Growth as a measure of socioeconomic inequalities and poor living conditions among Portuguese, Cape Verdean-Portuguese, and Cape Verdean children, between 1993 and 2001.

Maria Inês Varela-Silva[1,2] and Barry Bogin[1]
[1]University of Michigan-Dearborn
[2]Centro de Investigação em Antropologia
Universidade de Coimbra, Portugal

Contact: Maria Inês Varela-Silva
University of Michigan-Dearborn
Department of Behavioral Sciences
4901 Evergreen Road, Dearborn, MI 48128
Email: inesvs@umd.umich.edu

Abstract

The study of body size and shape may seem, at the first sight, an esoteric field of research. However, a more careful approach shows that this study is fundamental to understand the socioeconomic conditions of the populations. Louis René Villermé, a statistician of public health in the early 19th century, verified that the height of a population correlated positively with the productivity of the soil. The greater the stature and the faster the growth, the wealthier the country was (Komlos, 2002). The human phenotype is extremely plastic and the physical growth is particularly sensitive to the quality of its social and economic environments (Bogin 1999; Fogel 1986; Komlos 1994; Mascie-Taylor & Bogin 1995; Schell 1986; Tanner 1986). Children with growth delays, caused by bad socioeconomic conditions, become unhealthy adults, with small intellectual capacity and limited earning potential. The physical development and the health of children determine not only their actual capacities, but also their future development in terms of general health and productivity. Thus, anthropometric data provide reliable information about the moral and the material quality of the environment in which the populations live (e.g. Tanner, 1986).

Since 1993 we have been studying groups of Portuguese (PORT) and Cape Verdean children living both in Lisbon (CVP), Portugal and in the Cape Verde Islands (CV). In 1993, there was a significant difference in height, between both samples of PORT and CVP measured in Portugal and the sample measured in Cape Verde, the later being the shortest one.

It was expected that the mean values for stature would increase, from 1993 to 2001, indicating an improvement in the quality of the environment in Portugal. However, we found a negative time trend in height as both Portuguese and Cape Verdean-Portuguese children – measured in 1999 and 2001 – got shorter when compared with the samples measured in Portugal in 1993. The samples of 1999 and 2001 showed values for stature similar to the ones of the Cape Verdean children measured in Cape Verde in 1993.

A negative time trend in height is always synonym of a deterioration in the quality of the biocultural environment for human development (Bogin, 1999). Several economic, political and social reasons (e.g. increase of pollution in the area, nutritional changes, and higher rates of poverty in the neighborhood), that may explain this decrease in stature, are presented and discussed.

Theoretical background

The term "secular trend" describes the changes in growth and development of successive generations of human populations living in the same territories. In many populations, average height and weight have increased during the past 200 years. The reasons for the occurrence of a positive secular trend are: increased availability of public health services and improved nutrition, the expression of heterosis resulting from ethnic and social class migration and intermarriage; effects of assortative and selective mating without sizeable immigration; increased formula feeding of infants; reduction in child labor and other forms of child abuse; and improvement in prenatal care (Ulijaszek, 1998:395-398). In a few populations there has been a negative secular trend in height, for example among South African Blacks during the Apartheid era (Tobias, 1985). The loss in average height between generations is always a synonym for a deterioration in the quality of the biocultural environment for human development (Bogin, 1999). Therefore, data on physical growth of children can provide useful information about the extent of social inequalities within a society, as well as the temporal changes in the economic conditions of that society as a whole or of its several sub-groups (Bielicki, 1998:54-56).

The relationship between weight and height is very important to assess the health status of the populations. The indexes "weight-for-height" and "height-for age" provide reliable information about the nutritional status of a population and, indirectly, about the socioeconomic conditions of the country. A low weight-for-height means that the child is wasted and indicates, in the majority of the cases, a severe process of weight loss associated with hunger and/or disease. According to the World Health Organization (WHO) (www.who.org) when a severe shortage of food is not present, the prevalence of low weight-for-height tends to be below 5%, even in the poorest countries. A low height-for-age means that the child is stunted. Stunting is an indicator of low socioeconomic status and high risk of frequent exposure to adverse conditions, such as disease and inappropriate nutritional practices. On the other hand, a decrease in the rates of stunting is a reliable indicator of the improvement of the general socioeconomic conditions of the country. The worldwide variation for the prevalence of stunting is considerable, varying between 5% and 65% in the less developed countries.

Growth studies in Portugal

The social changes that have been happening since the revolution of April 25, 1974 are expressed in the average stature of the Portuguese population that has been increasing significantly. The most recent available data (Padez, 2002), concerning the Portuguese male conscripts, since 1904 to 1998, are summarized on figure 1, together with the international reference data from the WHO. In 1998, the average stature of the Portuguese, in spite of having significantly increased still only equals the 25th percentile of the international reference data. The average increase in height was 8.99 cm from 1904 to 1998 or a rate of 0.99 cm/decade. In 1986/87 and 1996/98 the average values for height revealed differences according to socioeconomic status (SES): the conscripts with an elementary school degree were the shortest (167.3 cm) and the conscripts with university education were the tallest (173.2 cm). The difference was 5.9 cm (p=.000).

Growth studies in Cape Verde

The only available data of systematic growth studies in Cape Verde are published in the "WHO Global Database of Child Growth and Malnutrition" (http://www.who.int/nutgrowthdb/p-child-pdf). Figure 2 presents the percentage of wasting and stunting of Cape Verdean children. Stunting is the biggest problem in Cape Verde with percentages ranging from 15.3%, in 1983; 25.8% in 1985 and 16.2% in 1994. However, the age of the child changes the interpretation of the results: for children between 2-3 years of age, a low height for age reflects a continuous process of growth failure, meaning that the child is falling behind the targets for height at each age. But, recovery is still possible should health and nutritional conditions improve. Above the age of 3 years growth failure may be irreversible (WHO Global database of child growth and maturation: www.who.int/nutgrowthdb/p-child-pdf).

Methods

Sample

The sample was composed by 1,642 individuals with ages between 10 and 14 years. The distribution of the subjects according to sex, ethnic group and year of observation is shown in Table 1. The PORT and the CVP live the Municipality of Amadora, especially in the Damaia *freguesia*, located in the outskirts of Lisbon. The PORT sample resides in regular neighborhoods and the CVP sample resides in slums. The CV sample in 1993 was tested in the islands of Santiago and S. Vicente in Cape Verde.

Procedures

The anthropometric variables were gathered using standard procedures proposed by Lohman et al (1988). The socioeconomic status (SES) was determined based on the profession of the father. The professions were categorized according to the National Classification of Professions (Instituto do Emprego e Formação Profissional, 1994) and regrouped in 5 categories following Freitas (2001). The professions with higher social importance were coded as 5 and the professions with lower social importance were coded as 1.

Statistics

We used parametric techniques (oneway ANOVA and *t* test for independent samples) to compare the mean values of height among samples and Pearson correlation to determine the magnitude of the association between stature and SES.

Presentation and discussion of the results

With this study we expected to find the following: i) the PORT would be taller than the CVP; ii) both PORT and CVP would be taller than the CV; iii) a positive increase in height between 1993 and 2001; iv) higher percentages of wasting and stunting in the CV; and v) SES correlated with height.

Height

In contrast to our expectations, we found a negative time trend in the stature of the boys, but not in the girls (Tables 2 to 5). The fact that only boys suffered of this decrease in stature may be explained by the gender differences in the sensitivity of the adverse conditions of the environment. Stinson (1985) summarized several studies that show how boys are more sensitive to changes in the environment than girls. According to this author, boys under environmental stress conditions show higher percentages of prenatal mortality, delays in physical growth, and higher incidence of contagious diseases.

The negative trend for the boys indicates that some environmental factor, or a combination of several factors, is damaging the health of the children in the area of Amadora. We cannot blame the bad environment of the slums in which the CVP live because the PORT boys do not live in the slums and have been also suffering. We do not have enough environmental data to be able to establish an association between the health of the children and the conditions of the biocultural environment, but finding evidence that something is not going well within the area is the first step to solve the problem.

Nutritional status

When evaluating the nutritional status we found significant differences regarding the ethnicity and the year of testing. In relation to the indicator "low height-for-age" we found that both groups in 1999 presented the highest percentage of stunting (figure 3). The CVP 99 showed a higher percentage of stunting when compared with PORT 2001 ($p = .001$) and with PORT 1993 ($p=.001$). The CV 93 showed a significantly higher percentages of stunting than the PORT 1993 ($p=.04$) and the PORT 01 ($p=.02$).

The indicator "low weight-for-height" showed that the CV 93 had the highest percentage of wasting (7.7%). This group showed significant differences when compared with all the others. The PORT 99 presented the second highest percentage of wasting (figure 4). The sample of CV 93, being above the 5% threshold (www.who.org) indicates that some severe conditions of living were present in the lives of the CV boys and girls.

Height and SES

Figures 5 and 6 shows the relationship between height and the profession of the father, for both boys and girls. It is noticeable that PORT and CVP boys do not differ from each other regarding their height but the CV boys are significantly shorter that the other two groups. No differences in height among the girls of the three groups were found.

The fathers of the PORT boys and girls have higher ranked professions that the fathers of the CVP. However, there is a decrease in the professional ranking of the PORT fathers that is significant between 1993 and 2001. This decrease in "job quality" is accompanied by a decrease in the stature of the boys ($p=.001$).

We may infer that this decrease in "job quality" among the PORT group may mean that the families with better social position are leaving the area allowing other families with less qualified jobs to come in.

As we previously stated, our results show, unequivocally, that the biocultural environment of Damaia is not getting better and these negatives changes are expressed in the height and nutritional status of the children. Further analysis is needed to try to establish a cause for these negative and harmful effects. It would be best to have the municipality and the local health authorities involved in the search for causes..

Conclusions

1. The anthropometric and nutritional indicators show a decline in the quality of the environment in which PORT and CVP live in Damaia.

2. This decline is also shown in the decline of the social status of the profession of the fathers.

3. The higher sensitivity of boys to adverse environmental conditions is shown in our data, for both PORT and CVP, concerning the average values for stature.

4. Girls are more resistant to adverse environmental conditions and therefore these changes are not shown in changes in stature.

5. We suggest that boys should always be analyzed separately from girls because of these differences in sensitivity to environmental stressors.

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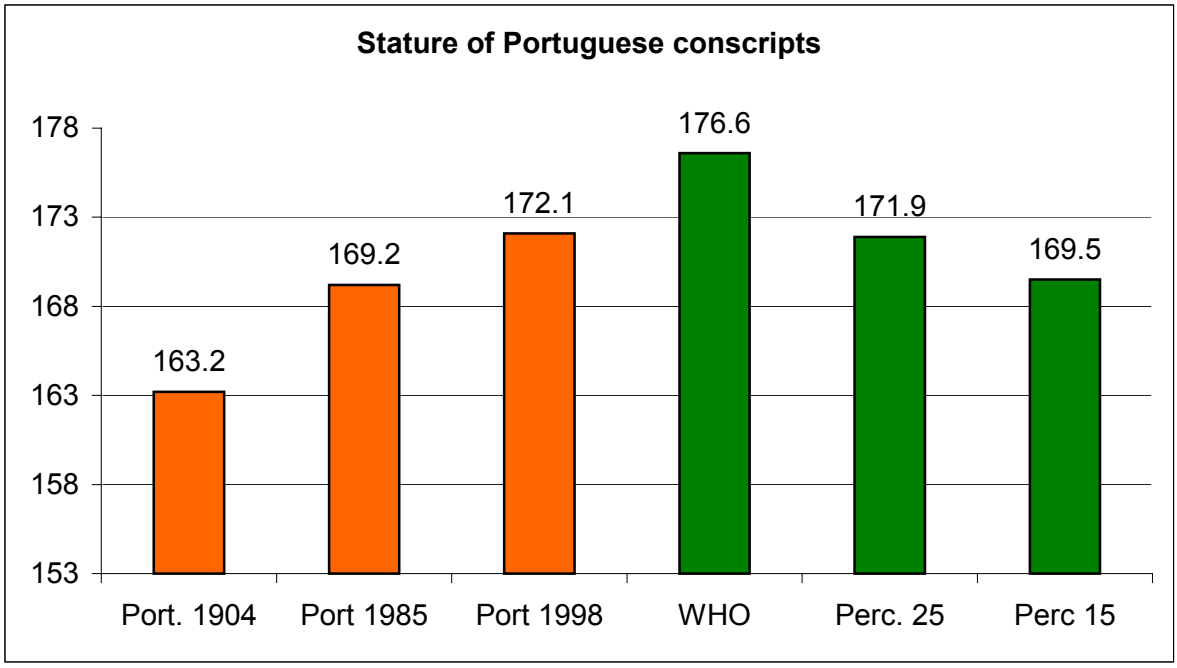


Figure 1. Stature of Portuguese conscripts and values from World Health Organization (adapted from Padez, 2002).

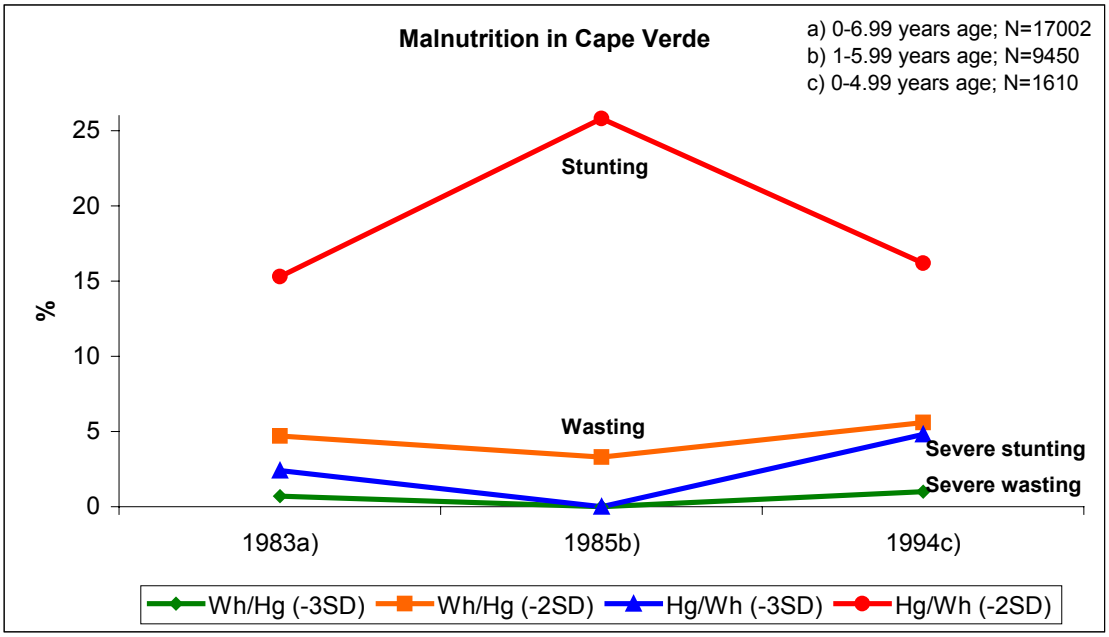
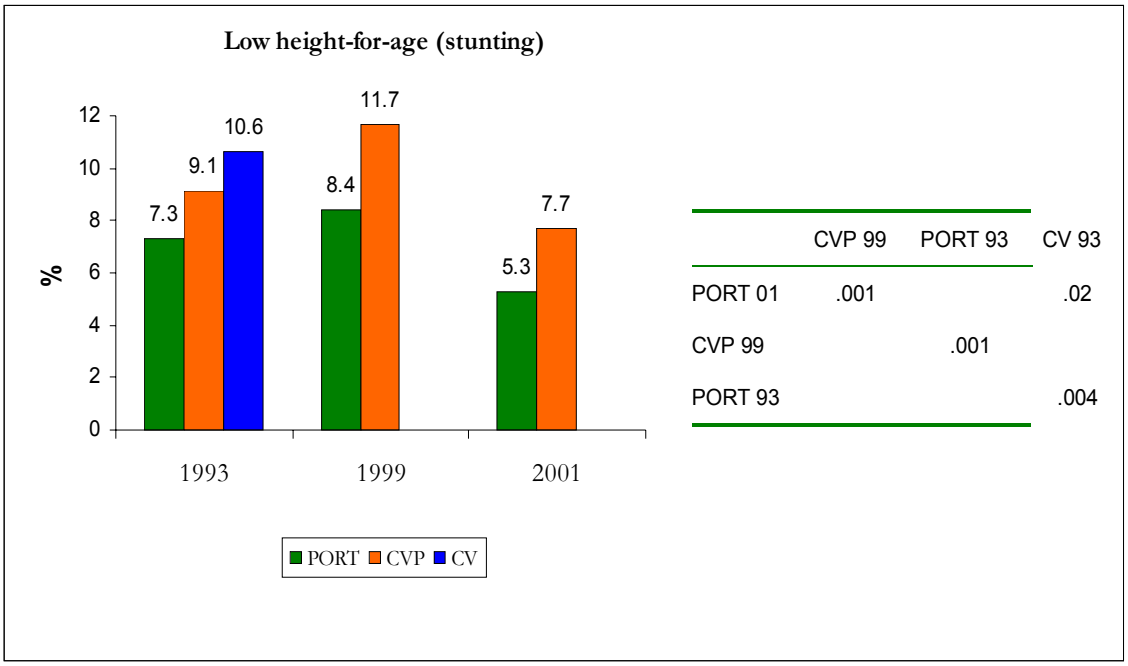
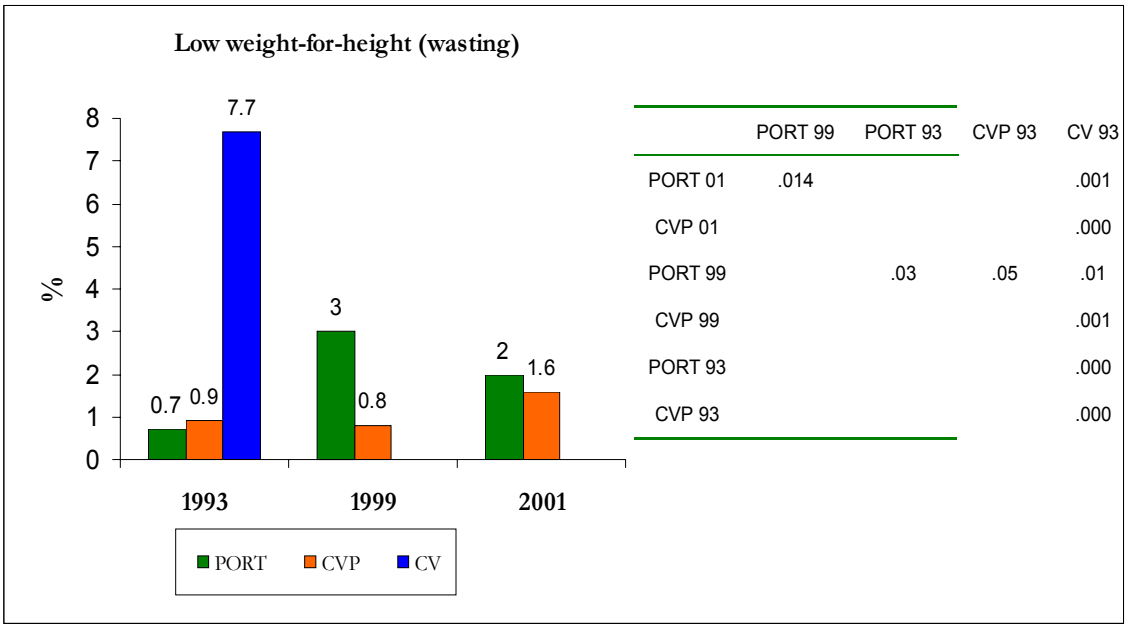


Figure 2. Percentage of wasting and stunting in Cape Verde – 1983, 1985 and 1994 (www.who.int/nutgrowthdb/p-child-pdf.



	CVP 99	PORT 93	CV 93
PORT 01	.001		.02
CVP 99		.001	
PORT 93			.004

Figure 3. Percentage of stunting



	PORT 99	PORT 93	CVP 93	CV 93
PORT 01	.014			.001
CVP 01				.000
PORT 99		.03	.05	.01
CVP 99				.001
PORT 93				.000
CVP 93				.000

Figure 4. Percentage of wasting

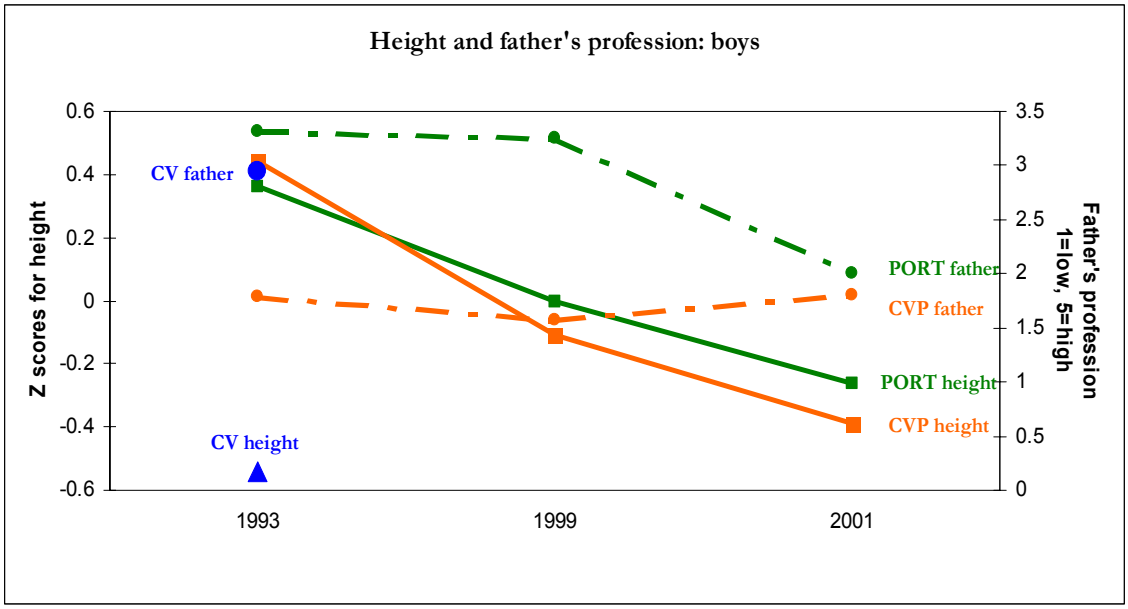


Figure 5. Association between height and profession of the father (boys)

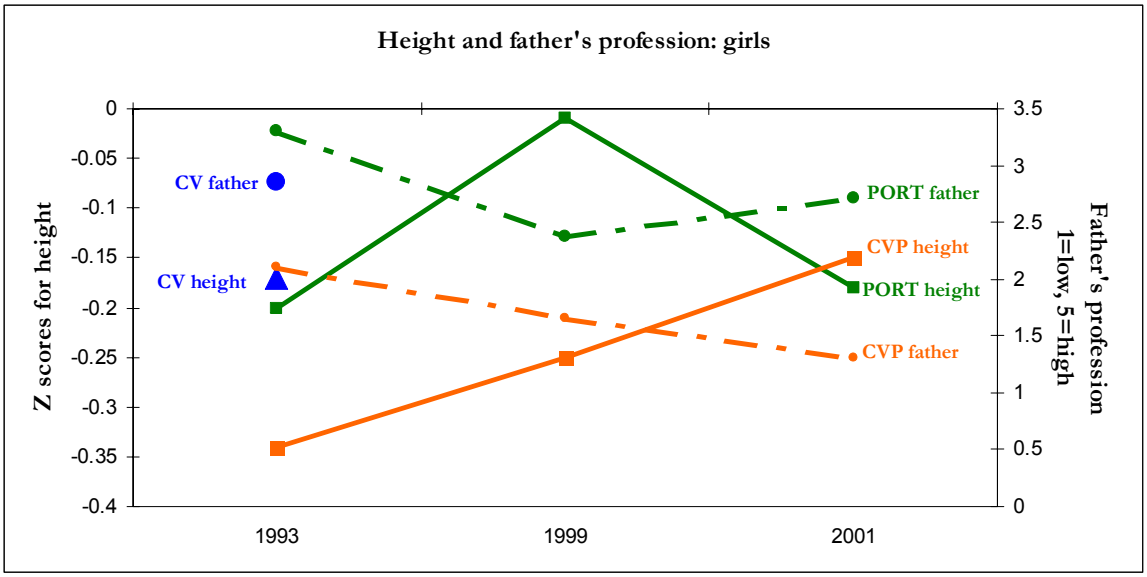


Figure 6. Association between height and profession of the father (girls)

Table 1. Characterization of the sample

N		1993	1999	2001	**Total**
PORT	Boys	120	112	77	*309*
	Girls	319	91	75	*485*
	Total	439	203	152	*794*
CVP	Boys	53	117	79	*249*
	Girls	166	122	104	*392*
	Total	219	239	183	*641*
CV	Boys	97	0	0	*97*
	Girls	110	0	0	*110*
	Total	207	0	0	*207*
General total		*865*	*442*	*335*	*1642*

Table 2. Average differences in stature (cm) and p value for boys

	Age	PORT - CVP	PORT - CV	CVP - CV
1993 *	10	Small n	Small n	Small n
	11	-4.49 (ns)	5.23 (ns)	9.72 (p=.005)
	12	-0.52 (ns)	5.01 (ns)	5.53 (p=.04)
	13	-3.42 (ns)	5.00 (ns)	8.43 (p=.001)
	14	Small n	Small n	Small n
1999 **	10	-2.08 (ns)		
	11	-3.93 (ns)		
	12	5.09 (ns)		
	13	5.12 (ns)		
	14	-1.10 (ns)		
2001 **	10	Small n		
	11	0.11 (ns)		
	12	-1.26 (ns)		
	13	Small n		
	14	Small n		

* Tukey test
** *t* test

Table 3. Tukey test – Stature according to the year of observation – boys

	Age	1993-1999	1993-2001	1999-2001
PORT *	10	1.43 (ns)	6.47 (p=.003)	5.05 (p=.03)
	11	2.46 (ns)	3.20 (ns)	0.73 (ns)
	12	2.80 (ns)	7.42 (p=.04)	4.61 (ns)
	13	Small n	Small n	Small n
	14	Small n	Small n	Small n
CVP *	10	Small n	Small n	Small n
	11	3.02 (ns)	7.80 (p=.05)	4.78 (ns)
	12	8.41 (p=.006)	6.31 (p=.02)	-2.09 (ns)
	13	11.33 (p=.000)	3.48 (ns)	-7.84 (p=.002)
	14	Small n	Small n	Small n

Table 4. Average differences in stature (cm) and p value for girls

	Age	PORT - CVP	PORT - CV	CVP - CV
1993 *	10	3.67 (p=.04)	Small n	Small n
	11	-1.48 (ns)	-1.65 (ns)	-0.17 (ns)
	12	0.67 (ns)	1.48 (ns)	0.81 (ns)
	13	0.99 (ns)	-1.03 (ns)	-2.02 (ns)
	14	Small n	Small n	-2.28 (ns)
1999 **	10	2.14 (ns)		
	11	0.30 (ns)		
	12	0.87 (ns)		
	13	1.15 (ns)		
	14	Small n		
2001 **	10	-3.24 (ns)		
	11	1.09 (ns)		
	12	-2.32 (ns)		
	13	Small n		
	14	Small n		

* Tukey test
** *t* test

Table 5. Tukey test – Stature according to the year of observation – girls

	Age	1993-1999	1993-2001	1999-2001
PORT	10	-2.21 (ns)	1.56 (ns)	3.77 (ns)
	11	-1.64 (ns)	-1.30 (ns)	0.34 (ns)
	12	-1.39 (ns)	0.29 (ns)	1.68 (ns)
	13	1.69 (ns)	Small n	Small n
	14	Small n	Small n	Small n
CVP	10	Small n	Small n	-1.61 (ns)
	11	0.14 (ns)	1.27 (ns)	1.13 (ns)
	12	-1.19 (ns)	-2.70 (ns)	-1.51 (ns)
	13	1.85 (ns)	-1.90 (ns)	-3.76 (ns)
	14	1.95 (ns)	1.66 (ns)	-0.28 (ns)