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# Social Environment, Body Structure and Function in Inhabitants of Yucatan, Mexico

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**KEYWORDS** Education. Body Build and Function. Physical Fitness

**ABSTRACT** The influence of education on adult body build and function was studied in Mérida (capital city of Yucatan State) and Progreso (a port on the shore of Gulf of Mexico), Mexico. Studies were conducted in 1993-94 and 608 men and 320 women, ages ranged from 18-98 years were investigated. Greater body height, vital capacity, spine flexibility and Sargent vertical jump were observed in individuals with better education than with lower one. Better educated women had also lower BMI and chest circumference and greater grip strength than less educated ones. In men vital capacity and physical fitness test results were better up to secondary school or incomplete high school level, then fell with better education. The only variable which did not show the association with education was systolic blood pressure.

## INTRODUCTION

Since at least the nineteenth century, the interrelationships between socioeconomic status and body build have been subjects of academic research. Half a century ago a Belgian, Graffar (1956), began to examine these characteristics as they related to different social groups.

It is generally known that children and adults with greater body build are more frequently associated with higher social strata than lower social strata (Bogin and MacVean,1978; Lasker and Mascie-Taylor, 1989; Tanner, 1990; Hauspie et al., 1996; Bogin,1999, Meyer and Selmer, 1999). Such differences are most likely related to social inequalities in living standards. It is interesting that social differences were not observed in children's stature in Sweden for a sample born in the 1950s (Lindgren, 1976), but appeared again in a sample born in the 1960s (Lindgren and Cernerud, 1992). According the authors this phenomenon may be related to migration, rapid upward or downward movements in social class and changes in the size of some of the social groups. For contemporary societies, there is also a possibility that upward social mobility can be selective regarding changes in some body characteristics that may be hereditary (Bielicki and Szklarska, 2000), but this concept is difficult to believe. It is more likely that good appearance and high social status help young people to achieve more easily their dreams or the wishes of their parents.

A number of studies have revealed that taller, non-obese men and women dominate in measures for many characteristics linked with social skills such as perception, intelligence, academic performance and others (Bogin, 1999). Conversely, an association between short statured individuals and degree of social deprivation has been noted (White et al., 1995).

Is height a measure of success? We can conclude that taller people achieve higher educational status than shorter people, and this phenomenon occurs also within families, where taller siblings are better educated than shorter ones (Bogin, 1999). Better education means a better job and higher wages, increased probability of marriage which altogether promote upward social mobility.

At the present time, studies have shown that correlations between education, income and body height are different in various populations. In sixteen populations studied in Poland, Japan, Korea and Mexico, height was positively correlated with level of education ((Wolan|ski, 1996), and a statistically significant association of body height with income was found in only two of the populations (a positive one for South Korea and a negative one for Japan).

The aim of this study is to examine the associations of the level of adult education of people living in the Yucatan Peninsula with their physical development, some physiological

functions and tests evaluating physical fitness.

## MATERIALS AND METHODS

The studies were conducted in 1993-94 in two cities of Mexico, Merida, the capital of the state of Yucatan and Progreso, a port town located on the Gulf of Mexico, 35 km north of Merida. This is a part of the material gathered during the research project of CONACyT, Mexico, No. 1325-S9206 and devoted to processes of aging occurring in the rather low socioeconomic group of people living in Merida and Progreso. The material comprised the individuals working mostly in different kinds of factories producing different brands of soft drinks, food products as well as garment factories, which mostly employed women. There was also a group of fishermen working in Progreso. Older, usually non-employed, subjects were members of factory workers' families or were living in shelters for the poor who had no families. For the purpose of this work individuals having higher education and better professional position in the mentioned factories were also included. The sample consisted of 608 men and 320 women between 18 and 98 years of age. The women came from only Merida. Individuals were mostly Maya, Creoles (European ancestors, mostly of Spanish origin, who inhabited this region many generations before) and Mestizos, a mixture of the first two groups. The sample was divided into 6 age groups: 25 (18-30 years of age), 35 (31-40), 45 (41-50), 55 (51-60), 65 (61-70), 75 (71-98). In the last age group there were 27 men between 70-75 years of age, 13 men 76-80, 12 men 81-85, 2 men 86-90; 21 women between 70-75 years of age, 9 women 76-80, 14 women 81-

**Table 1: The distribution of the ethnic groups in the studied material**

| *Age groups(years)* | *Man* | | | | *Women* | | | |
|---|---|---|---|---|---|---|---|---|
| | *Mayas and Mestizos* | | *Creoles* | | *Mayas and Mestizos Mestizos* | | *Creoles* | |
| | *F* | *%* | *F* | *%* | *F* | *%* | *F* | *%* |
| 25.00 | 90 | 59.6 | 61 | 40.4 | 32 | 56.1 | 25 | 43.9 |
| 35.00 | 62 | 51.7 | 58 | 48.3 | 28 | 47.5 | 31 | 52.5 |
| 45.00 | 59 | 51.3 | 56 | 48.7 | 23 | 42.6 | 31 | 57.4 |
| 55.00 | 37 | 35.6 | 67 | 64.4 | 19 | 39.6 | 29 | 60.4 |
| 65.00 | 26 | 40.6 | 38 | 59.4 | 23 | 46.9 | 26 | 53.1 |
| 75.00 | 21 | 38.9 | 33 | 61.1 | 15 | 28.3 | 38 | 71.7 |

**Table 2: The level of education of studied individuals according to their age groups.**

| *Education* | *25.00* | | *35.00* | | *45.00* | | *55.00* | | *65.00* | | *75.00* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *N* | *C%* | *N* | *C%* | *N* | *C%* | *N* | *C%* | *N* | *C%* | *N* | *C%* |
| *Man* | | | | | | | | | | | | |
| Uneducated | 3 | 2.0 | 3 | 2.0 | 11 | 9.6 | 7 | 6.7 | | | 8 | 14.8 |
| Primary school (incomp.) | 28 | 20.5 | 31 | 28.3 | 43 | 47.0 | 51 | 55.8 | 41 | 64.1 | 26 | 63.0 |
| Primary school | 26 | 37.3 | 22 | 46.7 | 27 | 70.4 | 21 | 76.0 | 12 | 82.8 | 8 | 77.8 |
| Secondary school (incomp.) | 23 | 53.0 | 16 | 60.0 | 12 | 80.9 | 6 | 81.7 | 4 | 89.1 | 4 | 85.2 |
| Secondary school | 38 | 78.1 | 17 | 74.2 | 7 | 87.0 | 7 | 88.5 | 4 | 95.3 | | |
| High school (incomp.) | 11 | 85.4 | 15 | 86.0 | 5 | 91.3 | 3 | 91.3 | | | | |
| High school | 20 | 98.1 | 12 | 96.7 | 8 | 98.3 | 5 | 96.2 | 2 | 98.4 | 6 | 96.3 |
| College (incomp. & complete) | 2 | 100.0 | 4 | 100.0 | 2 | 100.0 | 4 | 100.0 | 1 | 100.0 | 2 | 100.0 |
| Total | 151 | | 120 | | 115 | | 104 | | 64 | | 54 | |
| *Women* | | | | | | | | | | | | |
| Uneducated | | | 1 | 1.7 | 3 | 5.6 | 7 | 14.6 | 11 | 22.4 | 6 | 11.3 |
| Primary school (incomp.) | 7 | 12.3 | 10 | 18.6 | 8 | 20.4 | 22 | 60.4 | 24 | 71.4 | 28 | 64.2 |
| Primary school | 15 | 38.6 | 13 | 40.7 | 16 | 50.0 | 6 | 72.9 | 8 | 87.8 | 12 | 86.8 |
| Secondary school (incomp. & compl.) | 15 | 64.9 | 12 | 61.0 | 11 | 70.4 | 4 | 81.3 | 1 | 89.8 | 3 | 92.5 |
| High school (incomp. & compl.) | 17 | 94.7 | 17 | 89.8 | 10 | 88.9 | 7 | 95.8 | 4 | 98.0 | 4 | 100.0 |
| College (incompl. & comp.) | 3 | 100.0 | 6 | 100.0 | 6 | 100.0 | 2 | 100.0 | 1 | 100.0 | | |
| Total | 57 | | 59 | | 54 | | 48 | | 49 | | 53 | |

C% = Cumulative percent

85, 7 women 86-90, one woman 84 and another one 98 years old. The distribution of two ethnic groups (Mayas and Mestizos, and Creoles) is presented in the table 1. It can be observed that with older age group the number of Mayas and Mestizos diminishes when the number of Creoles increases. The education of studied individuals also differed with their age (Table 2). Together with older age group the number of individuals with a higher level of education decreases. Education levels of indivi-duals were evaluated on the basis of the level (years) of school completed The Mexican school system consists of six years of primary school, three years of secondary school, and three years of high school followed by university or college.

Standard methods of physical anthropometry (Martin and Saller, 1957), respiratory measures (Åstrand and Rodahl, 1986) and some motor tests (European Tests of Physical Fitness, 1988; Wolan|ski and Pyz{uk, 1973) were applied.

Eight variables were studied: body height, body mass index [BMI], chest circumference, systolic blood pressure [SBP], vital capacity [VC], grip strength of the dominant hand, and spine flexibility index [SFI; Wolan|ski and Pyz{uk, 1973], Sargent vertical jump index [SVJI; Wolan|ski and Pyz{uk, 1973]. Three indices are defined as follows: BMI = weight (in kg.)/stature$^2$ (in m.); SFI = (difference in cm between spine length in the points cervicale-sacrale [c-s] in the bending and standing positions / c-s in the standing position)*100; SVJI = (difference [in cm] between hand reach in vertical jump and hand reach when standing / hand reach when standing)*100. SBP (in mmHg) was measured using a mercurial sphygmomanometer. VC (in liters, BTPS) was measured using the Spirovit SP-200, produced by Schiller. The individual should breathe normally 3 times (through the flow sensor) and then inhale maximally to total lung capacity and then expire maximally. It measures the maximal volume of air that can be expelled from lungs. This test was performed in standing position.

Each individual had a complete set of measurements and was able to perform all tests. The respiratory and motor tests were explained and shown (if necessary) many times until the subject could do it correctly.

Levels of education were considered separately for each sex. There were individuals without schooling, and this group is called in the tables and figures "uneducated". However nothing is known about the ability of these people to write and read. Men were divided into eight groups; uneducated individuals, individuals having incomplete or complete primary school separately, incomplete or complete secondary school separately, incomplete or complete high school separately, and the sum of individuals having incomplete or complete college education. The cohort of women was much smaller than that of men. Because of this, women were divided into

**Table 3: Mean age and frequency of ethnic groups according to different levels of education of studied individuals.**

| *Education* | *Age* | | | *Ethnic group* | | | |
|---|---|---|---|---|---|---|---|
| | | | | *Mayas & Mestizos* | | *Creoles* | |
| | *N* | *Mean* | *SD* | *N* | *%* | *N* | *%* |
| *Men* | | | | | | | |
| Uneducated | 32 | 51.82 | 16.34 | 19 | 59.4 | 13 | 40.6 |
| Primary school (incomp.) | 220 | 50.57 | 16.30 | 106 | 48.2 | 114 | 51.8 |
| Primary school (comp.) | 116 | 44.09 | 15.35 | 59 | 50.9 | 57 | 49.1 |
| Secondary school (incomp.) | 65 | 38.10 | 14.90 | 32 | 49.2 | 33 | 50.8 |
| Secondary school (comp.) | 73 | 33.13 | 11.89 | 37 | 50.7 | 36 | 49.3 |
| High school (incomp.) | 34 | 34.19 | 9.85 | 17 | 50.0 | 17 | 50.0 |
| High school (comp.) | 53 | 39.77 | 17.01 | 20 | 37.7 | 33 | 62.3 |
| College (incomp. & comp.) | 15 | 48.00 | 15.43 | 5 | 33.3 | 10 | 66.7 |
| *Women* | | | | | | | |
| Uneducated | 28 | 61.04 | 11.37 | 16 | 57.1 | 12 | 42.9 |
| Primary school (incomp.) | 99 | 59.14 | 16.98 | 49 | 49.5 | 50 | 50.5 |
| Primary school (comp.) | 70 | 47.82 | 19.60 | 32 | 45.7 | 38 | 54.3 |
| Secondary school (incomp. & comp.) | 46 | 37.82 | 14.68 | 19 | 41.3 | 27 | 58.7 |
| High school (incomp. & comp.) | 59 | 40.63 | 16.62 | 19 | 32.2 | 40 | 67.8 |
| College (incomp. & comp.) | 18 | 39.79 | 11.13 | 5 | 27.8 | 13 | 72.2 |

six groups based on their education levels. Those were uneducated women and women with incomplete or complete primary school education as distinct groups. Three better-educated groups included women with incomplete or complete grade of schooling, and these were called the secondary school, high school and college education groups.

To describe the association of the individual's education level with body size, physiological functions and physical fitness, two more factors had to be added. These were age and ethnic groups. Age and ethnic distribution was not equal in each educational group (Table 3). The groups of people with better education included more younger than older individuals, and more Creoles than Mayas and Mestizos.

The question is whether education has an important impact on the studied variables. To study this problem a three-factor analysis of regression was used, for each sex separately: Independent variables (factors) were: age, ethnicity and education.

## RESULTS

This study shows that for men, the level of education is positively associated with greater

**Table 4: Values of studied variables according to age groups of individuals.**

| | | *Age group and number of individuals* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sex* | *Variables* | *25 N=151* | | *35 N=120* | | *45 N=115* | | *55 N=104* | | *65 N=64* | | *75 N=54* | |
| | | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* |
| Man | Stature | 159.83 | 6.09 | 159.02 | 5.60 | 157.49 | 5.65 | 158.91 | 5.16 | 157.96 | 6.08 | 154.80 | 5.55 |
| | BMI | 253.70 | 37.19 | 268.77 | 36.67 | 282.70 | 41.58 | 295.44 | 44.29 | 286.24 | 41.61 | 259.01 | 38.04 |
| | Chest cir. | 87.05 | 8.28 | 91.33 | 7.21 | 93.81 | 7.52 | 97.25 | 7.31 | 95.68 | 7.18 | 91.90 | 6.75 |
| | VC | 4.37 | 0.68 | 4.15 | 0.68 | 3.92 | 0.62 | 3.69 | 0.50 | 3.35 | 0.54 | 2.69 | 0.61 |
| | SBP | 109,80 | 11,75 | 115,53 | 13,41 | 119,48 | 13,69 | 124,28 | 21,45 | 126,01 | 18,45 | 127,59 | 22,01 |
| | GS | 40.46 | 14.75 | 41.53 | 14.69 | 41.37 | 12.77 | 36.47 | 12.16 | 33.39 | 11.08 | 26.33 | 10.04 |
| | SFI | 21.83 | 6.94 | 20.32 | 6.81 | 18.18 | 6.83 | 16.94 | 6.47 | 15.56 | 5.74 | 12.68 | 5.48 |
| | SVJI | 18.46 | 4.78 | 16.82 | 3.83 | 14.15 | 4.82 | 11.70 | 5.05 | 9.75 | 3.68 | 5.49 | 2.59 |
| | | *25 N=57* | | *35 N=59* | | *45 N=54* | | *55 N=48* | | *65 N=49* | | *75 N=53* | |
| | | *Mean* | *SD* | *Mean* | *DS* | *Mean* | *DS* | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* |
| Women | Stature | 148.48 | 5.64 | 147.64 | 5.26 | 147.40 | 6.20 | 146.80 | 6.54 | 144.13 | 5.55 | 140.58 | 6.15 |
| | BMI | 258.87 | 36.28 | 279.44 | 47.16 | 286.51 | 46.50 | 303.55 | 49.35 | 300.23 | 48.92 | 271.58 | 53.16 |
| | Chest cir. | 78.58 | 7.19 | 83.09 | 7.69 | 82.98 | 9.36 | 90.29 | 9.06 | 88.13 | 8.83 | 84.81 | 8.78 |
| | VC | 3.20 | 0.57 | 3.09 | 0.43 | 2.83 | 0.53 | 2.33 | 0.44 | 2.07 | 0.41 | 1.70 | 0.44 |
| | SBP | 104,82 | 12,82 | 110,42 | 15,26 | 113,15 | 19,53 | 117,71 | 19,27 | 124,90 | 16,60 | 128,68 | 21,10 |
| | GS | 27.05 | 9.45 | 24.21 | 6.24 | 22.13 | 9.28 | 19.04 | 8.12 | 15.98 | 5.76 | 12.85 | 5.90 |
| | SFI | 16.17 | 6.05 | 15.83 | 5.93 | 12.88 | 4.27 | 11.32 | 4.94 | 10.33 | 3.57 | 11.02 | 3.47 |
| | SVJI | 13.15 | 3.83 | 11.13 | 3.32 | 9.84 | 2.74 | 6.92 | 2.77 | 4.97 | 2.47 | 3.76 | 1.82 |

Chest cir. – chest circumference; GS – grip strength; SFI – Spine flexibility index; SVJI - Sargent vertical jump index.

**Table 5: Values of studied variables according to ethnicity of individuals.**

| *Variables* | *Mayas and Mestizos* | | | | *Creoles* | | | | *t-test* | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Man N=295* | | *Woman N=140* | | *Man N=313* | | *Women N=180* | | | |
| | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* | *Men* | *Women* |
| Stature | 157.49 | 5.62 | 144.28 | 5.78 | 159.31 | 5.94 | 147.19 | 6.66 | -3.87 *** | -4.11 *** |
| BMI | 268.10 | 39.26 | 282.26 | 51.94 | 278.00 | 44.85 | 282.63 | 46.98 | -2.90 ** | - .6 NS |
| Chest cir. | 91.01 | 7.40 | 83.74 | 9.17 | 93.43 | 8.94 | 84.92 | 9.24 | -3.64 *** | -1.14 NS |
| VC | 3.91 | 0.80 | 2.53 | 0.69 | 3.83 | 0.77 | 2.60 | 0.75 | 1.39 NS | - .83 NS |
| SBP | 116,89 | 16,80 | 112,50 | 18,50 | 120,06 | 17,69 | 119,11 | 19,44 | -2.27* | -3.08 ** |
| GS | 38.66 | 14.01 | 20.04 | 8.71 | 37.70 | 13.87 | 20.77 | 9.26 | .84 NS | - .72 NS |
| SFI | 19.53 | 7.31 | 12.75 | 5.22 | 17.59 | 6.81 | 13.34 | 5.47 | 3.38 *** | - .98 NS |
| SVJI | 14.97 | 5.68 | 8.86 | 4.50 | 13.27 | 6.02 | 8.17 | 4.42 | 3.58 *** | 1.36 NS |

*** - p<.001; ** - p<.01; * - p<.05; NS – no significant

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 143.058 | 1.617 | | 88.46 | .000 |
| Age | -.113 | .020 | -.303 | -5.52 | .000 |
| Ethnicity | 2.927 | .646 | .226 | 4.53 | .000 |
| Education | 1.197 | .250 | .264 | 4.80 | .000 |

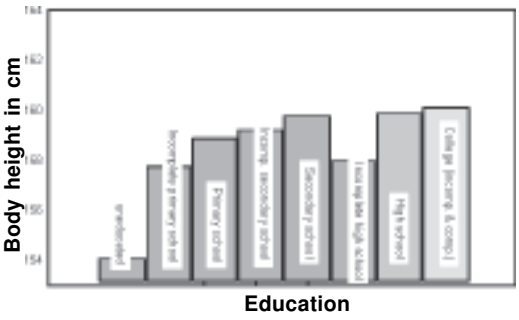


**Fig. 1. Body height and education of men in Merida and Progresso (Mexico)**

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 143.058 | 1.617 | | 88.46 | .000 |
| Age | -.113 | .020 | -.303 | -5.52 | .000 |
| Ethnicity | 2.927 | .646 | .226 | 4.53 | .000 |
| Education | 1.197 | .250 | .264 | 4.80 | .000 |

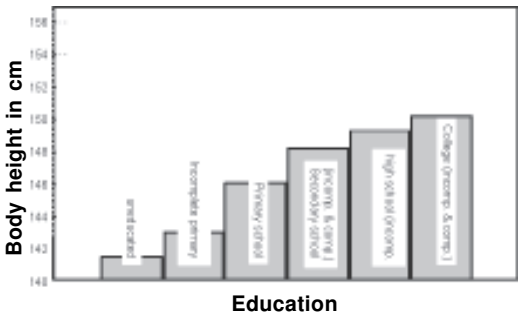


**Fig. 2. Body height and education of women in Merinda (Mexico)**

stature (Fig. 1), vital capacity (Fig. 7), and Sargent vertical jump (Fig.15). This picture is rather clear, up to secondary school or incomplete high school. In case of body mass index (Fig. 3) such association is observed only in the case of first three groups of education (not for the whole material), this means for rather older people who have more weight for height with better education.

| Model | All groups of education | | | | | Uneducated – Primary school | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Unstand. Coeff. | | Stand. Coeff. | | | Unstand. Coeff | | Stand. Coeff | | |
| | B | Std. Error | Beta | t | Sig. | B | Std. Error | Beta | t | Sig |
| Constant | 236.88 | 7.936 | | 29.85 | .000 | 216.95 | 13.28 | | 16.33 | .000 |
| Age | .51 | .112 | .192 | 4.55 | .000 | .58 | .15 | .21 | 4.12 | .000 |
| Ethnicity | 7.16 | 3.439 | .084 | 2.08 | .038 | 6.97 | 4.49 | .08 | 1.55 | .121 |
| Education | .80 | .962 | .035 | .83 | .406 | 8.33 | 3.81 | .11 | 2.18 | .030 |

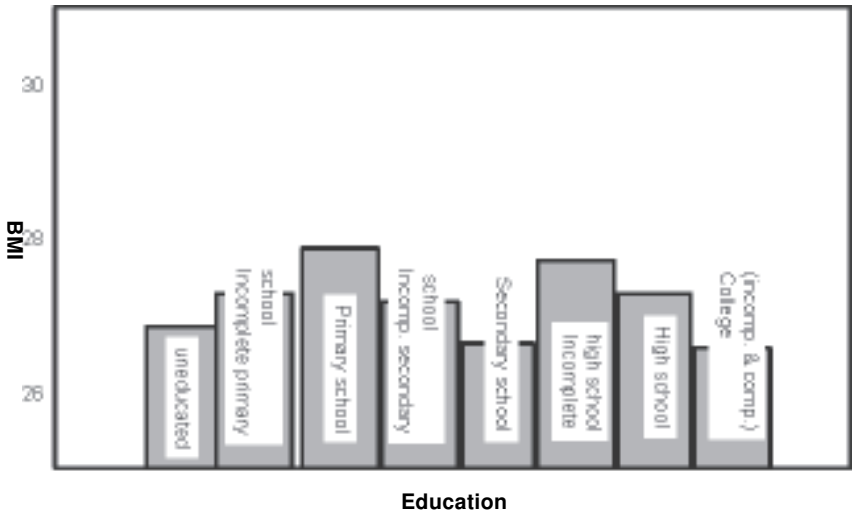


**Fig. 3. Body Mass Index and education of men in Merida and Progresso (Mexico)**

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 286.93 | 14.27 | | 20.11 | .000 |
| Age | .20 | .18 | .07 | 1.13 | .261 |
| Ethnicity | 1.86 | 5.70 | .02 | .33 | .745 |
| Education | -5.42 | 2.20 | -.16 | -2.46 | .014 |

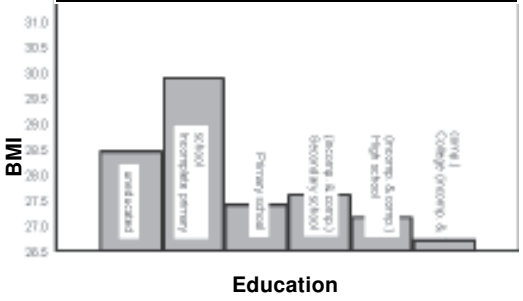


**Fig. 4. Body Mass Index (BMI) and education of women in Merida (Mexico)**

greater chest circumference than Creoles, Table 5).

The case of women is a little different because almost all dependent variables studied in this work are associated with their education. There is a positive association in case of stature (Fig. 2), vital capacity (Fig 8), grip strength (Fig. 12), spine flexibility (Fig. 14) and Sargent vertical jump (Fig 16), and the negative one in case of BMI (Fig. 4) and chest circumference (Fig. 6).

The only variable which does not show an association with education is SBP (Fig. 10). This does appear to depend not only on age but on ethnicity as well (Creoles have higher SBP than Mayas and Mestizos, Table 4 and 5).

| Model | All groups of education | | | | | Uneducated – Primary school | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Unstand. Coeff. | | Stand. Coeff. | | | Unstand. Coeff | | Stand. Coeff | | |
| | B | Std. Error | Beta | t | Sig. | B | Std. Error | Beta | t | Sig |
| Constant | 82.67 | 1.50 | | 55.15 | .000 | 80.55 | 2.39 | | 33.77 | .000 |
| Age | .16 | .02 | .31 | 7.48 | .000 | .137 | .03 | .27 | 5.24 | .000 |
| Ethnicity | 1.61 | .65 | .10 | 2.48 | .013 | 2.04 | .81 | .13 | 2.54 | .012 |
| Education | 3.3E-02 | .18 | .01 | .18 | .855 | 1.20 | .69 | .09 | 1.76 | .080 |

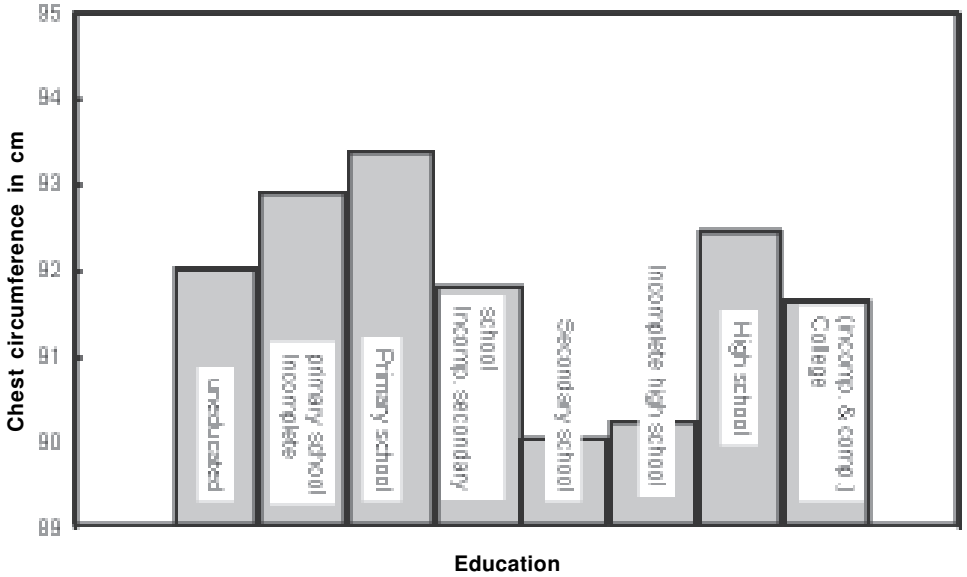


**Fig. 5. Chest circumference and education of men in Merida and Progreso (Mexico)**

In case of spine flexibility there is observed a positive association with the level of education up to the incomplete high school and the negative one afterwards (Fig. 13). There is no such association in case of chest circumference (Fig. 5), even for the first three groups only, grip strength (Fig. 11) and SBP (Fig. 9). The last three variables depend mostly on age (grip strength and SBP; Table 4) and chest circumference depends on ethnicity as well (Mayas and Mestizos have

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 80.59 | 2.59 | | 31.16 | .000 |
| Age | .00 | .03 | .21 | 3.37 | .001 |
| Ethnicity | 1.11 | 1.03 | .06 | 1.07 | .285 |
| Education | -1.04 | .40 | -.16 | -2.60 | .010 |

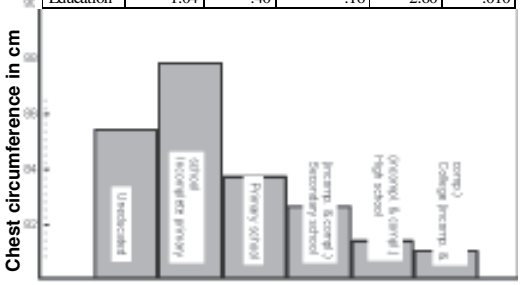


**Fig. 6. Chest circumference and education of women in Merida (Mexico)**

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 4.94 | .12 | | 41.27 | .000 |
| Age | -2.84E-02 | .002 | -.58 | -16.87 | .000 |
| Ethnicity | 4.65E-02 | .05 | .03 | .89 | .371 |
| Education | 3.48E-02 | .02 | .08 | 2.39 | .017 |

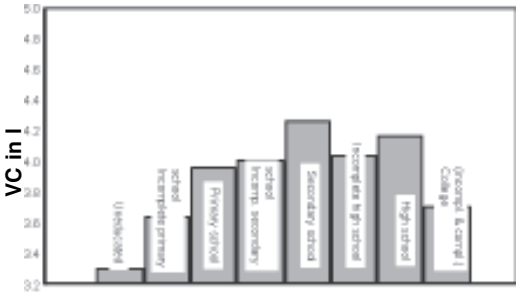


**Fig. 7. Vital capacity and education of men in Merida and Progreso (Mexico)**

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 3.56 | .14 | | 26.07 | .000 |
| Age | -3.02E-02 | .002 | -.72 | -17.50 | .000 |
| Ethnicity | .19 | .06 | .13 | 3.54 | .000 |
| Education | 5.81E-02 | .02 | .11 | 2.75 | .006 |

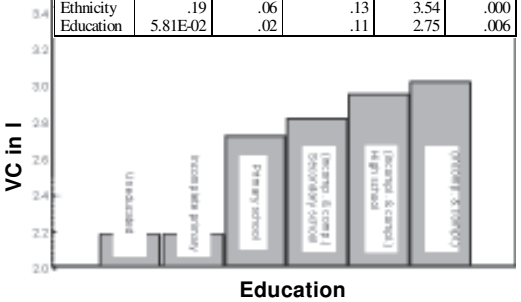


**Fig. 8. Vital capacity and education of women in Merida (Mexico)**

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 102.19 | 3.09 | | 33.08 | .000 |
| Age | .36 | .04 | .33 | 8.24 | .000 |
| Ethnicity | 1.49 | 1.34 | .04 | 1.12 | .265 |
| Education | -.54 | .37 | -.06 | -1.44 | .152 |

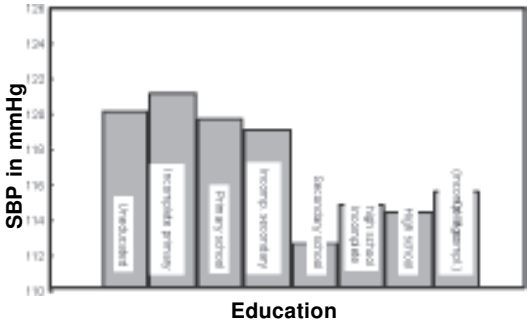


**Fig. 9. Systolic blood pressure and education of men in Merida and Progreso (Mexico)**

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 88.14 | 5.13 | | 17.19 | .000 |
| Age | .45 | .06 | .40 | 6.90 | .000 |
| Ethnicity | 4.48 | 2.05 | .12 | 2.19 | .029 |
| Education | -.28 | .79 | -.02 | -.36 | .719 |

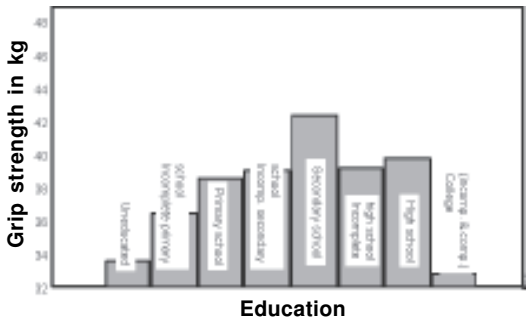


**Fig. 10. Systolic blood pressure and education of women in Merida (Mexico)**

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 48.28 | 2.56 | | 18.86 | .000 |
| Age | -.24 | .04 | -.28 | -6.69 | .000 |
| Ethnicity | .24 | 1.11 | .01 | .21 | .831 |
| Education | 7.33E-02 | .31 | .01 | .24 | .813 |

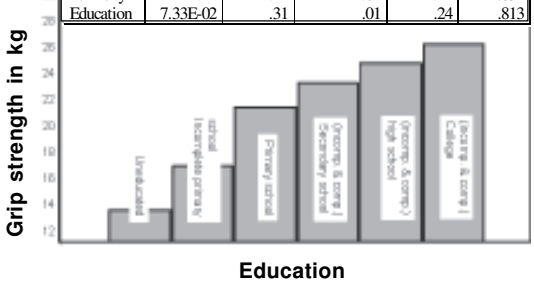


**Fig. 11. Grip strength and education of men in Merida and Progreso (Mexico)**

There is also another observation worth noting, but not statistically proven which indicates that men who have not completed high school

| Model | Unstand. Coeff. | | Stand. Coeff. | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| Constant | 26.17 | 2.18 | | 12.02 | .000 |
| Age | -.24 | .03 | -.46 | -8.79 | .000 |
| Ethnicity | 1.37 | .87 | .07 | 1.57 | .117 |
| Education | 1.26 | .34 | .20 | 3.74 | .000 |

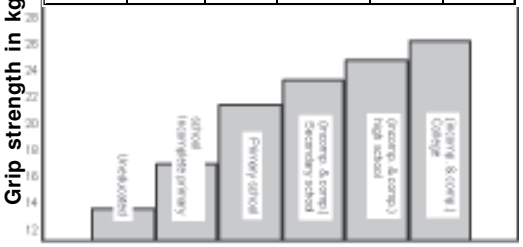


**Fig. 12. Grip strength and education of women in Merida (Mexico)**

| Model | Unstand. Coeff. | | Stand. Coeff. | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| Constant | 14.33 | 1.41 | | 10.14 | .000 |
| Age | -9.98E-02 | .02 | -.32 | -5.59 | .000 |
| Ethnicity | .73 | .56 | .07 | 1.29 | .198 |
| Education | .79 | .22 | .21 | 3.60 | .000 |

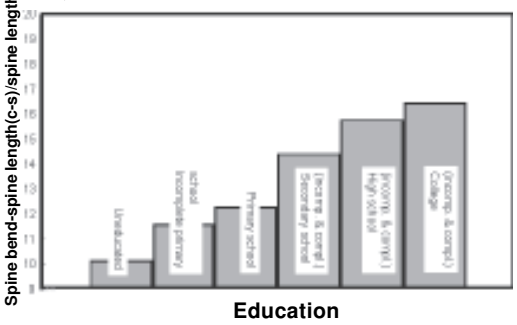


**Fig. 14. Spine flexibility and education of women in Merida (Mexico)**

| Model | Uneducated – Incomplete high school | | | | | Incomplete High school - College | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Unstand. Coeff. | | Stand. Coeff. | | | Unstand. Coeff | | Stand. Coeff | | |
| | B | Std. Error | Beta | t | Sig. | B | Std. Error | Beta | t | Sig |
| Constant | 22.89 | 1.46 | | 15.68 | .000 | 49.30 | 6.64 | | 7.43 | .000 |
| Age | -.13 | .02 | -.29 | -6.74 | .000 | -.17 | .05 | -.35 | -3.76 | .000 |
| Ethnicity | -1.19 | .56 | -.08 | -2.12 | .035 | -2.39 | 1.36 | -.16 | -1.76 | .082 |
| Education | 1.02 | .22 | .20 | 4.61 | .000 | -2.60 | .99 | -.23 | -2.63 | .010 |

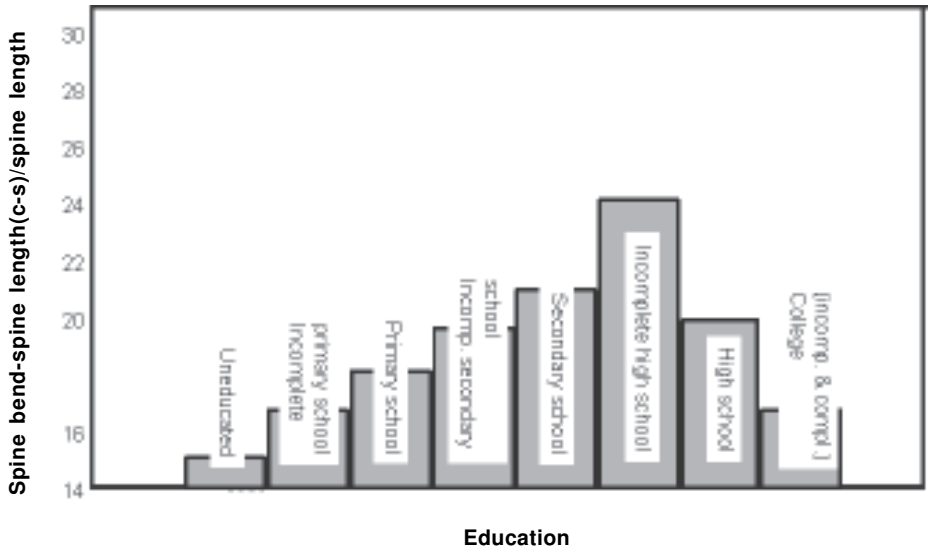


**Fig. 13. Spine flexibility index and education ofmen in Merinda and Progreso (Mexico)**

are shorter, have greater BMI and spine flexibility, and lower VC, SBP and grip strength values than those having complete secondary and high school education (Figs. 1, 3, 7, 9, 13).

## DISCUSSION

In Mexico, the part of the population having the lowest level of education is the largest one.

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 24.19 | .84 | | 28.93 | .000 |
| Age | -.23 | .01 | -.63 | -19.65 | .000 |
| Ethnicity | -.61 | .36 | -.05 | -1.69 | .092 |
| Education | .32 | .10 | .10 | 3.17 | .002 |

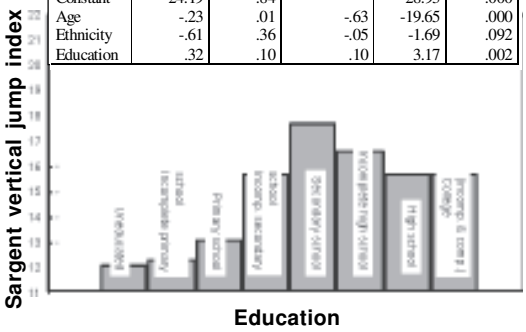


**Fig. 15. Sargent vertical jump and education of men in Merida and Progreso (Mexico)**

| Model | Unstand. Coeff. | | Stand. Coeff. | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| Constant | 16.39 | .86 | | 19.11 | .000 |
| Age | -.18 | .01 | -.71 | -17.00 | .000 |
| Ethnicity | .11 | .34 | .01 | .31 | .760 |
| Education | .30 | .13 | .10 | 2.30 | .022 |

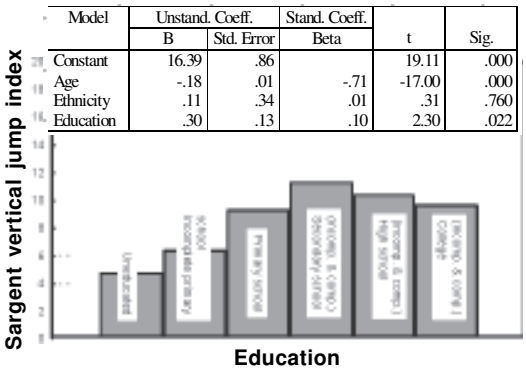


**Fig. 16. Sargent vertical jump and education of women in Merida (Mexico)**

Child labor is not unusual. Many children are hired in large supermarkets to pack purchases for customers. Beggars are not often seen as people will look for any job to earn some money. For example men, who immigrate from villages to towns start to work as parking assistants on streets or in supermarket parking lots. This gives them just enough pesos to survive. It also tremendously decreases unemployment and begging. Such phenomena are rather rare in many European countries.

In Mexico, especially in Yucatan, individuals who come from very low social strata and reach a higher level of education may have a chance to completely change their life styles, but this is not a very common situation in reality. People from low social strata are very poor, the quality of public school education is very low and continuing education is very expensive. Additionally there are differences in what we can call "mentality" or work ethics. Many people, especially in villages, seem to be happy enough and do not want to change their living conditions. Or perhaps even though they want to change something, they just do nothing, maybe because they don't know how to start.

To understand the problems presented above it is necessary to have greater knowledge about the Mexican psyche, or the psyche of tropical inhabitants in general, or attitudes typical for specific socioeconomic situations.

The main problem focused on in this work is education and its possible influence on body build and function of human organisms. How-ever two additional factors are age and ethnicity, which may also affect the observed phenomena. Education is a part of socioeconomic status (SES) which additionally combines occupation and social prestige of a person or social group (Bogin, 1999). However, SES can be measured by other criteria (for example: the size of land holdings, animals owned, quality of the home etc.). Generally, SES is closely correlated with better health care. After the second world war Poland was a country where the level of education was the most important, much more important than income. There was no correlation between these two criteria, and it was observed that parents with better education (especially mothers) had taller and heavier children than parents with bigger income (Siniarska, 1996).

As in all of Latin America, Mexico is characterized by great social inequities. There are differences of about 6 cm in the stature of men and 9 cm for women between uneducated and those having university-level education (Figs. 1 and 2). Differences may also result from ethnic distinctions. In the study group of the uneducated, 60 % individuals were Mayas and Mestizos. In contrast, the group of the most highly educated individuals principally consists of Creoles (70%). Moreover, many differences between ethnic groups may have their origins in socioeconomic status. Another problem concerns the men with incomplete high school. Their rather short stature coexists with greater BMI, lower SBP and very good spine flexibility com-pared with those groups closest to them in education. The reason they did not complete high school, perhaps, is that they come from a lower socioeconomic strata (their parents' families), and that their economic resources did not allow them to finish their studies. They look rather obese but are physically fit.

There are some hypotheses that Mexicans and especially Yucatecans are characterized by a specific type of carbohydrate digestion (Ferre, 1999 - personal communication). Such digestion is associated with their massive body build, negligible obesity (Wolan|ski, 1998a,b, 2000) and a very frequent occurrence of diabetes (Dickinson, 1992). The above mentioned phenomena may be responsible for obesity in children seen in almost all schools in Mérida The lower weight for height values observed in women associated with higher achieved education levels are probably the result of the women's efforts to keep their calorie intake low in order to be fashionably slimmer. Comparative studies of girls in private and public schools in Merida seem to confirm this hypothesis. Girls in private schools, in contrast with those in public schools, participate more actively in aerobic and other physical exercise programs in their schools to keep their bodies slim. They also consume drug prescriptions dispensed by physicians (Siniarska, 2000 - unpublished data).

Differences between educational groups in vital capacity show that values of VC are higher with better education. There is a positive correlation between values of VC are body size (Åstrand and Rodahl, 1986; Kristufek et al. 1987; Nevill and Holder, 1999), and negative one with chest wall adiposity (Lazarus et al. 1998). Women with higher levels of education show greater values for VC together with greater stature, however with smaller chest circum-ference values. The measurements of chest circumference, especially in Yucatan, may be related to obesity observed in this region, so the difference observed in this parameter between educational groups not necessarily can be associated with changes in size of the chest but can be provoked by fat adiposity around the chest, which diminishes in women together with higher education. For men, there is a similar tendency, though it was not statistically significant, and after secondary school men's VC values start to decline, which may suggest that their style of life, possible type of work, could influence the values of VC. In other words, men with the highest education can devote less time to keep their body in good physical shape. Also, especially among women, there may exist a kind of selection to the group of individuals, who continue their education. These might be individuals from families which are more socio-economically advantaged, have better physical development including good respiratory capacity, and more slender body builds.

The reason for including the blood pressure values in the present analysis was that the authors expected to find a relation of this characteristic with education. Better educated individuals take better care of their health status and usually reduce carbohydrate food. However neither men nor women show such association. It is well know that SBP increases with age of individuals, and because lower educational groups consist of more older people than the higher educational ones, it appears that together with better edu-cation the blood pressure diminishes (Figs. 9 and 10). Some results (Wolan|ski, 1979) show that a more stressful lifestyle is expected among groups of more highly-educated individuals, and it looked to be confirmed by the college graduated women who had SBP higher than women in the most of other educational groups. But again, the distribution of SBP in women depends on their ethnicity (Fig. 10), and the college graduated group includes mostly Creoles who have significantly higher SBP than Mayas and Mestizos (Tabs. 3 and 5). There is another question. Why do Creoles have higher SBP? Certainly they come from better socioeconomic conditions (Siniarska and Wolan|ski, 1999a,b), and it can be expected that they have different nutrition, less traditional than Mayas and Mestrizos. So, a more stressful style of life, together with higher meat and salt consumption, may lead to so-called "civilization diseases" (mostly cardiovascular ones) which are usually characterized by higher BP values.

If this is the case, what about the physical activity levels of more highly educated people? Grip strength in men did not show any association with education. For the rest of tests there was observed higher physical fitness with level of education up to the secondary school level (all physical test values for the men and the jump test values for the women). Among the individuals with more than secondary education or incomplete high school levels somewhat lower values were shown. The only significant downward trend was seen in case of spine flexibility (worse flexibility in individuals with high school and college education). The lower values might be caused by more sedentary life styles of the better-educated people, resulting from characteristics of their professional activities or seden-

tism, what may be also the reason of lower VC values in men in the highest educational groups.

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