Height and longevity among males born in Villagrande Strisaili, (1866-1915)

Altezza e Longevità Tra i Maschi Nati a Villagrande Strisaili, (1866-1915)

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Riassunto: Il presente contributo analizza la relazione tra l'altezza e la sopravvivenza della popolazione maschile di un comune dell'area interna della Sardegna. Il comune di Villagrande Strisaili è stato selezionato per uno studio più approfondito. Attraverso la tecnica del *linkage* individuale per i coscritti nati tra il 1866 e il 1915 l'esatta età al decesso rintracciata nei registri dello stato civile è stata messa in relazione all'altezza rilevata all'atto della visita di leva. Dall'analisi emerge l'esistenza di una correlazione negativa significativa tra altezza e longevità tra quanti sopravvivono oltre i 70 anni.

Keywords: Height, Longevity, Sardinia

1. Introduction

The present contribution aims to investigate the association between height and survival in one selected municipality in Sardinia's inland. This area was chosen as it registers on the one hand, the lowest average value of height (Piras et al., 2005); while on the other hand has been identified as a zone of exceptional longevity (Poulain et al., 2004). The municipality of Villagrande Strisaili has been selected for an in-depth analysis. The research question addressed is the following: *Is there a possible relation existing between a persons height and duration of his life*? Are taller or shorter individuals having a higher probability of survival? Through individual linkage procedure, data from the military registers has been linked to data from the municipality civil registers.
This work is the result of a collaboration between the research team on longevity of the *Université Catholique de Louvain* and the research team of the *Università degli Studi di Cagliari* involved in a broader national research project PRIN "Evolution of biodemographic characteristics of Sardinian recruits in a century: 1890-1980".

2. Data and Methods

In Italy, military service was compulsory for all men born between the years 1861 and 1985. All conscripts were submitted to a medical examination and height measurement. Therefore, we have used this source to gather the information on all conscripts born in Villagrande Strisaili from 1866 to 1915, who were 19 or 20 years old at the time of the visit. The individual file shows the number of matriculate, name, surname, father and mother's Christian name, date of birth, height, thoracic perimeter[1]. The precise information reported on name, date of birth and parents name has enabled us to trace back in the municipality civil registers the exact date of death of 550 conscripts born in 1866-1915. We therefore linked directly each individual to his height at age 20 and check his survival at later ages. There were in Villagrande 1,369 male newborns between 1866 and 1915[2]. We selected only males surviving above 20 years and traced the height value registered at the time of military medical visit (table 1).

Table 1 – Number of male newborns in Villagrande Strisaili, coverage of survival at age 20, and height

Year of Birth	No. New borns	% Survivors age 20+ for which date of death is known (A)	% Known Height of A
1866 - 1875	203	53.2	50.5
1876 - 1885	212	65.5	73.6
1886 - 1895	266	71.6	84.7
1896 - 1905	337	63.5	80.0
1906 - 1915	351	62.5	77.7
Total	*1,369*		
Average		*63.2*	*73.3*

As a first attempt to identify a possible relation between height and longevity, we looked at the distribution of age at death by height and compared the mean age at death by height groups. Later we inverted the prospective and considered the mean height by age groups. Pearson correlation coefficient was used to assess the degree of correlation between the two variables at individual level.

3. Literature review

According to most of the literature on this topic, there exists a negative correlation between height and longevity, meaning that shorter individuals live on average longer than the taller ones. Findings from previous studies suggest that smaller bodies have lower death rates since increased body mass would favour faster ageing (Sunder, 2005). This relation was proved for both humans and animals (Samaras and Elrick, 1999). However, this negative correlation does not always appear direct and clear. In fact, there are confounding effects of individual social economic status, which finally influence other factors such as nutrition and lifestyle. In addition, especially for younger age groups the presence of accidental deaths does not permit the identification of a clear

[1] The individual file reports in addition: state of teeth, occupation, date of the medical examination, activities during the military service, expiration date from military duties. Some files included also variables such as: colour and shape of hairs, colour of eyes, shape of nose and of the chin.
[2] The exact date of death is known for 83.4% of the total of male newborns.

relationship (Samaras et al., 2003). However, according to the literature, at older ages the relationship is more significant.

4. Discussion

The average height estimated for all individuals in Villagrande Strisaili between 1866 and 1915 was 160.02 cm. When comparing this value with what was reported in other works on Sardinian population for the same period (Coletti, 1908; Piras et al., 2005), it emerges that conscripts born in Villagrande Strisaili are on average slightly shorter than other Sardinian recruits (161.9 cm), which are themselves shorter than the national average (164.5 cm). This trend is confirmed for example when comparing conscripts from cohorts 1880-1884. We found that the number of Villagrande Strisaili conscripts shorter than 160.0 cm was 46.6%, which is proportionally higher than in Sardinia at 32.2%, and in the Reign of Italy, there was a level 22.7% recorded (Coletti, 1908).
By plotting the distribution of age at death by height (Figure 1), it emerges that most conscripts are located in the upper-left square, meaning that the majority are shorter than 165.0 cm and have survived later than 70 years. The small group dying at 20 years of age can be mainly attributed to the deaths occurred during the two World conflicts.

Figure 1 - Distribution of age at death by height at age 20

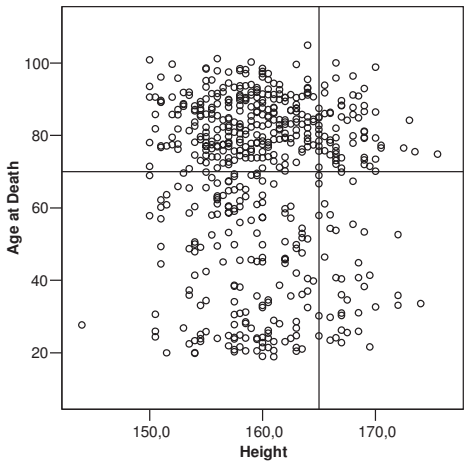
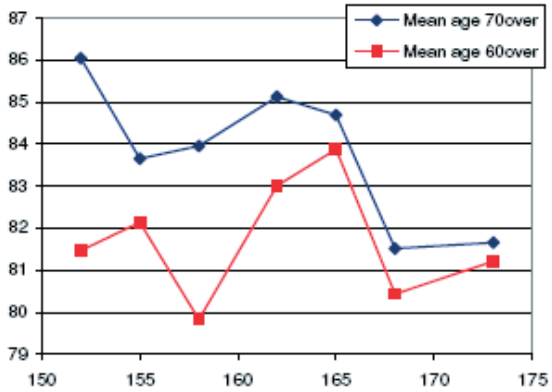


Figure 2 – Comparison of mean age at death by height group

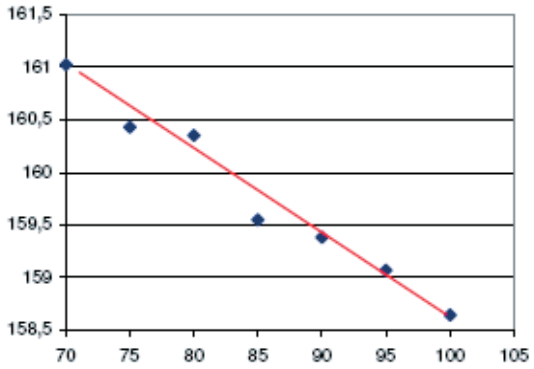


Based on the confounding effect of accidental deaths at younger ages, the analysis was concentrated on deaths occurred after 60 and after 70 years. The comparison of the mean age at death by height groups (figure 2)[3] emphasised the existence of a sort of "optimal survival age/height" estimated around 83.0 to 83.9 years by a height value varying between 158.1 and 164.0 cm. The same favourable height interval is found when looking only those surviving after 70 years. However, the modal age is registered among those shorter than 152.0 cm. Certainly, for individuals from both groups of age being higher than 165.0 cm, can assume reduced survival chances. The work of Sunder (2005) may give some suggestions for interpretation. In fact, he points out the existence of an optimal metabolic rate associated with lower risk of mortality. However, we cannot test this hypothesis for Villagrande conscripts from our data.

[3] We classified individuals into 7 height groups by interval of 3 cm, choosing as starting and ending categories less than 152, higher than 168.

Through the estimation of Pearson correlation for individuals living after 70 years, we found a negative linear association between the two variables, despite the coefficient being weak. However, the associated probability proves to be statistically significant[4] (r = - 0,116; p =0.032). We decided, therefore, to group the data and compare the mean values of height by 5 years age group, inverting the prospective from our previous attempt. This negative relation appears more clearly (figure 3). Individuals living at oldest ages are shown to be shorter than those dying earlier. The expectations deriving from the literature are therefore met. However, some authors have stressed that the potential greater longevity of shorter people could be compatible with their nutrition, lifestyle and the environment (Samaras et al., 2003). This means that to understand process of the relation between these two variables, there needs to be a contribution of further research from various fields.

Figure 3 – Comparison of mean height by age groups



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[4] Significance at a level of 0.05