. Growth and Inequalities of Height in Brazil, 1939-1981. in: Ricardo D. Salvatore; John H. Coastworth; Amílcar E. Challú. (Org.). Living Standards in Latin American History: Height, Welfare, and Development, 1750-2000. Cambridge, Massachusetts: Harvard University Press.

Ordoñez, A. Ramírez, G. & Polanía, D., 1992. "La estatura y el desarrollo económico y social en Colombia". Informe Final, Fedesarrollo, Bogotá.

Ricardo D. Salvatore, John H. Coatsworth, and Amilcar E. Challu., 2010. Living Standards in Latin American History, Height, Welfare, and Development, 1750-2000, DRCLAS, Harvard University Press, USA.

Robert W. Fogel, 2004. The Escape from Hunger and Premature Death, 1700-2100: Europe, America, and the Third World, Cambridge University Press, USA.

Romero, J., 2010. "Educación, calidad de vida y otras desventajas económicas de los indígenas en Colombia". *Documentos de Trabajo sobre Economía Regional*, Centro de Estudios Económicos Regionales (CEER), No. 124. Banco de la República, Cartagena.

Rosique, J., Restrepo, M., Manjarrés, L., Galvez, A. & Santa, J., 2010. "Estado nutricional y hábitos alimentarios en indígenas Embera de Colombia", XXX Vol. 37, No. 3, septiembre, 270-280.

Profamilia, 2011. Encuesta de Demografía y Salud 2010. Bogotá, D.C.

Sahn, D.E. & H. Alderman, 1997. "On the determinants of nutrition in Mozambique: The importance of age specific effects". World Development. Volume 25, Issue 4, 577–588.

Steckel, R. (1995). "Stature and the living standard of living. Journal of Economic Literature". Vol. XXXIII, 1903-1940.

Steckel, R., 2009. "Heights and Human Welfare: Recent Developments and New Directions", Explorations in Economic History, 46. Volume 46, Issue 1, 1–23.

Stanley J. Ulijaszek, Francis E. Johnston y Michael A. Preece. The Cambridge Encyclopedia of Human Growth and Development.

UNESCO (2005). http://www.unesco.org/culture/intangible-heritage/11lac_uk.htm.