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**Parental Investment in Growth and  
Development: Cape Verdean migrants in a  
Portuguese Poor Neighbourhood**

By

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A Doctoral Thesis

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## **Abstract**

### **Background**

Cape Verde has produced migrants over the centuries. Its history and geography have compelled males and females to leave their homeland in search of resources to invest in their family's survival and development.

Literature on parental investment has evidenced the association between investment in embodied capital during infancy and early childhood and its outcomes at later stages. However, these studies seldom address migrant population.

### **Aim**

This study aims to gain a better understanding of the relationship in a migratory context between parental investment in infancy and its outcomes in prepuberty embodied capital, among Cape Verdean children living in Cova da Moura, a deprived neighbourhood in Lisbon Metropolitan Area, Portugal.

### **Methods**

A mixed method's approach – combining quantitative with qualitative studies - is used. The prepubertal capital of the 221 schoolchildren attending the basic school located in Cova da Moura is assessed through Anthropometry and educational records analysis. The parental investment in infancy of 75 is analysed through interviews with parents and combined documentation (e.g. health booklets, reports, legislation).

### **Results**

The key findings are:

- 1) Children are born and raised between 1997 and 2002, a time characterized by a favourable socioeconomic development in Portugal in general and Cova da Moura in particular.
- 2) In spite of living in a so called "deprived neighbourhood", the school children linear growth falls into the healthy range of the III NHANES growth reference, and it is slightly better than the linear growth of other groups of children measured in Portugal in late 1980s and early 2000. School-oriented cognitive development is not adequate, however. A third of the students have not a regular school performance.
- 3) Parental investment in infancy is significantly associated to prepubertal physical growth and school-oriented cognitive development. The size effect is, however, small.

### **Emigrante**

*Quando eu puser os pés no vapor que me levará,  
quando deitar os olhos para trás  
em derradeiro gesto de desprendimento,  
não chorem por mim.*

*Levarei numa pequena mala  
entre a minha roupa amarrotada de emigrante  
todos os meus poemas  
- todos os meus sonhos!  
levarei as minhas lágrimas comigo  
mas ninguém as verá  
porque as deixarei cair pelo caminho  
dentro do mar.*

*Levarei já nos olhos a miragem de outras paisagens  
que me esperam,  
já no coração o bater forte  
de emoções que eu pressinto.*

*E se eu voltar  
se voltar para a pobreza da nossa terra,  
tal como fui,  
humilde e sem riquezas,  
também não chorem por mim  
não tenham pena de mim.*

*Mas se eu trazer esse ar de felicidade  
que fica a arder na chama de charutos caros  
que cintila em pedrarias de anéis vistosos  
se anuncia em risadas ruidosas  
e se garante na abundância das cifras bancárias,  
então chorem por mim  
tenham pena de mim,  
porque a pequena mala do emigrante que fui,  
com os meus poemas – os meus sonhos! –  
ficou esquecida como cousa inútil  
como peso inútil,  
não sei em que parte do mundo!*

Jorge Barbosa, 1948

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**Abbreviations, and acronyms**

BMI	Body Mass Index
CSO	Civil Society Organization
CV-PT 09	Cape Verdeans measured in Cova da Moura in 2009
CV-PT 88	Cape Verdeans measured in Buraca in 1988
CV-PT 87	Cape Verdeans measured in Costa da Caparica in 1987
EB1-CM	Jardim Infantil/Escola Básica 1 da Cova da Moura
GDP	Gross Domestic Product
HDI	Human Development Index
LMA	Lisbon Metropolitan Area
NGO	Non Governmental Organization
NS	Non significant
NHANES III	Third National Health and Nutrition Examination Survey
PALOP	Portuguese-speaking African Countries
PIT	Parental Investment Theory
RCV	República de Cabo Verde
SGA	Small for gestational age
SHR	Sitting Height Ratio
UNDP	United Nations Development Programme
UNICEF	United Nations Children Fund
WHO	World Health Organization

**Map 1 – Map of Cape Verde**



**Source:** Adapted from the Cape Verdean boundaries map (Map Library software). Cape Verde is composed of nine islands, of which one is uninhabited.

# Chapter 1 – Introduction

## 1.1 Background

Migration is an essential feature of the history of the Cape Verde, an archipelago of ten islands and two islets in the Atlantic Ocean, located 600 km off the West African coast (see Map 1). Since its settlement (1462), migration has marked its history.

Cape Verde was first inhabited by a mixture of forced and voluntary migrants. White Southern European nobles, peasants and convicted citizens, black Western African slaves and freemen, settled in the islands of Santiago (1462) and Fogo (1493->), following the “discovery” of the archipelago. Fewer Europeans and Africans and a growing number of offspring born from an intermarriage between white men and black women settled in the islands of Brava (1545), Santo Antao (1548), Sao Nicolau (late 1500), Boavista (mid 1600), Maio (late 1600), Sal (late 1600), and Sao Vicente (late 18<sup>th</sup> Century) (Carreira 1977).

From late 17<sup>th</sup> Century, the migration cycle was, however, to reverse. Cape Verdeans initiated an emigration trend which still characterizes the archipelago today. The number of Cape Verdeans currently living in the diaspora is estimated to be similar or higher than the number of Cape Verdeans living in the archipelago<sup>1</sup>.

At the beginning, emigration was directed to the United States and the islands of Sao Tome and Principe (1860). In the 20<sup>th</sup> Century, destinations diversified due to the increasingly restrictive immigration policies in the United States from 1917. Cape Verdean migration was partially diverted to other geographical areas, such as Southern America (Brazil and Argentina) and Africa (Senegal, Guinea Bissau, and Angola). Europe only became the main destination from the end of the World War II (Netherlands, France, Italy and Portugal).

Cape Verdean international migration was mostly an adaptive response to its geophysics (e.g. climate and arable surface) and the colonial policies (e.g. land distribution, and relief aid). These were the “push factors”, as they are often called in the migration literature, for families adopting emigration as a strategy for survival.

Besides its deprivation of valuable mineral resources and vast productive land, the archipelago is located at the end of the Sahel region, a transitional ecoregion (semi-

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<sup>1</sup> Despite the difficulties in assessing the volume of Cape Verdean migrants and non migrants living abroad, Carling estimated between 366 and 622 thousands (on average 458 thousand) Cape Verdeans living in Europe, America and Africa in mid-1990 (Carling 1997). The last Cape Verde Population Census indicates 492 thousands Cape Verdeans living in Cape Verde in 2010 (INE). In the thirteen years between Carling’s estimates and the last Cape Verde Population Census, the number of the Cape Verdeans in the diaspora has very likely increased. Thus, it is not incorrect to say that the volume of diaspora is similar, or higher than the volume of residents in the archipelago.

arid) between the arid Sahara in the North and the Sudanian savannas in the South. Cape Verde's location makes it vulnerable to the meteorological phenomena accompanying the yearly South-to-North movement of the Intertropical Convergence Zone and its devastating effects. On its way to the North, the rainfall does not reach the Cape Verde archipelago. Over centuries the recurrent low and irregular rainfall caused cyclical and prolonged droughts and, as a consequence, severe famines; famines which were sometimes accompanied by epidemic outbreaks (e.g. smallpox and yellow fever) and heavy death tolls<sup>2</sup>. In addition, the heavy rains which followed the long droughts dragged the best layers of organic material in the soil down into the rivers, seriously reducing the arable surface. The arable surface has been decreasing because of soil erosion. The significant increase in human and cattle population had upset the ecological balance of the archipelago. A progressive destruction of vegetation had taken place to meet the growing demands of raw material for housing, firewood, and furniture, or pastures. The reduction of vegetation, combined with the lashing of the soil by the regular violent winds, hastened the soil erosion and, ultimately, the scarcity of arable land. Not having the opportunity to collect the essential resources for the survival of the family in the original biocultural ecology, the potential migrant felt compelled to search for another ecological niche which was perceived as offering better opportunities (Carreira 1977, Patterson 1988, Rocha 1987).

Colonial policies on land distribution also contributed significantly to emigration. Land was mostly allotted at a period when no African could aspire to be free, let alone own land. The Crown «donated» territories to specific individuals. In turn these individuals distributed the land under their administration according to two systems, which varied depending on location and time: large sized units (*morgadio* or *capela*) and small and middle-sized units. The first system prevailed in the islands of Santiago and Fogo where the first settlement took place, whereas the second system prevailed in the remaining islands where it was required to integrate the growing number of *mestiços* - who were children of the European men and African women.

Regardless of the land distribution system, land was inalienable, indivisible, and transmitted in the male line by primogeniture. Moreover, wherever land was proved to be unproductive, the landlord would be deprived of it. In this system, the few available options for the landless people to have access to the increasingly scarce land was through the land tenure or share-cropping system, which became common practice when the number of slaves began to decline and landlords found

---

<sup>2</sup> Prior to the 1940s, the high mortality rate during almost every episode of famine was ascribed to relief not delivered in time or/and not effectively administered.

themselves without labour to cultivate the large stretches of unproductive land. But these leasehold contracts proved to be disadvantageous for tenants and sharecroppers. Landlords often did not renew the contract to the first tenant, who had worked hard to turn unproductive arable surface into productive land, in order to raise the price of the rents. The efforts of the Colonial Administration (e.g. abolishment of the inalienable propriety system, revision of the leasehold contracts) to change the situation toward one of greater equity proved to be ineffective (Carreira 1977).

In sum, as Carreira emphasizes *"the faulty land distribution, particularly in Santiago, allied to the droughts and famines, and the absence of a basic economic structure, [was] the most outstanding cause of emigration"* (Carreira 1977:30). Even when survival was no longer an issue (i.e. from the second half of 20th century), or was never an issue (i.e. for the upper and middle classes), emigration became a viable strategy to have access to goods (e.g. diet diversification, clothing), infrastructures (e.g. water supply, better house and acquisition of property), and services for their children (e.g. education and health) relevant to healthy growth and development, productivity and social mobility, and reproductive success.

The migratory movement was, and still is, first performed individually, that is by a single person. Often the migrant intends to emigrate for a determined period and then return to Cape Verde, but just as often those plans are soon postponed to an undetermined time. The increasingly restrictive immigration policies (especially for the undocumented migrants) as well as the increasing difficulties in accomplishing the migratory goal (e.g. accumulation of economic capital, or a cultural capital) combine to defer returning to the country of origin.

In the case of emigrant parents, the protracted absence causes reorganisation of the family life, in particular when the migrant is the head of the family and/or is a woman. The exercise of his/her parental responsibilities at home, in particular the daily care and upbringing of children, is left to other kin who usually belong either to the nuclear family (e.g. the non-migrating spouse) or extended family (e.g. the migrant's parents). While striving to accomplish the migratory goal, the migrant is expected to send remittances regularly, crucial for the household management back in Cape Verde, as well as to contribute to the migratory movement of other family members.

These social and economic consequences of migration often extend until the age of retirement. In the short or long run, the migrant sends for the family left in Cape Verde or starts a new family in the host county. Both situations involve a redefinition of parental investment strategies. In the former, the migrant can

reassume the responsibility of direct parenting, and owns more financial resources to allocate to parenting, as family reunion means concentration of resources in one family living in one place. In the latter, the migrant's resources are instead distributed unequally between the offspring (and spouse) left in the country of origin and the new family created in the country of immigration. The biased allocation of resources on behalf of the family in the host country is the commonest situation.

The purpose of our research is to understand the decision making process of the Cape Verdean migrant parents for the allocation of resources and the effects of those decisions on the growth and development of their offspring who were born in the immigration country. These parental decisions often involve taking into account the distribution of resources between offspring left in Cape Verde with a parent or a kin member, and those living with the migrant.

The research is restricted to the study of a group of Cape Verdean children living in Cova da Moura. Cova da Moura is a deprived neighbourhood located in the municipality of Amadora (i.e. Lisbon Metropolitan Area, Portugal). The reason for this choice lies in the fact that Amadora is one of the main Portuguese municipalities to host immigrants, including Cape Verdeans. Cova da Moura is a neighbourhood with a high concentration of Cape Verdeans.

## **1.2 Research Questions**

The formulation of the research questions required a review of the literature on parental investment on human capital, that is, the stock of economically productive human capabilities. Behrman and Taubam (Behrman, Pollak et al. 1982) explain that the production of these capabilities combine innate abilities with investments in human beings, such as nutrition, health, education, and on-the-job training. *Parental Investment Theory* (PIT) is a branch of biological evolutionary theory which focuses on many of the issues regarding human capital formation (Ayalew 2005, Yueh 2006).

A review of the PIT literature was crucial to formulate the research questions and identify some relevant issues presented. First, parents matter because their decisions and behavior affect the biologically based behavioral tendencies of their offspring. These decisions are extremely important during the early stages of lifespan as the offspring is completely dependent on parents for survival. Second, parents share universal hierarchical goals for their offspring (i.e. survival, economic independence, and maximization of non-economic values) and parents adopt strategies to achieve those goals according to their ecological niche (LeVine, LeVine

et al. 1994). Third, parents do not invest equally in their offspring (Trivers, Willard 1973, Clutton-Brock 1991). Each parent invests differently according to their own priorities. Mothers usually allocate more resources than fathers. Moreover, in some species kin members contribute to parenting, which further complicates the study of investment. Fourth, in general parents do not allocate an equal quantity and quality of resources to each of their offspring, as contexts in which their offspring are born vary. Allocation usually varies according to the offspring (i.e. sex, age, birth order, and health condition), parents (i.e. sex, age, health condition, and professional activity), and family characteristics (i.e. number of offspring, number, age, sex and relationship of other household members, child spacing,), as well as physical, economic, social and political environmental conditions. Fifth, migrant parents are neglected in the biological literature on parental investment. The understanding of parental investment strategies among mobile people requires to take into account the *time* and *space*, that is the historical and geographical contexts, in the analytical model.

Bearing in mind the main elements identified in the literature review, the following research questions emerged:

- 1) How do Cape Verdean migrant parents allocate resources to their offspring in an immigration context?
- 2) What are the main environmental factors that shape parental decisions on the allocation of resources?
- 3) What are the effects of the adopted parental investment strategies in terms of their offspring's growth and development?

### **1.3 The «Cape Verdean» Identity: From Europe to Africa**

The identification of the community commonly known as «Cape Verdean» is a complex task. This group is not confined to the geographical area delimited by physical boundaries such as the Atlantic Ocean. Emigration is so strong that Cape Verdeans have become a de-territorialized transnational people. This was described earlier in this chapter.

Cape Verdeans are a group composed of several sub-communities spread along different countries and continents and for which the nation of Cape Verde often serves as the "hub". Cape Verdeans includes a diversity of juridical situations that range from people who were born in Cape Verde to people who were born abroad, never visited the archipelago, nor hold the Cape Verdean nationality. The social and cultural organization of Cape Verdeans is best classified as an "ethnic group".

Several definitions have been proposed for ethnic group, a label which is derived from *ethos*, the Greek word for people, and that gained momentum in the socio-cultural literature from 1960s onwards. The majority of definitions stress the belief that an ethnic group is a human population with common ancestry, history and culture associated with a specific territory (Amselle, M'Bokolo 1985, Amselle 2010, Rivière 1995, Smith 2009, Weber 2009). Indeed common origin, history, and culture seem to be the elements which bind Cape Verdeans in the diaspora and those in the archipelago.

Cape Verdean people represent a genetic admixture of peoples with different phenotypes. The archipelago was believed to be uninhabited when vessels under the Portuguese flagship discovered it (1460)<sup>3</sup>. The Portuguese Crown donated territories of the island of Santiago to Antonio da Noli, and Diogo Gomes, the explorers who first visited the island. Also, it promoted settlement of the major and most attractive islands in terms of natural ports, water, and arable land and pastures, that is Santiago (1462) and Fogo (1493). However, its distance from the kingdom and the environmental constraints (e.g. climate and lack of resources) attracted few European settlers, mostly individual men from Southern Europe. The development of the agriculture sector required a large pool of labour which was met by importation of slaves from the West African coast (mainly from Senegambia).

Only a few European women were lured in the settlement process. Thus intercourse relations between European white men and African slave black women became a common situation. From these relations were born the first children of the archipelago, the *mestiços*, a genetic synthesis of the admixture of white and blacks. The combination of different peoples (i.e. white men and black woman, *mestiço* men and black women, and white men and *mestiços* women) which followed led eventually to the formation of a creole society (Carreira 1977). The increase of the number of *mestiços* caused Portuguese authorities to decree in 1620 the deportation of convicted European women from Brazil into Cape Verde in order to gradually eradicate the *mestiço* ethnic group. However, even when European men were married to a European woman the men would continue to father offspring with African women.

Genetic studies conducted on Cape Verdeans living in the archipelago concluded that there was a high diversity of people in this archipelago. Cape Verdeans not only differ from other Sub-Saharan populations, but also between themselves: the

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<sup>3</sup> At present, this official version is refuted. Evidence suggests that peoples from the shores of the African Western Coast – Wolof, Serer or Lebu – might have been in the southern islands before the European arrival. In this vein, Portuguese did not “discover” an archipelago “uninhabited” (Andrade 1996, Carreira 1977). Albuquerque advocates that, even if the island were known by African peoples, their visits were short and never promoted the settlement of any island of the archipelago (Albuquerque, Santos 1988).

northern from the southern. The admixture of African slaves with European populations and the genetic drift associated with the gradual settlement might explain the genetic differences. European free individuals and African slaves settled in the southern islands in the 15th century whereas *mestiços* mostly settled the northern islands during the 16th and 17th centuries (Fernandes, Velosa et al. 2003).

This hybridization, or creolization, is reflected in other sectors of the society, in particular the culture. As Gabriel Mariano defined it, the Cape Verdean culture is the triumph of the hybrid expressions of culture. It integrates heterogeneous elements, brought first by Southern Europeans and Western Africans settlers, into its landscape. This integration led to the formation of a society where habits and customs are essentially the same for all its individuals, regardless of their ethnic or social group, their urban or rural background, and their inland or coastal residence (Mariano 1991). Rather than opposing themselves, these opposing elements interpenetrated each over time in a diversity of cultural dimensions (Carreira 1977, Langworthy, Finan 1997). Catholicism, estimated to be the main religion, is combined with African beliefs, in particular in rural areas. *Krioul*, the *vernacular* language, is based on a mixture between ancient Portuguese and West African coast languages. Gastronomy is based on a combination of foods introduced from Southern and Central America (corn and beans), Africa (cassava), and Asia (sugar cane). Music is influenced by the European (e.g. morna), African (e.g. batuque and tabanca) and Brazil/Caribbean (coladeira) forms.

The claim for a Cape Verdean cultural identity only emerged in early 20th century, however. The claim emerges from a fight against the racist hierarchy of the Colonial Administration, which privileged Portuguese whites to the detriment of the Cape Verdean people. A group of intellectual *mestiços*, maintained they were the only persons capable to act as mediators between the Colonial Authorities and the Cape Verdean people. Unlike the Portuguese white officers sent from the metropolis, they adhered to both systems of cultural codes, the Portuguese which they achieved through schooling, and the Cape Verdean which they acquired through their being born and raised in the archipelago. This tension between Portuguese senior officers and Cape Verdeans holding intermediary positions, often with a higher level of schooling than the former, resulted in a redefinition of the Cape Verdean intellectual stance Anjos 2004).

The Portuguese dictatorship (1933-1974) prevented the sociopolitical claims from being published in the local newspaper, causing a shift in the strategies used to express those claims. A production of Cape Verdean literature, published in literary magazines "Claridade" (1936-194?) and "Clareza" (1944-?), and whose subject is

Cape Verde and Cape Verdean hardships (in particular, draught, famines, poverty), shifts away from the Portuguese literary traditions. The *locus* of identity is shifted from the Portuguese culture to the other side of the Atlantic, to Brazil, rather than to the African continent, despite their African origins. Cape Verdean intellectuals refused the African cultural roots assigned to them by the Portuguese Colonists. They saw themselves closer to the Brazilian culture, a culture which represented a synthesis of heterogeneous ethnic groups from Europe, Africa, and local areas. Also, they recognized in the Brazilian literature themes present in the Cape Verde reality. Despite being seen through the lens of Brazilian literary parameters, Cape Verdean literary production of this period is acknowledged in literary circles as specifically Cape Verdean (Prado 2004, Varela 2000).

In mid-1950, Cape Verdean cultural identity suffered another change of *locus*, this time towards the African continent. At the beginning, a significant number of intellectuals did not share this cultural proximity to African cultures as advocated by the intellectual followers of the Amílcar Cabral, the leader of the *Partido para a Independência da Guiné e de Cabo Verde* (PAIGC). Only gradually did this movement incorporate the remaining intellectuals (Anjos 2000, Margarido 1994). Those who were not incorporated were those who migrated to Portugal following the independence of Cape Verde.

Following the independence of Cape Verde, African cultural roots suffocated for centuries, were revitalized, such as the vernacular language and the musical and dance expressions. Despite the preservation of Portuguese as the official language, *Kriol*, the vernacular language which was used as a tool of resistance against the colonizer, was recognized as a national language and a group of linguistic specialists has been working to formally codify the *Kriol* language. It is the only language shared by Cape Verdeans, either living in the archipelago or abroad. The descendants of Cape Verdean migrants in diaspora only communicate in *Kriol* with other Cape Verdeans. Except for those in Portugal, they mostly do not speak Portuguese, nor do they understand it. The reason for this is that their parents and grand-parents spoke to them in only *Kriol* (Meintel 2002).

Changes also occurred in musical tastes towards more African-based musical forms. Traditional musical forms from the island of Santiago suffocated during the colonial times due to the perceived sexuality of its rhythms and the dance styles or rites involved in it. Rhythms and forms such as *tabanka*, *batuque* and *funana*, reemerged as Cape Verdean traditional music (Hurley-Glowa 2005).

## 1.4 Biocultural Perspective

A promising point of view to help answer the three research questions listed above is the *biocultural perspective*. The biocultural perspective emphasizes the interaction between biological, environment, and cultural phenomena to shape human variation (McElroy 1990). Its conceptual framework and models are relevant for understanding dynamic interactions between human biological and cultural traits in response to the environment. Under this perspective, culture is seen as an important mediator between the environment and human biology, acting as a buffer between the two (Bindon 2007, Dufour 2006, Khongsdier 2007).

The biocultural perspective has been developing and changing since the 1960s. Frank Livingstone's study on sickle cell anemia and malaria in West Africa is considered a milestone work in this perspective. He combined ethnographic and biological data on various societies to explain the sickle cell gene as an evolutionary response to the changed disease environment unchained by the agriculture revolution (Livingstone 1958). A decade later, Paul Baker used the term "biocultural" in the research on the Andean people he was developing under the Human Adaptability Programme (HAP)<sup>4</sup>. This programme, a component of the wider International Human Biological Programme, would contribute greatly to popularize the term 'biocultural'.

The biocultural perspective is increasingly recognized as being an ideal which has more often been advocated than adhered to (Hruschka, Lende et al. 2005). Epistemological and methodological differences seem to constrain the disciplinary dialogue crucial for consolidating it and reaching a synthesis of theories and methods. Goodman and Leatherman (1998) proposed a biocultural synthesis, based on a political economy theoretical focus within the field of anthropology. Later this biocultural synthesis would be criticized for not taking into account the role of the mind in linking the sociocultural context and individual biology and for the insufficient care given to cultural measurements. Today the urgency of building a biocultural synthesis seems to be overcome by the urgency of building dialogues between different biocultural approaches (Bindon 2007, Hruschka, Lende et al. 2005). This multiplicity of biocultural approaches led us to use the term "biocultural perspective", intended as guiding paradigm of the research, rather than its commonest term "biocultural approach".

The difficulty in making crucial constructs operational is believed to be a relevant determinant for the "biocultural chasm", as Leatherman (Leatherman 2005) calls it. The secular debate around "culture", one of the core constructs of the biocultural

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<sup>4</sup> The HAP strived for a better understanding of the way individuals and groups of individuals, with diverse cultures adapt to their environment. This was achieved through the combination of the work of physiologists, geneticists and anthropologists/anthropometrists (Edholm 1983)

perspective, is a good example. Culture is not a set term. Different people perceive it in different ways for different ends, including anthropologists who are believed to be the guardians of the cultural scientific domain. Kroeber & Kluckhohn (1952) identified about 164 definitions of 'culture' (Kroeber, Kluckhohn 1952). More than fifty years later, Baldwin *et al.* elaborated a list with more than 300 entries, most since 1952 (Baldwin, Faulker *et al.* 2006). An analysis of the content of these definitions caused Kroeber & Kluckhohn to elaborate the following seven categories: enumerative descriptive (content of culture), history (social heritage or traditions), normative (ideals or ideals plus behavior), psychological (learning, habit, adjustment, problem-solving device), structural (pattern or organization of culture), genetic (symbols, ideals, artifacts), and other. Baldwin *et al.* employed a more formal content analysis and also produced seven categories, but with different overall themes: structure, function, process, product, refinement, power/ideology, and group membership.

The word 'Culture' is as old as Latin vocabulary. However, the application of this word to human societies only occurred in the second half of the eighteenth century and in association with the German word *kultur* (or *cultur*), that is, cultivate higher values, expressed in symbols and embodied in religion (Kroeber, Kluckhohn 1952); (Baldwin, Faulker *et al.* 2006). A formal and explicit definition of culture was proposed by Edward Tylor, one of the fathers of British Anthropology, a century later: *culture or civilization, taken in its wide ethnographic sense, is that complex whole which includes knowledge, belief, arts, morals, law, custom, and any other capabilities and habits, acquired by man as a member of society* (Tylor 1994). This definition was inscribed in the evolutionist thought of the epoch. Culture was regarded as a synonym of civilization, composed of several stages of development or evolution.

Tylor's definition was ignored for more than thirty years. Kroeber & Kluckhohn enumerated the published use of Tylor's definition and they show that less than four per cent of the uses occur prior to the year 1920. Franz Boas, his students and his disciples were determined to make known Tylor's definition and to further develop the concept of culture. Boas's contribution was not so much the refinement of the concept, but more its introduction into American Anthropology. Born in Germany, Boas was familiar with the term when he migrated to the United States. Unlike Tylor, and the other cultural evolutionists, Boas considered that the human world was composed of many "cultures" which were not placed in a hierarchy. For him culture was acquired through learned behavior, transmitted from one generation to another (Bindon 2007, Kuper 1999).

Boas's students and collaborators (e.g. Margaret Mead, Melville Herskovits, Ruth Benedict, Alfred Kroeber, Robert Lowie, Edward Sapir) played a leading role in the revival and refinement of the culture concept (Kuper 1999).

After the Second World War, Tylor's construct of culture was to be challenged. It was not longer useful to many anthropologists. By throwing together many disparate elements, such as behavior, material items, and social structure Tylor's idea of culture lost coherence. This all-inclusiveness might be explained by what Kroeber & Kockhohn (1952) identified as an anthropological mainstream who deny simple determinism in the interpretation of human behavior (Bindon 2007, Dressler 2005).

Talcott Parson's pleas for a narrowing of the concept is said to have created the need for a modern, and scientific conception of culture (Kuper 1999). Parsons was convinced that Anthropology could flourish only if the study of culture was to be taken as an academic specialization. This plea echoed amongst the anthropologists, in particular those who received education and worked within Parson's department (e.g. Clifford Geertz, David Schneider and Marshall Sahlins), who subsequently adopted a more restricted, more focused, and more abstract concept of culture. Culture emerged as ideas, beliefs and values shared across a society, expressed in symbols, and in terms of which individuals define their feelings, make their judgments and orientate their behaviors. In such a definition the non-ideational elements of the all-inclusive classic definitions (i.e. behavior, material, social structure, and institutions) were excluded from the modern concept. The exclusion of behavior, one of the most discussed, is justified on the basis of: 1) not all human behavior is determined by culture. Culture may explain some human behavior under some conditions, but not all. It is a challenge to determine under what circumstances culture is the driving force and under what circumstance culture is subordinated and mediated by other factors; 2) culture constitutes the frequency of patterns of behavior, and the limitations on types of acceptable behavior, and not behavior itself. Culture is a kind of "recipe" (socially transmitted information) for behavior. By excluding behavior from the concept, it became possible to examine whether culture can or cannot explain human behavior (Brown 2008, Cronk 1999, Kuper 1999).

The conceptualisation of culture has not evolved similarly in Europe, in particular in British and French anthropologies where only slowly has the discussion on the nature of culture been grasped. The concept of culture was not discussed for a long period and when it did become a topic of discussion British and French social scientists were not inclined to accept the exclusions proposed by the post World War II American anthropologists (e.g. social sphere vs culture sphere; social

structure vs culture; material vs culture). There was a tendency in Europe toward Tylor's definition (Goody 1993).

The above epistemological and methodological disputes on culture have constituted a setback on creating "a" biocultural approach. As a matter of fact one of the problems ascribed to the biocultural perspective remains the choice of resorting to the all-inclusive Tylor's definition rather than adopting the idea of culture as an abstract (Bindon 2007, Dressler 2005). Cronk (1999) argues that despite not being observable, culture, like an electron, is indirectly observable through its effect on behavior: its presence is inferred when behavior forms certain patterns and its absence when those patterns are not presented. In fact a growing number of biocultural researchers have come to appreciate recently the usefulness of an ideational definition of culture.

Regardless of the concept adopted, researchers face another relevant problem: how to measure «culture». Cultural ethnographies – description of the cultural aspects in a specific setting – have been used to collect information on culture. Standardized surveys including questions on culture with "correct" answers have been an alternative method often resorted to. Biocultural studies have been based on the assumption of a monolithic culture. Nowadays, a consensus has been reached that neither there is no such thing as "a culture", and that not every member of the same group shares what may be called the mainstream culture (Bindon 2007, Chaves 2006).

In the 1980s, Romney et al. tried to solve the problem of measuring culture by developing a model (*cultural consensus*) in which the questions and the answers are not predefined. Through key informants, information is collected for the group being surveyed and subsequently the degree of collective culture is assessed. Dressler (2006) and Bindon (2007) have gone further. They have worked on an additional model, the *cultural consonance model*, which aims to identify what is cultural about the behavior of an individual. The cultural consonance model is supposed to assess the degree to which individual behaviors approximate the behavior prototypes encoded in the cultural consensus model (Bindon 2007, Dressler 2005).

Culture is certainly the main variable in any biocultural perspective. However, it is not the only variable examined by biocultural researchers. Social variables (e.g. education and occupation) or social composites (e.g. social class and social status) were routinely used since its beginnings. In fact during the 1960s and 1970s the term biocultural was used as a synonym for biosocial in measuring the adaptability of different communities to the environment (Bindon 2007). Over time the two

perspectives differentiated themselves, mainly placing more emphasis on cultural variables (biocultural perspective) or social variables (biosocial perspectives).

The biocultural perspective continues to examine social variables, however. The extension of the term "environment" to other than the physical environment confirms this situation. Nowadays, the term incorporates other types of 'environments' such as biotic (i.e. food, pathogens, and predators) and sociocultural (i.e. social, religious, economic structure) environments (Dufour 2006). Goodman and Leatherman contributed to this type of usage by bringing the political-ecological variables to this perspective. Biology and behavior in environmental contexts are better understood through an analysis of how local and global contexts interact in a rapidly changing world as well as how peoples from different socioeconomic status experience and negotiate these realities (Leatherman 2005).

The interdisciplinary character of the biocultural perspective seems adequate for the study of parental investment and its effects on human biology (i.e. growth and development). This is especially so for the study of migrant children, whose development is guided by a mixture of two ecological niches – the culture of origin and the culture of the hosts. The potentialities of this kind of perspective contribute to a better understanding of the direct action of physical, social, economic, political, and cultural environments on the parental behavior. The interactions between parental decisions and parental behavior will have biological and social impacts during the infancy and early childhood of the offspring. We then can assess the consequences of these early life parental investment decisions on the growth and development of their offspring in prepuberty.

## **1.5 Structure of the dissertation**

This dissertation is structured in seven chapters, including the present one. Cape Verdean migrations, and their contribution to the formation of a Cape Verdean identity which goes beyond the physical boundaries of the archipelago, is explored. The research aim and questions are defined, followed by a discussion on the advantages of applying a biocultural perspective.

Chapter Two presents a general literature review on the parental investment theory, the main theoretical approach to guide this research. It discusses parental strategies and decisions regarding allocation of resources to an individual offspring, and the environmental factors that might influence parents' decisions on allocation. Chapter Three gives a brief description of the migration "vintages" (specific groups) from Cape Verde into Portugal and introduces the site where the research takes

place: Cova da Moura, a deprived neighbourhood located in the municipality of Amadora. It examines the evolution of this peri-urban neighbourhood, and its contribution to create a new concept in the housing policies, and suggests forms of parental investment.

Chapter Four discusses the advantages of mixed methods approach to identify the social, cultural, economic and political environments which influence parental decisions on how best allocate the resources available to an individual offspring, and, at the same time, assess the effects of these investments on prepubertal embodied capital.

Chapter Five analyses the data from the quantitative and qualitative studies. First, it presents the embodied capital of 221 schoolchildren attending the first cycle of the Basic School, located at Cova da Moura (EB1-CM), during the academic year 2008/9. Second, it addresses the issue of postnatal parental investment (i.e. feeding, protection and learning) in migratory context and its effects on the prepubertal embodied capital of 75 out of the 175 schoolchildren attending EB1-CM and born in Portugal. Third, it examines the prenatal parental investment and its effects on the prepubertal embodied capital of 46 out of the 75 schoolchildren attending EB1-CM born in Portugal.

Chapter Six discusses the key findings of the quantitative and qualitative studies in order to gain a better understanding of parental investment strategies in one stage of life (infancy) and its effects on the later stages (childhood and juvenile).

Chapter Seven offers final remarks, stressing the weakness and the strengths of this research.

## Chapter 2 – Literature Review

*Parental Investment Theory* (PIT) is the main theoretical approach that guides this research on Cape Verdean migrants' parental investment and its effects on growth and development. This approach to middle-range evolutionary theory, to borrow a term used by David Buss (Buss 1995), is essential to explore the formats of allocation of resources to offspring over the course of lifetime and the ecologies in which the decisions on models are made and taken.

A vast literature exists under the aegis of Parental Investment which can be group into different theoretical frameworks (economical, sociological, evolutionary theory). Regardless of the theoretical approach, the literature are essentially of two kinds: 1) theoretical models aimed at explaining parenting mechanisms (e.g. Aiyagari *et al.* 2002, Becker, Tomes 1993, Clutton-Brocks 1991, Geary, Flinn 2001, Trivers 1972, Trivers & Willard 1973) and 2) empirical studies aimed at refuting or corroborating predictions of the optimality models (e.g. Bugental *et al.* 2010, Hagen *et al.* 2001, Kushnick 2008, Quinlan 2003, Sui-Chu & Willms 1996, Tracer 2009).

The basic model for Evolutionary Theory, the approach which integrates Parental Investment Theory as a subfield of Life History Theory, consisted of predicting the optimal amount of parental investment to allocate to current offspring at the cost of parent's ability to invest in other component of fitness (i.e. self growth, future reproduction, or other offspring), considering the potential individual and environmental determinants. Alternative versions of the basic model hypothesized the effects of the behavior of other individuals on the optimal allocation of parental resources (i.e. conflict and cooperation models of parental investment) or trade-offs involved in allocating resources (i.e. life history models of parental investment) (Kushnick n.d).

Early literature is derived mostly from studies conducted on non human species (e.g. birds and fishes). Only gradually it extended its boundaries to human species. As an example, *Jstor*, an academic platform integrating a large group of journals publishing literature on parental investment, shows out of 60 articles on parental investment published in the decade that followed the publication of Trivers' paper (1973), less than three papers focused on human parental investment.

This chapter mainly addresses literature on human species. Humans have specific characteristics distinguishing them from other species, including other internal gestation, lactation, and attachment mechanisms. Humans have a longer developmental period (childhood and adolescence as additional life history stages) combined with relatively short birth intervals, which makes offspring costly (Bogin 1999a, Bogin 2002, Geary, Flinn 2001, Flinn, Quinlan *et al.* 2007, Mace 2000).

The longer developmental period in humans requires a higher level of parental investment. Thus, a diversity of forms of parental investment are involved over the lifespan, which extends feeding after weaning, vigilance against offspring morbidity and mortality risks even after survival is guaranteed, creating a supportive environment for acquisition of skills and competencies essential for future socioeconomic independence.

The relatively short birth intervals cause mothers to raise simultaneously several dependent children at different developmental stages. Mothers try to alleviate this high burden of care by co-opting other group members to help out. This rearing system in which offspring receive care from individuals other than the biological parents is called alloparental care. The social systems which combine high levels of alloparenting with delayed or suppressed reproduction are in turn called cooperative breeding systems. Their members are not only kin members, as assumed by Hamilton's *kin selection* principles. Despite the high degree of relatedness in cooperative breeding systems, non kin individuals have shown to contribute significantly to the cooperative breeding (Hagen 2009, Hrdy 2005b).

The cooperative breeding system has allowed female to produce costly offspring without increasing inter-birth intervals as well as to move into new *habitats*. Such a help releases maternal decision-taking from the usual trade-offs constraints. Mother are able to produce more offspring or with short birth intervals without jeopardizing their own or their offspring survival. This intensity and duration of human parenting - involving biparental care, a more stable pair bonding, and multigenerational bilateral kin networks - appears to be unique. In modern societies the investment is even higher as offspring remain dependent on parents for a longer period (Hrdy 2005a).

Theories of *migration* and *physical growth* are additional important approaches, both complementary to PIT. A variety of environmental factors shape parental behaviours and decisions in immigration contexts, often combining factors related with the context of origin and the context of immigration. As such, migration theories might be helpful to explain immigrant's decisions regarding parental investment.

Theories of growth and development are important to understand how parental investment may contribute the well-being of offspring. Parents influence the growth and development of offspring from their conception, and even earlier if we consider nutritional status, illness, drug and alcohol use, and other factors that act on people years before they become parents. Biological parents contribute directly to the genetic make-up of the offspring, and their physical condition at birth. From their birth, biological parents or alloparents affect the postnatal experiences of growth

and development. Until their independence parents or alloparents act as mediators between the environment and the offspring.

In this chapter we will discuss the main issues of parental investment theory which are relevant for answering our research questions, such as the concept «parental investment» and its key variables to measure it; the role of each parent in parenting and the possible reasons associated with each contribution; the factors that might influence parental bias; the environments that shape parents' behaviour, and last the changes in parental investment strategies over the time and across spaces.

## 2.1 Parental Investment Theory

Parental Investment Theory (PIT) is a branch of Life History Theory (LHT) which is specialized in strategies on allocation of resources to offspring developed by parents in order to maximize their reproductive success.

LHT is an evolutionary approach assumes that resources (i.e. time and energy) are finite. They cannot be spent more than they are available. Their allocation entails trade-offs, that is, sacrifice one attribute on behalf of another. Although they can be allocated in several different ways (e.g. growth, reproduction, or maintenance), the finite resources allocated to one function cannot be allocated to other function. As such individuals are forced to develop strategies designed to allocate the resources within a minimum of losses and maximum of efficiency (optimal allocation under the constraints imposed by trade-offs). Some of the decisions are genetically fixed; others entail adjustments to environmental cues (Hill, Kaplan 1999, Kaplan et al. 2009, Voland 1998).

LHT provides a framework that addresses optimal allocations of resources in the face of trade-offs. Natural selection favours strategies allocating resources that, on average, results in the maximization of fitness (i.e. reproductive success or number of descendants produced). The strategies of how to allocate energy depend on the individual circumstances such as timing of the life events (i.e. life stage), and health condition. Therefore, optimal allocation varies across the lifespan and entails processing information about the environment upon which allocation decisions out to be based (Kaplan, Gangestad 2005, Kaplan, Lancaster 2003).

Over the lifespan, human organisms face two fundamental reproductive trade-offs: current versus future reproduction and quality versus quantity. The first trade-offs, which affects the number of descendants an individual produces, takes the form of *somatic effort* (i.e. all investments in own's growth, development, differentiation and maintenance) versus *reproductive effort* (i.e. all investments in reproduction

such as in mating and parenting). The former favours allocation of energy to grow which increases the organisms' energy capture capacities in the future and, as a consequence, its future reproduction. The allocation of energy to grow implies the cost of not reproducing. However, the organism eventually reaches a size at which allocation of energy increases fitness (reproduction) more than growth. Then the organism exploits the existing reproductive material by investing in searching for mates (*mating effort*) or in producing and raising offspring (*parental effort*). During the reproductive period, some energy is, however, diverted away from reproduction and allocated to activities such as repair somatic tissue, enhance immune function, or engage in further energy production (i.e. *maintenance*) so that the organism can live to reproduce again. Physical condition will depreciate over time if no effort is allocated to maintenance (Hill et al. 2003, Kaplan et al. 2004, Voland 1998).

The second trade-off is related to the resources allocated to current reproduction, that is, whether to invest in a higher quantity or a better quality of offspring. As parents have finite resources, an additional offspring implies a reduction of individual allocation per offspring. The evolutionary life history predicts that siblings determine the allocation of those resources all other things being equal. Since conception, they compete for the resources, lowering individual shares per offspring, negative outcome and lower inclusive fitness (Lawson, Mace 2009).

Parents face the problem of how best to allocate their finite resources across offspring. The basic parental investment model predicts that optimal investment is reached when the proportional decrease in number of offspring produced equals the proportional increase in survival of offspring to adulthood and, as a consequence, in reproductive success. On this basis of this assumption, the regulation of fertility is seen as an adaptive strategy to ensure the offspring success (Kaplan 1996, Hill, Kaplan 1999, Sefcek, Figueredo 2010).

Modern societies, or societies in demographic transition from high mortality and high fertility to low mortality and low fertility regime, contradict, however, the abovementioned evolutionary assumption. Contrary to the expectations, these societies with unprecedented levels of resources (e.g. food and effective medical care availability) reduce their fertility rates below replacement fertility universally associated with pre-modern societies (see Vining 1986 for review of data showing and inverse relationship between cultural success, measured by the access to resources, and reproductive success in modern societies).

Evolutionary models have been proposed to explain this phenomenon (see Newson *et al.* 2005 and Perusse 1993 and for a discussion of those explanatory models). The trade-off between quantity vs quality model is based on the assumption that mechanisms of fertility regulation are set to promote the offspring fitness, through

fewer high quality offspring over more low quality offspring. Studies on contemporary horticultural, agricultural, and pastoral societies – as well as historical European, and American societies – have shown some evidence of the predicted negative relationships between family size and reproductive success, whereas no strong evidence of this trade-off was found in studies of hunter-gatherer communities (Lawson, Mace 2011, Perusse 1993).

Lawson and Mace attribute this variation of outcomes to the socioecological context, an extrinsic variable to parental allocation trade-offs. Considerable social and environmental variation exists in a region - not to mention in a country, a continent or the world-, able to influence an offspring's fitness (i.e. survival into adulthood and reproductive success), in particular in infancy, when the child is more vulnerable to diseases and death. For instance, in contexts where they have limited capacity to protect their offspring from environmental insults, the allocation of resources in order to promote fewer high quality offspring is questionable. In spite of acknowledging the little advantage of fertility decline to reproduction success, the authors propose an explanation which takes into consideration the cost and the benefits of rearing children in reproductive decision-making, that is, they explain the fertility decline as a strategic shift from more low quality to fewer higher quality offspring. In their analysis of sibling configuration effects on growth trajectories of contemporary British families, they demonstrate that family size negatively affects formal education assessments as well as physical growth throughout childhood. Based on studies which demonstrate associations between childhood linear growth and adult linear growth, as well as an association between physical growth and cognitive performance, these results suggest negative health (physical and psychological) consequences into adulthood in large families.

In this section we will restrict our analysis to the reproductive effort, in particular the parenting effort, that is, the allocation of resources to parenting.

### **2.1.1 Parental Investment: from notion to conception**

Robert Trivers is often cited as the founder of the phrase 'parental investment theory'. However, the study of parental allocation of resources is older than Trivers' theory on parental investment. Most of the «ingredients» used in PIT can be traced back to Darwin's theory of sexual selection, which is not a surprise as Trivers' theory is framed in the evolutionary approach.

A few years before Fisher published the book which would diffuse the term «parental expenditure», Leonard Darwin had already attempted to explain fertility resorting to the factor of «parental care», that is, all expenditure in the form of feeding, effort, or exposure to danger, incurred in the production and nurture of

young. In the *Genetic Theory of Natural Selection*, Fisher introduces «parental expenditure» to describe the expenditure of nutriment, time or activity parents are induced by their instincts to make for the advantage of the offspring before they are able to lead an independent existence (Fisher 1930).

Trivers disposes of the concept «parental expenditure», arguing that its measurement (i.e. energy and time) as suggested by Fisher is inappropriate. It does not appropriately capture the value, as it happens, when an individual defending its brood from a predator expend very little energy in the process but suffer a high chance of mortality. Moreover, "expenditure" refers to a cost whereas "investment" invoked the future with a suggestion of compound interest when high reproductive success is repeated (Trivers 2002).

Trivers defines parental investment "as any investment by the parent in an individual offspring that increases the offspring's chance of surviving (and hence reproductive success) at the cost of the parent's ability to invest in other offspring" (Trivers 1972: 139). Each offspring receives an investment independent from his/her siblings. Hence, the increasing parental investment in an offspring reduces the parent's ability to invest in survival of the other offspring, in producing other offspring or invest in their somatic maintenance.

In the following decades, evolutionary biologists introduced changes to the key-concept of PI. The original definition of parental investment has been broadened, referring to any characteristics or actions of parents which increase the fitness of their offspring at a cost to any component of parent's fitness (Clutton-Brock 1991). Clutton-Brock underlines the importance of distinguishing the different "currencies" in which cost and benefits of parental care are measured. To the effect that *parental care*, a term regarding any form of parental behaviour, likely to increase the fitness of a parent's offspring, is distinguished from *parental expenditure*. *Parental expenditure* refers to the expenditure of parental resources (including time and energy) on parental care of one or more offspring. Rather, *parental care* is related to the extent to which parental care of individual offspring reduces the parent's residual reproductive value (RRV) in future offspring.

Both terms «parental care» and «parental investment» are widely used in the PIT literature, very often indistinctly to refer to the allocation of resources to an individual offspring at the cost of parents' ability to invest in other components of fitness. In a compilation of his papers, Trivers explains why he still prefers "parental investment" and "reproductive success" to "parental care" and "fitness". The latter term is not appropriate to measure the number of surviving offspring because of its imprecision: «(...) the word "fitness" itself suggested physical fitness or moral fitness or, in the way the term actually originated, how "fitted" the

*organism was to its environment»* (Trivers 2002: 64). However, this term has been applied to anything that will improve children's chances of survival, make them healthier, and increase their chances of making a living and reproduce when they become adult (Gray, Anderson 2010).

The term «parental care» is instead too limited. It excludes investment in the prenatal life and tends to restrict attention to behaviourally mediated benefits.

Besides the difficulty to agree on a uniform terminology, there is no consensus on the indicators, and its variables, to measure parental investment (Lawson, Mason 2009). For Trivers, parental investment is a composite of forms of investment that benefits the offspring since conception (e.g. feeding, protection, and learning). Its size is measurable by reference to its negative effect on the parent's ability to invest in other offspring. A large parental investment is one that strongly decreases the parent's ability to produce other offspring. Clutton-Brock also measures parental care in terms of forms of care such as preparation of shelter, care of the offspring before birth, provisioning of the offspring before and after birth, and care of the offspring after nutritional independence.

Literature on parental investment/care has produced over the years a variety of composites or indicators to operationalise the concept. Table 1 gives us a glimpse of such a diversity of indicators.

**Table 1 – Examples of Indicators for Human Parental Investment**

<b>Authors</b>	<b>Indicators (direct and indirect)</b>
Gibson, 2008; Hagen 2006, 2009; Flinn et al. 1999; Neill, 2011; Sang-Mi Park <i>et al.</i> , 2010	Anthropometry Child labour (childcare and housework)
Betzig & Turke 1986; Bugental et al. 2010; Kushnick 2009; Yamauchi, 2009	Emotional Support (time, attention, attachment)
Conley & Glauber 2006; Lawson & Mason 2009	Family structure (siblings)
Quinlan et al. 2003; Tracer 2009; Turner 2006, Mascaro <i>et al.</i> , 2002	Feeding Health
Behrman 1987; Burgenholf Mulder 1998, Levine 1999, Kantarevic & Mechoulan 2006, Sui-Chu & Willms 1996; Yueh 2006	Human capital (cognitive, motivational and social skills)
Hrdy & Judge, 1993 Bugental et al. 2010;	Inheritance Money
Daily & Wilson, 1984, 1988, Volland et al. 1997	Mortality (Infantice, homicide, survivorship)
Barber 2001	Social condition (poverty, incarceration, unemployment, marital opportunity)

One of the main reasons for that diversity of indicators lies in the different disciplinary scientific areas of the studies. Most of the early studies were conducted by evolutionary biologists who were dedicated to analyse non-human species, often in the laboratory. From the eighties onwards, studies on human parental investment flourished, attracting gradually researchers from different disciplines:

psychology, sociology, anthropology, economy, and education. The diversity of discipline meant the introduction of new indicators to measure parental investment in conformity with one's own disciplinary area.

Another difficulty with the referred concept is to measure parental investment, in particular in humans because of the longer period of dependence on the parents (Sieff 1990). This investment can be direct or indirect (i.e. those acts performed in the absence of the children which increase the offspring survivorship, social competences, or social value). "Direct investment" refers to forms such as holding, carrying, and close interaction with the child whereas "indirect investment" entails a diversity of forms of provisioning (e.g. inheritance) and protection (e.g. protection against predators). Listing the presence and absence of each pattern of investment is not sufficient, nor even to measure the frequencies or durations of patterns of male and female parental investment. Indirect forms of investment are difficult to measure due to the imprecise cost of the contribution (Geary, Flinn 2001, Kleiman, Malcom 1981).

The contribution of the group members other than genetic parents for parenting (alloparents) is also one of the key elements which might make it difficult to quantify parental investment. Depending on the ecology of the childrearing, different alloparents, biological-related (called consanguineous) and social-related (called affinal), might allocate resources (in particular time and energy) to a child. This perspective on parenting questions the traditional pair-bond hypothesis (i.e. mother and father) prevailing until the 1990s based on the assumption that help for the mother came from the father. According to the latter, raising offspring entailed mutual interdependence of husband and wife (Grey, Anderson 2010, Sear, Mace 2008).

Empirical studies on hunter-gatherer communities suggest the positive contribution of alloparents to the survival of children (i.e. infant mortality) or fertility of women, in particular grandmothers, older daughters, and aunts (Mace, Sear 2005). In the last two decades, studies on historical and contemporary non hunter-gatherer societies have been reinforcing the positive role of group members in parenting, in particular kin members (e.g. Pavard *et al.* 2005 for Quebec, Reher & Gonzalez 2003 for Spain, Sear 2008 for Malawi, Sear, Mace *et al.* 2009 for Gambia, and Voland & Beise 2002 for Germany). Care responsibilities are distributed in different ways: parents have help but still are the main caregivers or parents share caregiving with sibling (first degree kin) or other kin members such as grandparents, aunt (second degree kin) or even cousins (third degree) (Herring 1998, Hertwig, Davis *et al.* 2002, Webster 2004).

Mace & Sear's literature review on the effects of kin on child survival shows, besides mothers, who have an exceedingly important influence in infant survival, maternal grandmothers' contribution is clearly beneficial to the survival of their grandchild, equalling or even exceeding that of the father, in particular. There is also some indication that older siblings (at least old enough to be helpful caregivers) enhance the survival prospects of their younger siblings. However, these kin members seem not to play the same role on the women's fertility. Rather, patrilineal kin, who tended to have no effect or a negative effect on child survival, play a positive role in women's fertility. Patrilineal presence tends to shorten birth intervals and advance age at first birth (Sear, Mace 2008, Sear 2011).

The abovementioned literature review found evidence on the association between mother's death and child death in 28 studied population. But, this mother effect was dependent on the age of the child. This effect is weaker or disappears entirely after children are weaned. Weaning is a dangerous time because it increases children exposure to pathogens in food and is often associated with the arrival of a younger sibling. By late infancy, child care and provisioning can be successfully taken over by a kin member. On the contrary, 15 populations studied show that the father's death substantially has less impact on child survival, frequently making no difference to child survival. Even where they are relevant, it is not clear that children benefited from the traditionally assumed provision and economic support. These findings must be read carefully because 10 of the 22 studies focus only on children under the age of 5 years old, a life stage where child survival is highly dependent on the mother's provision services.

Sear and Mace suggest that grandmothers are more reliable sources than fathers as far as their effect on child survival is concerned, in particular maternal grandmothers. In 9 of 13 studies maternal grandmothers improved child survival whereas contribution declines in the case of paternal grandmothers (9 of 17 studies). These studies show that maternal and paternal grandmothers play different roles in the lives of mothers and children. Maternal grandmothers have the strongest effect around the age of weaning whereas paternal grandmothers during the first month or year of child's life. The maternal grandmother's effect concerns direct child care whereas the paternal grandmother's effect concerns directly to the condition of the mother and, as such, indirectly to child survival.

The authors also found evidence that grandfathers are much less important to children. In 10 of 12 maternal grandfather studies and in 6 of 12 paternal grandfather studies no effect was found on their respective presence on child survival. In studies where effects were found, those effects were of borderline statistical significance.

Looking into the effect of older siblings who are potential helpers (restricted to at least 3 years older than the focal child), 5 of 6 studies show a positive effect, in particular older sisters, suggesting that domestic chores of juvenile girls are beneficial to children survival.

### **2.1.2 Sex Differences in Parental Investment**

Evolutionary biologists have been interested in understanding the sex roles in reproductive success. Reproductive success is expected to vary with the sex of the parent: males competing for mating whereas females competing for parenting. In general, female care is higher than male parental care. Males provide parental care in only 5% of mammal species. Human beings are one of the species of that 5% but even so in all human societies males spend less time in direct offspring care than females (Kokko, Jennions 2008, Gray, Anderson 2010).

What factors do explain the abovementioned asymmetry in reproductive behavior? For Trivers the explanation is found in sexual selection mechanisms, that is, competition within one sex (usually male) for members of the opposite sex and differential choice by members of one sex (usually female) for members of the opposite sex (Trivers 2002). Bateman's study on intra-sexual selection, conducted in the late 1940s on reproductive success of fruit fly males and females, had tried to gather data on the reproductive success of each sex on a single species (*Drosophila melanogaster*). The British geneticist resorted to chromosomally marked individuals in competition with individuals bearing different markers. Subsequently, he identified the markers in the offspring. The experiment showed sex differences in reproductive success: male reproductive success varied more than that of female; male reproductive success was severely limited by the ability to attract the opposite sex whereas that of the female was not; and male reproductive success increased with the frequency of insemination whereas that of the female did not. Energy investment of each sex in their sex cells explains these results. Males invest very little metabolic energy in production of a given sex cell, whereas females invest considerably energy. Spermatozoa are little more than vehicles to deliver chromosomes to the ovum, but ova are, essentially, complete cells, with all normal cellular apparatus of endoplasmic reticulum, Golgi bodies, mitochondria, etc. Thus, male reproductive success is limited by his ability to fertilize eggs with sex cells, while female reproductive success is limited by her ability to produce eggs (Bateman 1948, Trivers, Willard 2002). This initial difference in terms of investment in gametes is compounded by further postconception investment by females in the care of fertilized eggs. The lower investment in spermatozoa and postconception care is correlated with the higher variance in male

reproductive success, and to low male parental investment in fertilized eggs or offspring (Bogin 1999a).

Bateman believed that the results of his study could be applied to other species, except for a few very primitive organisms, and those in which monogamy combined with a sex ratio of unity eliminated all intra-sexual selection. His study influenced future explanations of sex differences in parental investment. Human beings are quite different from fruit flies; however, many of these same principles are relevant to understanding sex differences in human parental investment. Like the flies, human spermatozoa are cheaper to produce than human ova, and human males invest much less than females in offspring care during pregnancy and lactation. However, as will be shown in subsequent chapters, human males can and do make substantial investments in offspring.

Trivers develops Bateman's explanations on conventional sex roles divergences (i.e. caring female and competitive male). His explanation on its evolution revolves around the "female argument" and the "male argument", as termed by Kokko & Jennions (2008).

The female argument ascribes the evolution of sex roles divergence to anisogamy (i.e. females produce higher gametes than males). The male's initial parental investment (investment at the moment of fertilization) is much smaller than the female's. For this reason, females are more vulnerable to desertion. Female initial higher investment commits her to additional investment more than the male's initial slight investment commits him. In other words, the initial asymmetry in pre-mating parental investment is assumed to increase in post-mating parental investment on the basis that females cannot afford to lose the initial investment.

Trivers recognizes, however, that each sex is more or less free to terminate its investment at any time. In many species, the males' only contribution to the survival of the offspring is their sex cells. A higher male investment would decrease his ability to compete for new mates. In humans, men may terminate it immediately after fertilization, abandoning the woman who, alone or with the aid of a member of the kin, will raise the offspring, whereas women may terminate at the end of a more or less nine-month pregnancy after giving birth to the offspring. However, women would lose their greater initial investment if they were not more committed than men to the post-birth parental investment.

Men may reduce, and even overcome, this disparity in investment in prenatal parental investment (eggs vs. sperm). This disparity tends to amplify in postnatal period, through a variety of forms of parental care: feeding, sheltering, protection to the pregnant woman, and feeding, sheltering, protecting and learning to the offspring from birth to independence. These forms of male parental investment are

found in species of vertebrate animals, ranging from fish to birds, to those 5% of mammals. All of these forms of male investment are found in human species.

Kokko & Jennions refute this causal link between female pre-mating and postnatal parental investment. According to these theorists, the assumption on additional female parental investment in order not to lose past investment leads to commit the *Concorde fallacy* – the cognitive illusion that past investments per se makes it more profitable to continue with, rather than abandon, a costly activity. Optimal decisions should not depend on past cost but rather they should depend on future pay-offs.

The male argument rests on the premise that anisogamy produces a male-biased operational sex ratio, that is, ratio of sexually competing males to females ready to mate. The best response for males, who face more mating competitors than females, is to invest into traits that increase competitiveness. Kokko & Jennions also criticize Trivers' assumption that male-male competition will tend to operate against male parental investment. Males' avoidance of intense male-male competition because of reducing the likelihood they will obtain another mate has been reported. The authors argue models of sex role evolution should describe alternative routes to increased fitness that a male (or female) can pursue when the Operational Sex Ratio is biased in their direction, other than investing more in being competitive. The better alternative is to shift to another activity with larger fitness return, like Fisher sex ratio selection hypothesis which predicts that if one sex is overrepresented in the primary sex ratio, it is profitable for a parent to shift reproductive effort from producing offspring of this sex to producing offspring of the underrepresented sex.

Kokko & Jennions proposes a general, theoretical model to explain the evolution of sex roles on various species. Five parameters interact in this integrative model: care needs of offspring; sexual selection, non-random variance in mating success; multiple mating; sex-specific mortalities with consequences for Adult Sex Ratio (number of adult males for 100 females) and Operational Sex Ratio (ratio of sexually active males to receptive females). In a scenario where mortality rates are the same for caring and mate searching, and they are identical for both sexes:

- 1) care is selected when total parental investment is low so that survival is small, when the offspring benefit greatly from additional care so that survival is large, and when the absolute mate encounter rate is higher;
- 2) sexual selection on males selects against male care;
- 3) mate multiply in females selects against male care;
- 4) when the OSR is male-biased, males are selected to provide more care than females. The reverse is true when the OSR is female-biased. The OSR is partly

determined by the relative amount of parental care each sex provides so the net effect is that whichever sex currently cares less will be selected to care more.

5) Any process biasing the ASR affects the evolution of sex roles. Whenever sex role evolution biases the ASR, sex roles will diverge less markedly if deserters become the more common sex in the ASR, and more markedly if they become the rarer sex.

The third feature of the model has been widely discussed in the literature. Since Trivers' prediction that parental investment should be related to certainty of parentage, general models have been produced showing males provide less parental investment for putative offspring who are unlikely to be their actual offspring. Actual genetic paternity may differ from paternity confidence; that is, a man's assessment of the likelihood that he is the father of a putative child. Though those models initially suggested that there should be no relationship between parentage and parental care, more recent models predicted that, under some circumstances, parentage can be expected to influence parental care. Empirical studies have been conducted to test the relationship between the two variables with mixed results. Various studies have found that male investment is higher if he is the biological parent rather than stepparent. In societies in which the paternity certainty is high (i.e. men are most likely to be the actual father of the supposed offspring), fathers may provide more direct care than mothers. This investment might be understood as a reflection of the male's interest in channelling resources to his biological relative (Grey, Anderson 2010, Kleiman, Malcom 1981).

Biological paternity confidence is one of the explanatory factors of the variety of male investment strategies. As males usually are less certain than females of their biological paternity, it is natural they invest more in mating than in parenting. However, in species with behavioural or social mechanisms that increase male paternity certainty there is greater male parental investment in offspring and parenting. The human species has many biocultural behaviours and mechanisms to increase paternity certainty, including monogamous marriage, and sequestration of women away from non-husbands (Anderson 2006). Nowadays, the DNA test increases the chances of the certainty.

Literature on stepfather partially sustains the hypothesis that confidence in paternity increases parental investment. Studies comparing two genetic parents with stepparents households have shown that stepchildren have poorer outcomes than their peers who are raised by two genetic parents. The stepchildren's outcomes are similar in some ways to those of children who are raised by a single parent. These poorer outcomes may be caused by stepparent investment rather

than by a non genetic relatedness (Anderson 2006, Anderson et. al.1999, Zvoch 1999).

### **2.1.3 Biased Parental Investment**

Theoretical models of the evolution of parental care predict that parents will often treat their offspring differently. These models are based on the assumption that natural selection has shaped parental psychologies to function as if they value individual offspring investment; that is, it has endowed parents with decision-making mechanisms to invest in individual offspring development in conformity with the expected effects of such investment in parental reproductive success (Draper 2000, Hertwig *et al.* 2002).

Empirical studies have also shown that parents do not invest in each of their offspring in the same way (Sieff 1990, Chahnazarian, Blumberg et al. 1988). Resources are allocated differently to produce the greatest effect on parents' reproductive success. Parental investment decisions are made and taken according to cues related to the offspring fitness, which range from actual or perceived offspring characteristics (e.g. sex, birth order, birth interval, health status, age) to parents' attributes (e.g. biological relatedness), and environmental condition (e.g. food, diseases, predators). This perspective is, however, integrated in a broader framework in which culture plays a crucial role in the way parents perceive the environment (physical, social, etc.) in which they live. However, under the same culture, parents do not act in the same way. For instance, parents from different socioeconomic status invest differently in their offspring (Bugental et al. 2010, Chahnazarian, Blumberg et al. 1988, Chahnazarian 1990, Gibson 2009).

#### ***Sex-Biased Parental Investment***

Literature on biased parental investment has been devoted to sex-biased, a condition that contradicts Fisher's theory of sex ratio. In this theory, Fisher argued that, in principle, natural selection favours a sex ratio of 1:1. Fisher sustained that because each sex must supply half of the ancestry of all future generation, the total reproductive value of the males is exactly equal to the total value of all the females at the moment when the parental expenditure on behalf of the offspring has ceased. If this is not so, it results in a bias towards producing one sex. Under the influence of natural selection, adjustments will be brought about to cancel biased sex ratio at conception. Whichever is the scarcer sex it will have more value and, consequently, a more intense selection will be exerted in favour of all modifications tending towards its preservation. Thus, sex-ratio will be raised until the expenditure upon the less produced sex became equal to that upon the opposite sex. In human

species, natural selection tends to favour males at birth, but they become less numerous before the end of the period of parental expenditure owing to their higher death-rate (Fisher 1930).

Fisher's principle has been questioned throughout the years. Hamilton argues that Fisher's Principle does rest on special assumptions not holding in situations quite widespread in nature. For instance, Fisher's hypothesis is restricted to the unusual case of population-wide competition for mates. It does not apply to cases wherein the competition amongst relatives for mates (local competition). In this case, sex ratio will be biased against the sex whose reproductive value is reduced to its parents or other relatives due to competition among relatives for mates (Hamilton 1967).

Human sex ratio worldwide's data contradict Fisher's assumption. At birth, a bias towards the sex which is more energetically expensive to produce in utero is evident in almost all human population. The number of males per 100 females is characterized by an excess of males births, which varies among population groups because of differential migration by sex or because of differential mortality by sex (Chahnazarian 1990, Johansson, Nygren 1991). The human sex ratio at birth is biologically stable. In the absence of sex-selective underreporting, sex-selective abortion, and sex-selective infanticide, the reported sex ratio at birth should be equal to the true sex ratio of around 106. The sex ratio at birth tends to decline very slightly, or at least remain constant, as woman's parity increases (Yi, Ping et al. 1993).

**Table 2 - Sex ration in the world: 2000, 2005 & 2010**

<b>Sex ratio</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>
at birth	105	106	107
<15	105	106	107
15-64	102	103	102
>64	78	79	79
Total population	101	101	101
Infant mortality		109	110

**Source:** CIA, *World Fact Book* (2000, 2005 & 2010)

Table 2 shows a male-biased ratio at birth, a trend which is maintained until old age. Male's production requires more energy, as they grow faster and are large at birth

Surprisingly, although the infant mortality rate is higher among male than females, this seems not to cancel out the male-biased sex ratio under the age of 15 years

old. The male-biased ratio is only cancelled out and inverted from sixties years old onwards.

The universality of the pattern (male-biased sex ratio at birth) would support the notion that the sex ratio at birth is biologically pre-programmed to compensate for higher male mortality during infancy, childhood and adolescence – nature's way of trying to ensure that a sex ratio of 100 males per 100 females is reached during childbearing ages (Sustainable Development for the New Zealand)

As male mortality is higher than female, in particular from birth to end of childhood, there is an adjustment of the initial sex bias. This tendency seems to vary in at least three instances: increase of sex ratio amongst white populations; increase of sex ratio in belligerent countries; secular increase of the sex ratio (Chahnazarian 1990, Bethmann, Kvasnicka 2009).

Literature on sex ratio supports the hypothesis that there is a tendency for parents to manipulate the sex of their offspring at conception (primary sex ratio) at birth (secondary sex ratio), or postnatally. Studies conducted in India and China have shown a higher than normal sex ratio. This deviation is explained in terms of the traditional preference for sons to daughters. Selective abortion, infanticide and underreporting of female births are the main explanations given for the higher sex ratio. Access to prenatal sex determination has been facilitated with extension of access of ultrasound equipment to rural and urban areas. Women most at risk of selective abortion are those who have previously given birth to girls (Johansson, Nygren 1991, Seth 2010, Yueh 2006).

Trivers and Willards (1973) offer a model that explores the adaptive variation of sex ratio. According to the theoretical model, natural selection favours a reproductive strategy that arranges the deviations from a 50/50 sex ratio at conception. By skewing the sex ratio of their offspring, parents increased their expected number of grandchildren. Assuming that at the end of parental investment the condition of the offspring is correlated with the condition of the mother, differences in the condition of the offspring at the end of parental investment endure into adulthood, and adult differences in condition affect male reproductive success more strongly than female reproductive success in species showing negligible male PI, Trivers and Willard predicted that females would have more grandchildren if mother in best condition produce offspring belonging to the sex with greater variance (males) and if mothers in poor condition were to have more daughters (Trivers, Willard 1973).

Trivers and Willard's hypothesis has provided a useful framework to begin to study sex-ratio variation in several species (Rosenfeld, Roberts 2004). In humans, there has been extensive interest in sex ratio variation, but results have not been

inconsistent. The outcomes of these studies do not allow to drawing a precise conclusion. Different places (Africa, America, Asia, and Europe), spaces (rural, urban), times (Pre-industrial, Industrial, and Contemporary), societies (hunter-gatherer, herding, agrarian and industrial) were analyzed. While some studies in traditional societies support the TWH, this is not so in industrialized humans, where most studies showing no difference, or smaller differences (e.g. Alderman, King 1998, Almond, Edlund 2008, Betzig, Turke 1986, Boone III 1986, Cronk 1991, Guilamoto, Hoàng et al. 2009, Keller, Nesse et al. 2001, Keller 2003, Khoury, Erickson et al. 1984, Seth 2010, Voland, Siegelkow et al. 1991).

Different causes have been suggested to have affected sex ratio at conception. Production of one sex or the other may be predisposed by: 1) parental nutritional status (e.g. Ethiopian women in better nutritional state gave birth to sons); 2) hormones (e.g. high levels of gonadotrophins to the production of daughters, high concentrations of testosterone are associated with sons); 3) time of insemination within the menstrual cycle (e.g. insemination in early or late in the fertile window is associated with production of sons); 4) direct treatment with hormones (e.g. induction of ovulation with gonadotrophins or clomiphene is associated with production of daughters); 5) pathological chemical exposures (e.g. paternal exposures to some specified chemicals is associated with production of significant excess of daughters); 6) adverse occupation exposures (e.g. pilots of high-performance aircraft and astronauts, non-ionizing radiation occupation such as professional driver and professional diver are associated with production of girls), domiciliary arrangements (e.g. in polygynous societies, where co-wives live together they tend to produce an excess of sons; where each co-wife reside in her own dwelling, and each is visited by the husband in turn, they tend to produce an excess of daughters (Ruder 1985, Cameron, Dalerum 2009, James 2010, James 2011)).

### ***Birth Order-biased Parental Investment***

Birth order is another variable often used to explain biased parental investment. Despite being less abundant than literature on sex-biased parental investment, a vast literature on birth order has been produced in the last three decades which ranges from historical (e.g. Boone 1986, Voland 1998) to contemporary societies (Davis 1997, Keller, Zach 2002 for industrialized societies; Draper 2004 for hunter-gatherer society, Mace 1998 for pastoral societies, Voland et al. 1991 and Boone III 1986 for historical Societies).

Birth position provides information on the parity of the parent and sibship system of the child (Sulloway 2000). Evolutionary theoretical models predict a U-shaped parental allocation of resources in which middleborns receive fewer resources than first and lastborns due to the counterintuitive consequences of the equity heuristic. "Equity heuristics" is the decision rule that specifies that, in societies where enough resources are available to raise all offspring to adulthood, parents attempt to split resources equally among all children during a given arbitrary unit of time. Even if parents attempt to invest equally, birth order causes an unequal allocation on the amount of resources each receives (countervailing effect) (Hertwig *et al.* 2002).

Firstborn and often lastborn children experience a period of exclusive parental investment, whereas the middleborn children never experience a period in which they are the only child at home. As such parents allocate more resources to the former than to the latter. In fact middleborns suffer from what is called the "cruch in the middle effect". They share the resources with all the siblings who are present at home (Hertwig *et al.* 2002, Kantarevic & Mechoulan 2006, Sulloway 2007).

Firstborn children are favoured over their younger siblings because of their highest reproductive value (i.e. in a better position to promote parent's reproductive success). In general, parents allocate more resources to their survival and physical growth (e.g. more medical care and better nutrition), and development (e.g. more stimulation of skills and competences). The biased allocation of resources confers firstborns with a significant advantage in several domains such as health (less likely to infant mortality due to higher vaccination rates, better nutrition and medical care), personality (more assertive and self-confident due to higher levels of parental stimulation), and occupation status (higher intellectual attainment due to more intellectual orientation) (Draper 2000, Sulloway 2007).

Besides the so-called "natural development advantage", firstborn children usually benefit from institutional practices that can tip the balance of opportunity systematically on their behalf. The system of progeneriture is a case in point. Both historical societies as well as contemporary agricultural, horticultural, and pastoral societies are full of examples where the firstborn males become heirs to family titles and estates (Boone 1986, Volland 1998)

## **2.2 Parental Investment Goals**

In an evolutionary perspective, parents share goals as regards to their offspring. These universal goals are based on the offspring perspective, and not on the parent, that is, they are concerned with what parents want for their offspring rather than what parents want from their offspring.

Levine (1974, 1977) identified three universal parental goals which are hierarchically structured: 1) the physical survival and health of the child; 2) the development of the child's behavioural capacity for economic self-maintenance in maturity; and 3) the development of the child's behavioural capacities for maximizing other cultural values. These goals are hierarchical because the first goal, survival to adulthood, must be accomplished before the second goal of independence from parents can be achieved. Moreover, the goals of survival and independence must be satisfied before achieving the third goal of instilling cultural beliefs and behavioural norms. Adult independence is required for both successful sexual and cultural reproduction (Bogin, Loucky 1997).

Despite their universality, each human society shapes the specific characteristics of the goals via culturally determined pathways. This is because despite being universal, the goals of survival, independence, and cultural reproduction can have different meanings from culture to culture, as we will later in this chapter.

### **2.2.1 Survival and reproductive success of the experience**

Trivers proposed, and others reinforced, that survival of the offspring to reproductive age as the main goal of parental investment. In biology, survival is the ultimate criterion of adaptation, achieved through feeding, protection, learning, and maintenance of social order (LeVine, LeVine et al. 1994).

The survival is endangered in specific stages during the span from birth to the age when death is imminent. Different taxonomies for lifespan have been proposed, based on specific human growth and development milestones. Components of the same continuous process, growth is different from development as it concerns the quantitative increase in size and mass whereas development concerns the progression of changes related to the transition from an undifferentiated or immature state to a highly organized, specialized or mature state (Bogin 1999b).

Sinclair proposes a three-phase postnatal life cycle. In the first phase - the one which begins before birth, continues throughout the childhood, and ceases at maturity with the attainment of adulthood - a balance is struck between growth and development. In the second phase, during adulthood, the goal is functional activity, and growth becomes a matter of making good losses occurring through wear and tear. In the third phase, which occurs in the old age, growth becomes insufficient to maintain equilibrium, so that cells are lost without replacement and functions may become inefficient as result. Growth cease with the death of the tissues (Sinclair, Dangerfield 1998)

In this study we will use the taxonomy on human life cycles proposed by Bogin (1999), instead, as it is more comprehensive. Bogin identifies five stages of

postnatal life: infancy, childhood, juvenile, adolescence, and adulthood (for specific-stage milestones see Table 2. This study focuses on the review on infancy and childhood, as they are two sensitive periods with long lasting effects and in which the offspring are completely dependent on their parents/alloparent.

Growth and development in infancy and childhood are believed to be important milestones as they will unleash a chain of events. In adulthood, they will affect not only health (Baker 1994, Haojie Li 2003), but also educational attainment, socioeconomic status and well-being (Bogin, Loucky 1997, Behrman 1987). Indirectly, it also affects reproduction success (Crespi, Devender 2005).

In the early stages of life cycle, humans are completely dependent on parents, or any other individual who assists the parents in childcare (alloparent), for survival. The transition between life *in utero* and postnatal life is a critical period for survival. The newborn leaves a protected environment with quite restricted physiological variations to enter an new environment characterized by varied and varying conditions (Bogin 1999b, Lejarraga 2002).

In the first twenty-eight days postpartum (neonatal period), the individual is indeed highly vulnerable to death, in particular in poorer regions of the world. The World Health Organization estimates that twenty-six per a thousand individuals died in 2008 during the first twenty-eight complete days of life (neonatal mortality). Conditions arising in the neonatal period (e.g. prematurity, birth asphyxia, neonatal sepsis, and congenital abnormalities) account for thirty-one percent of the deaths. The majority of the deaths occur in the developing regions, in particular in Africa (forty), Mediterranean (thirty-five) and South East Asia (thirty-four) countries (WHO 2010b).

Infancy, the period between birth and weaning, is very critical for survival. The number of deaths between birth and exactly one year of age (infant mortality) or between birth and exactly five years of age (under-five mortality) also confirms how critical are the first years of postnatal life in developing regions of the world. Despite the globally decline in infant mortality rate (deaths per 1,000 live births in the first year) and under-five mortality rate (death per 1,000 live births under five years), WHO's estimates still show a high global mortality rate during infancy in the new millennium due to the high volume of deaths in Sub-Saharan Africa: in 2008, sixty-six under-five children per 1,000 live births died in the world in 2008. A

**Table 3** - Postnatal Growth and Development Milestones

<b>Stages</b>	<b>Duration</b>	<b>Growth</b>	<b>Development</b>
Infancy	First 36 months	Rapidly changing rate of growth (continuation of fetal growth in length, followed by a steep deceleration) Similarity in amount and rate of growth in length and weight during the first six months	Skeleton, musculature and nervous system progressions Motor skills development: walk bipedally but without efficiency of the adult Eruption of deciduous teeth Rapid growth of the brain
Childhood	3-7 years	Acceleration Predictability of the pattern of growth Mid-growth spurt	Locomotive skills develop and mature: ability to walk with the adult-type efficiency Replacement of deciduous by the permanent teeth Completion of growth of brain
Juvenile	8-10 (girls); 8-12 (boys) years	Predictability of growth Short-live decrease in rate of growth	
Adolescence	10 (girls)/12 (boys) – 19 years	Acceleration of growth Growth spurt Increases differences in fatness between sexes	Early stages of reproductive maturation: Reactivation of hypothalamic-pituitary-gonadal system of hormone production; development of external genitalia, sexual dimorphism in body size and composition, deepening of the voice in boys, onset of greater interest and practice of adult patterns of sociosexual behaviour and food production
Adulthood	From 20 onwards	Attainment of adult stature Most tissues lose the ability to grow by hyperplasia, whereas many may grow by hypertrophy Homeostasis, and resistance to pathological influences	Full reproductive maturity

Source: Adaptation from Bogin, Barry, *Patterns of Human Growth*, 2<sup>nd</sup> ed., Cambridge: Cambridge University Press

combination of the neonatal, infant, and under-five mortality data for 2008 suggests that most of the children die in the neonatal period (twenty-six) and after completing the first year (twenty-one).

During this stage, infants are completely dependent on the caregiver for feeding and protection. Feeding is particularly important in this period because of the rate of physical growth and development which requires a high amount of energy expenditure. For example, the newborn allocates 87% of its resting metabolic rate for brain growth and function (Lejarraga 2002).

The infant is breastfed or bottle fed (or other culturally derived imitation of lactation) during the first months. In urban and semi-urban societies, the period of breastfeeding is usually inferior to that recommended by the World Health Organization. Unlikely, in rural societies, in particular those of the developing countries, the period of breastfeeding is much longer. In the 1970s, Levine found that in the most rural Africa, children were weaned towards the end of infancy, often when the mother got pregnant again. In those societies, the longer breastfeeding was beneficial for the infant, in particular in areas where the postweaning diet was very low in protein. In spite of having no understanding of nutrition in the present sense, mothers were orientated by their cultural belief to adjust the age of weaning to the size of the infant. They might recognize a specific age as the ideal age for weaning but the infant was weaned later or earlier according to his or her size (LeVine 1977).

The WHO recommends exclusive breastfeeding to all infants for the first six months of life as, besides costing less than artificial feeding, breast milk contains exactly the nutrients an infant needs, it is easily digested and efficiently used by the infant's body, and it protects an infant against infections (WHO 2002b). In the period 2000-2009, only thirty-six percent of babies were exclusively breastfed according to WHO's recommendations. Countries benefiting of an high as well as countries belonging to the European region are those less inclined to follow those recommendations (WHO 2010b, WHO 2010b, WHO 2010a, WHO 2010b).

From the six months of age onwards, exclusive breastfeeding does not fulfil the increasing nutritional needs of the infant. Thus, weaning should be initiated along with the gradual introduction of solid food. This food initially acts as a complement to breast milk and later as a substitute. Caregivers are important in this transition period as they will be responsible to acquire and select adequate food (both quantity and quality) as well as to prepare them according to the infant eating motor skills (e.g. eruption of deciduous teeth from the age of six months) (Lejarraga 2002).

Protection from environmental stressors is also crucial during infancy, as the survival of the infant is totally dependent on the adult caregiver. Protection, as provision of a safe environment includes different activities related to preventing injuries or damages ranging from adequate shelter to prevention from parasites, predators (*Online Oxford English Dictionary*, Triver 2002). By the time walking is in progress, the infant is exposed to other hazards such as burning, falling off, or falling into. For example, reflecting on data derived from his field experiences, Levine (1977) associates the practice of carrying babies on the back until 18 months of age or older in some African societies to many potential hazards to the infant in a typical African environment, such as the burn hazard of the cooking fires, the danger of falling off high places (e.g. cliffs, hills) or falling into water sources (e.g. rivers, wells, and dye pits).

Childhood, the period that goes from weaning to independence for survival, is another sensitive stage. After overcoming the risk of deaths related to adaptation to the physical and biotic environment, survival is increasingly related to a healthy growth and development.

In this stage, the child is still dependent on caregivers for food and protection. Feeding is particularly important because the child's immature dentition and small digestive system requires prepared food easy to chew and swallow. The child has not developed yet the motor and cognitive skills to prepare foods, however. Only towards the end of the childhood, the deciduous teeth are replaced by the permanent teeth and the molars erupt. By the same time, the weight of the brain ceases to grow, along with a decline of the percentage it uses of the resting metabolic rate.

The child is also particularly vulnerable to hazards, injuries and diseases because his/her cognitive and motor skills are incipient to avoid them. WHO estimates that forty-four percent of under-five children have globally died in 2008 of communicable diseases, that is, diseases caused by the presence of pathogenic microorganisms (i.e. bacteria, viruses, parasites or fungi) in an individual host organism, which were transmitted by contaminated food or water (e.g. diarrhoea), contact with vector organisms (e.g. malaria), airborne inhalation (e.g. pneumonia), and fluids (e.g. measles) (WHO 2010b).

WHO/UNICEF (WHO, UNICEF 2008) alerts to the fact that injury is an area of concern from one year old. Injury is defined as human physical damage caused by a sudden amount of energy (e.g. mechanical, thermal, chemical or radiated) which exceeds the threshold of human physiological tolerance or by a lack of one or more vital elements, such as oxygen. This damage can be caused unintentionally (e.g. drowning, fall, fire-related burns, poisoning, road traffics, smothering, asphyxiation,

choking, animal or snakebites, hypothermia and hyperthermia) or intentionally (e.g. violence).

Those international organizations report drowning, road traffic injuries, fire-related burns, and falls amongst the twelve main leading causes of death in children in 2004. However, the importance of these unintentional injuries varies according to the group of age: drowning (8<sup>th</sup>), road traffic injuries (9<sup>th</sup>), fire-burned related (11<sup>th</sup>) rank higher for the group 1-4 years old, whereas road traffic injuries (2<sup>nd</sup>), drowning (6<sup>th</sup>), fire-related burns (11<sup>th</sup>) and falls (12<sup>th</sup>) rank higher for the group 5-9 years old. We can see that from the age of five year unintentional injuries are one of the biggest threats to children. It goes from the eighth position in the group 1-4 to the second position in the group 5-9.

Not all injuries are fatal. Unintentional injuries are reported to be one of the leading causes of hospitalization and disability across the world. Many children are left with some form of disability, often with lifelong consequences.

The abovementioned communicable diseases and unintentional injuries are not inevitable ([www.who.int](http://www.who.int)). Caregivers can protect children from their eruption or effects. They can adopt preventive measures (e.g. vaccination for measles) or in time seek treatment from health professionals.

### **2.2.2 Self-maintenance in maturity**

Once survival is guaranteed parents can shift their efforts to attain the second universal goal, that is, to develop the child's behavioral capacity for economic self-maintenance in maturity. They can divert resources to the formation another aspect of human capital, that is, the acquisition of knowledge and development of competences, and skills, attributes which will affect the ability to perform labor and to produce economic value and, as a consequence, determinant of economic independence (i.e. productivity capacity, earning capacity, employment prospects). Human capital may be accumulated through three main components: early ability acquired or innate; qualifications and knowledge acquired through formal education; and skills, competencies and expertise acquired through training on the job (Blundell, Dearden et al. 1999).

Early abilities, related to processes like memory, attention, perception, judgment, reasoning, problem-solving, among other, are acquired through interaction, experiences, observation, among other things, occurring during infancy and early childhood. Indeed, the first years of life are crucial for setting the foundations of learning, the building blocks for life long learning. Brain development is essential for learning, as this organ is responsible for different aspects of cognition, consciousness, and responding to both internal and external environment. Despite

brain formation occurring in prenatal life, brain maturation takes place in the postnatal life. The brain of a newborn is about one-quarter of its adult size. The ongoing and intense proliferation of wiring and rewiring the connections among neurons (synapse) and insulation of brain cells (myelination), which are essential for facilitating learning, happens in the first years of postnatal life. By the end of infancy, the individual's brain has reached 70% of its adult weight. This intense activity in the brain requires it uses a greater amount of energy than any other period (ZeroTree online).

Brain development is highly dependent upon early experiences. There is mounting evidence in neuroscience studies that synapses are strengthened through repeated experiences. Experiences as nutrition and interaction with people and objects are responsible for the "wiring". Single experiences, either good or bad, are less likely to affect brain development. Good repeated experiences contribute to adequate brain development, whereas stressful experiences (e.g. negligence and abuse) can have a lifetime negative influence on brain function, learning, and memory. In short, positive stimulation of early abilities is required in infancy. Infancy, the stage in which the brain shows more "plasticity" in terms of receptivity and vulnerability, is one of the "windows of opportunity" for learning. For instance, language, a fundamental component in cognitive development, is highly dependent on stimulation. Infants and children who are engaged in verbal interaction show more advanced linguistic skills (Brotherson 2005, Santrock 2011).

Parents and caregivers are responsible for creating a stimulating and supportive environment to promote attention, memory, and thinking, i.e., three areas involved in processing information. If they succeed in doing so when experience has a higher effect on moulding the brain, they are positively contributing to the setting of the foundations of learning and later on positive school performance (Facini, Combes 2001).

In general, the stimulation of early abilities varies with the level of human development of the society in which the individual is born or raised. For instance, in societies characterized by a high infant mortality rate, such as low income or low human development countries, parents' priority is the physical survival and health of the infant or child, whereas in societies where infant mortality or under-five mortality is low, the priority lies in the development of cognition.

Levine et al.'s study on childrearing practices in two different cultural settings (i.e. Africa versus America, rural versus urban, agrarian versus industrialized, polygynous versus monogamous system) is a good example on priority of parental goals oriented to their ecological niche. The authors identified two models of childcare: the Gusi's pediatric model and the American pedagogic model. Unlike

the latter model, in the former model infants were deprived of lack of support/stimulus (from mother or other caregivers) aimed at the development of their cognitive, language, emotional, and social competences. These attributes might optimize the child's preparation for entry to a school, but they were not useful for children who did not attend school. Like other African peoples, Gusi's priority was survival of their offspring. They socially organized ways of cultivating different competences (i.e. cognitive, social, and emotional competencies), not school-orientated, which involved the participation of other members of the family and the community (LeVine, LeVine et al. 1994).

Learning is a long process. In traditional societies, learning is processed in the context of the household. From infancy the individual would gradually be introduced to their group productivity system (e.g. agrarian, foraging) through observation and, subsequently, participation in activities of the group. They are initiated in the house chores like collecting food and water, preparing food, childcare, amongst others.

Parents of 2-year-old infants living in Lagos state (Nigeria) reported in one survey that more than 90% had started to learn how to take things from one place to another, carry water in a small bowl, put their own things away, and wash their own hands and face; 75% to buy things; 39% to wash their own plate and cup; 28% to do housework (e.g. sweeping and washing clothes). Fifteen percent of these infants were reported to actually perform household chores. These skills are expected to have mastered by the age of 5 years old. A UNICEF baseline survey on Yoruba children (2-6 years old) also reported children aged 3 to 5 were attentive participants in adult activities, such as helping their caregivers by completing errands (e.g. assisting in food processing, retrieving items such as water, bags, chair, or foodstuffs) and spontaneously taking responsibility for tasks (e.g. driving away goats or dogs from foodstuffs, adding wood to the fire, feeding domestic animals, taking care of younger siblings in times of distress, and running to carry an older person's bag without being asked) (Zetlin 1996).

In modern societies, in particular in the urban ones, learning is acquired informally (i.e. within the family) and formally (i.e. through childcare institutions and later the school system). Both parents tend to work outside household and often miles from it. Kin members (e.g. grandparents and siblings) are less available to childcare. Often they are also involved in recreational, professional or school-related activities. As such parents are increasingly compelled to transfer partially their childcare responsibilities to specific institutions (e.g. nursery, kindergartens or preschools) (Edwards, Gandini et al. 1996). These institutions will play a fundamental role in stimulating the minimum developmental level their offspring

will need to respond adequately to school demands when entering into elementary school. This process of preparation of children to elementary school by developing cognitive, emotional, and social qualities essential for a child to function successfully in school context is known as *school readiness* (Lemelin, Boivin et al. 2007).

Traditional societies are also gradually incorporating the above trend. The last decades have shown an increase in the number of children enrolling in school: globally primary enrolment has increased from 83 percent in 1991 to 87 per cent in 2005. Low Human Development countries account significantly for this increase. Their governments have been promoting a campaign on universal education, by expanding geographically the educational services and enacting legislation on compulsory school. With the extension of educational services and introduction of compulsory school, the *locus* of learning in traditional societies has also changed. Now, from late childhood parents share with teachers and other educational services professionals the responsibility of imparting knowledge and competences. By the time the child entry school dependency on parents for survival is about to finish. The onset of formal education corresponds to the transition into juvenile period, a stage in which children are able to survive the death of the caregivers, as they have achieved physical and cognitive abilities to provide food for themselves as well as to protect themselves from injuries. Furthermore, the immune system has already matured to fight diseases (Bogin 1999a, Kaplan, Lancaster et al. 2003). Nigerian Yoruba children are shown to end their dependency by 7 years old. At this age children were expected to think for themselves, care for themselves and younger siblings, assist in home, and contribute economically in the workplace, either on the farm or with trading activities (Zetlin 1996). Child contribution to productivity should not be equal that of adults. Full productivity is only achieved in adulthood (Kaplan, Lancaster et al. 2003).

The brain is also about to complete its growth process, which corresponds to a decrease in the large energy reserves devoted to it. The brain will be crucial to the long period of learning. Kaplan et al. (2003) compares the growth of brain to building a "physical plant" which support learning.

### **2.2.3 Cultural Reproduction**

The last universal goal is the maximization of non-economic values as formulated in the culture of the parents, which is based on the interpretation of the environmental demands, like geography, subsistence activities, and environmental hazards.

Babies are born in a specific ecocultural setting. They gradually adapt and internalize the society in which they are in (socialization). Parents, or other caregivers, «prepare» them for the socially accepted environment (i.e. physical, biotic and sociocultural) in which they are to live (i.e. survival, growth and development, reproduction, caring for offspring, and death). Their social integration, and contribution to the reproduction of their culture (i.e. perpetuation of system of ideas in which the group is embedded), will depend on the organization of their behaviour according to the cultural group they are in. This will allow them to anticipate the behaviour of others, and to make sense of their environment. Social controls are in place to ensure that the prescribed patterns for behaviour are observed as well as those proscribed are avoided (Rubin, Chung 2006).

The values of the group might belong to a coexistent culture which does not share the same values as the dominant culture. The intersection between the two cultural systems might even cause collision. There might be more similarities in socialization goals among groups of urban setting in different countries than among groups in rural and urban settings of the same country; among ethnic communities located in two different countries than among ethnic communities located in the same country; among socio-economic status groups in the different countries than socio-economic status groups in the same country (Kagitçibasi Budhwar, Reeves & Farrell 2000, Chaves 2006).

Non-economic values like correct vs. incorrect, good vs. bad, wrong vs. right, and appropriate vs. inappropriate are addressed differently according to the group's socialization goal. In societies that emphasize interdependence, «correct» is synonymous of respect for the authoritarian, harmonious and hierarchically organized social structure, conformity, obedience, dependence, shared responsibility, maintenance of social relationship with others, and acceptance of social roles. Unlikely, in societies that value independence «correct» means cultivation of the individual mind, exploration, autonomy, assertiveness, discovery and personal achievement (Keller 2003, Kagitçibasi 1997).

Basing on these differences, two models emerge. Those models should not be understood as dichotomous, but rather as two separate dimensions which are part of the psychology of any human being and always occur in particular mixtures: pediatric and pedagogic model, in LeVine et al.'s words, or apprentice and equality model, in Keller's words. The pediatric and apprentice models value interdependence and are often adopted by traditional or rural societies in the developing countries (e.g. hunter-gatherers, nomads, agrarian), whereas the pedagogic and the equality models encourage independence and are mostly adopted by Western and urban technological, information or knowledge societies.

The former stress cooperation social skills which are important for maintaining the family subsistence system in traditional and rural settings whereas the latter are more grounded in competition which is important for succeeding outside the family subsistence system as it is the mass anonymous urban setting.

Kagitçibasi proposes a third model: the psychological interdependence model. This pattern can be found in urban population with strong interdependent family relationships as well as material and instrumental independence because of the formal education acquired and urban professional occupation. In these families the child is raised stressing values as agency in order to cope with the urban lifestyle where schooling and economic independence are important. Nonetheless, the cultural of relatedness perpetuates the emotional interdependence (Kagitçibasi 1997).

### **2.3 “Migrants” in Parental Investment Theory**

Literature on human parental investment is mostly focused on sedentary lives. Few researchers have shifted their focus to non sedentary lives, even when migrants are their object of analysis.

In this study migrants are understood as individuals who have performed a spatial movement which involves the crossing of a frontier and a continuous staying in the receiving society for a certain period. Six months is the consensual temporal threshold internationally set. These temporal and spatial features usually imply ruptures with the society of origin and adaptation to the receiving society in the long run. This definition covers a wide range of situations which affect differently parental investment strategies: an individual who moves for family reasons (i.e. reunite with a collateral/spouse, ascendant/ parent, or descendant/offspring); an individual who moves for economic reasons (i.e. to improve the income), educational reasons (i.e. access to school or training institutions), or health reasons (i.e. access to health services) leaving their family behind; individual who moves for environmental reasons (e.g. desertification, erosion, natural disaster), an individual who moves for political reasons (i.e. searching for a refugee), amongst others (Jackson 1986, UNDP 2009).

Migration usually occurs between societies with different physical (e.g. climate, topography, water sources), biotic (e.g. food, pathogens) and sociocultural (i.e. cultural, demographic, social, economic and political profile) environments which might affect the parental investment strategies, previously adopted before the movement.

Migration may occur between areas with different: climates (i.e. tropical moist climates, dry climates, humid middle latitude climates, continental climates, cold climates), topographies (i.e. mountains, hills, plains, glaciers, and water), and water sources (i.e. surface water, groundwater, and precipitation). The combination of three physical features will determine not only the fauna and flora of an area, but also the type of economic productivity (i.e. quantity and quality) and diseases of that area. The environmental conditions of the area will affect the demographic and culture profile of the area.

The UNDP reports that most movement in the world does not occur from developing to developed countries. The overwhelming majority of people who move do so within the borders of their own country. Furthermore, the bulk of international movements (corresponding to a 1/4 of number of the internal movements) do not occur between countries with very different levels of human development (UNDP 2009). Unless otherwise specified, human development is defined as the process of enlarging people's choices by expanding three essential human capabilities, as specified in the United Nations Development Programme's annual reports from 1990s: 1) to lead long and healthy lives, 2) to be knowledgeable, and 3) to have a decent standard of living. The *human development index* (HDI), a composite to measure human development, is based on the achievements in these three dimensions: 1) long and healthy lives as measured by life expectancy at birth; 2) access to education as measured by adult literacy rate (weighting two thirds) and combined primary, secondary and tertiary gross enrollment ratio (weighting one third); and 3) decent standard of living as measured by the gross domestic product (GDP) per capita at purchasing power parity (PPP) in United States dollars (UNDP website).

Only 37 percent of migration in the world occurs from developing to developed countries. The high costs of the movement account for such a low percentage of this type of movements. These high cost comes not only from transportation costs, but also from policy-based restrictions on crossing international borders. The remaining migrants move either between developing countries or developed countries (UNDP 2009). We will focus on the former type of migration as the international migration involved in this study occurs from developing to developed region.

Migration from developing to developed regions corresponds to migration from an area characterized by a lower life expectancy, lower formal education, and lower income to an area characterized by a higher life expectancy at birth, higher formal education, and a higher income. Moreover, it usually corresponds to a transition between countries with different orientation of socialization goals. Thus, the

likelihood of the receiving country not prioritizing the same parental goals as the migrant's country of origin is high.

When people migrate from one developing country to a developed other changes usually occur. In principle, people not only come into contact with a country with physical and socioeconomic environment, but also with people who do not share the ideas (i.e. beliefs, values, customs) of parenting (e.g. quality versus quantity). As such, they are introduced to the immigration country ideas of parenting in their daily interaction with the others, or they might resist and strive to reproduce their own cultural models. In the latter, any change might raise fears of a breakdown in the way of life and, in some cases, generate transgenerational conflicts.

In practice, often the cultural gap between the migrants and sedents is not so wide. Cultural systems are dynamic and subject to historical processes and information flows. Although aspects of culture have continuity, change and even lack of consensus exists among the members of the group as they differ, in particular in terms of education and age. Even where no migration occurs, today one generation is not able to reproduce its culture without any changes to the next generation. Globalization has been narrowing the gap among societies. New technologies and faster transportation has accelerated the flow of information, capital, and ideas around the world, connecting people from different areas, in particular the local to global (Chaves 2006, Appadurai 1996).

## **2.4 "Change" in biology and morphology in response to migration**

Other changes that might occur are those related to reproduction strategies (i.e. current versus future reproduction, mating versus parenting, and quantity versus quality of the offspring), and those related with migrant's and/or their offspring morphology and physiology. Changes will depend on the stage of life cycle in which the individual move, differences between the home and the host environments, in particular physical, biotic, and socioeconomic (Mascie-Taylor, Little 2004).

Migration often involves leaving a familiar environment to enter into an unfamiliar environment. The movement involves some stress, at the least. The organism responds in different ways to the transition of environment. It might respond with short-term changes in physiology and behavior or long-term physiological and morphological adjustments to environmental conditions (i.e. stressors and facilitators). The type of response will varied greatly with the age of the individual at the time the movement takes place. If the movement occurs in the organism's sensitive periods in growth and development, it is likely it might affect greatly and in the long term. Outside the sensitive periods, as it is in adulthood, it might have

little or no effect. For instance, the *fetal origins hypothesis* predicts that a stimulus or insult during critical periods of growth and development, such as the fetal stage, may permanently alter tissue structure and function, expressing itself later in life (Crespi, Devender 2005, Bateson, Barker et al. 2004, Drake, Walker 2004).

Growth and development are seen as good indicators of the quality of the environment (Bogin, Loucky 1997). A mainstream of biocultural studies have been dedicated to understand the effects of international migration on growth and development since the beginning of the twentieth century (see (Lasker, Mascie-Taylor 1988)). Challenging the prevailing theoretical tradition at the time of fixity of human types and heredity, these studies have emphasized the human organism plasticity, that is, the process of an organism modify its behavior, morphology, and physiology to changing environments (Crespi, Devender 2005, Mascie-Taylor, Little 2004, Kaplan 1954).

Changes in physical growth were identified in several migrants and their children born in the United States. Fishberg found that the first-generation Jews immigrants in New York were usually taller than the European population from which they derived, and second-generation were taller than the first-generation migrants. However, the same could not be said regarding cephalic index. Native Jews fell within the range of Eastern European first-generation native Jews for that anthropometric measure (Fishberg 1902, Fishberg 1903).

Years later, Boas measured head dimensions (breadth, length, and height) and stature of large numbers of children and adults by age of immigration. His data supported Fishberg's observations, except for the cephalic index, for which he found differences among first- and second generation Eastern European, Sicilian, and Neapolitan migrants. Boas used these findings to refute the belief in the fixity of racial characteristics for the skull (Boas 1911, Boas 1912).

Boas's study would be seen as the first on the nature of human biological plasticity and would inspire many more physical anthropological studies on migrant's plasticity from the late 1920s. In the 1930s, two studies reexamined Boas' data and argued against Boas' conclusions. Morant and Samson found that, after age and sex corrections, differences between American born Jewish children and their parents were small. They concluded that larger differences would have to be found in order to establish the theory that head-form, as estimated by the cephalic index, is modified directly by the environment (Morant, Samson 1936). Also Fisher and Gray (1937) reanalyzed data on Sicilians and were concerned about their reliability and the accuracy of all the head measurements published ((Mascie-Taylor, Little 2004). More than sixty-years later, Spark and Jantz reassessed Boas' data with a modern statistical and quantitative genetic framework. They found that the

differentiation between American and European-born children is insignificant. No effect of exposure to the American environment on the cranial index in children was found. The authors conclude that modern analysis does not support Boas' original findings about environmental influence on cranial form (Sparks, Jantz 2002). In response, Gravlee et al. (2003) use analytical methods that were not available to Boas and support his findings that cranial form changed in response to environmental influences within a single generation of European immigrants to the U.S ((Gravlee, Bernard et al. 2003a, Gravlee, Bernard et al. 2003b).

From late 1920s, Boas's migration design was applied to first and second-generations of migrant populations, and/or migrants and sedentes, involving people whose origins were Japanese, Chinese, Mexicans, Central and Eastern European Jews, Puerto Ricans, and Switzerland (see Kaplan 1957 and Mascie-Taylor 2004 for a review of the literature). These studies almost uniformly demonstrated minimal biological differences between migrants and sedentes, an increased size in height and weight of second generation migrants, and varying degrees of biological change in the children and grand-children of migrants (*migrant effect*) (Little, Baker 1988).

Under the umbrella of the International Biological Program (IBP) another group of studies on migration and plasticity emerged in 1960s and extended into the 1970s. These studies were part of the Human Adaptability agenda of the IBP. The researchers conducting these studies explored adaptation of migrants to temperature extremes; effects of migration on blood pressure and growth and development; the relationship between migration and catecholamines and stress and certain nutritional deficiency diseases, among others.

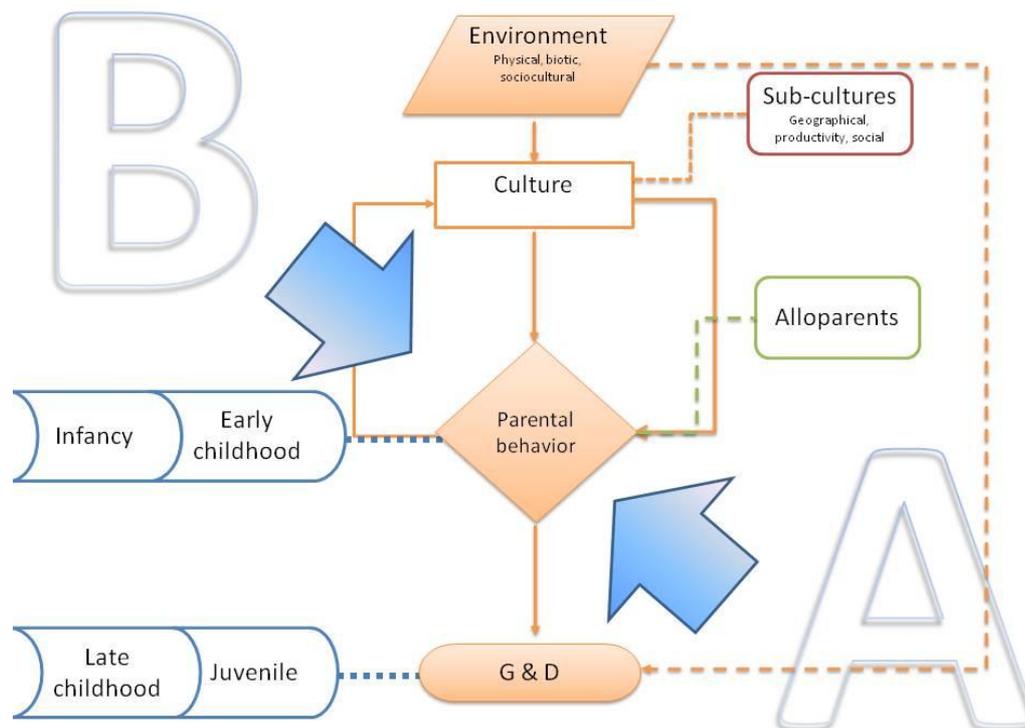
Studies on the biology of migrants declined by the 1980s, but increased again in the 1990s as new research questions emerged. The worldwide epidemic of overweight and obesity encouraged some of the new research, as migrants are often especially susceptible to weight gain (e.g.(Bogin, Loucky 1997); Varela & Bogin 2003, Varela-Silva et al. 2007). Nonetheless, the number of studies dedicated to this matter has not recovered from the downward trend since the last decades of the twentieth century.

## **2.5 Summary**

The review of the biological literature on parental investment theory, combined with concepts and theories derived from other approaches and disciplines is summarized in the analytical model elaborated to explore parental investment in migratory contexts (Figure 1).

The model evidences the interaction of factors affecting parental decisions and the outcomes. This model predicts that socioeconomic, biotic, physical, and political environmental factors (input symbol: Environment) shape parental choices and decisions (decision symbol: Parental behavior). Parental behavior during infancy (stages of life symbol: infancy and early childhood) ultimately affects the offspring growth and development (output symbol: G & D) in prepuberty stages (stages of life symbol: late childhood and juvenile). The relationship environment – child’s growth and development is not direct, especially during the early stages of life when infants and children are most dependent on their parents for survival. Parents act as mediators between the environmental factors and their children. Their decisions and behaviors, culturally shaped, regarding how to optimally allocate resources affect children’s growth and development (process and alternative process symbols: Culture and Sub-cultures). In migratory context, the migrant cultural script may be derived from immigrant’s origins (emigration country symbol: A) or may be a mixture of both the society of origin (emigration country symbol: A) and host society (immigration country symbol: B).

**Figure 1 – Research Analytical Model**



Legend of the symbols:

 - input	 - process	 - Decision
 - stages of life	 - output	 - alternative processes
A Emigration country	B Immigration country	

## Chapter 3 – Migration from Santiago to Amadora

For centuries Cape Verdeans have migrated in search of a better life for themselves and their own families. The directions they took varied over time, guided by a combination of labour market demands, immigration policies and controls, and the existence or not of a supportive social network. Until the 1920s, the United States was the main destination. Its increasingly restrictive immigration policies, adopted between 1917 and 1924, diverted migration to South America (Brazil and Argentina), and Africa (Senegal, Guinea and Senegal). From the end of the World War II, the European countries with intense seafaring activities (Netherlands and France) became an alternative.

Portugal was not a “choice” at the beginning. Cape Verdeans passed through the metropolis to obtain the required documentation on their way to other countries. The high rate of emigration of Portuguese natives into the blossoming industrial European countries and the beginning of the colonial war (1961) caused a high demand for labour. The Portuguese companies who were carrying out infrastructure works in Cape Verde began recruiting Cape Verdean labour to meet the labour demands. This was the beginning of the Cape Verdean migratory chain into Portugal. The island contributing the most to this migratory flow is Santiago and, to a lesser degree, Santo Antão and São Vicente.

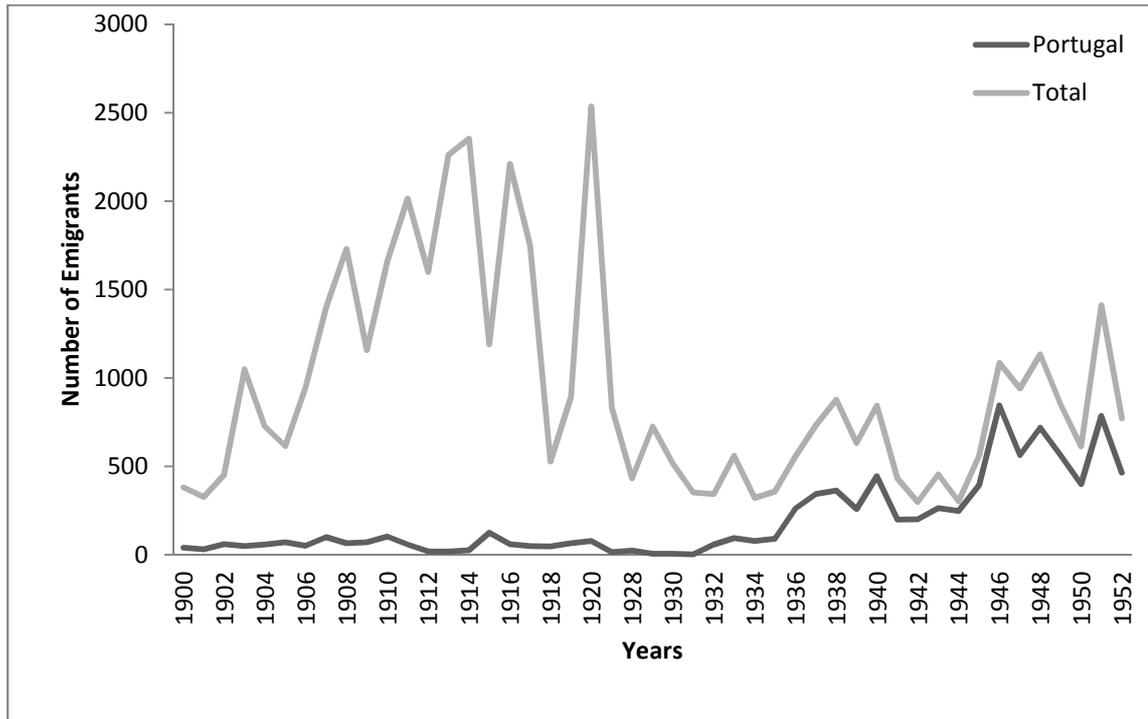
This chapter aims to identify the several *vintages* of Cape Verdean migration into Portugal. The term “vintage”, popularised by Egor Kunz back in the 1970s, is taken to mean a group which differs from the rest because of its specific characteristics (e.g. the period of migration and type of settlement). The identification of the different vintages is essential to gain a better understanding of the physical, social, culture, and economic environment in which children descendant of Cape Verdean migrants were born and raised.

### 3.1 The displacement

Cape Verdean migration into Portugal goes back to the colonial period (figure 2). Despite the increasing displacement into Portugal during the first three decades of the 20<sup>th</sup> century, it is from the mid-1930s the Cape Verdeans begun moving into Portugal in a consistent way. From 1936 the number of Cape Verdeans displacing into Portugal accounted for more than 40% out of the total migration from Cape Verde. From 1942, that contribution increased to more than 60%, except for the years 1943, 1947 and 1951. The omissions and deficiencies of data do not allow

further analysis for this time period nor for displacements in the following period 1952-1975.

**Figure 2 - Cape Verdean migration: General and Portugal only**



**Source:** Estimates obtained in Carreira, António, 1982, *The people of the Cape Verde islands : exploitation and emigration*, London; Hamden: C. Hurst; Archon Books ,

Carreira points out that the estimations do not reflect the real situation. The increasing numbers of outflows into Portugal are best explained by the fact that Portugal was a platform of emigration to the Netherlands and other European countries. For instance, the Capuchin fathers who served in the island of Sao Nicolau were recruiting girls since at least 1960 to serve as domestic servants in Italy. These girls travel to Italy via Lisbon. Officially this emigration did not exist. In 1972, 2,500 Cape Verdean girls were known to be living in Italy (Carreira 1977). The Cape Verdeans who wanted to migrate to a foreign country were required to obtain a visa. The difficulty and uncertainty in the application for a visa in the archipelago led Cape Verdeans who could afford to travel to Lisbon, Dakar, or Banjul to apply for visas or passage towards Western European countries.

### 3.1.1 First Vintage: Educational Internal Migration

From late 1940s, an increasing group of Cape Verdean students from the different islands came to Portugal to obtain a university or polytechnic degree. Until

independence, there was no higher education institute in the archipelago. The Cape Verdean elite mostly attended the *Liceu Gil Eanes* in Mindelo (island of São Vicente) or its section in Praia (island of Santiago), the only institutions which provide secondary education in the archipelago.

#### **Box 1-** Education in Cape Verde

The secondary school was introduced in 1847, following a report on education, written in 1845 by the bishop of Cape Verde, in which he defended the creation of primary schools in every island as well as religious education institutions which offered both religious studies for those who aspired to the ecclesiastic life and secondary education to those who aspired to a higher education. The “Escola Principal de Cabo Verde”, aimed at training students to be teachers, was installed in the island of Brava (decree 23 November 1847), one of the least populated, but with a high concentration of white influential families. This decision was highly criticised by people from other islands who saw this island an inadequate place to install such a educational system, in particular due to the means of transportation and the reduced number of inhabitants (Silva 1929).

Thirteen years later, a secondary school was created in the capital, located in the island of Santiago in which the majority of the inhabitants were a few white traditional families. In a short time, this secondary school was closed because of disputes between the elite groups. The small white and mixed-colour elite could afford to send their children to the metropolis.

In this context, the *Seminário-Liceu de São Nicolau*, a religious education institute which offered secular and religious education, was created in the island of Sao Nicolau *Nicolau* ((B.O. 44, 3/11/1866). This institute, which became “the” institution offering secondary education for fifty years, was deprived of its educational function in 1917 in the context of the educational reform during the First Portuguese Republic (1917). In the same island, the *Liceu Nacional de Cabo Verde* was created in June 13<sup>th</sup>, 1917 (Law 701, 13<sup>th</sup> June 1917) to offer both general and professional curricula. In the same year, this institution was transferred to the island of Sao Vicente (decree 3435, 8<sup>th</sup> October 1917), where the seaport-activities contributed to a high concentration of a heterogeneous population. This educational institution, renamed *Liceu Infante D. Henrique* in 1925, gave way to the historical *Liceu Gil Eanes* in November 1937. It took another eighteen years to created a section of this institution in Santiago (Decree 40198, 22<sup>nd</sup> June 1955). During the 1920s, in the building of the *Seminário de S. Nicolau* there emerged another secondary institution: the *Instituto Caboverdeano de Instrução* (Colonial Legislative Diplome 22, 7<sup>th</sup> October 1925)

Due to the material resources (space, human, materials) faced by the *liceu Gil Eanes* to host a growing school population, a section of the *Liceu Gil Eanes* was created in the capital in 1955 (Decree 40197, 22 June 1955). This section became independent in the 1960-1 academic year (Decree 43158, 8 September 1960, B.O 39, 24 September 1960), following which it changed its name to *Liceu Adriado Moreira* (1962).

Few families could afford to send their children to the metropolis to obtain a lower degree. Indeed, the majority of the families who belonged the local elite could barely afford to send their offspring to Portugal to attend a higher educational institute. Although no published data were found on the subject, information on the structure of Cape Verdean society and the organization of the educational system

would suggest this group of students was most likely composed of male adolescents.

Once they obtained their university (law, medicine, and engineering) or polytechnic (agronomy) degrees, the majority returned to Africa but not to Cape Verde where the working opportunities were few. They went to work in the Portuguese-speaking African colonies where they filled the intermediate positions in the colonial administration or in the companies set in the Portuguese-speaking colonies in Africa. Only a small group remained working in the metropolis (Batalha 2004).

### **3.1.2 Second Vintage: Labour Internal Migration**

From the mid-sixties, Portugal adopted a new role: from a platform to the blossoming industrial European countries it became a destination for Cape Verdean labour migration. In a retrospective analysis, the 1981 Portuguese Census reported that out of the 18,557 Cape Verdeans who lived in the country at the time 46.5% moved before 1974 (Saint-Maurice, Pires 1989).

Cape Verdean male labour on their way to the industrial Western European countries, or living in the island of Santiago, were recruited to fill the shortage of unskilled labour created by the migration of the Portuguese natives into the industrial Western Europe (e.g. France, Germany and Luxembourg) and, from the 1961 onwards, by participation in the colonial war (Serrão 1982, Batalha 2008b).

At the beginning, Portuguese construction companies carrying out public works in the archipelago recruited male labour to work in public works (underground), construction (housing) and shipping sectors in the Lisbon's Metropolitan Area (LMA) and, to a lesser degree, to work in the construction sectors in Alentejo (industrial complex) and Algarve (hotels and touristic settlements) regions. Later, this labour would be partially diverted from construction to the mining sector (Tungsten) in the Beira region and the industrial sector in Setubal. Over time the role played by the Portuguese companies in recruiting local labour lost its importance. Once settled migrants would perform that role by passing word along back to the archipelago. This would lead to the creation of a new chain in the Cape Verdean migration (Batalha 2008b).

The severe droughts in the Sahel region between 1968 and 1973 increased the volume of migration into Portugal. Like other Sahelian countries, Cape Verde experienced a prolonged drought which compelled people to leave the archipelago. Only this time Portuguese authorities reacted to it to prevent the death toll caused during the previous disastrous droughts. In the metropolis, they created in 1973 a centre to aid the overseas workers (*Centro de Apoio aos Trabalhadores*

*Ultramarinos*) and promote the labour integration of the growing number of Cape Verdean who migrated into Portugal (Carreira 1977, Oliveira 1973).

In general, these labour migrants were born and raised in a different physical, cultural and social environment from that of the LMA. They were raised in rural areas, which prevented them from being acquainted with the complexities of the urban centres, let alone of the cities. They did not manage the Portuguese codes (e.g. language, dress, and behaviour). The majority had not attended primary school or, at least, had not completed it. At the time, primary school in Cape Verde essentially covered the elite's offspring. 80% Cape Verdeans were illiterate in 1958. The educational reform which extended education to all of the population only took place following the claims of the freedom fighters for independence (Batalha 2004, Neves 2007).

### **Box 2 – Educational Reform in Cape Verde**

The educational reform (ordinance 20380, February 19<sup>th</sup> 1964 and DL 45098, September 10<sup>th</sup> 1964) decreed it was compulsory to have a basic education, until final examination, for individuals between the ages 6 and 12 years.

Basic schooling was composed of four grades, preceded by a preparatory grade in which the children gained familiarity with the Portuguese language and were prepared to receive schooling. In spite of these reforms, it failed to reduce significantly the rate of illiteracy which was 70% by time of the independence of Cape Verde. This failure was essentially due to the deficiency in quality and quantity of the infrastructures (e.g. scarcity of schools and uneven distribution) and teachers, as well as the inadequacy of the curricula to the reality of the country (Afonso in Neves 2007). Except for some adaptations, the curricula and the books were similar to those used in Portugal as it aimed to cultivate the Portuguese culture in the overseas provinces (ordinance 20380, February 19<sup>th</sup> 1964). Even if Geometry, Arithmetic, Design and, to some extent, Geography were universal, history, the Portuguese language, female and musical education were not adequate to the reality of Cape Verde. The reluctance increased amongst the parents already disinclined to send their children to school at all or on a regular basis, in particular in rural areas where the distance between the households and the primary school was often large and child labour was required for the domestic economy.

In the first period of independence, the fight against adult illiteracy and promotion of universal basic education was one of the top priorities: the percentage of the education sector in GDP gradually increased (9.4% in 1980 to 20.2% in 2000) in order to achieve that goal. At the beginning, the funds were aimed at increasing the number of infrastructures (e.g. school buildings, classrooms, teaching material) and services (e.g. teachers).

The conclusion of the I National Development Plan (1982-5) showed, however, that adult illiteracy rate had decreased (48.8% in 1980/1 to 41,1% in 1985/6) and net enrolment rate in basic schooling (72.6% in 1980/1 to 76.3% in 1985/6) and secondary schooling (2.8% in 1980/1 to 5.3% in 1985/6) had increased. However, the failure rate was high and had increased both in basic schooling (29.5% in 1980/81 to 30.2% in 1985/6) and in secondary schooling (27% in 1980/1 to 28% in 1985/6). Therefore, under the II National Development Plan (1986-1990), an assessment was conducted to reform the education system. The assessment underlined the need to continue to invest in quantity (e.g. pre-primary, secondary and higher schooling, offering meals) but also in quality (e.g. curricula, and qualification of teachers) to meet the real needs of the country (República de Cabo Verde-MEVHR 2002).

From the late 1980s, Government reformed the educational system, creating the first Fundamental Law for Educational System (Law 103/III/90, December 29<sup>th</sup>), which defined the fundamental principles for the organization and functioning of the educational system (República de Cabo Verde 29 de Dezembro). It continued the investment in eradicating adult illiteracy rate and promoting basic schooling in all human settlements, in particular in rural areas. Illiteracy rate dropped from 38% in 1990/1 to 25% in 2001. The 2010 population census indicated that the literacy rate for the over 15 year old individuals had reached 82.8% in the archipelago. However, it varied by location and age range. In urban areas, the adult literacy was 91.7% for males and 83% for females whereas in rural.

**Box 2 – Educational Reform in Cape Verde (cont.)**

areas the percentage dropped to 82,9% for males and 67.6% for females. Moreover, the older the age range the lower the literacy rate: 96.9% for 15-24 years old, 91.7% for 25-44 years old, 64.6% for 45-64 for 45-64 years old, and 30% for older than 65 years old. The net enrolment in basic education increased from 89% in 1990/91 to 96% in 2000/1 and 95.8% in 2005/6). By 2015, it is believed that Cape Verde will achieve the second millennium development goal defined by the United Nations (i.e. universal education), that is, all Cape Verdean boys and girls will be able to complete a full course of primary schooling (RCV 2010). A significant contribution to this achievement was the liberation of the child from domestic chores (i.e. fetching water and organic material for fuel) with the extension of the electric and gas system, and domestic supply of drinking water, as well as the closeness of basic schools to the human settlements and the implementation of a social program in which a meal is offered, funded by the World Food Program (1976-2006), Government, and, to a small degree, by parents (República de Cabo Verde-MEVRH 2002, RFB-ME 2007). Pre-primary education and secondary schooling were increasingly funded in order to meet their high demand. Pre-primary education was urgently needed to free mothers who could no longer depend on their family members (e.g. grannies or siblings) to care for their younger children. Its cover increased from 40% in 1990/1 to 52.5% in 2000/1. Secondary schooling was also needed to meet the increasing demand: from 20.3% in 1990/1 to 54% in 2000/1. As a consequence of the measures implemented to reform the secondary education, the failure rate decreased from 26% (1990/1) to 22% (1997/8) (Neves 2007, Pina 2009).

**3.1.3 Third Vintage: Political Migration**

The independence of the Portuguese African colonies (1975) caused a second cycle of migration. No statistical data are published on the number of Cape Verdeans who comprised the 500,000-1,000,000 individuals who moved into Portugal in the wake of independence process. The 1981 Census indicates that 53.5% of the Cape Verdeans who lived in Portugal in 1981 migrated between 1974 and 1981 (Saint-Maurice, Pires 1989). However, as shown below, it is not possible to jump to the conclusion that percentage is related to the independence of the Portuguese-speaking African colonies.

The group who migrated because of the independence is mainly composed of people who thought themselves close to the Portugal, either by families or professional ties. They felt there was no social space left for themselves in the newly independent Cape Verde, governed by an new elite who embraced the Pan-Africanism project. The new leadership did not trust the members of the colonial elite who did not oppose colonialism. The old elite did not share the Marxist-Leninist political views of the new political elite who controlled the political power in Cape Verde, in particular their political amalgamation with Guinea Bissau (typically African in attitudes and policies). They did not envisage any future for a country which was small, deprived of valuable resources (e.g. minerals), and frequently beset by droughts. They did not want to lose their social benefits (retirement) and labour rights as civil servants acquired by their working years under the Portuguese State (Batalha 2004, Batalha 2008b).

Those individuals who held mid-level administrative positions in the colonial administration (i.e. civil, fiscal, post administration), banks and private companies in Guinea-Bissau, S. Tome and Principe, Angola and Mozambique or in Cape Verde were mostly integrated into the middle and higher professional hierarchy of the Portuguese public administration or services under the aegis of the Portuguese state, according to their previous labour experience in the colonial administration. (Batalha 2008b, Saint-Maurice 1997).

The process of independence brought about abrupt changes in the law of nationality. Until 1975, the individuals born in a Portuguese territory – Portugal and its colonies – were considered Portuguese citizens (DL 2098/1959, July 29). The end of the Portuguese colonial empire raised the issue of whether or not people born in the former colonies should keep the Portuguese nationality. In 1975 a new nationality law was enacted (DL nº308-A/75, June 24) which denied the right of Portuguese nationality to those who were not born in Portugal (i.e. Continental Portugal, Madeira and Azores) or were not descendants of a parent, grand-parent or great-parent who was born in Portugal. The law allowed the individuals born in former colonies (including spouses and underage children) who had lived for more than five years in mainland Portugal or in its islands (Madeira and Azores) to retain the Portuguese nationality. Even so, many Cape Verdeans living in Portugal at the time were unable to keep the Portuguese nationality. Unawareness prevented them from applying for the Portuguese citizenship as recommended by the law. In the blink of an eye, people who were Portuguese nationals became foreigners because they were no longer colonial subjects. This was the case for a significant number of the 8,600 Cape Verdeans nationals who indicated in the 1981 Population Census that they had arrived in Portugal before 1974.

### **Box 3 – Evolution of Nationality Law in Portugal**

The Portuguese nationality law has introduced several changes (e.g. reduced requirements and simplified procedures) since the change of the principle of *ius solis* for *ius sanguinis*. From 1975, this principle was the basis of the acquisition of Portuguese nationality. Non immediate acquisition implied requiring for the nationality, upon meeting the requirements.

Law 37/81, October 3, regulated through DL 322/82, August 12 and DL 253/94, October 20, DL 37/97, January 31, is the first law post-dictorship to regulate Portuguese nationality. In general, individuals born in Portuguese territory, offspring of foreign parents (excluding offspring of foreign serving in diplomatic services), whose foreign parents were living for at least six years and not working for the country of origin could apply. Under 17 year old or handicapped whose parent acquired Portuguese nationality, formal marriage with a Portuguese national, previous loss of nationality due to an incapacity period, adopted, residents at least six years, with moral and civil behavior as well as financial independence, could also be granted nationality.

Law 25/94, August 19, modified L37/81. Individuals born in Portuguese territory, offspring of foreign parents, could apply as long as their parents had lived with a valid residence permit for at least 6 years. Foreign individuals married with a Portuguese ought to wait 3 years before applying. Individuals living in Portuguese territory at least six years with a valid staying permit, proved relation with the national community, civic behavior, financial independence could also apply.

**Box 3 – Evolution of Nationality Law in Portugal (cont.)**

The Organic Law 2/2006, April 17, regulamentated through DL 237 A/2006, December 15, modified L37/81, reinforcing the principle of *ius solis* in order to solve the condition of individuals who were born in Portugal and did not hold Portuguese nationality. Individuals born in Portuguese territory could apply if at least one parent was born in Portuguese territory and holds residence permit, regardless of the type, at the birth, or one parent holding residence permit for at least for five years, or is stateless. Nationality is also granted by application to individuals married informally for 3 years, under 17-year-old individuals whose parent has acquired Portuguese nationality, individuals with legal residence for at least 6 years, knowledge of Portuguese language, no conviction for a similar period or more than 3 years by Portuguese law, individuals born in Portuguese territory whose parents have lived in Portugal for the last 10 years immediately before the application (not required for a 5 year residence permit), or under 17 year-old individuals (with knowledge of Portuguese language and not convicted for a period equal to or longer than 3 years) whose parent has legally lived in Portugal for 5 years, or under 17 year-old who has concluded the 1<sup>st</sup> cycle of the Portuguese schooling.

Thousands of children were born in Portugal and have always lived in Portugal and did not hold the Portuguese nationality. As holders of a permit residence they couldn't, for instance, participate in sport competitions as Portuguese. As they live in Portugal, they cannot participate in the competitions for the country which gives them nationality either.

For the migrant, the changes introduced to simplify the procedures are important because they often perceived the renewal of the residence permits and the acquisition of nationality as a long, complex, painful and stressful application. The simplification of the procedures, and the acceleration of the granting of documentation, influences migrants' economic, social and political lives. They are more easily granted bank loans, credit cards, installments, social benefits (e.g. social housing), political rights (e.g. voting for local government in the case of some foreign nationalities and central and European institutions in the case of nationals).

They are able to travel, work and do business in the European Union, amongst others. The juridical status might not change the way the natives regard the migrants but it certainly gives the migrants more tools to fight discrimination and improve their well-being. Like one of the interviewees said regarding the acquisition of nationality: "*you do not abandon your migrant condition, but you're not a foreigner any longer. You are empowered to fight discrimination*".

Since the enforcement of the new nationality law, the number of foreign individuals granted Portuguese nationality has significantly increased, including Cape Verdeans (Figure 1, Appendice B).

The high volume of people from African colonies who moved into Portugal following independence obscured the labour migration trend. Despite its decrease in numbers, labour migration proceeded under the unstable political situation which Portugal went through following the end of the dictatorship and the process of decolonization (Saint-Maurice 1997, França 1992).

In 1981 The *Serviço de Estrangeiros e Fronteira* (SEF) estimated 22,842 Cape Verdean nationals were living in Portugal, whereas the *Instituto Nacional de Estatísticas* (INE) estimated a lower number (18,557) ( IESE/GEOIDEIA 1998, Saint-Maurice, Pires 1989). The discrepancies in figures between these two public institutions are due to the population each of them addresses. SEF, the national service responsible for borders and foreigners (*Serviço de Estrangeiros e Fronteiras*), address foreigners who are a position to apply for the resident permit, and do not miss that chance because of the advantages of being a documented immigrant. INE, the national statistical institute, addresses all Cape Verdeans who complete the population census form. As the census is not seen as something that

affects the migrant's life, and sometimes they are quite complex to fill in, a considerable number of Cape Verdeans avoid filling it in<sup>5</sup>.

This migrant group is believed to be mainly composed through labour migration rather than political-induced forced migration. As referred previously, Cape Verdeans who migrated during the independence process reacquired their Portuguese nationality in order to be able to claim their rights to be professionally reintegrated in the State services. Even taking into consideration that there might be Cape Verdeans who migrated because of the independence but were not able to claim Portuguese nationality (e.g. those had migrated for other Portuguese-speaking African colonies but did not work for the Colonial Administration), this group does not account for the 22 thousand Cape Verdean nationals estimated by SEF.

Second, unlike the other Portuguese-speaking African colonies, Cape Verde was not ravaged by war, or conflicts, during its transitional period to independence. The post independence period was also characterized by a stable political life, in spite of having adopted a single party political system.

Third, this group shows characteristics usually assigned to labour migration, such as homogeneity in terms of age and education. The group is composed of economically active age individuals (55.4%), amongst whom the rate of unemployment is low. Professional insertion in the construction sector (48%) prevails, a usual feature of migrant population whose aim is associated with physical survival. The education level is very low, taking into account that 90% have completed the basic education at the most and that only 10% are below 12 years old. Lastly, as migration assumes a more permanent character, the household acquires a family dimension, that is, couples with their offspring (Saint-Maurice, Pires 1989).

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<sup>5</sup> Neither of the estimates offered is close to the reality, however. In 1994, a study conducted on the shantytowns located in Lisbon and the Peninsula of Setubal identified 40,904 thousand Cape Verdeans (CEPAC 1995). Bearing in mind that not all Cape Verdeans lived in shantytowns, the number of Cape Verdeans living in Portugal at that year was much higher. This is not, however, what the SEF estimates point to. For that year, SEF estimates a lower number (36,560) of Cape Verdeans nationals residing in Portugal. Even taking into consideration that there might be Cape Verdeans who were Portuguese citizens living in the shantytowns, it seems that SEF estimates are a little bit far from the reality.

As a matter of fact, the SEF recognizes that its estimates do not reflect the number of foreigners living in Portugal. If undocumented migrants were to be included, the number of foreigners would rise significantly. In the two extraordinary regularization procedures of undocumented immigrants, conducted between October 1992 and March 1993 (Decree Law 212/92, October 12), and between June and December 1996 (Law 17/96, May 24), the number of Cape Verdeans who applied were respectively 6,778, and 6,872 (Malheiros, Baganha 2001). In 2001, the Government created an exceptional procedure to legalize foreign workers who had not been expelled, convicted to sentences longer than 6 months and identified as inadmissible in the SIS or SII systems. During this procedure (closed by Decree Law 34/2003, February 25), 8,674 thousand Cape Verdeans workers were legalized (SEF 2004)).

### 3.1.4 Fourth Vintage: Mixed International Migration

In mid-1980s, a resumption of labour migration took place. In 1991, SEF estimated 29,743 Cape Verdean nationals and INE estimated 15,714 Cape Verdean nationals plus 15,361 Cape Verde-born Portuguese. Ten years later, the number of Cape Verdean nationals registered at SEF increased 1,6 times (49,930) whereas those interviewed by INE doubled in the case of Cape Verdean nationals (33,145) and decreased 2% in case of the Cape Verde-born Portuguese (12,444). The study conducted on Cape Verdeans living in Portugal in 1997 offers higher estimates: 83,000 thousand Cape Verdeans (SEF 2001, INE 2001).

The traditional immigration countries in Europe increasingly set restrictive policies to migration following the oil crisis in 1973 and 1979. On the other hand, Portugal became a member of the European Union in 1986. This resulted in new investment and, ultimately, labour demand. Portugal received a huge amount of money through the European structural funds scheme (FEDER – European Regional Development Fund; FSE – European Social Fund; FEOGA-O – Agricultural Guidance and Guarantee Fund)<sup>6</sup>, which would invest in infrastructural works, among others. This kind of investment required a great deal of elementary qualified labour.

Migrant perceived Portugal as a platform to the European countries. Documentation was more easily obtained in Portugal both in terms of permission to remain (called a 'staying permit') and the acquisition of Portuguese nationality, due to the special agreements between Portugal with its former African colonies. The staying permit, allowing an immigrant to move along Schengen area for a short period (Regulation (CE) 1030/2002, 13 June 2002) and even work in countries where ineffective control exists, gained relevance in recent times to migrants moving out to a third country. The European Union pressed, however, Portugal to introduce successive changes in order to restrict its immigration policy (see Box 4 for changes in immigration law in Portugal)

This fourth vintage is characterized by the same pattern of professional integration as their fellows during the 1950s to mid 1970s, that is, construction and public works for males or industrial and domestic cleaning services for females. Women also worked as fishmongers until the late 1990s, a period in which fiscal controls prevented them from continuing to sell fish and compelled them to seek work in low-wage activities such as cleaning (private homes, public services, shopping malls), kitchen's assistants or factory workers (Fikes 2010).

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<sup>6</sup> Since its accession to the European Community, (1986), Portugal has been supported through the Structural Funds, defined in the EU Framework (1986-8, CAFI 1989-1993, CAFII (1994-1999) and CAF 2000-2006 and CAFIV (2007-2012).. The aim of this financial support is to promoted a balanced development (<http://www.qca.pt/fundos/estrutura.asp>)

**Box 4 - Evolution of the Portuguese Immigration Law**

	For centuries, hundreds of thousands Portuguese have left their motherland in search of resources which would improve their well-being. Due to its traditional role as an emigration country, Portugal took time to acknowledge its new function in the migratory system (i.e. immigration country) and, as a consequence, to design immigration policies.
DL 264-B/81, September 3	Criteria for residence permit: respect for the laws regarding foreigners, livelihoods, reason for staying, family relationship with residents in Portugal
DL 59/93, March 3	<i>Changes</i> Criteria for residence permit: <b>valid residence visa, presence in national territory</b> , inexistence of any fact which would prevent Portuguese authorities from issuing the permit
DL 255/98, August 8	<i>Changes</i> Family reunification: a foreign resident, holder of a valid resident permit for more than one year, can claim reunification with a family member who does not live in Portugal. «family member» means a spouse, a descendant under 21 years old, minors adopted by both spouses, dependent parents, in-laws or minor siblings
Law 97/99, July 26	<i>Changes</i> Family reunification: a spouse or a person with has been married to the sponsor for more than two years
DL 4/2001, January 10	<i>Changes</i> A staying permit may be granted to foreigners who have not an adequate visa but hold a labour contract including information from the Labour Inspection Institute. The foreigner should not have been convicted for more than 6 months in jail or included in the European or national information system as an inadmissible person. If expelled from the country, the deadline that forbids his/her entry should have expired. Family reunification: in exceptional cases, extended to a family member who already lives in Portugal as long as the sponsor has proof that they live in adequate housing and income to accommodate the family member.
Law 23/2007, July 4 (cancels previous legislation)	<i>Changes:</i> Criteria for residence permit: valid residence visa; inexistence of obstacles to concede a visa; presence in Portuguese territory; financial independence; housing; register in the social security (if applicable); no conviction greater than 1 year in jail; deadline forbidding entry in national territory expired; not included in the Schegen Information System, nor classified as non admissible in the SEF Information Integrated System. Family reunification with those family members already living in national territory loses its exceptionality, as long as that member has entered in Portugal with a valid document and is a dependent of the sponsor. Besides the spouse, children (biological or adopted), dependent parents, in-laws or minor siblings, duly attested unmarried partners, and adult unmarried offspring who are studying in Portugal are also eligible for family reunification.
<b>Note:</b> This box aims to provide evidence of how a non-EU foreigner who entered Portugal might apply for a residence permit. For this reason, the criteria required to enter and leave Portugal are not specified	

In terms of labour relations, there are people who are under the formal labour market (i.e. signature of a contract and payment of social contributions), others who work in the informal labour market (i.e. no contract and no payment of social contributions), and a mixture of those two situations. These labour relations influence their juridical status. They cannot apply to residential permit without proving they have a financial situation which allows them to keep themselves in

Portugal. The undocumented condition exposes the migrant not only to labour exploitation but also to psychological and physical stressful conditions, as shown in Box 5.

**Box 5 - The world of the undocumented migrant**

Maria has just arrived in Portugal when she becomes aware that she is pregnant. She does not dare go to the health centre in case she is spotted as an undocumented migrant. Suspicion or unawareness prevents her from benefiting from the prenatal care offered by the National Health Services institutions (i.e. hospitals and health centres) to every migrant, whether they are a holder of a Portuguese valid document or not. At birth, she borrows the health card of her friend to give birth to her baby in the hospital. She does not anticipate the consequences of her act.

When she tries to register the baby she cannot register the baby as her offspring. In the hospital record, the mother of her baby is her friend and the father is her husband. Her friend compels her to solve the problem. But the solution involves going through a long judicial process which she eventually faces. She is fined 3 thousand euro. She has no money to pay. Therefore, she appeals invoking her vulnerability and the health problem of her elder sister and the sentence is cancelled.

Carla is not so lucky. She lives in Portugal for some months when she discovers she is pregnant. After some months of pregnancy, she begins having stomach aches. Aware that the Portuguese law allows undocumented pregnant migrants to benefit from free medical visits, she looks for medical help. In the general hospital, she is prescribed medicines. Even without pains, she continues not feeling well. After some days she goes to a child-specialized hospital. As she needs an excuse to obtain a visit in this kind of hospital, she lies about her presence in the area. She submits to a deep examination, after which she finds that the fetus is dead. She feels that her «baby» could have been saved if she was not an undocumented migrant at the time.

Students are another type of migrants prevailing in this vintage. Following a trend which was started in the fifties, adolescents and individuals in early adulthood migrated into Portugal to attend higher education institutes under the cooperation agreement on education and training of human resources signed November 4, 1976 between Portugal and Cape Verde. Despite the improvement in the educational sector, the educational reforms in the first decades were concentrated mainly to reduce the rate of illiteracy. Until recently, the majority of the Cape Verdean students needed to travel either to another country or to another island to obtain a university degree. There was no public university in Cape Verde, and the private institutes in place were concentrated on the island of São Vicente<sup>7</sup>. A significant number of these students were incorporated into the Portuguese labour market either to complement their low scholarships or to support themselves after completing their university degree. Only recently has there been a return movement of these students to Cape Verde. They gain awareness that Cape Verde offers them better professional and social opportunities than they have in Portugal.

<sup>7</sup> Some of the private institutes in place before the installation of the Cape Verdean University (November 2006) were *Instituto Superior de Ciências Económicas e Empresariais* (1991), *Universidade Jean-Piaget* (2001), *Instituto de Estudos Superiores Isidoro da Graça* (2002), *M-EIA – Mindelo Escola Internacional de Arte* (2004) e *Instituto Superior de Ciências Jurídicas e Sociais* (2006).

Cape Verdeans who moved into Portugal under the health cooperation programme are another group to be considered. The cooperation agreement allowed, since 1976, a maximum of 300 individuals a year individuals to be evacuated into Portugal to receive treatment which Cape Verde institutions are not able to offer (Decree 24/77, 3 March 1977 and Decree 129/80, 18 November 1980). This limit is usually exceeded as shown by statistics: 345 in 1999, 300 in 2000, 305 in 2001, 325 in 2002 (Ministério da Saúde). Despite the investment in health sector since independence, Cape Verdean have only two central hospitals (Praia and Mindelo), and three regional hospitals (Sao Filipe, island of Fogo, Ribeira Grande, island of Santo Antao, and Santa Catarina, island of Santiago) which are not equipped to address some specific interventions (e.g. cardio-thoracic, neurosurgical, neoplasia, and ophthalmology). The majority of this group did not return to Cape Verde, remaining in Portugal in a precarious situation, depending on family, friends or private (e.g. charities) or public institutions (e.g. hospital social services, social security) for accommodation, feeding, medicines, and transport to medical visits. The person who accompanies the sick people usually tries to find employment in Portugal, to earn money and to survive (Borges 2011).

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Cape Verdean migration to Portugal over half a century meant a transition between countries characterized by different geographies (e.g. continental *versus* insular, temperate *versus* dry climate) and histories (e.g. metropole *versus* colony, Europe *versus* Africa) which have influenced their respective human development level. As the time went by, the differences in human development were mitigated, however. In 2010, the human development index was less than 0.3 between the two countries (Table 4).

When Cape Verdean migration to Portugal gained visibility (late 1960s), the survival of offspring to adulthood was the main universal parental goal. Despite the lack of data, studies suggest a high infant mortality for that period, in particular during the periods of famine. Their higher vulnerability caused the children to be the main target of the famines - induced by periodical and recurrent droughts (Carreira 1984, Sant'Anna in Rocha 1987). Sarmiento calculated that infant mortality accounted for almost half of the mortalities between 1950 and 1952. This high rate of mortality was caused by congenital, infectious and nutritional problems (Sarmiento 1954). The increasing adoption of social policies has contributed to the reduction of the mortality among newborns, infants and children. For several decades, no reliable data was made available on infant and under-five mortality to our knowledge. Newspaper and politicians proposed rates based on no statistical data and sometimes mixing neonatal, infant and under-five mortality. For instance,

three institutions offer different values for infant mortality in 2000: 54.6 (CIA 2000), 26.2 (RCV 2008), and 32.5 (United Nations in Cape Verde).

**Table 4** - Human Development Indicators for Portugal and Cape Verde

Development Indicators	Portugal	Cape Verde
<b>Human development index</b>		
Human development index value, 2010	0.795	0.534
HDI rank, 2010 (out of 169 countries)	40	118
Life expectancy at birth (years), 2010	79,1	71,9
Adult literacy rate (% ages 15 and above), 2005-8	95.8	85.9
GNP per capita (PPP 2008 US\$)	22,105	3,306
<b>Education</b>		
Net primary enrolment ratio (% of primary school-age population), 2001-9	98.9	84.4
Net secondary enrolment ratio (% of secondary school-age population), 2001-9	87.9	56.7
Repetition rate, all grades (% of totally primary enrolment in previous year), 2005-8	10.2	11.6
Pupil-teacher ratio (number of pupils per teacher), 2005-8	11,7	24,4
<b>Health</b>		
Physician per 10,000 people, 2000-9	34	6
Infant mortality per 1,000 live births, 2008	3	24
Under-five mortality, 2008	4	29
Maternal mortality ratio, 2003-8	11	210
Births attended by skilled health personnel (%), 2000-8	100	78
<b>Enabling environment</b>		
Public expenditure (% of GDP)		
Education, 2000-7	5.3	5.7
Health, 2000-7	7.1	3.4
Net inflows of foreign direct investment (% of GDP)	1.5	13.3
Total Official Development Assistance (% of GNI), 2008	0.27	12.8
Total remittances Inflows (% of GDP), 2008	1.7	9.7

**Source:** Adaptation from *Human Development Report 2010 – The Real Wealth of Nations: Pathways to Human Development*, New York: United Nations Development Programme

In 1995, the Cape Verdean Health Ministry estimated 57.9 for infant mortality and 76.8 for under-five mortality in 1995<sup>8</sup>. Five years later, those rates almost halved: 26.2 for infant mortality and 31.9 for under-five mortality (INE-CV 2005). At present Cape Verde is claimed to be the only African country to show low rates of infant and under-five mortality: «A few countries in the African Region, such as Cape Verde [...], have very low maternal, neonatal and child mortality rates that are comparable with those in industrialized countries. If progress is going to be made in improving maternal, newborn and child health in this Region, these successes need to be replicated where possible and primary health-care systems in these countries need to be revived as conduits to deliver essential care and treatment (WHO 2006: 18).

<sup>8</sup> Data on under-five mortality for 1995 is not very clear. It says that infant mortality was 57.9 (1,000 live births), 1-4 year-old mortality was 4.3 and under-five mortality was 76.8 (1,000 live births).

The Cape Verdean Health Ministry reported infant mortality was 141 for boys and 127 for girls in 2007. For both sexes, early neonatal (0-6 days) and postneonatal (28-365 day) mortality accounts for more than 90% of infant mortality. This prevalence of male infant mortality is consistent with the evolutionary principle of male-biased sex ratio at birth. As mentioned in chapter 2, all over the world birth data consistently indicates an excess of males. Evolutionary theory explains this male-biased sex ratio by differential sex mortality in the postnatal period. After adjusting for gestational age and body size, male mortality is higher than female mortality in early life, because male is more vulnerable to environmental stresses (i.e. malnutrition combined with infectious and diseases). In early life, male physiology is less robust than that of females. This differential sex-mortality, which is aggravated in neonates with low weight and born premature, is favoured until the offspring is sufficiently independent to allow mother to reconceive (Wells 2000).

At present, Cape Verde's infant mortality shows values similar to those of Portugal in the early 1980s. Moreover, its under-five mortality is close to the values shown in Portugal before World War II. At the end of Portuguese dictatorship (1974), under-five mortality in Portugal was no longer a problem (1.9). The high rates of infant mortality were also decreasing fast (from 77.5 in 1960 to 38.9 in 1975 and 10.9 in 1990). At the turn of the millennium, the infant mortality had dropped to one digit (5.5 in 2000). In 2007, the infant mortality was 3.53 for boys and 3.35 for girls (INE 1960-2000, INE online).

The levels of infant and under-five mortality indicated that Portugal has already shifted to the second universal parental goal, that is, the development of the child's behavioural capacity for economic self-maintenance in maturity. Cape Verde is in a transitional phase between the first and second universal parental goals. Thus, Cape Verdeans migrating to Portugal face a different social environment which influences parenting. As the development gap between Portugal and Cape Verde is bridged, the social environment-induced differences in parenting are also narrowed.

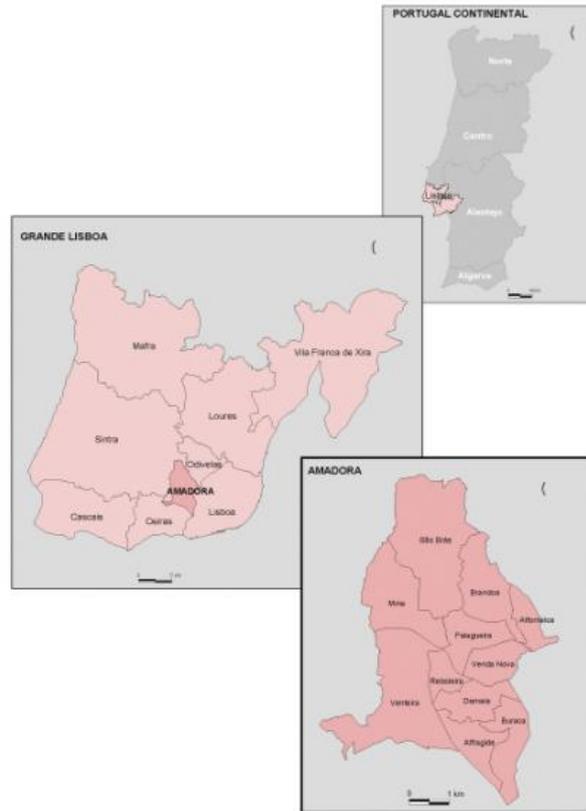
### **3.2 The settlement**

The four vintage groups showed different patterns of settlement in "Grande Lisboa" (Great Lisbon), an area of the Lisbon region which comprises the municipalities of Amadora, Cascais, Lisboa, Loures, Mafra, Odivelas, Oeiras, Sintra, and Vila Franca de Xira (Map 2).

This section gives emphasis to "Great Lisbon" as this region hosts the majority of the Cape Verdeans living in Portugal. Figure 4 shows Cape Verdeans who lived in Portugal in 1997. This covers all vintages. However, bearing in mind that the

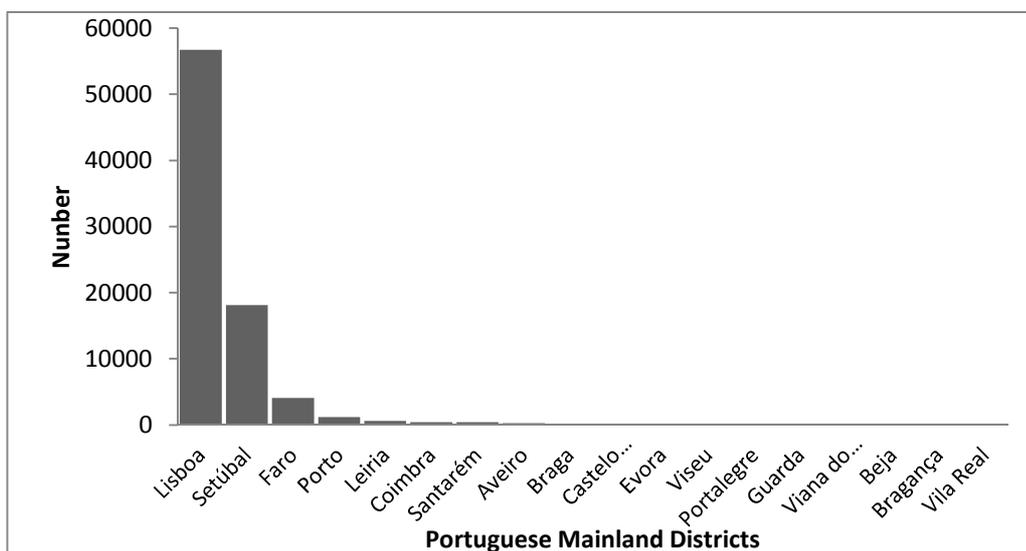
majority arrived after the Independence (21,008 in 1981 to 29,743 in 1991, and 49,930 in 2001), one might conclude that the estimates reflect the spatial distribution of the fourth vintage.

**Map 2** - Map of the Grande Lisboa and its municipalities, emphasizing the boroughs in the municipality of Amadora



**Source:** Câmara Municipal da Amadora

**Figure 3** – Distribution of Cape Verdeans in mainland Portugal



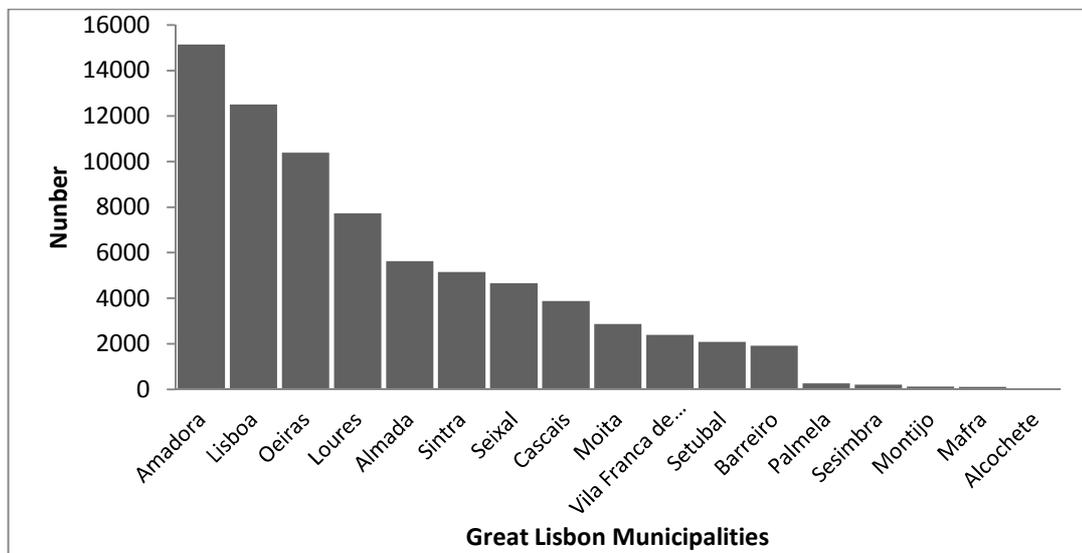
**Source:** Adaptation of IESE/GEOIDEA, 1998, *Estudo de Caracterização da Comunidade Caboverdeana Residente em Portugal*, Relatório Preliminar. Lisboa: Embaixada de Cabo Verde em Portugal

Three patterns of settlement stand out. Cape Verdeans from the first and fourth vintages settled in the capital, either as the university students who lived in hall residences, rented a room in the house of a Portuguese family, or shared a house with colleagues; or as the workers who rented a room in a cheap boarding house. The historical neighbourhood of São Bento was one of areas which hosted many Cape Verdeans from the second vintage. The streets of São Bento, including Poço dos Negros e Poiões de São Bento, are still remembered as having been until mid-1980s an extension of the islands of Cape Verde. Manuel Correia, a former union leader who migrated in 1969, recalled when together with two friends he created a welcoming committee to help Cape Verdeans who arrived in Lisbon. They went to the port to welcome their fellow countrymen. They helped them to settle in the boarding houses of São Bento and to find a job in the construction company where he worked, *J. Pimenta*, or in the public works for the Lisbon's underground. From 1980s, Cape Verdeans began leaving São Bento. Men migrated to wealthier European countries or moved into other municipalities when their families arrived from Cape Verde (Catulo 2006, Oliveira 1973).

The Cape Verdeans who migrated in the wake of the independence also settled in middle-class neighbourhoods of city, mixing with the Portuguese natives with whom they share some cultural similarities. Over time, some moved out to the middle-class neighbourhoods of another LMA municipality where the housing prices were more affordable and the housing conditions were better (Batalha 2008a)

Many Cape Verdean workers preferred to settle in adjacent areas of the working sites, in particular those who aspired to save money, or were less familiar with Portuguese cultural codes and felt more comfortable sharing accommodation with people from their own country or island. This concentration also prevented them from some forms of racial discrimination. Portuguese natives often classified the latter as "uncultured blacks" (Batalha 2008b).

When men began sending for their family in 1970s, in particular women and children, larger accommodation was required. Those who found it difficult to rent accommodation ended up occupying vacant land on the outskirts of the capital (e.g. Pedreiras do Hungaros in Alges, Cova da Moura in Amadora) where they built their own houses. This type of informal settlement would increasingly be adopted following the independence of the Portuguese-speaking African colonies. Friends and family passed word along of vacant land to build housing to the newcomers or those who were seeking a place to live (Horta 2008).

**Figure 4** – Distribution of Cape Verdeans in Grande Lisboa

**Source:** Adaptation of IESE/GEOIDEA, 1998, *Estudo de Caracterização da Comunidade Caboverdeana Residente em Portugal*, Relatório Preliminar. Lisboa: Embaixada de Cabo Verde em Portugal

The capital gradually gave way its hosting role to the surrounding municipalities (Amadora, Oeiras and Loures). The real estate market price increases and the consolidation of the capital as a provider of services, caused the gradual peripheralization of the immigrant's settlement. Nowadays, Lisbon mainly hosts Cape Verdean individuals or couples. Cape Verdean families tend move out to the municipalities surrounding Lisbon to live in middle-class neighbourhoods or shantytowns.

In 1994, 40.904 Cape Verdeans were reported living in one of the 106 shantytowns located in Lisbon (81%) and the Peninsula of Setubal (19%). Amadora (32%), Oeiras (24%), and Lisboa (10%) account for more than half of the municipalities hosting Cape Verdeans living in shantytowns (CEPAC 1995).

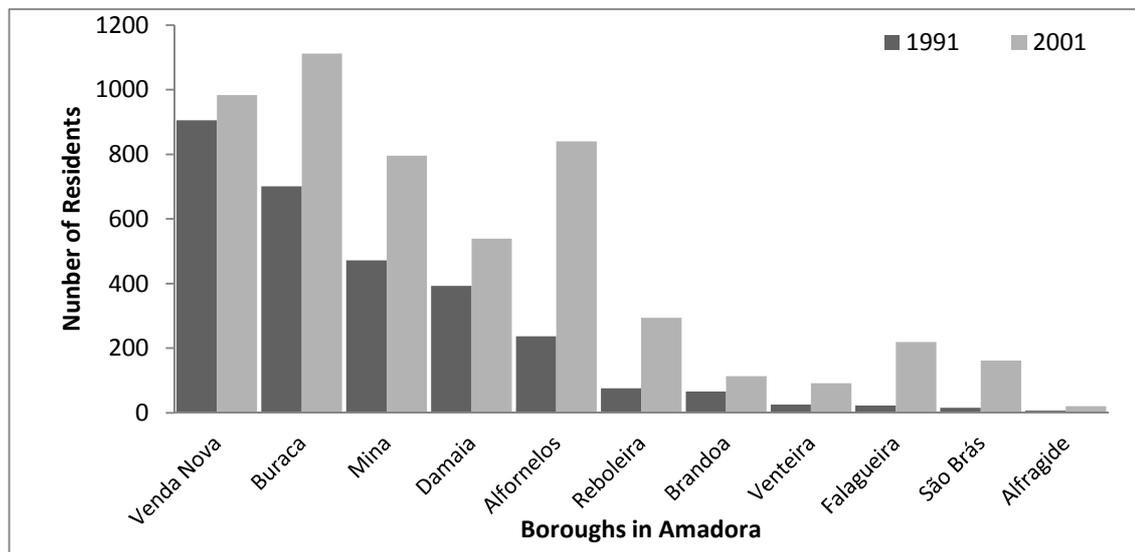
### 3.3 Cape Verdean Pathways in Amadora

Amadora is one of the eight municipalities of the Great Lisbon area (Map 2). It occupies an area of 24 km<sup>2</sup> and is divided in 11 boroughs. This is the smallest municipality and has the highest population density (7,390 inhabitants/km<sup>2</sup>) in the Great Lisbon. Migration has contributed significantly to the population density.

Between 1950 and 1970, the construction of transportation infrastructures (underground, railroad, ring-roads, industrial parks, gas, water and electricity), the shortage and prices of the housing in the capital, its proximity to the capital and the excellent means of transportation to the capital (10 minutes travel by train) and to the surrounding municipalities (in particular Oeiras), has attracted people from

other Portuguese regions who migrated into the Great Lisbon as well as people who left the capital in search of affordable housing or recent built housing (CESIS 2004). The rate of population growth slowed down from the 1970s. The estate and housing speculation drove away potential people to Sintra, an adjacent municipality. This situation seemed not to apply to the foreign population, as their presence increased from this period. Amadora is the municipality which receives the highest volume of foreign people. In 2001, the foreign population account for 7.1% of its population. If the undocumented migrants were included, then the percentage would likely increase to 9% (CESIS 2004, CMA 2008).

**Figure 5** – Cape Verdeans in Amadora, 1991 and 2001



**Source:** Adaptation of the Census estimates, INE, XIII and XIV *Recenseamento Geral da População e da Habitação*, Lisboa: Instituto Nacional de Estatística

The foreign population was mainly concentrated in four boroughs (Venda Nova, Brandoa, Mina and Damaia). However, the 2001 population census showed a wider spatial distribution. This might be related to the diversification of the composition of foreign population as well as the resettlement process from the shantytowns and deprived neighbourhoods. Out of the foreign population, nationals from the Portuguese-speaking African countries prevailed in the municipality (82%), followed by nationals from Brazil (7.5%), another Portuguese-speaking country. Two groups with historical and cultural links to Portugal. Asiatic (i.e. Chinese and Indians) and Eastern Europe nationals are also present. Throughout the 2000s, these groups have accounted for the increase of foreign population in the municipality, the diversity of population and the diversity of residential destinations in the municipality (CMA 2008).

Cape Verdeans were, and still are, the main foreigner community in the municipality. They are concentrated essentially in five boroughs: Venda Nova,

Buraca, Mina, Damaia and Alfofnelos. However, their spatial distribution has changed between 1991 and 2001. Venda Nova, the main host of Cape Verdean population in 1991, was replaced with Buraca. Alfofnelos, the fifth main host of Cape Verdean population in 1991, overcame Mina and Damaia (Figure 6).

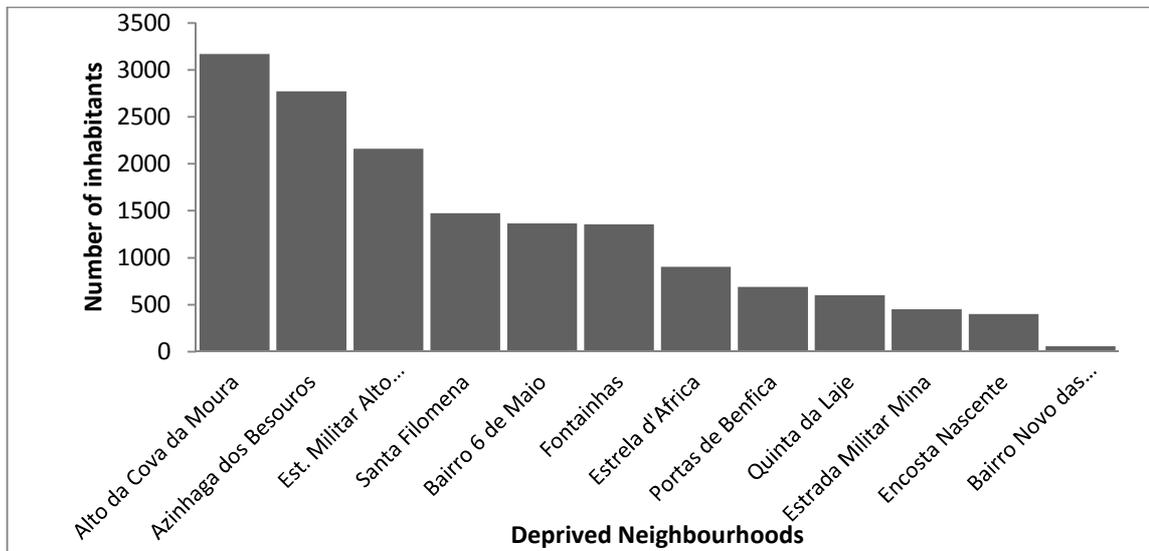
This growing distribution through the various neighbourhoods is due to the impact of several programs implemented to resettle residents from deprived neighbourhoods. In 1993, in search of a solution for the housing problems, the Portuguese Government created a special initiative, the *Programa Especial de Realojamento* (PER). This program aimed to eliminate shantytowns in the metropolitan areas of Lisbon and Porto through resettlement of families to appropriate housing. The Government would support the building or acquisition of housing aimed at relocation of the shantytowns households (DL 163/93, May 7, modified by Law 34/96, August 29, DL 1/2001, January 4, and DL 271/2003, October 28). All municipalities located in metropolitan areas of Lisbon and Porto were invited to adhere.

Amadora was the last municipality to adhere in the LMA (1995). By adhering to this initiative, the City Council engaged itself to register the inhabitants of the shantytown, relocate them in appropriate housing and demolish their shanties. It identified 35 deprived neighbourhoods, in which there were 4,855 shanties occupied by 6,138 households (21.4 thousand people) (CMA online).

In 1994, CEPAC identified 12 deprived neighbourhoods in Amadora, hosting African population. Six of these neighbourhoods were considered as "African villages" (Figure 7), as the number of Africans was higher than a thousand. This is a huge number if we bear in mind that many Portuguese boroughs are inhabited by a lower number of people (CEPAC 1995).

Those deprived neighbourhoods showed different characteristics. Six of them were a concentration of shanties or other type of temporary and weak housing, usually inhabited by individuals without family who arrived in the 1980s (Azinhaga dos Besouros, Santa Filomena, Bairro 6 de Maio, Fontainhas, Estrela d'Africa and Quinta do Laje); three were a concentration of shanty-type housing or low cost precarious housing inhabited by families who arrived previously (Alto da Cova da Moura, Estrada Militar Alto Damaia and Estrada Militar Mina); two were a mixture of both types (Portas de Benfica and Encosta do Nascente); and one was social housing, usually inhabited by the families of the second vintage who were transferred from the deprived neighbourhoods they previously inhabited (Bairro Novo das Fontainhas).

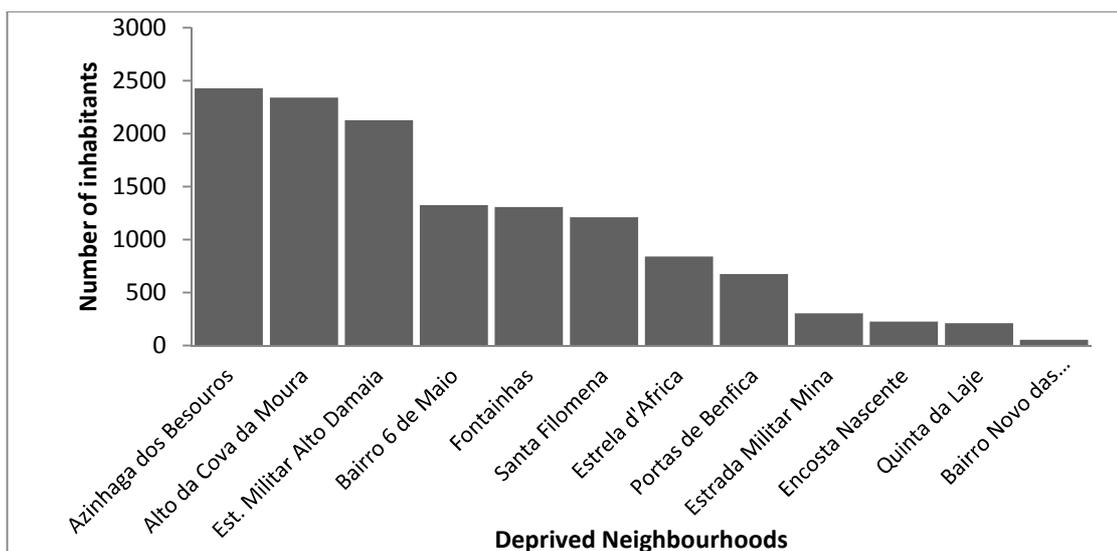
**Figure 6 – Deprived Neighbourhoods in Amadora, 1994**



**Source:** Adaptation of CEPAC, 1995, *Os Números da Emigração Africana – Os Imigrantes Africanos nos Bairros*, Cadernos CEPAC 2. Lisboa: Departamento de Estudos e Documentação sobre a Imigração Africana em Portugal/Centro Padre Alves Correia

Cape Verdeans were reported in the study to concentrate essentially in Azinhaga do Besouro (19%), Cova da Moura (18%), Estrada Militar do Alto da Damaia (16%), Bairro 6 de Maio (10%) and Fontainhas (10%).

**Figure 7 - Cape Verdeans in Deprived Neighbourhoods, 1994**



**Source:** Adaptation of CEPAC, 1995, *Os Números da Emigração Africana – Os Imigrantes Africanos nos Bairros*, Cadernos CEPAC 2. Lisboa: Departamento de Estudos e Documentação sobre a Imigração Africana em Portugal/Centro Padre Alves Correia

According to the City Council, 15 deprived neighbourhoods have been already demolished, corresponding to a total of 2,625 shanties demolished. 2,038 households have been excluded, mainly because they left the neighbourhood or

gave up. A total of 1,993 households have been relocated through social housing, a payout or other measure, and 392 were integrated in the initiative to restore one own house or buy a house outside the metropolitan area (*Programa Especial de Realojamento*). Another 353 have adhered to the initiative to be relocated outside the municipality (*Programa de Apoio ao Auto-Realojamento*), and 37 households had returned to their countries under the initiative to support voluntary return (*Programa de Retorno*). The remaining 1,816 households are waiting to be relocated (CMA 2006).

Azinhaga dos Besouros, the main deprived neighbourhood hosting Cape Verdean, is one of the 15 neighbourhoods demolished. Following its demolition, the *Alto da Cova da Moura* is the main deprived neighbourhood to host Cape Verdeans in Amadora.

### 3.4 Cova da Moura: From Squatter to Critical Neighbourhood

**Map 3** – The *Alto da Cova da Moura's* neighbourhood



**Source:** Adapted from Câmara Municipal da Amadora, <http://www.cm-madora.pt/>

The *Alto de Cova da Moura* is a deprived neighbourhood located in the Eastern side of the municipality of Amadora under the jurisdiction of the boroughs of Buraca and Damaia (Map 3). This settlement is one of the few which is not officially included in the list of settlements to be demolished. By the time the census of the shantytowns

and deprived settlements was conducted, out of the total households living in shanties only 0.9% were located in Cova da Moura (CMA 2008).

The *Alto da Cova da Moura* is one of the three neighbourhoods covered by the experimental pilot initiative for the qualification and reinsertion of critical neighbourhoods in the metropolitan areas of Lisbon and Porto: *Iniciativa Operações de Qualificação e Reinserção Urbana de Bairros Críticos*. This initiative, created in 2005, aims to develop solutions for urban requalification in a restricted number of neighbourhoods in the metropolitan areas of Lisbon and Porto through the adoption and testing of innovative institutional solutions, in terms of procedures and technologies used to design, implement and evaluate the public action in the critical urban areas. The adoption and testing operations were to be conducted between 2005 and 2007 (RCM 143/2005, September 5)<sup>9</sup>.

### 3.4.1 From a Slum-Type to a Deprived Neighbourhood

Cova da Moura is often called a slum from non-residents. Their residents and people working there do not agree with the terminology given by outsiders. Resorting to the *United Nations Human Settlements Programme* (UN-HABITAT) operational definition for slum, proposed in 2003, Cova da Moura is assessed. Restricting itself to the physical and legal characteristics of the settlement, the UN organization defines a slum as an area that combines, to various extents the following characteristics:

- less than 50% households with improved water supply (i.e. house connection, public stand pipe or rainwater collection), with at least 20 litres *per* person/day available within an acceptable collection distance;
- less than 50% households with improved sanitation (i.e. public sewer, septic tank, pour-flush latrine, ventilated improved pit latrine), shared by a maximum of two households;
- proportion of households residing on or near a hazardous site (i.e. geologically hazardous zone, under garbage mountains, around high-industrial pollution area, around other unprotected high risk-zones such as railroads, airports or energy transmission lines);
- proportion of households live in temporary and/or dilapidated structures (i.e. quality of the construction for wall, floor and roof and compliance with local building standards);
- proportion of households with more than two persons per room;

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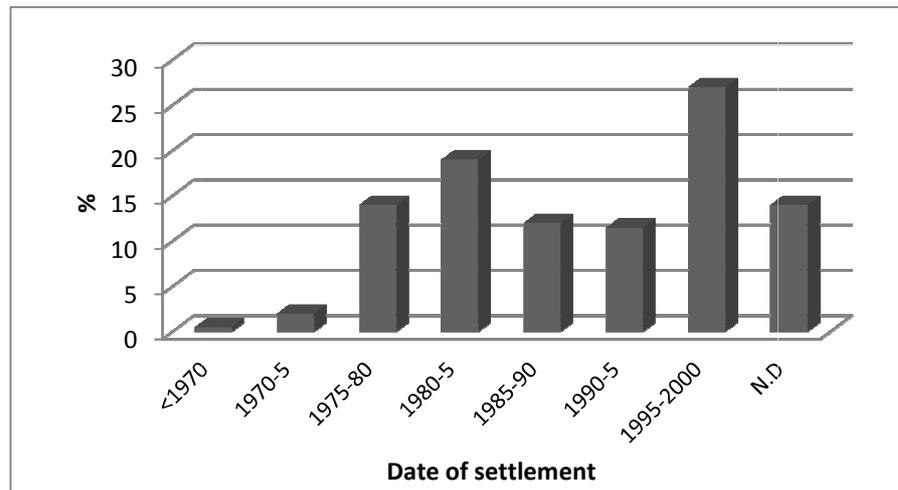
<sup>9</sup> One of the innovative aspects of the *Iniciativa Bairros Críticos* has been the integrative and comprehensive territorial approach, in which different stakeholders (central governmental, local government, civil society organizations, local intervention organizations) involved in the socio-territorial development participate directly. Another innovative feature is the creation of sustainable neighbourhoods not from scratch but from valuing the potentialities of socio-territorial spaces already in existence (Sousa 2008).

- proportion of households without formal title deeds to land and/or residence or enforceable agreements or any document as a proof of a tenure arrangement (UN-Habitat 2003).

In spite of being present in its inception, are those features still present in the neighbourhood? The next section is likely to give an answer to this question.

### 3.4.1.1 Settlement

**Figure 8** - Period of Settlement in Cova da Moura



**Source:** Vasco da Cunha – Estudos e Projectos S.A., 2001, *Estudo de Caracterização/Diagnóstico do Bairro do Alto da Cova da Moura*, Amadora: Câmara Municipal da Amadora (Reproduction)

The *Alto da Cova da Moura* settlement corresponds to a 16 ha area integrated in the Lisbon's volcanic topography complex, characterized by a small plateau at the southern region and slopes at the northern and eastern regions (Godinho 2010).

The first wooden housing emerged next to Quinta do Outeiro (southern area) in 1940s to keep agricultural inputs and to accommodate its agricultural workers. During the 1960s, rural migrants, living in the surrounding neighbourhoods, occupied the land next to the inoperative quarry (northern area) to cultivate small vegetable-gardens. Later, a small number of Cape Verdean families settled in the area and invited families and friends, living in other municipalities, to join them in the vacant land. Resorting to the *djunta mon* system<sup>10</sup>, the newcomers build housing, often from waste collected in demolished building sites. By 1974, 360 people were estimated to live in the area (Horta 2008).

The independence of the Portuguese-speaking African colonies promoted the human occupation of the territory. From 1975/6, people who returned from the colonies and had been temporarily accommodated by the *Instituto de Apoio ao*

<sup>10</sup> *Djunta mon* means "putting hands together". It is a Kriol expression for cooperation between people in order to achieve a chore or similar objective.

*Retorno dos Nacionais*<sup>11</sup>, moved into the area. They paid the people who cultivated vegetable-gardens to free the land next to Av. da República and began building their masonry houses (Godinho 2010, Vasco da Cunha 2001).

An increasing group of people from Portuguese-speaking African countries were drawn into the area due to the excellent location in terms of means of transportation (i.e. train and bus)<sup>12</sup> and the existence of a social network (i.e. family and friends) which pass along information on vacant land. Between 1977 and 1987, the number of inhabitants increased from 600 to 5,000 (Vasco da Cunha 2001).

No one knows the precise number of people who lived in Cova da Moura. The presence of high rate of undocumented migrants and the high spatial mobility of the residents makes it difficult to offer any adequate estimation. The City Council estimated 5,000 people by 1987 (Horta 2008). CEPAC estimated 3.170 African inhabitants in 1994, of which 73.8% Cape Verdeans, 15.2% Angolans, 6.3% Santomenses, 2.8% Guineans, and 1.9% Mozambicans (CEPAC 1995). Vasco da Cunha estimated 5.500 residents in 2001, of which about 40% were born in Portugal and 31% born in Cape Verde (Vasco da Cunha 2001). For the same year, the 2001 Census estimates a lesser number for the same year: 3.253 inhabitants (INE 2001). Last, LNEC estimated 4,814 residents in 2008. None of these estimates reflects the reality, according to the civil society organisations (CSO) which intervene in the neighbourhood. These CSO propose a number higher than 6,000 (Moinho da Juventude online).

There are few doubts that the majority of Cova da Moura residents are Cape Verdeans (Horta 2008, Vasco da Cunha 2001). They are mainly Cape Verdeans from the island of Santiago, followed, to a lesser extent, by the islands of Santo Antão and São Vicente. This pattern conforms to the image propagated in Portugal that Cape Verdean migration to Portugal is mainly composed of individuals from the island of Santiago and, to a lesser extent, from Santo Antão and São Vicente (Carling 2001, Góis 2006, Saint-Maurice 1999). These were the islands which provided labour for the other Portuguese African colonies during colonial times, whether low qualified labour (Santiago and Santo Antão), or officer for colonial administration (São Vicente).

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<sup>11</sup> The *Instituto para Apoio ao Retorno de Nacionais* was an institute created in 1975 (DL 69/75, March 31) to accommodate Portuguese who were returning from the former Portuguese-speaking African colonies following their independence.

<sup>12</sup> Besides the good access to railway and highways, the neighbourhood is next to a variety of public services (e.g. health centre, primary and secondary schools) and potential employers such J. Pimenta (construction sector), SOREFAME (railway sector), Continente and Jumbo (shopping sector).

**Box 6** - The cultural origins of Santiago, Santo Antão and São Vicente

Santiago is larger (991 km<sup>2</sup>), less arid, less rocky and relatively easier to access than the other two islands, making it the most suitable island to promote human settlement. The nature of the soil (poor) and climate (semi-arid and arid) did not lure a significant number of voluntary settlers. Two years after its discovery (1462), the island was mainly settled by a small group of white European free individuals, a larger group of white European deported individuals and a vast group of Western African black slaves (Carreira 1982, CGD 2008).

In 1548, the settlement of the island of Santo Antão was initiated by a group of settlers from the northern regions of the mainland and a group of the *mestiços* from the island of Santiago and Fogo, who received small plots of land. Santo Antão orographic and rainfall characteristics influenced the pattern of settlement: the northeast region where the rainfall is relatively regular and the land is mostly fertile was dedicated to agriculture production whereas human settlement occurred in the arid southeast. Agriculture production (corn, sugar cane, and beans) is of vital importance in this island, seen as the granary of the Windward islands. (CGD 2008).

Settlement in the island of São Vicente is greatly associated with seafaring activities. After several attempts from 1795, settlement only occurred in a consistent way from the second quarter of the 19<sup>th</sup> century when the British created strategic stations in São Vicente to supply coal and provide maintenance for their steamships on their way to Africa, South America and Asia. The activity around the port (e.g. stevedores, boatmen, divers), lured people from other islands and from other countries (e.g. British). The presence of British people, who in some periods exceeded that of the Portuguese natives, contributed to the formation of a different society. By working for British people, Cape Verdeans in Mindelo developed different crafts and cultural features which gradually distinguished them from the remaining islands, and contributed to Mindelo becoming the heart of the economic and culture life of the archipelago.

The different historical features of these three islands influenced their cultural development. The prevalence of Western African people, combined with an economy based on the slave trade for more than two centuries, and a land distribution system preventing landless people from an adequate livelihood, would contribute to the development of a *badiu* culture in the island of Santiago, that is, a culture strongly influenced by Western African cultures.

In the post-independent Cape Verde, the use of the term "*badiu*" is controversial. The group of people against its use argue it is a term traditionally used to distinguish people of the island of Santiago, in particular those with somatic (e.g. darker skin, thicker hair) and cultural traits closer to Western Africans, from the *sampadjudo*, residents from other islands where European cultural traits and a mixed phenotype prevail (Batalha 2005).

The origin of the term goes back to the slavery period, when Portuguese first applied it to the slave labour who escaped from the colonial plantations to the inner and not easily accessible mountain regions of the island of Santiago (called "rebelados", the "rebels"). There, they created self-sustained small-scale agricultural communities based on beliefs (spiritualism), customs, musical/dance expressions (e.g. batuque, tabanka), and socio-political organizational practices closer to their Western African ancestry (Hurley-Glowa 2005). In spite of their independence and the attempts of the colonial authorities to turn this "non-assimilable" people into "productive labour", they have never lived in isolation as they are often portrayed. For food security purposes, they were in contact with the urban centres (Fikes 2006), exposing their cultural aspects to the others.

From the 1960s, the *badiu* culture was revitalized as a symbol of resistance against colonialism. The transcending group dance, the music experiences and the use of the Kriol language, suffocated by the colonial authorities with tacit agreement of the *mestiços* society, were reassessed and considered to belong to the "the Cape Verdean" cultural sphere. In spite of its revitalization, the *badiu* is not a nationwide culture. Rather, it refers to the people of Santiago, in particular with those with darker skin and thicker hair and clearly of African ancestry (Batalha 2008a, Challinor 2010).

The term *badiu* is not used uniformly. It varies with the sociocultural environments. Lobo found in the island of Boavista the term *badiu* was used to describe in a pejorative way the people from Santiago migrants in the island: «*the local behaviour to the presence of the badius is ambiguous. Sometimes it is strongly negative and fearful; others are seen as something necessary. They are seen as dirty, rude, aggressive and violent [...]. Their Kriol and skin are features which makes badius look like Africans, opposing them to the people of Boavista*» (Lobo 2006).

**Box 6** - The cultural origins of Santiago, Santo Antão and São Vicente (cont.)

Batalha sustains *badiu* is used in opposition to *sampadjudo*, a mixture of people from different cultural origins, with no specific territory, and it is associated with *morabeza*, a kriol term for cordiality and openness to the world, and with *caboverdianidade*, the miscegenation of cultural identities (Andrade 2011)<sup>13</sup>.

Nowadays, the bipolarity of *sampadjudo* and *badiu* is questioned, even refuted, by a group mainly composed of Cape Verdean intellectuals. For them, from the ethnical point of view, there is no "*badiu*" as a homogeneous group based on African identity with identifiable cultural traits (e.g. *tabanca*, *batuku*, *funana*, *finason*). In the post-independent Cape Verde, the intermixture is so great that the previous identities were dissolved (Andrade 2011). Fikes somehow reasserts this position when she says that *Santiaguenses* (though black-identified) do not necessary articulate their daily Cape Verdean experience as Africans, though "black" and "African" can be treated as synonyms (Fikes 2006).

Besides emigration and the reduction of the divide between the urban and the rural, the internal migration in the post-colonial period might have contributed to the cancellation of the "*badiu*" cultural particularities. The island of the Santiago, the most populated island, is estimated to have received 31% of the 43 thousand internal migrants identified in 2000 (INE-CV 2000b), who were lured by the employment opportunities (e.g. Public Administration, public works and commerce sectors) offered in the capital.

Despite the intellectual controversies surrounding the term *badiu*, the distinction between Cape Verdeans with phenotype closer to Africans and those of phenotype resulting from miscegenation of European and Africans is still present in some sociocultural environments.

**3.4.1.2 Housing**

In 1977, 230 batches of land had already been allocated. The area was occupied by 213 houses of which 103 shanty houses, 90 masonry houses and 24 shanties to keep agricultural inputs, animals, cars and other material (Horta 2008), mostly built without a project and/or in compliance with the housing standards.

The sustainability of the housing has improved over time. The number of shanties has decreased throughout the years. In 2006, there were only 39 shanties accommodating 54 families (CMA 2008).

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<sup>13</sup> On one occasion, the author accompanied a colleague to a household she had previously interviewed. The author explained to the mother that she had come back because her colleague would like to interview her as her story was interesting. The mother replied that she did not remember anything of what she had said previously. And she had nothing interesting to talk about. The author was surprised at this "polite" refusal. The author had interviewed this mother twice and she had always been willing to cooperate. In spite of her polite refusal, conversation went on for more than an hour. During the conversation, the mother was surprised to know that the author was not Cape Verdean. When the author informed the mother that her colleague was Cape Verdean, the mother replied that the author looked like (ie had a phenotype) more Cape Verdean than the colleague (who had lighter skin, straighter hair and green eyes). At another point of the discussion about phenotypes, the colleague said that "*we, Cape Verdeans, are all equal*", to which the mother replied "*we are not. Look at my hair, it hardly grows. This is normal where I come from*". Challinor also found the distinction between *badiu* and *sampadjudo* in her study on Cape Verdean maternity and identity in Portugal. Sara, a Cape Verdean from São Vicente who had two children from a Cape Verdean from Santiago, underlines the rivalry between *badiu* and *sampadjudo* which goes beyond the archipelago. When she lived in a deprived neighbourhood in Porto, her *badiu* neighbours began treating her badly when they found out that she was no longer with her boyfriend, a Cape Verdean from the the island of Santiago. They interpreted her silence regarding her separation as a standard *sampadjudo* behaviour indicating superiority to others (Challinor 2010).

The last houses were horizontally built in 1985/6. As the land ran out, vertical buildings escalated. This situation turned Cova da Moura into a highly density neighbourhood. In 2001, there were 85.4 houses/ha and 306 inhabitants/ha in Cova da Moura, higher densities than those shown by the municipality - 34 houses/ha and 74 inhabitants/ha (Mendes 2008). This high housing density is due to the excess of horizontal construction, the creation of outhouses, and a high number of multi-storey buildings: of the 833 lots identified, 38% two-storey, 37% three-storey, 6% four-storey, and 1% five-storey buildings (LNEC 2008).

Units 5 and 2 are the areas characterized by a higher housing density. Shops and services are concentrated in unit 5, turning into the central area of the neighbourhood. A lower density housing is found in units 3 and 4. Unit 3 is the area which shows greater typological and morphological uniformity: one or two storey houses with a courtyard. It is the area occupied by the people who returned in 1970s from the former Portuguese colonies in Africa. Unit 3 is also dynamic because it hosts the basic school (EB1 - CM), the sporting club and some bars (IBC 2003).

The higher housing density has «robbed» space from the streets, giving way to a crossed network of narrow and often unpaved streets. This is important for the residents, as streets have different functions. They are spaces for movement, but perhaps more important they are places of interaction, where Cape Verdeans do business, exchange information, and socialize.

The high housing density is accompanied by a high population density due to multi-family households, present in transitional phases of life (i.e. migration, marriage, or reproduction). In 2001, Vasco da Cunha identified 41.2% households composed of more than 4 people. This percentage suggested the existence of multi-family households, resulting from reunion of offspring born from different relationships, integration of new members (e.g. the offspring's spouse or child), or the hosting of friends or family members who have recently migrated. The high demand of accommodation, the racist attitudes of landlords and the difficulty of the undocumented migrants in getting a house in the formal housing market continued to attract African migrants into the neighbourhood. Often the newcomers pay rents higher than those found in the standard housing market.

### **3.4.1.3 Tenure**

The municipal authorities classify the *Alto da Cova da Moura* as a double illegal neighbourhood. First, it is a squatter settlement on land which belongs to three private and two non-public landlords. When people began occupying the territory they did not buy the lots. Rather, they bought the "use" of the lots from people who did not own the land (Horta 2008). This situation might be partially explained by

the unstable political period the country was going through at the time and by the absence of the main landlord, who owned 11.3 out of the 16 ha of land, from the country.

Second, housing was built without any license ever being issued. Following its instructions to stop illegal constructions (1977), the City Council of Oeiras ordered the demolition of the new constructions in order to implement an urban reconversion plan in the neighbourhood. The negotiations between the residents' committee and the City Council would prevent further demolishments.

The committee was informally legitimized to manage the land distribution and supervise the processes of construction. It defined the criteria to distribute lots of land and to build housing. It indicated spaces, provide labour and collected funds to buy material to open streets; streets which were name after African countries (e.g. Sao Tome e Principe and Cabo Verde), islands of Cape Verde (e.g. Sao Antao, Sao Nicolau and Brava), residents (e.g. Reis), amongst others. More important, it supervised constructions and, when not in compliance with criteria established, it would require the municipality to take measures against it (Horta 2008).

The evolution of behavior of the municipality should, however, be framed in the evolution of the political stance regarding the illegal construction in urban areas. During the Portuguese dictatorship, the law was very strict against illegal construction (DL 278/71, June 23). The end of dictatorship and the subsequent increase of illegal construction required new legislation. In 1976, a new law was enacted which cancelled the juridical and technical guidelines to assess projects aimed to legalize illegal construction areas, that is, areas in which a high percentage of constructions were deprived of any license.

Recognizing the urgency for the public sector to make available land to meet the shortage of housing (DL 275/76, April 13), the costs to harmonize the existing housing in order to meet the *Regulamento Geral das Edificações Urbanas* (regulation of urban buildings) or the social and economic costs of demolishing such a high percentage of illegal construction, the Government stipulated the minimum conditions to legalize or temporarily keep those areas.

Legalization of an illegal construction area required that the area be appropriate to human settlement; the creation or improvement of urban facilities in the area be technically and economically viable as well as the creation of social equipment an essential element; and the construction be acceptable in terms of quality and quantity. Should legalization be recommended, the Administration ought to design a program aimed to urbanize and qualify the area (DL 804/76, November 6). Instead, temporarily keeping the existing housing was recommended when human settlement was unacceptable, but the area was not required for public construction,

and the housing did not endanger the human lives (DL 90/77, March 9). Only in mid-1980, did the law establish the minimal required habitability conditions (Ordinance 243/84, April 17), which were based on the area (m<sup>2</sup>) required for each type of house.

In 1995, a new law was enacted to create an extraordinary system to promote urban reconversion of illegal urban areas. By 'illegal urban areas' it is meant areas that, without the lot license, had been submitted to a physical distribution aimed at construction until the entry into force of the DL 400/84, December 31, and were classified as urban/urbanized space in the municipal land planning (Law 91/95, September 2, modified by Law 165/99, September 14, and Law 64/2003, August 2003).

The choice of Cova da Moura as one of the three deprived neighbourhoods to participate in the pilot project of the "critical urban areas" initiative<sup>14</sup> (2005-2013) is a culmination of a long process of negotiations between the residents of Cova da Moura and the local power. More important, it is a proof of changing political stance regarding housing policies. Rather than demolishing, the neighbourhood is to be qualified. Its several characteristics and potentialities make it adequate to qualification.

#### **3.4.1.4 Utilities**

At its inception, there was no improved sanitation and electricity. Water was collected in two fountains located in the area. Many residents, in particular those who were from the rural areas, were familiar with this shortage as they had been raised in places which offered similar conditions.

For example, during the colonial period and still in the decades after independence, the rural areas of Cape Verde lacked access to improved drinking water supply, improved sanitation and electricity. Data regarding 1998 still shows few people with access to household drinking water connection (21.3% at national level, only 4.3% in rural areas), and access to a bathroom with latrine (38.8% at national level, 19.1% in rural areas) or only latrine (23% at national level, only 12.6% in rural areas). The majority of population collected drinking water from fountains (43.8%) followed by river water sources (11.2%) (INE-CV 1998). Cape Verdeans who had migrated into Portugal during the sixties and seventies were not strangers to the lack of household drinking water connection, adequate sanitation and electricity. Each of these conditions was common in the islands. One must take into consideration, however, that this situation in *Alto da Cova da Moura* persisted for

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<sup>14</sup> The "critical urban areas" initiative is a national programme to qualify vulnerable urban areas (Resolução do Conselho de Ministros nº143/2005, August 2, modified by Resolução do Conselho de Ministros 189/2007, December 31.

two decades after the independence of Cape Verde, and that a huge investment had been done during this period to improve basic conditions in many parts of Greater Lisbon.

The informal constitution of a residents committee was relevant to negotiate with the municipality<sup>15</sup>, and collect money to fund public works, to introduce basic facilities (i.e. household drinking water connection, electricity, basic sanitation, roads, and garbage collection) to the majority of the households (1979-1985). However, these facilities quickly deteriorated due to the poor quality of the public works in the installation of electrical, water and sewer systems. From 1985, public works were conducted to repair and improve the quality of the facilities (Godinho 2010).

#### **3.4.1.5 Services**

From late 1990 the neighbourhood went through intense changes. Once solved the main problems regarding improved services (drinking water, sanitation, electricity and phone), the cso's concentrated their efforts to improve the social services, in particular those aimed at families. Childcaring services are one example.

For economic reasons, parents are increasingly unable to adequately monitor their children, often delegating this role to the nurseries and pre-schools present in the neighbourhood or surroundings. For these parents, migration was carried out in order to improve their own or family conditions. For this reason, and as above mentioned, most of the mothers worked during their offspring infancy and childhood. As their professional activity was mainly related to cleaning and personal services, this means double fixed shifts or rotating shifts, rotating days off, hourly assignments, overtime, and physical work which prevents them to bestow adequate time, energy or mood to their children.

Cova da Moura is equipped with three institutions and several private organizations which offer daycare services, such as Moinho da Juventude (local non profit institution), São Gerardo (religious non profit institution), Santa Casa da Misericórdia (charity), and private institutions or individuals or institutions.

Moinho da Juventude, today a non-profit organization, was created in 1980s by a group of residents to struggle for improvement of living conditions (i.e. housing, sanitation, hygiene, legalization, and so on). Gradually, it extended its activities to social, economic, and cultural fields, aimed at children, youth and adults. In 1987, it was officially constituted (DL 22/04, 9 June 1987) and two years later it was recognized as Instituição Particular de Solidariedade Social, which means it was

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<sup>15</sup> Until 1979, the boroughs of Damaia and Buraca, where Cova da Moura is located, were under the jurisdiction of the municipality of Oeiras. Only in 1979, the municipality of Amadora is created and those boroughs are transferred to its jurisdiction.

able to obtain funds to develop activities aimed at children. In 1995, a kindergarten was open and in 2000 a day family nursery. The latter is a project in which the organization supervises 12 childminders (one for four children) who take care of 48 infants from 8 to 5 pm and, subject a payment of additional 10 euros/ month, overtime from 6 to 8 am or 5 to 8 pm. Despite the main activities being developed in their own home, childminders take weekly children to play in the organization's facilities.

Besides the childminders, Moinho da Juventude provides also nursery and preschool services. Since 5 May 2003, it hosted the nursery "A Árvore" receives 60 children from 4 to 36 months in four different rooms: Limoeiro – 8 children from 4 to 12 months; Laranjeira – 16 children from 12 to 24 months; Macieira – 18 children from 24 to 36 months; Dragoeiro – 18 children from 24 to 36 months<sup>16</sup>.

The preschool, which was opened in 1995, expanded ten years later its initial two rooms: one for children aged 3/4 years old and other for children aged 4/5 years old. Two more rooms were opened in the following years: a third room in 2003 and a fourth room in 2006. In total, the present preschool, which is opened from 8 am to 7 pm, has capacity to receive eighty-eight children distributed by four rooms: room 1 for 24 3-years old children, room 2 for 24 4 and 5-years old children, and room 3 and 4 for 16 5 and 6-years old children. One teacher and one assistant are available for each room. One individual from the European Volunteer Service is also available in the first room.

The Centro Infantil de São Gerardo is an infant daycare centre run by the Centro Social e Paroquial N<sup>a</sup> Sra. Mãe de Deus da Buraca, a parish social center, which aims to creating appropriate conditions for taking care of children. In 2003, under the Community Initiative Programme Urban II – Damaia and Buraca, it created the nursery "Creche sem Fronteiras", installed in movable containers, to fill a gap at early childhood. This nursery is equipped with two rooms to receive 27 children from 7 am to 7 pm: one cradle room for infants from 3 to 12 months and a room for 16 children from 12 to 36 months.

Santa Casa Misericórdia da Amadora, a regional charity<sup>17</sup>, created the Centro S. Francisco de Assis in 1993. This center which is located at one of the main entrances of the neighbourhood, hosts a nursery and preschool which are opened from 8 am to 7 pm. The nursery receives infants from 4 to 12 months, who are

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<sup>16</sup> The nursery was created under a multi-partner project integrated in the National Anty-Poverty Programme, a programme which from early 1990s supported local initiatives to fight poverty and social exclusion. In December 1, 2004 an agreement was signed between Associação Moinho da Juventude and the Regional Centre of Social Security, whose funds are essential for running the nursery.

<sup>17</sup> Santa Casa da Misericórdia da Amadora was official constituted by a parish decree in 2 February 1987 and recognized by the Directorate-General of Social Security by DL 21/86, 16 September 1987.

distributed by three rooms: cradle, 1 year-old and 2 years-old rooms. In turn, preschool received children from 3 years old until they entered into primary school, distributed in two rooms: 3 years-old and 4 and 5 years-old rooms.

Last, EB1 Cova da Moura, a neighbourhood-based primary school, integrates a preschool since 1996/7. The requalification of the primary school premises, started in 2000/1, has increased the number of rooms and created an office, a storeroom and a bathroom. Opened from 9 am to 3 pm, the preschool is attended on average by 40 children, from ages 3 to 6 years, distributed by two rooms, each one supervised by one teacher (eb1.covadamoura.edu.pt).

#### **3.4.1.6 Security and safety**

Cova da Moura is perhaps the most known deprived neighbourhood in Lisbon Metropolitan Area. The criminal activities (e.g. storage and distribution of drugs) in which some of its residents (e.g. gangs) are involved inside and outside the neighbourhood have contributed to the negative image non-residents have of Cova da Moura and its residents. Many residents claim that employers refused to give them an employment when they became aware that they lived in Cova da Moura. Beyond the negative image, the fact remains that it is a neighbourhood which hosts criminals. According to a recent survey on the neighbourhood, only in certain criminal activities was the percentage of crime higher than that registered in the municipality or the Lisbon Metropolitan Area: offenses regulated by specific law, such as drug dealing. Drug dealing has gained ground with the demolition of the traditional drug dealing neighbourhoods in Lisbon. In addition, offenses against people (e.g. physical attack), combined with offenses against property, gained ground and has contributed to the insecurity inside and outside the neighbourhood (IBC 2008). One old resident admitted «every week a coffin is ordered», and one of the mothers told us that her husband had been shot three years ago, leaving four children still to be raised. In recent years, there has been an investment in changing the image of the neighbourhood, aimed to show the positive side of the neighbourhood to the outside world. This strategy involved a variety of actions such as including Cova da Moura in tourism; showing itself to the outside world through TV documentaries and films (e.g. *a ilha da cova da moura, com uma ilha às costas – Cova da Moura island ... with an island on own's back*) and receiving state representatives (e.g. President of Portugal and Cape Verdean politicians or ambassadors).

By the very fact of hosting drugs dealing, people who are not familiar with the neighbourhood would include living in the neighbourhood as a negative element on parental investment. However, the neighbourhood should be examined as a

heterogeneous space. Insecurity is localized. It is concentrated in alleys, unlighted streets, and in streets which give access to the outside world. The *Rua Principal*, *Rua do Moinho*, *Rua do Vale*, *Rua da Palmeira*, *Rua do Outeiro*, *Rua 8 de Dezembro*, *Rua de Santa Filomena* and *Rua da Ladeira* are tagged as the most problematic streets (IBC 2008).

As far as safety is concerned, several problems regarding the shared elements in the land batch endanger the safety and health of the residents as well as affect the habitable conditions. In 2008, more than 50% of the buildings show anomalies in terms of the roof (deficiencies in sealing or inexistence of a thermal isolation layer), walls (uncoated), stairs (severely degraded, unfinished, uncoated or showing severe deficiencies), and safety devices (no railings or other device against falling). And more than 40% of the buildings show problems in the paving surfaces and ceilings. In terms of the private housing, more than 50% of the buildings show anomalies in the ceilings, external and internal walls, as well as gas, electrical and ventilation systems. LNEC also alerts to the high risk of fire spreading because of the high housing density combined with the narrow streets which would prevent an effective intervention by the fire department (LNEC 2008).

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The answer to the question whether the neighbourhood is a slum or not would be negative. Despite showing some of the slum characteristics at its inception, the *Alto da Cova da Moura* has eliminated some of these characteristics over the years. It would be more appropriate to call it a «deprived neighbourhood».

### **3.5 Parental Investment in Cova da Moura**

Parental investment in Cova da Moura is substantially influenced by the social, economic and cultural environment in which parents raise their children. Feeding, protection, and learning practices are not the same as those practiced in Cape Verde when they left. They tend to breastfed lesser time and introduce complementary food before. The baby food is also different. Infants are less frequently fed by homemade food, prepared with maize. Protection is also different. In spite of the precarious conditions, houses have very often better conditions than that in Cape Verde. However, outwards, there is not much room to play. Parents also are less inclined to let their children play outside because of the criminal activities in some areas of the neighbourhood. Learning is left to institutions. The childcare services present in the institution act as “alloparents”, accommodating infants since the third month until they enter the basic school.

The physical, social, economic and cultural differences between Portugal and Cape Verde, in particular rural Cape Verde where migrants from Cova da Moura come from, account for the differences. The working conditions in Portugal do not allow parents to care for their children in the same way. Also, they do not have the same social network, where grandmothers and older female offspring play a leading cooperating role. This role is performed by the childcare institutions.

Mothers are the parents who invest more in the offspring. They invest more in all aspects of the embodied capital. The father regularly gives financial support if he leaves in the same household; only sporadically if he lives in another household. It is very common female parental households or stepfather households, composed of children from different fathers. In the same household, children from different parents cohabit. In this study, we found two cases in which the father and mother were separated, but the mother continued to take care of her stepson.

This situation is most common amongst mothers born in Cape Verde. The explanation seems to lie in the gender relations in Cape Verde, in particular in the matrimonial and parental areas. Borja reports that an informal polygamy prevails in Cape Verdean society, which is socially tolerated (RCV-MTFS 2007). Males act as temporary sexual partners, not assuming the parental role, nor the economic responsibilities associated with it. In search of a stable partner, mothers often enter into sequential relationships with different partners (Chelala 2000).

The reproductive survey indicates that less than 50% of the infants not older than 2 years old (47.1%) lived with both parents in 2005. The second most common situation was living with the mother (43.9%). The percentage of offspring living with both parents or only with the mother decreases with age in favour of a non biological parent (INE-CV 2005), which usually is the grandmother. Emigration may only partially explain this tendency to the absence of the father and, later, of the mother from the household. The gender relations seem a more reasonable explanation.

Boys' early initiation of sexual life is seen as a sign of manhood, regardless of the social class. A kind of social pressure exists for boys to become sexual active, an important element to become a man. They are expected to prove their manhood through sexual behavior. In fact, it is common for Cape Verdean boys to be asked «how many girls do you have?», rather than «who is your girlfriend?». As they grow up, they tend to accumulate several girlfriends. Eventually, a girlfriend gets pregnant, in particular amongst the poorer where the idea of «getting a man» through giving birth is common. The first baby becomes a proof of the male virility and manhood. Over time, other girlfriends get pregnant and are abandoned. The number of offspring keeps increasing, often without them ever taking responsibility

for their offspring. As Rodrigues puts it *«men are seen, in this context, as temporary and through cultural conceptions of biologic hyper-sexuality. [...] The competition among women to «get» a man is important for male virility. Not only men are assessed for their virility but they also show the other men they are able to meet the women sexual demands. Thus, manhood is based essentially in sexuality. It is not a personal investment in paternity or marriage (Rodrigues 2007).*

Carreira traces back the explanation for this plasticity in relationships to the formation of Cape Verdean society, when European men entertained sexual relations with African women, regardless of their social class and their marital status. These unofficial marriages, known by both the spouses and the community, would create a society that accepts polygamy *de facto*. In rural areas it becomes the standard situation that a man can have an official spouse (formally married or not) whom he lives with and, at the same time, several sexual partners who give him other offspring. In this context, the single mother and her illegitimate offspring becomes a «legitimate» institution (Carreira 1977).

The instability in sexual partners is somehow expressed in the increasing number of informal marriages in the last decade: 22.5% informal marriage versus 16.8% formal marriage in 2000 and 22.3 informal marriage versus 13.6% formal marriage in 2010 (INE-CV 2000a, INE-CV 2010). This would be consistent with the growing trend in the contemporary world, if it were not for the fact that in Cape Verde informal marriage is associated with sociocultural and economic differences, that is, in urban, young, less educated and poorer people who are vulnerable social groups (INE-CV 2000a). According to Rodrigues, these informal unions make it easier for males not to assume their responsibility as fathers, leaving it to the «mãe d'fidju» (mother of the child) (Rodrigues 2007).

### **3.6 Summary**

This section described the Cape Verdean migration vintages since 1960s, in particular the profile of their protagonists and their pattern of settlement in Portuguese mainland. This historical, geographical and cultural description inscribes Cova da Moura as a typical Cape Verdean neighbourhood and, as such, an adequate neighbourhood to examine parental investment strategies in migratory context and its effect on the offspring embodied capital.

## Chapter 4 - Methodology

To answer our research questions required a combination of different strategies of inquiry (i.e. methodology). Each strategy is informed by two different philosophical stances, that is, postpositivism and constructivism.

Postpositivist knowledge claims are based on the assumption that “causes” determine “outcomes”. The knowledge is based on a careful observation and measurement of the objective reality that surrounds the individual behavior. The theories which govern the world need to be tested and refined for gaining a better understand of the world. In contrast, constructivism knowledge claims are based on the assumption that individuals seek understanding of the world in which they live. They develop subjective meaning of their experiences in the world they live. So the meanings are socially and historically constructed, requiring an in-depth analysis to understand the complexity of points of view (Creswell 2003). Both stances are present in our study as it intends to identify factors that influence parental investment and their indirect effects on child's growth and development (postpositivism). In addition, it aspires to understand the meanings which influence parental investment among a certain ethnic group.

Biases are inherent in any single stance, however. Only an approach which combines quantitative and qualitative approaches (a mixed methods approach) allows us to overcome these biases and contribute to a better understanding of the research problem.

### 4.1 Strategies of Inquiry

Strategies of inquiry provide specific direction for procedures in a research design (Creswell 2003). These positivist and constructivist philosophical stances correspond to specific strategies of inquiry. Yin (Yin 2009) maintains that the positivist/quantitative research (e.g. cross-sectional study) is more adequate to answer the “what” and “how much” research questions on contemporary events whereas the “how” research question is more adequately replied by a constructivist/qualitative research (e.g. case study).

The first and second research questions – i.e. how parents invest and in which environment - require an analysis of the complexities of parental investment among Cape Verdean families who live in Cova da Moura, as well as an in-depth exploration of the several dimensions of the phenomena and the environment in which takes place. To that effect, a qualitative strategy was chosen: the case study. The Cape Verdean children born in Portugal, and attending the EB1-Cova da Moura school in the academic year 2008/9 constitute the *case study*.

The third research question – how much does parental investment in infancy affect prepubertal embodied capital (i.e. growth and development) - are better answered by a cross-sectional study. In the cross-sectional study, the effects of socioeconomic and cultural-environmental factors on parental investment are assessed. Also, physical growth and cognitive development of the children who attend the EB1 school assessed and, eventually, the conclusions are generalized to the children who live in the neighborhood but do not attend the EB1 school (quantitative strategy).

The combination of quantitative and qualitative strategies is expected to contribute to providing the key-elements for better understanding of the complexities of parental investment and their effects on growth and development. This mixture is based on a concurrent procedure, that is, the process of collection of quantitative and qualitative data started at the same time. However, the collection of qualitative data extended for a longer period. The collection of qualitative data was relevant to the design of the quantitative study, and the collection of the quantitative data was essential to draw a general picture of the children background such as household information. Qualitative and quantitative data are eventually combined to produce a comprehensive analytical framework and interpret the overall results.

## **4.2 Quantitative Research**

The negative effects of a constrained environment on growth and development have been stressed in previous research. As reviewed in the literature section, human growth and development are sensitive to the quality of the social, economic, and physical environments. Changes in health and affluence in a society (measured by changes in level of income, education, housing conditions and density, amongst others) have affected growth and development of its members. Access to a higher quantity and quality of resources, in particular over a long and consistent period of time, has shown to cause an increase in height and weight as well as acceleration in the acquisition of cognitive skills (see Cole 2000, Eveleth & Tanner 1990 for a review of studies on secular trends).

The cross-sectional study aimed to assess whether the parents' decision to rear their children in such a physical and social environment affected the children. Children's embodied capital is greatly affected by parental choices regarding household and family structures, residential area, and eventually allocation of resources to offspring. The time and the amount of parental investment is to influence children attainments in terms of growth and development.

## **4.2.1 Methods of data collection**

Two specific methods of data collection sustained the cross-section study on growth and development, that is, anthropometry and documental analysis.

### **4.2.1.1 Anthropometry**

Anthropometry, the method of measurement of the human body, was chosen to obtain basic data on the child's physical growth. This method is the most highly recommended and widely used method to assess size, proportions, and composition of human body in terms of dimensions of the bone, muscle, and adipose tissue. It is simple, precise, inexpensive, portable and non-invasive (CDC 2000, Frisancho 2008, WHO 1995). The effects of the environment factors are to a great extent inferred from the patterns of growth in size, shape, and maturation of human populations (Bogin 1999).

In this study, body composition and shape are obtained through anthropometric measures related to linear growth (i.e. height, and leg length) and fatness distribution (i.e. weight, abdominal and mid-upper-arm circumferences, average of triceps and subscapular skinfolds), which reflect the nutritional status of the children.

Height and weight are the traditional basic measurements to assess physical growth. They are easy to collect in a variety of settings and to compare with data collected in other settings. Weight is an indicator of general growth of body. It is the sum of the adipose tissue, skeletal muscle, bone, blood and residual tissue (visceral organs, etc.). It varies over the short term, either increasing or decreasing. Height is an indicator of the amount of linear growth that occurs due to the increase of the skeleton. It takes a longer time to vary. It reflects the long term cumulative effects of the nutritional situation and health in general. As such, it is used as an indicator of environmental conditions and/or long term reflection of a child's growth potential (Chumlea & Guo 2002, WHO 1995).

Leg length is another sensitive indicator of the contribution of the environmental quality for pre-pubertal growth; perhaps even more sensitive than height. In the pre-pubertal period, a greater proportion of growth in total stature is due to the length of the leg rather than the trunk. Leg length is obtained by subtracting sitting height from total height. Because of the difficulty in comparing individuals with different statures using this unstandardized measure, Sitting Height Ratio (SHR), which defines the percentage of total stature that is comprised by head and trunk, is calculated (sitting height/height) x 100). The higher the SHR the relatively shorter the legs and longer the trunks are. This condition is associated with a lower health status, and reflects growing up in an adverse environment (Bogin 2001,

Bogin, Varela-Silva 2010, Frisancho *et al.* 2001, Gunnell 2001, Kinra, Rameshwar Sarma *et al.* 2011).

Because of its deficiencies (e.g. fail to distinguish between a short child with adequate body and a tall child with inadequate body weight), weight is complemented with other measures, and indexes. The resort to circumferences (e.g. mid-upper arm and abdominal), skinfolds (e.g. triceps and subscapular), and to Body Mass Index ( $\text{weight}/\text{height}^2$ )<sup>18</sup> are cases in point (Collins *et al.* 2000). The abdominal and mid-upper arm circumferences are indicators of the development of abdominal obesity, and underlying fat and muscle tissue, respectively. Skinfolds, measurable at different locations on the body, are indicators of the subcutaneous adipose tissue, which is the primary site of lipid storage (WHO 1995).

Based on a statistical data provided by the educational department of the City Council, 228 children were expected to attend the EB1 - Cova da Moura, of which the majority were Cape Verdean children. At this point, we were faced with a dilemma: how to measure the Cape Verdean children without awakening a feeling of discrimination among the remaining schoolchildren? We decided to measure all children who agreed and whose parents gave consent to be integrated in the study. The decision would also prevent us from the entanglement of identifying who were the Cape Verdean children. Thus, except for the children who were absent at the time ( $n=6$ ) or refused to participate in the study ( $n=1$ ), all children were measured from December 2008 to March 2009, that is, a total of 221 children (119 girls and 102 boys). A well-trained anthropometrist and a data recorder (the author) collected the anthropometric data using standardized techniques (Lohman *et al.* 1988). In general, data were collected once or twice a week, from 10 am to 3 pm, in order not to interfere in the school activities and in accordance with the availability of the anthropometrist.

Before the anthropometric assessment, the anthropometrist prepared the room with the measurement equipment: digital scale to measure weight (kg), stadiometers to measure height and sitting height (cm), calipers to measure triceps and subscapular skinfolds (mm) and metric tape to measure arm and abdominal circumferences (cm). Then, he checked the calibration of the digital portable scale, the stadiometers, and skinfold caliper.

Meanwhile, the recorder requested the records of the children whose class was to be measured that day, and copied the information from the school records to the specially created recording forms for this study. When the preparation was concluded, a school officer accompanied two of children (same sex) from the

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<sup>18</sup> There's a debate in the literature about the usefulness of BMI for children due to the substantially changes with the age (Cole *al.* 2000).

classroom to the examination room. Once inside the room, the children were introduced to the staff, and (re)informed about the examination procedure. Afterwards, one of the children was chosen to initiate the examination. Following the confirmation of basic data (e.g. sex, age, school grade), the child was asked to undress, but for the underwear, and to remove shoes and ornaments. In the few cases where the child did refuse to take off some clothes because it was winter and there was no heating in the room, the recorder wrote a note on the record form, including an approximate value provided by the anthropometrist to make corrections.

After each measurement, the examiner read aloud the value and the recorder noted the value in the record form. Subsequently, the recorder repeated the value to the examiner in order to confirm it. This procedure continued until the last measurement was taken. While the child who was measured was getting dressed, the next child was asked to undress to be measured. When both children were measured, the school officer came to accompany them to the classroom and on her return brings another couple of children.

#### **4.2.1.2 Document Analysis**

Document analysis was selected to review students' records (written documents) to assess their cognitive development as measured by their progress in the educational system. These records summarise general information on the child (i.e. name, birthday, birthplace and ethnicity, parents/alloparents name, birthday, and address), and school progress since the child is enrolled in school (i.e. grade for academic year). Despite the brief information provided, these records include additional notes regarding households (e.g. names of the members) or other relevant information for the child's well-being (e.g. social benefits). These notes are only examined in order to gain understanding of the development of children in the school.

Parents' birthplace is fundamental to assert children's Cape Verdean origin, in particular for those not born in Cape Verde. The records confirmed the vast majority of the children had one of both parents born in Cape Verde: 60% of the mothers and 80% of the fathers (Figure 9, section 5.1).

The presence or not of both parents in the household and the level of social benefits received for a child's education suggest the amount of resources available in the household. As a matter of fact, these proxies are the only variables available on parental resources one can rely on, as data on parental education and occupation included in the child's record were not consistently collected. The presence of both biological parents is often associated with higher access to resources, both material

and non material (e.g. time, affection). Rather monoparental families are often associated with deprivation of resources, in particular in poor families.

The social benefit for education is another factor usually associated with the availability of resources in a household. This social benefit is provided according to the law on child allowance. Child allowance is a social benefit provided to families whose household assets do not exceed € 100,612.80 and the reference income does not exceed the third level of the reference income (RI). By RI is meant the sum of the revenues of each member of the household divided by the number of children eligible to the child's allowance benefit plus one child. Only families whose RI is equal or less than  $1,5 * (\text{Index of Social Support} * 14 \text{ months})$  are eligible to receive this child's allowance benefit (Portal of the Ministry of Social Affairs, <http://195.245.197.196/left.asp?03.04>). In 2009, the Index of Social Support was 419,22 (Portaria 1514/2008). Thus, RI exceeding €8,804 were not eligible. Eligible families fell into one of three levels: 1st level if the income was  $0.5 * \text{IAS} * 14$  ( $\leq$  €2,934.54), 2<sup>nd</sup> level if the income was  $1 * \text{IAS} * 14$  (2,934.54-5,869.08), and 3<sup>rd</sup> if the income was  $1,5 * \text{IAS} * 14$  (€ 5,869.09-8,803,62). Families ought to prove their yearly household revenue - usually showing the declaration on the individual's yearly household revenue. Thus, the levels of the child's allowance are a reliable proxy for the household income.

Cognitive development is measured by school achievement per age. While this is an imperfect estimate of cognition, it is the only adequate variable available for this study. The variables school year (grade attended at the time of the measurement) and school condition (any school failure or not) are proxies for school achievement. The Portuguese Educational System for children is structured in preschool and basic school. The basic school is composed of three levels: first cycle (4 years), second cycle (2 years), and third cycle (3 years). In the first cycle, the one attended by the children of EB1-CM, each school defines its own criteria of assessment for each school grade, according to the national *curriculum* provided by the Ministry of Education. The assessment is based on learning and skills defined in the national *curriculum* for the various disciplinary (i.e. Portuguese, Mathematics, Environment, Artistic and Psycho-motor Expressions) and non disciplinary areas (i.e. Project, Follow-up, Civic Education and Moral and Religious Education) for each school grade (DLi 6/2001, Declaração de rectificação 4-A/2001, Despacho Normativo 1/205).

Retention or progress is based on an accumulated assessment of the learning process of each child according to the criteria defined for each school (24<sup>o</sup>, 54<sup>o</sup>). However, no child is retained in the first grade according to national guidelines, except a child who exceeds the limit of unjustified absences (55<sup>o</sup> articles).

Data collected for the quantitative study is summarized in the Table 5 for reference.

**Table 5** – Dimension, indicator, variable and source of collected data

<b>Dimension</b>	<b>Indicator</b>	<b>Variable</b>	<b>Source</b>
Student Profile	Biological	Sex Age	Anthropometry Anthropometry
	Socioeconomic	Social Benefit Type of household	School record School record
	Culture	Birthplace Mother birthplace Father birthplace	Anthropometry School record School record
Growth	Linear Growth	Height SHR	Anthropometry Anthropometry
	Fatness	Weight BMI Skinfolds (tricep + subscapular/2) Arm circumference Abdominal circumference	Anthropometry Anthropometry Anthropometry Anthropometry Anthropometry
Development	Cognition	School performance	School record
		School grade	School record

## 4.2.2 Data Management and Analysis

### 4.2.2.1 Data Management

Ten children were later excluded from the analysis, 2 due to severe health problems (i.e. kidneys and amputated leg) and 8 because they were over 11 years old (5 boys and 3 girls, mostly for PALOP). As such, using a standardized procedure, anthropometric data was reduced to 211 children (53.4% girls and 46.6%) who attended one of the four grades of the first cycle (Table 6).

**Table 6** – Sample of children in EB1-CV in 2008/9 by sex, age and grade

	Age	School Grade				Total
		1	2	3	4	
<b>Boys</b>	6	24	2			26
	7		19			19
	8		9	7		16
	9		4	10	5	19
	10	1		2	5	8
	11				9	9
Total N		25	34	19	19	97
%						(46.6%)
<b>Girls</b>	6	27	1			28
	7		21			21
	8		3	16		19
	9		2	12	7	21
	10			8	9	17
	11			1	7	8
Total N		27	27	37	23	114
%						(53.4%)
<b>Grand Total</b>		52	61	56	42	211

All data from the recording form and notes were put in a excel spreadsheet.

Chronological age is determined based on the date of birth and on date of the observation. Age is then converted into decimal age using the following formula:

$$\text{(decimal date of observation}^{\text{a}} - \text{decimal date of birth}^{\text{b}})$$

- a) Date of measurement is calculated as  

$$\frac{[(\text{month of observation} - 1) * 30] + \text{day of observation}}{365} + \text{year of observation}$$
- b) Date of birth is calculated as  

$$\frac{[(\text{month of birth} - 1) * 30] + \text{day of birth}}{365} + \text{year of birth}$$

Indexes and indicators are created to better interpret the height and weight data. Body mass index (BMI) is created to estimate body fatness and sitting height ratio, and (SHR) to estimate the relative length of legs. BMI is calculated as the quotient of weight in kilograms divided by height in metres squared (weight (kg)/height (m<sup>2</sup>)). SHR is calculated as the ratio of sitting height to stature times 100 (sitting height/stature\*100) (Frisancho 2008).

Z-scores (standard deviation score) are created for our anthropometric data, as they are important when comparing a child with a reference population that is based upon normally distributed variables categories. They tell the distance in standard deviation units the value is above or below the mean (Frisancho 2008, WHO 1995). Z-scores are calculated by taking each score and subtract from it the mean of all and then dividing the resulting score by the standard deviation. Indicators for overweight and obesity are created resorting to the classification of overweight (BMI 25kg/m<sup>2</sup>) and obesity (BMI 30 kg/m<sup>2</sup>) for children designed by Cole and its team. Stunting is calculated as 2 SD from the height mean reference. To better interpret anthropometric data of children measured in EB1-CM, the data are compared against international growth references. All anthropometric data was also entered onto a computer-assisted evaluation software package of nutritional anthropology, developed by Roberto Frisancho, based on the anthropometric data source derived from the NHANES III growth references. The interactive evaluation is presented in excel spreadsheets formatted to calculate without additional help the age-and sex specific z-scores for the measurements, and indexes related to body size and body composition. These Z-scores data are copied into a database. The choice of references, rather than standards (i.e. World Health Organization child standards), is due to the fact that growth references reflect growth "as is" whereas growth standards reflect growth "as it ought to be". In the former the label "normal" represents the average child in a particular population who is subjected to the potential environmental constraints upon growth whereas in the latter "normal" represents the growth pattern exhibited by the child growing in an environment free from potential growth constraints (Cameron 2009).

The Third National Health and Nutrition Examination Survey of the United States (NHANES III) growth references, integrating data collected from 1988-1994 from the National Centre for Health Statistics, is used to assess the normality or otherwise of the process of growth of the Cape Verdean children. These references are chosen because they are applicable to the age range of our study and they are widely used in other research. In addition, there are no appropriate growth standards or references for Cape Verdeans, to our knowledge.

Few anthropometric studies exist on Cape Verdean children either in Cape Verde or Portugal. The first anthropometric assessments were conducted in Cape Verde after the end of the World War II following the Portuguese *Instituto de Medicina Tropical* (Tropical Medicine Institute) resumption of their activities (1946). During a campaign to eradicate *sulidae*, from the island of Sal (1948-50), Manuel Meira took advantage of measuring the height and weight of 192 individuals between 5 and 15 years old. Five years later, during a mission to assess the situation of malaria, he also measured the height and weight of 1698 individuals between 5 and 15 years old in Sao Vicente. In the same year, under a nutritional assessment, Júlio Barbosa measured height, weight, and abdominal skinfold of 1070 individuals of all ages in the island of Sao Nicolau (Rocha 1987).

A second wave of anthropometric assessments took place in the 1970s when assessments of the nutritional situation were required when a new period of drought (1968-74) struck the Sahel region. Janz and his collaborators measured 6757 individuals - 87.4% of whom were between the ages of 6 and 15 - in the islands of Fogo, Boa Vista and Santiago (Rocha 1987). After the Cape Verde independence (1975), international organizations (e.g. FAO, UNICEF, and WHO) or private donors (e.g. states, foundations, and ngos) also funded nutritional assessments covering several islands such as those of Stabile-Wolcan (1977), Pina et al. (1979), Legrain & Cap (1989), Wennberg (1977-80), and Rocha (1982-3). Under post-graduate programmes, some anthropometric studies were conducted such as those of Oliveira (1991) and Varela-Silva (1993). But for a few studies, the anthropometric assessments do not disclose data for ages between 6 and 11 (e.g. Barbosa 1954 and Stabile-Wolcan 1977), nor do they cover all ages between 6 and 11 years old (e.g. Wennberg 1977, Oliveira 1991, Varela-Silva 1993). In some cases, studies are not easily accessible (e.g. Pina et al. 1979, Legrain & Cap 1989). As far as anthropometric assessments in Portugal are concerned, they mostly do not address Cape Verdean children as a specific ethnic group. In the late 1980s, two specific studies on Cape Verdean schoolchildren were, however, conducted in boroughs where a high proportion of Cape Verdeans lived. In 1987, Gomes measured 242 Cape Verdeans children, between 7 and 12 years old who attended

primary school in Costa da Caparica (municipality of Almada, Lisbon Metropolitan Area). A year later, Gama measured 202 Cape Verdean children, between 6 and 11 years old, who attended a primary school in Damaia (municipality of Amadora, Lisbon Metropolitan Area). Varela-Silva also measured Cape Verdeans in the same municipality in the late 1990s and early 2000. However, the individuals measured were between 10 and 14 years old and were at a higher educational level. Fragoso coordinated two regional anthropometric surveys (1991 and 2001) in the Area Metropolitan of Lisbon which included children from Cape Verdean origin.

The lack of adequate growth references for Cape Verdeans requires the use of references which may include Cape Verdean individuals. NHANES III growth references are a case in point. They are likely to include Cape Verdean children as the United States is the first immigration country for Cape Verdean since late 17<sup>th</sup> century. Since late 1800s, Cape Verdeans have been migrating into the United States. In mid-1990, 250 and 400 thousand Cape Verdeans were estimated living in this country (Carling 1997, Meintel 2002).

#### 4.2.2.2 Data Analysis

The database is checked and cleaned of inconsistencies, and then incorporated into the *Statistical Package for Social Sciences* (SPSS) in order to produce statistical analysis of the data. This analysis is conducted according to the level of measurement of the variable (Table 7).

**Table 7** – Independent and Dependent Variables in Analysis

Variable	Type	Measurement	Processed
Sex	Independent	Categorical/Binomial	Dummy (Girls=Ref.)
Age	Independent	Continuous	Decimal
Birthplace	Independent	Categorical/Nominal	Dummy (Portugal=Ref.)
Social Benefit	Independent	Categorical/Nominal	Dummy (None=Ref.)
Type of household	Independent	Categorical/Nominal	Dummy (Biparental=Ref.)
School grade	Independent	Categorical/Ordinal	Continuous (number of school grades attended)
Height	Dependent	Continuous	Z-scores
SHR	Dependent	Continuous	Z-scores
Weight	Dependent	Continuous	Z-scores
BMI	Dependent	Continuous	Z-scores
Skinfolds (tricep + subscapular/2)	Dependent	Continuous	Z-scores
Arm circumference	Dependent	Continuous	Z-scores
Abdominal circumference	Dependent	Continuous	Z-scores
School performance	Dependent	Categorical/Binomial	Dummy (Regular=Ref.)

The assumption of parametric data is checked continuous dependent variables, that is, normality, homogeneity of variance, interval level, and independence. The latter

two assumptions are observed. Despite the first assumption being observed (big sample, i.e., more than two hundred individuals), normal distribution is checked visually, quantified with numbers, and tested. The P-P plot (probability-probability plot), a graph plotting the cumulative probability of a variable against the cumulative probability of a particular distribution, suggest a healthier data on linear growth (i.e. height and SHR) than on fat patterning (BMI, circumferences, skinfolds, but not weight). The latter data appear to deviate significantly from the normal distribution. This deviation is higher in the group of boys (see Figure 3, Appendice B).

The quantification of skewness and kurtosis of these distributions support the above conclusion. The value of 2.58 ( $p < 0.01$ ) is used as a threshold because it is a large sample. Kurtosis is significant for measurements related to fat distribution: weight, BMI, abdominal and arm circumferences, and skinfolds for boys and arm circumference and skinfolds for girls. Skewness is also significant for measurements regarding fat distribution: BMI, abdominal and arm circumferences, and skinfolds for both sexes, and weight for boys. Linear growth measures are, however, not significant: kurtosis is -1.49 and 1.58 for girls' height and SHR, and 2.16 and 0.18 for boys' height and SHR; skewness is -0.39 and 1.94 for girls' height and SHR, and 2.16 and 0.18 for boys' height and SHR. Except for girls' height, kurtosis and skewness values are positive for all measurements in question (see Table 3, Appendice B).

The test of normality (both Kolmogorov-Smirnov and Shapiro-Wilk) confirms the non deviation from normality in linear growth-related measurements for both sexes. However, boys' weight [ $D(97)=0.00, p < 0.05$ ], BMI [ $D(97)=0.00, p < 0.05$ ], abdominal [ $D(97)=0.00, p < 0.05$ ] and arm [ $D(97)=0.00, p < 0.05$ ] circumferences, and skinfolds [ $D(97)=0.00, p < 0.05$ ], deviate significantly from normality. Girls' BMI [ $D(114)=0.38, p < 0.05$ ], abdominal circumference [ $D(97)=0.19, p < 0.05$ ], and skinfolds [ $D(97)=0.00, p < 0.05$ ] are significantly non-normal. The Shapiro-Wilk test, a more powerful test to detect differences from normality, not only reinforces the deviation from normality in all fat-patterning related measures for boys, but also extends the same conclusion to all fat-patterning related measures for girls (Table 4, Appendice B).

Levene's test shows the homogeneity of variance in both groups is only violated in skinfolds ( $p < 0.05$ ). The variances for height [ $F(1,209)=1.01, p > 0.05$ ], weight [ $F(1,209)=1.74, p > 0.05$ ], BMI [ $F(1,209)=3.30, p > 0.05$ ], SHR [ $F(1,209)=0.23, p > 0.05$ ], abdominal [ $F(1,209)=2.05, p > 0.05$ ] and arm [ $F(1,209)=1.97, p > 0.05$ ] circumferences, are equal for both sexes (see Table 5, Appendice B).

Graphs for distribution of Z-scores of the anthropometric data (i.e. standardized deviations of each score from its mean) are displayed to check for observations very different from the others in a 95% Confidence Interval (CI). The outliers are checked for inconsistencies. These graphs show Z-scores fall in the -1.96-1.96 interval, except for few cases. It falls below the lower cut-off-point in six cases of height (2.8%), and two cases of SHR (0.9%). It is above the upper cut-off-point in three cases of height (1.4%), seven cases for SHR (3.3%), seven cases of weight (3.3%), thirteen cases of BMI (6.2), twelve cases of both abdominal and arm circumferences (5.7%), and fifteen cases of skinfolds (7.1%) (see Figures 4-10, Appendice B).

Once the assumption of parametric data is checked, a table of means and standard deviations for each measurement, index, and ratio for age and sex is displayed (chapter 5). It includes the calculus of variances. *t*-tests are produced to look at the differences between sexes for each age (Tables 6-12, Appendice B).

*T*-test and Anova are also used to compare our data with data produced by:

- Two local studies on the nutritional status of Cape Verdean children, conducted in the municipalities of Almada (Southern Lisbon Metropolitan Area) and Amadora (Northern Lisbon Metropolitan Area) in 1987 and 1988, respectively. 242 Cape Verdean children attending basic education – first cycle (EB1) schools at Costa da Caparica participate in the first, *Estado da Nutrição dos Caboverdeanos residentes na Freguesia da Costa da Caparica*, whereas 202 Cape Verdean children attending the EB1 at Buraca, *Estatutura e Peso das Crianças Caboverdianas e Portuguesas*.
- A regional survey on growth, *Reavaliação Antropométrica da População Infantil de Lisboa*. 3591 children from different ethnic groups, aged from six to eleven, are measured in 2001 in the Lisbon Metropolitan Area.
- A national survey on growth, *National Survey on Prevalence of Obesity in Portuguese 7-9-year-old-children*. 4511 Portugal-born children, aged from seven to nine and half years old, are measured in 2003 in Portugal.

Two types of comparison are produced. First, our data are compared together to the two local studies and the regional survey. The analysis of variances for the four groups is calculated using a online Anova calculator developed by Professor Soper (<http://www.danielsoper.com>) (Tables 22-24, Appendice B). Our data is also compared to each one of the groups (*T*-test, Tables 13-14, Appendice B).

Second, our data is compared separately with the national survey, because the latter is organized in 0.5 year age intervals. The analysis of variances (*T*-test) is computed using the SPSS syntax editor, because only *N*, mean, and standard deviation are available for the national survey group (Tables 17-21, Appendice B).

- The NHANES III growth reference is a valid source to complement the comparisons, as the anthropometric surveys conducted so far do not cover all districts (e.g. RAPIL) or do not include all ages and ethnic groups covered in our study (e.g. National Survey on Prevalence of Obesity). NHANES III is likely to include data on individuals of Cape Verdean ancestry.

Z-scores error bars for each measurement, index, and ratio, produced by Frichanso's software, are displayed to compare our data with NHANES III growth references (chapter 5).

For simplifying reading, the five groups are to be referred from now onwards as CV-PT 09 (Cape Verdean children measured in 2009 at EB1-CM), CV-PT 87 (Cape Verdean children measured in 1987, Costa da Caparica), CV-PT 88 (Cape Verdean children measured in 1988, Buraca), PT 01 (children measured in 2001, Lisbon Metropolitan Area), PT 03 (children measured in 2002-3 Portugal), and NHANES III (USA growth reference).

Besides looking at differences between groups, relationships between variables are analysed using regression analysis, *Pearson's chi square* and loglinear analysis, according to the level of measurement of the variable. Linear regression (simple or multiple) is used to predict a continuous dependent variable (i.e. anthropometric measurements) from one or several independent variables. Logistic regression is used to predict a categorical dependent variable from one or several continuous or categorical independent variables. *Pearson's chi square* is used to analyse a relationship between a categorical dependent variable and a categorical independent variable. Loglinear analysis is used to analyse a relationship among several categorical variables (i.e. interaction sex-school performance-school grade).

### **4.3 Qualitative Research**

The research question on how parents invested in their children in Cova da Moura and the environment in which it takes places required an in-depth analysis of the meanings of parental investment for Cape Verdeans who lived and raised their children in this social segregated neighbourhood. Qualitative research is the most adequate to achieve this in-depth understanding.

Besides the general literature on the neighbourhood and on the Cape Verdean migrations, the author found only sparse information on Cape Verdean reproduction patterns in Cape Verde. No study has focused on parental investment either in Cape Verde or Cape Verdean migrants, to our knowledge.

### **4.3.1 Methods of data collection**

The *case study* is based on different qualitative methods of data collection, such as the observation of the neighbourhood and school daily life (non-participant direct observation), documentation analysis of reports, laws and cartography on Cova da Moura, and the interviews to the families of the schoolchildren.

#### **4.3.1.1 Observation**

The author of this study conducted the qualitative research between January 2009 and June 2010. At the beginning, she was accompanied by another African non-resident. After two weeks, the visits to the neighbourhood were carried out alone.

Observation was mainly conducted through walking along the streets, visiting institutions, sitting at bars and shops, and chatting with Cape Verdeans owning shops or services. No notes were taken during the observation because the residents would be suspicious of the non-resident motives in visiting the neighbourhood. The unspoken question "are you a policewoman, a municipality inspector or a social security inspector?" was in the air most of the time. This is relevant because the neighbourhood receives frequent visits of the Police.

The wandering alone through the neighbourhood, facilitated by the street map provided by the City Council, occurred between 10 a.m. and 5 p.m. The neighbourhood is not safe for a non-resident after sunset, as it is more exposed to drug dealers and addicts.

#### **4.3.1.2 Documentation analysis**

Research was conducted in the archives (e.g. legal decrees and official reports), libraries (e.g. Cape Verdean literature such as novels and poems) and on the worldwide web (e.g. audio-visual material) to gain information on the social (e.g. child care, child health, deprived neighbourhoods), economic (e.g. labour market), political (e.g. immigration, nationality) and cultural (e.g. traditions, customs) environments in which the child was raised.

#### **4.3.1.3 Interviews**

Interviews with parents, or alloparents, were conducted to obtain information on parental investment strategies during infancy. For the pilot study, 12 mothers were interviewed. The interview guidelines were composed of few open questions in order to assess the relevance of the subjects included and identify subjects to be included. "Culture" and "occupation" were cases in point. In the initial guidelines, these factors were treated as homogeneous. The pilot-study revealed more variation than expected.

In the initial guideline, the questions about culture were focused on culture reproduction, that is, how parents conveyed Cape Verdean culture into their offspring. The interviews and informal conversations with the residents gave us a pretty homogeneous picture, however. Cultural reproduction was reported to be mainly expressed through music, dance and language. Gastronomy, often associated to culture reproduction, is not practiced often. Changes in diet are one of the consequences of migration. The difficulty to access ingredients and the time-consuming task of cooking Cape Verdean dishes were reported to be the main reasons to eat it once a week or month. Besides difficulties, children are said not to be very fond of such dishes. They are said to like best fast food dishes, such as French fries and meat.

Due to the homogeneity of responses, we included in the second version of the interview guideline questions on mother attachment to Cape Verde, such as frequency of visits to Cape Verde, and family members still living in Cape Verde.

These questions led us to confirm that the prevailing Cape Verdean subculture in this neighbourhood is that of the island of Santiago (Table 1, Appendice B).

As far as occupation is concerned, some differences were found in this groups usually portrayed as homogenous in the literature on Cape Verde. In their examination of the census data for 1981, Saint-Maurice and Pires identified less than half of Cape Verdeans integrated in the Portuguese labour market as working in civil construction and public work occupations (48.8%). According to the authors, this concentration in hardworking occupations reflects the individual's low schooling and survival-oriented migratory goal (Saint-Maurice, Pires 1989).

A decade later, a study on the Cape Verdean community in Portugal would specify Cape Verdean integration in the Portuguese labor market, taking into account skills. The study reported the majority of men worked in civil construction (tasks requiring more skills) and public works (tasks requiring fewer skills), whereas most women worked in the cleaning services in domestic, services or industrial sectors (tasks requiring fewer skills) or in the catering sector as kitchen assistants (tasks requiring more skills).

In 2001, the *Serviços de Estrangeiros e Fronteiras*/Border Services (SEF) confirmed the tendency of Cape Verdeans to occupy low qualification jobs, even when they possessed high formal qualification. By resorting to the Portuguese Classification of Occupations, SEF estimated most Cape Verdean nationals in Portugal working in crafts and related trades (23.2%), elementary occupations (24.7%) or shop and market selling (6.9%). SEF reported few Cape Verdeans integrating the group "senior officials and managers" (0.3%) or "scientific and professional staff" (0.7%) or "technicians and associated professionals" (1%) (ACIME, n.d.).

For classifying parents occupation, this study uses the Portuguese Classification for Professions 2010, which is based on the International Standard Classification of Occupations (Labour International Organization) and National Classification for Professions 94 (Insituto do Emprego e Formação Profissional, National Institute for Labour and Training). It used only the main occupation groups, each requiring specific skill levels and specializations to competently perform the tasks and duties of the occupation (Table 8).

**Table 8 – National Classification for Occupations**

<b>Occupational Main Group</b>	<b>Skills Required</b>
0 – Armed forces	
1 – Legislators, senior officials and managers	
2 – Professionals	Tasks requiring a high level of professional knowledge and experience in the fields of physical and life sciences, or social sciences and humanities It comprises education leading to a university or postgraduate university degree, or the equivalent
3 – Technicians and associate professionals	Tasks requiring technical knowledge and experience in fields of physical and life sciences, or social sciences and humanities It comprises education leading to an award not equivalent to a first university degree
4 – Clerks	Tasks requiring and understanding of and experience with the natural resources and raw materials used and how to achieve the desired result; or an understanding of how to operate, identify malfunctioning and what to do in case of malfunctioning of tools and machinery
5 – Service workers and shop and market sales workers	It comprises first and second stages of secondary education
6- Skilled agricultural, forestry and fishery workers	
7 – Craft and related workers	
8 – Plant and machine operators and assemblers	Tasks requiring low or elementary skills and little or no judgement It comprises primary education
9 – Elementary occupations	

**Source:** Adaptation from Hoffmann, E., *International Standard Classification of Occupations*, Geneva: International Labour Organization; INE, *Classificação Nacional das Profissões 2010*, Lisboa: Instituto Nacional de Estatística

The parents interviewed were found to perform a variety of professions, concentrated in three out of the ten main occupation groups. Mothers perform tasks requiring elementary skills (60.3% in group 9), and, to a lesser extent, operational skills (36.6% in group 5). Rather, fathers mostly perform tasks requiring understanding of how to operate, maintain and repair tools and machinery (76.5% in group 7). In a few cases, parents perform administrative (2.7% for mothers and 1.5% for fathers) and technical (1.4% for mothers and 3% for fathers) occupations. Administrative tasks are performed by parents who concluded compulsory schooling and technical tasks by parents who obtained a college or university degree. These tasks are performed by parents born in Portugal. None of the parents not born in Portugal performed these occupations, even if they concluded compulsory education or secondary schooling (see Tables 1, Appendice B). These results suggest a potential relation between occupation, education, or birthplace.

The parent's occupation profile fits into the general occupation profile of Cape Verdeans living into Portugal as seen above, in particular labour migrants of the second and fourth vintage. Peixoto sustains that older Cape Verdean migrants have created an informal labour market allowing a newly migrant to work as soon as he or she arrives in Portugal (Peixoto 2009).

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In the second version, conducted with 75 mothers/tutors of children measured in the EB1-CM in 2008/9, the open ended interview guideline is converted into a semi-structured interview guideline, in which «time» plays an essential role. The neighbourhood inhabitants are highly mobile. Families, at least some of its members, move into, out, and within the neighbourhood. In this case, households' composition changes due to integration or leaving of its members (i.e. friends or family members accommodated upon their arrival in Portugal leaving after founding a job and a place to live; matrimonial unions or separations; re(migration) for a third country).

Households interviewed contradict to some extent the image widely communicated of pluri-family and monoparental households. The majority of the households are nuclear bi-parental households, of which 6.5% are headed by females because of their mate emigration to another European country. If stepparents households are added, the percentage of households in which two adults of different sexes share parenting increases. Female-headed mono-parental households are also common, whether two (parent and offspring) or pluri-generations (grand-parents, parent, and offspring) cohabite (Table 1, Appendice B). In a few cases, parents have relegated the responsibility of caring to the offspring's grand-parents. The latter often occurs where mothers have migrated or are working in another country or municipality (Box 7)

#### **Box 7– Cape Verdean Alloparents**

*Dona Emilia is an eighty-four years old lady who migrated to Portugal in 1975. During colonial times, she and her family had migrated to São Tomé and Príncipe following the droughts which devastated Cape Verde in the 1940s. Over the years, their offspring left Portugal in search of better paid jobs in other European countries. One of her offspring followed the migratory path of her siblings, leaving behind the offspring with her grand-parents. These children added to the other grand-children who Dona Emilia was already taking care of. She feels she is not up to the chore. They do not follow her commands, and she is too old to discipline them.*

*Two streets away lives Dona Elsa, another Cape Verdean old lady, who migrated to Portugal in the 1970s. She hosts several grand-children and their respective parents. After separating from the mother of his offspring, her son kept parenting his two offspring. Her daughter lives with her offspring under the same roof. Two years ago, her daughter who has migrated to the United Kingdom sent her two daughters to Portugal to study in the EB1-Cova da Moura. Their aunt is tutoring them. D. Elsa feels too old to be their tutor.*

The household dynamics require framing parental investment in specific times. The second version of the interview guidelines include indicators to assess parental investment in infancy, that is: feeding measured by duration of breastfeeding and the age of introduction to complementary food; protection measured by birth space, frequency of development screening visits and housing habitability; learning measured by the main caregiver during working hours.

The rationale for selecting the above indicators and variables is based on a mixture of international and national recommendations for children. Based on a systematic review of the available scientific evidence on the effects of breastfeeding on child's health, growth and development and on maternal health, the World Health Organization recommends exclusive breastfeeding (i.e. no other solids or liquids) during the first 4-to-6 months of the infant's life. Human milk not only contains the exact nutrients an infant needs, but it is also easily digested and efficiently used by the infant's body. In addition, human milk confers advantages by protecting the infant against gastrointestinal infections and promoting physical growth and sensory and cognitive development (Butte, Lopez-Alarcon M. *et al.* 2002, Kramer, Kakuma 2002, WHO 2002b). It helps to maximize financial resources because of its low cost and its contribution to have larger intervals of birth in a household.

WHO recommends the introduction of complementary foods at 6 months of age, roughly corresponding to weaning phase. By the time the nutrients of the human milk are no longer enough to meet the nutritional needs of the infant, parents should add complementary food easily digestible to the infant's diet (Brown, Dewey *et al.* 1998, WHO 2002a).

Protection is examined in terms of birth spacing, infant development screening, and housing habitability. Based on a systematic review of scientific literature on the effects of birth spacing on maternal and child health, an interval of at least 24 months between the date of a live birth and the start of the next pregnancy is recommended to reduce the risk of adverse maternal, perinatal and infant outcomes (WHO 2006a). As energy and time are finite resources, the birth of a new offspring diverts resources (in particular feeding and caring) from the child to his or her sibling.

Frequent screening is recommended to assess infant's growth and development against growth and development milestones (i.e. psychomotor, language, cognition, and socialization). The schedule of screening varies with the infant age. In place since 1992, the Portuguese health screening programme (Circular Normativa 9/DSI, 6th October 1992), recommends the following visits during infancy: six visits for first year (i.e. on completion of first week, first, second, fourth, sixth, and ninth month), three visits for the second year (i.e. on completion of twelfth,

fifteenth, and eighteenth month), and two visits for the third year (i.e. on completion of the twenty-fourth and thirty-sixth month). This schedule is flexible. The infant may be screened a little earlier or later. The schedule is adaptable to individual cases. Visits should be cancelled or added according to the individual requirements (Portugal – Direcção-Geral da Saúde 2005).

Provision of adequate housing conditions is another relevant form of protection. Not only it is important the location to build or rent a house, but also the conditions of the house (i.e. sanitation, water, dimension per capita, and temperature). Children living in poor housing conditions, such as cold, damp, mouldy, and/or overcrowding, are more likely to be exposed to health problems. For instance, cold reduces the individual resistance to respiratory infections. Damp is favourable to viruses and bacteria. Mould produces allergy which in turn can cause respiratory problems. Overcrowding facilitates the propagation of respiratory problems. In addition, poor housing conditions are likely to contain hazards (e.g. uneven floors, faulty electrical wires) which create an unsafe environment to raise a child. Those hazards can cause falling or a domestic fire (Harker 2006).

Housing conditions are assessed through questions on conditions available (i.e. sanitation, drinking water, electricity, indoors kitchen and bathroom, and the number of rooms), and resorting to the classification of the *Laboratório Nacional de Engenharia Civil's* housing survey, conducted in 2008 in Cova da Moura. This survey is the baseline for implementation of the neighbourhood rehabilitation programme. By rehabilitation is meant the relation between the intervention required to correct construction anomalies (but keeping the capacity to use the space) and the need to construct a new house for the same purpose. In this vein, each house of the neighbourhood is classified according to the four levels of rehabilitation defined: 1<sup>st</sup> level – irrelevant anomalies; 2<sup>nd</sup> level – small anomalies which affect the visual aspect; 3<sup>rd</sup> – anomalies which affect the use and/or comfort; 4<sup>th</sup> level – anomalies which endanger health and/or safety (LNEC 2008).

Learning, the third indicator chosen to assess parental investment, is related to the infant acquisition of knowledge and/or skills. Parents and caregivers are responsible to create a stimulating and supportive learning environment. Learning environment is here assessed by the main individual who takes care of the child during daytime. Bearing in mind the recommendations on home setting as likely to be more appropriate for learning because of its stimulation on individual basis and provision of a supportive emotional environment, a classification is developed on childminders which privileges first parents and second blood-related alloparents. Official infant caregiving institutions, which receive babies from 3 months to 3 years old, occupied the third position, as they are required to meet specific standards to

provide infant caregiving services, such as locations, spaces, building material, environmental conditions, and furniture. In addition, they are required to accommodate a limited number of infants per room (8-12 infants), to provide adequate (both quantitatively and qualitatively) food and nutrition according to age, hygiene care, and individual care, as well as to promote educational, motor, and recreational activities (article 5th, Portaria 262/2011, 31 August). Last, non official recognized childcare services are ranked as the least appropriate, as they are not "licenciadas de acordo com a legislação em vigor, e o seu funcionamento não é acompanhado, avaliado e fiscalizado por parte dos serviços competentes do Instituto da Segurança Social as recommended by Despacho Normativo 99/89 (rectified by Portaria 262/2011).

Based on the above components, a composite is created for *parental investment* to better assess the effects of individual components related to allocation of resources to an individual offspring that increases his or her fitness at cost of the parent's ability to invest in other offspring or themselves. A score is allocated to each of the six individual components, according to the observation or not of the national or international recommendations (Table 9). The composite is the result of adding up the individual scores.

**Table 9 – Composition of Parental Investment Indicator**

Components	Recommended	Non recommended
Exclusive breastfeeding	≥ 4-6 months = 1	<4 months = 0
Introduction of complementary food	≥ 6 months = 1	< 6 months = 0
Birth space	≥ 24 months =1	< 24 months = 0
Infant development screening – 1st year	≥5 visits = 1	< 5 visits = 0
Infant development screening – 2nd year	≥3 visits = 1	<3 visits = 0
House rehabilitation	small repairs = 2 medium repairs = 1	Other = 0
Childminder during working hours	parent = 4 alloparent = 3 official institution = 2 unofficial institution = 1	0 – other

The composite ranges from zero (minimum) to eleven (the maximum). It is divided in tertiles in order to obtain three categorical groups: children receiving low parental investment (0-3 scores), children receiving medium parental investment (4-7 scores), and children receiving high parental investment (8-11).

Besides parental investment in postnatal life, children are assessed according to pre-natal parental investment. Birthweight is used as a proxy for assessing pre-natal parental investment. Birth implies the transition from the intra-uterine to the extra-uterine environments. The size at birth is acknowledged as an important

indicator of intra-uterine health as well as a predictor of the individual's health in infancy and childhood. Adjusted for the gestational age, it reflects the average growth rate for the infant from conception to birth and predicts the risk for mortality, morbidity, and impaired development from birth into childhood (Saenger *et al.* 2007).

Neonates are classified as large for gestational age (LGA), appropriate for gestational age (AGA) and small for gestational age (SGA) (WHO 1988). Taking as reference a study on birthweight from 2000 to 2004 at the *Hospital Fernando Fonseca*, the hospital that covers the municipality of Amadora and its surroundings, in this study AGA term neonates measures between 2600 – 3600 grammes for 37 gestational weeks, 2700 – 3800 grammes for 38 gestational weeks, 2900 – 4000 grammes for 39 gestational weeks, 3000 – 4100 grammes for 40 gestational weeks, and 3200 – 4200 for 41 gestational weeks (Cunha *et al.* 2007).

The interviews are only conducted with parents whose child was born in Portugal, because the latter were the only ones to own the infant development screening booklet issued at birth. During the anthropometric assessment, the number of the schoolchildren born in Portugal was identified as 175 (see Table 10).

The sample was defined as one-third of the Cape Verdean schoolchildren born in Portugal. One third corresponds to about 74 children (37 boys and 37 girls), equally distributed for each of the four grades. Thus, a list was created with the names and addresses of the children born in Portugal and their educational grade to identify the schoolchildren who would be part of the qualitative study.

**Table 10** - The expected composition of the sample of children attending EB1/JI-Cova da Moura in 2008/9

Sex	Grade	N	Born in Portugal	(%)
Girls	1	31	27	87.1
	2	24	22	91.6
	3	40	29	72.5
	4	24	17	79.8
	Total	119	95	<b>54.3</b>
Boys	1	30	28	93.3
	2	27	24	88.9
	3	22	17	77.3
	4	23	11	47.8
	Total	102	80	<b>45.7</b>
<b>Total</b>		221	175	100

A combination of reasons (e.g. working schedules, unavailability) did not allow to put it into practice the stratified sampling. We were able to meet the goal only for children attending the second grade.

**Table 11** - The composition of the sample of children attending EB1/JI-Cova da Moura in 2008/9

Sex		Grade				Total
		1	2	3	4	
Boys	N	8	11	8	6	33
	%	24.2	28.0	30.7	18.7	44.0
Girls	N	9	10	15	8	42
	%	21.4	23.8	35.7	19.0	56.0
Total	N	17	21	23	14	75
	%	22.7	28.0	30.7	18.7	100.0

The interviews are usually conducted with the mother of the child. When the mother is absent for a long period (e.g. migration into another country) or no longer lived in the household (e.g. abandonment or divorce), the interview is conducted with the person responsible for the child's education (e.g. grand-mother or father). In the latter case, information collected is usually poorer because the interviewee knows or recollects little on the infancy of the child.

A multi-stage interview procedure is used to collect information in the child's home. About three 30 minute visits are conducted with each of the mothers whereas two longer visits are conducted in the case of the mother's long absence. The reason for a multi-stage interview lies in the need to build confidence between the interviewer and the interviewee. Besides the importance of this kind of relationship in any interview, the high rate of the drugs dealing-related and theft criminality associated to the neighbourhood makes it all the more necessary. As such, the first visit focus on information regarding the child's birth and the environment in which the child lives. The second visit is dedicated to collect information on household and housing conditions and confirming information collected in the previous visit. The last visit is aimed to collect sensitive information such as family relations and migratory process and clear any doubts from previous visits. Following each visit, the notes taken during the interview are transcribed to an interview guide form.

No electronic recorder is ever used to record the interviews. By asking to record the interview the interviewees will feel uncomfortable to talk. It could also endanger the safety of the researcher in an environment highly associated with criminality.

During the interviews, parents are asked to show the child's *Boletim de Saúde Infantil e Juvenil*, a medical record issued at birth. This record includes information on gestational age, type of birth, height, weight, and brain circumferences, vaccines, and health problems detected at birth. Health practitioners are supposed to continue recording on it information on height, weight, and brain circumference

during the infant development screening visits. Medical record data are obtained from fifty-two out of seventy-five children.

Birth weight can be seen as the outcome of prenatal parental investment. The size at birth is acknowledged as an important indicator of intra-uterine health. Adjusted for the gestational age, it reflects the average growth rate from conception to birth. Besides the genetic contribution, parental decision is relevant for birth weight as nutrition, lifestyle (e.g. smoking, level of stress), health condition, maternal age, and weight gain are leading determinants of the size at birth (WHO 1995). Extensive literature has shown an association between birth weight and risk of mortality, morbidity, impaired cognitive development from birth into childhood, and lower wage and employment as adults (Loughran et al 2004, Saenger et al. 2007, WHO 1995).

### **4.3.2 Data Management and Analysis**

Information obtained from qualitative methods is managed in two ways: statistically and thematic content analysis. The latter consists of distilling from documentation common themes in order to give expression to the communality of voices across interviewees. This information is used to sustain the discussion chapter and is used in examples provided in boxes. The former consists of statistical data analysis of information collected during interviews, information previously converted into measurable data (i.e. indicators and variables). Table 9 shows the dimensions, along with their respective indicators and variables, type and level of measurement of the variable, and the source of information.

Data are entered in the main database in order to process them statistically with the *Statistical Package for Social Sciences* (SPSS). A specific code is allocated in order to be able to select and the data corresponding to the children whose parent/allopresent was interviewed and conduct statistical analysis. No software for qualitative data analysis (e.g. In Vivo) was used because the interviews were not recorded.

Statistical analysis is based on descriptive statistics, comparison of birthweight means for children of Portugal-born mother and PALOP-born mother, and Z-scores-for-height and Z-scores-for-SHR for each component of parental investment and for the composite. Linear growth is the only antropometric measurement used here because of its potentialiy to indicate allocation of resources (e.g. energy, time, attention) throughout an individual lifetime. Height-for-age indicates poor environmental conditions and/or long term restriction of a child's growth potential.

**Table 12** - Dimensions, Indicators, Variables, and Source of collected data from interviews and medical records

Dimension	Indicator	Variable	Type	Measurement	Processed	Source
Household profile	Biological	Mother age Father age	Independent	Continuous Continuous	Integer Integer	Interview
	Socioeconomic	Mother education Father education Mother occupation Father occupation Number of parents House ownership		Ordinal Ordinal Nominal Nominal Continuous Nominal	Cont./interval Cont./interval Dummy (No qual.=ref.)  Dummy (owned=ref.)	
	Culture	Mother birthplace Father birthplace Family in Cape Verde Migration vintage		Nominal Nominal Nominal Continuous	Dummy (Portugal=ref.)	
Prenatal parental investment	Birth	Birthweight (gr) Prenatal medical visits (number) Gestational age (weeks) Maternal age (years) Parity (number) Birth space to older (months) Type of family	Both	Continuous Continuous Continuous Continuous Continuous Continuous Nominal	Dummy (biparental=ref)	Medical record
			Independent			
Parental investment in infancy	Household	Type of family Grandmother presence Siblings (number) Adolescent siblings (number) Older siblings (number)	Independent	Binominal Continuous Continuous Continuous Continuous		Interview
	Feeding	Exclusive breastfeeding Complementary food		Continuous Continuous		
	Protection	Infant screening 1 <sup>st</sup> year Infant screening 2 <sup>nd</sup> year House habitability Birth space to younger	Dependent	Continuous Continuous Ordinal Continuous	Dummy (recom= ref.) Dummy (recom= ref.) Dummy (recom= ref.) Dummy (recom= ref.)	LNEC Interview
	Learning	Childminder during daytime		Ordinal	Dummy (recom= ref.)	

Leg length, measured as sitting height ratio, is a sensitive indicator of the pre-pubertal nutrition.

Regression analysis is used to identify main predictors of birthweight and parental investment, to test assumptions on biased parental investment, and predict linear growth and cognitive development from the parental investment composite.

### **4.3.3 Constraints**

At the beginning, the author envisaged conducting the study under the auspices of a civil society organisation (CSO) which is based inside the neighbourhood. This CSO intervenes in several social areas, in particular in provision of childcare services. After a couple of months, this attempt proved however to be ineffective. The CSO informed us of its unavailability to accommodate this study.

Another focal point urgently needed to be identified. But it ought to be an institution with easy access to the parents. The chairman of the *Agrupamento das Escolas da Damaia*, group of schools integrating the EB1-Cova da Moura, was contacted. Against all odds, this institution did not take weeks to reply. They agreed to accommodate the cross-sectional study, as long as the study was conducted inside the school building, for which a room would be available. The school officers would obtain consent from the parents for their children participate in the study. The respective form to obtain parental consent, along with an information sheet on the aim and procedures used during the study, was handed in. A second constraint to be addressed was the criminality in the neighbourhood. The researcher decided to conduct the quantitative and qualitative analysis mainly during the daylight and working days, although she did it in the night and weekends in the beginning of the study. No record device was use. Its use would have made it difficult to build an adequate research environment. Regardless of their involvement or not in criminal activities, the residents do not trust non-residents. In addition, they are tired of researchers. Over the years several quantitative and qualitative studies have been conducted in the neighbourhood. Parents have been interviewed in several occasions. They feel they are repeating themselves every time another study is conducted.

## **Chapter 5 – Parental Investment in Infancy and Embodied Capital in Prepuberty**

Children's growth and development can be described as *embodied capital*. They are the outcome of a continuous investment in stocks of assets, such as somatic tissue, immune system, psychomotor, cognitive, emotional and social competences. Parental choices, decisions and behavior since conception are crucial for its formation, consolidation and maintenance, in particular in critical periods. Infancy, here including the first 28 days of postnatal life, is a case in point.

Parental investment in early life has a long-lasting effect. A physically and psychologically healthy child is likely to have an adequate cognitive development, to perform better in school and, later, to earn a good salary (Garasky 1995, Feinstein, Haveman, Wolfe 1995, Sabates et al. 2008). Literature has evidenced to a certain extent the relation between poverty and deficient allocation of resources to feeding, protection, and learning. This relation is believed to be aggravated in case of migrant people, due to their vulnerability. As such, we expect children born and/or raised in Cova da Moura to receive a low parental investment in infancy and, as a consequence, to be shorter and have a lower performance in school than their peers living under better conditions.

The aim of this chapter is to assess the effects of environment in infancy (mediated by parental investment) on prepubertal embodied capital. This assessment requires a combined analysis of the data collected through qualitative and quantitative methods. The analysis is to be carried out backwards, however. Children are examined from prepuberty to birth. The prepubertal growth and development of the 211 children measured is first examined. Then, parental investment in infancy of the 75 children of the parents interviewed, and its effects on stature and school performance are analyzed. Last, parental investment in prenatal life of 46 children holding the infant development record is inferred from size at birth, and its effects on prepubertal stature and school performance are assessed.

### **5.1 Demographic Profile**

Before exploring the anthropometric measurements and indexes to assess children's embodied capital, this chapter addresses some basic demographic characteristics, in particular the differences between children born in Portugal and those born in Portuguese-speaking African Countries (PALOP) and between boys and girls.

**Table 13** - Mean age for Boys and Girls born in Portugal and PALOP

Sex	Birthplace	N	%	Mean & S. Error	95% CI*	t	r
Boys	Portugal	82	38.9	8.10 (0.16)	(7.77-8.45)	-2.885**	0.26
	PALOP	15	7.1	10.06 (0.35)	(9.34-10.68)		
Girls	Portugal	91	43.1	8.28 (0.16)	(7.95-8.61)	-4.766**	0.44
	PALOP	23	10.9	9.31 (1.60)	8.69-9.89)		
Boys		97	46.0	8.41 (0.16)		0.375	0.03
Girls		114	54.0	8.49 (0.15)			
	Portugal	173	82.0	8.20 (0.11)	(7.97-8.43)	-5.236**	0.34
	PALOP	38	18.0	9.61 (1.53)	(9.14-10.07)		

\*Age interval: 6.14-11.67 for girls and 6.17-11.87 for boys; 6.14-11.87 for Portugal-born and 6.20-11.54 for PALOP-born children

\*\*  $p < 0.01$ .

Table 13 evidences salient features in children attending Cova da Moura basic school in 2009. The girls outnumber the boys 1.2 to 1, and the Portugal-born children outnumber the PALOP-born children 4.6 to 1. Children were born between 1997 and 2002. The age range is slightly higher for boys (5.70 years) than girls (5.53 years) and for Portugal-born children (5.73 years) than PALOP-born children (5.34 years).

On average, Portugal-born children are younger than PALOP-born children, regardless of the sex. The mean age for birthplace is significantly different for both boys ( $t(97) = -2.89, p < 0.01$ ) and girls ( $t(114) = -4.77, p < 0.01$ ). Although the effect size is medium for both sexes, it is larger for girls ( $r = 0.44$ ) than for boys ( $r = 0.26$ ). The individual examination of mean age for birthplace and sex shows a significant difference only for birthplace. Removing the birthplace variable, the mean ages for boys and girls are not significantly different, whereas, removing the sex variable, the mean ages for Portugal-born and PALOP-born children are significantly different and the effect size is medium ( $r = 0.34$ ).

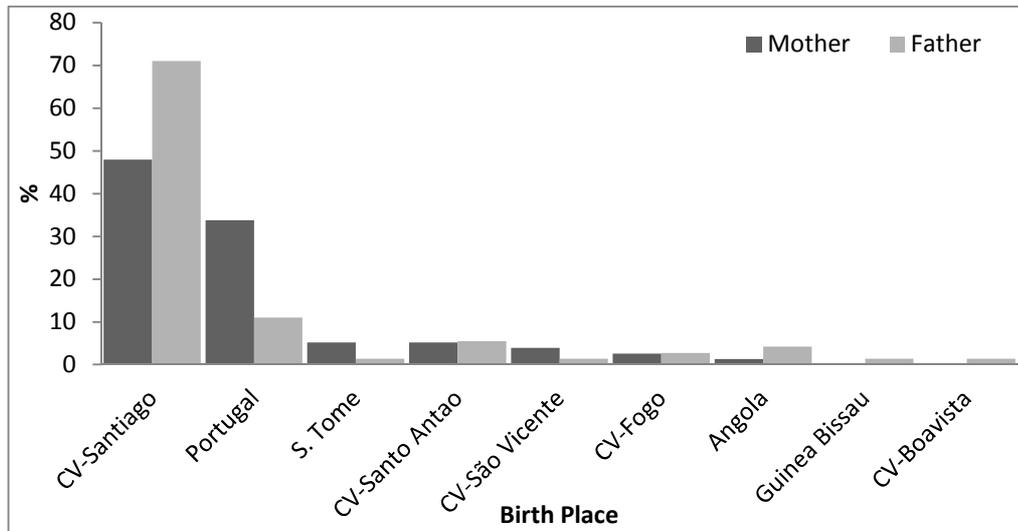
School records identified most of the CV-PT 09 children as Cape Verdeans. The majority are descendants of Cape Verdeans who migrated directly into Portugal or Cape Verdeans who migrated to a PALOP country during colonial times or to another country after independence (Box 8).

**Box 8 – Stepwise migration among Cape Verdean Families**

*D. Emilia is an eighty-four-year-old woman who left from Cape Verde following the drought devastating the country in 1940s. Still adolescent, she migrated with her parents to Sao Tome to work in cacao plantations, in search of a better life. There, she marries and gives birth to several children. In the wake of Portuguese-speaking African countries independence, she, her husband and children leaves Sao Tome. Rather than return to Cape Verde, she, her husband and children migrates to Portugal.*

*Carla is another case of stepwise migration. In 1980, at the age of eighteen years old, she left Santo Antão to work in Italy, where she lived for sixteen years. In 1997, she decided to migrate to Portugal to join her Cape Verdean partner, who is himself a migrant in France. Portugal was the best choice as her partner had a house in Portugal.*

**Figure 9** – Ethnic background of the children CV-PT 09



The interviews confirmed the Cape Verdean ethnic background of the children (Figure 9). About 60% of the mothers and 80% of the fathers were born in Cape Verde. Parents born in Portugal are descendants of Cape Verdean migrants. The remaining parents are Cape Verdean born in another PALOP.

As discussed in the introduction, “Cape Verdean” is an ethnicity-related label going beyond the birthplace. It is associated with a mixture of elements, such as the sharing of a language (*Creole*), traditions (e.g. musical and body expressions) and specific ideas and values (e.g. *djunta mon*, matrifocality). The sharing of an ethnic identity made us include all children attending the EB1-CM in the study.

Because of the small sample size of children and the common ethnicity, the data on foreign-born children, between ages 6 and 11 years are processed together with data on the children born in Portugal.

## 5.2 Embodied Capital

This section presents data on linear growth, fat patterning, and cognitive development of the 211 children measured in the EB1-CM. Linear growth is assessed through height (measurement) and Sitting Height Ratio (SHR, index). Fat patterning is examined through weight, circumferences and skinfolds (measurements) and BMI (index). Cognitive development is assessed through school grade attended and school performance.

### 5.2.1 Linear Growth

**Table 14** - Descriptive statistics (means and standard deviations) for height-for-age, and SHR-for-age for CV-PT 09 boys and girls

Sex	Age	N	Height Cm		SHR %	
			Mean	SD	Mean	SD
Boys	6	26	122.65	4.45	52.03	1.34
	7	19	127.66	6.03	51.95	1.45
	8	16	130.89	5.74	52.62	1.61
	9	19	136.43	6.78	51.53	1.16
	10	8	143.91	5.16	50.22	1.76
	11	9	146.12	8.74	50.31	1.29
Girls	6	28	121.68	6.07	53.14	1.29
	7	21	124.91	7.73	51.72	1.13
	8	19	132.37	6.08	52.22	1.07
	9	21	139.38	5.99	51.12	1.21
	10	17	140.46	6.53	51.09	1.20
	11	8	143.31	4.44	49.85	0.9

In general, the mean height increases with age for both sexes, in spite of the increases not being consistent within and between groups (Table 14). On average, boys are taller than girls, except for eight and nine year-old boys. Girls' higher increase at ages seven-to-nine years old (boys' increase is at ages eight-to-ten) might explain this exception. This is typical of growth at these ages, as girls enter puberty about two years earlier than boys. With puberty, growth rates increase as the adolescent growth spurt commences (Bogin 1999b, Tanner 1962).

On average, SHR is above 50 for both boys and girls, except for nine-year-old girls. In other words, these children have short legs, in particular younger children. Seven-to-nine-year-old boys have shorter legs than girls, whereas six, and ten-to-eleven-year-old girls have shorter legs than boys.

For both sexes, the variation of mean SHR is not consistent. It declines from six to seven years old, it increases from seven to eight years old, and it gradually declines in the subsequent years.

The mean stature for boys and girls is not significantly different, however (Tables 6 and 7, Appendice B). It is only significantly different for height at seven years old ( $p < 0.05$ ) and SHR at six years old ( $p < 0.01$ ).

*EB1-CV 09 versus CV-PT 87, CV-PT 88, and PT-2001*

**Figure 10** – Mean height-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, basic schools in Caparica in 1987, Buraca’s Basic School in 1988, and Lisbon Metropolitan Area in 2001

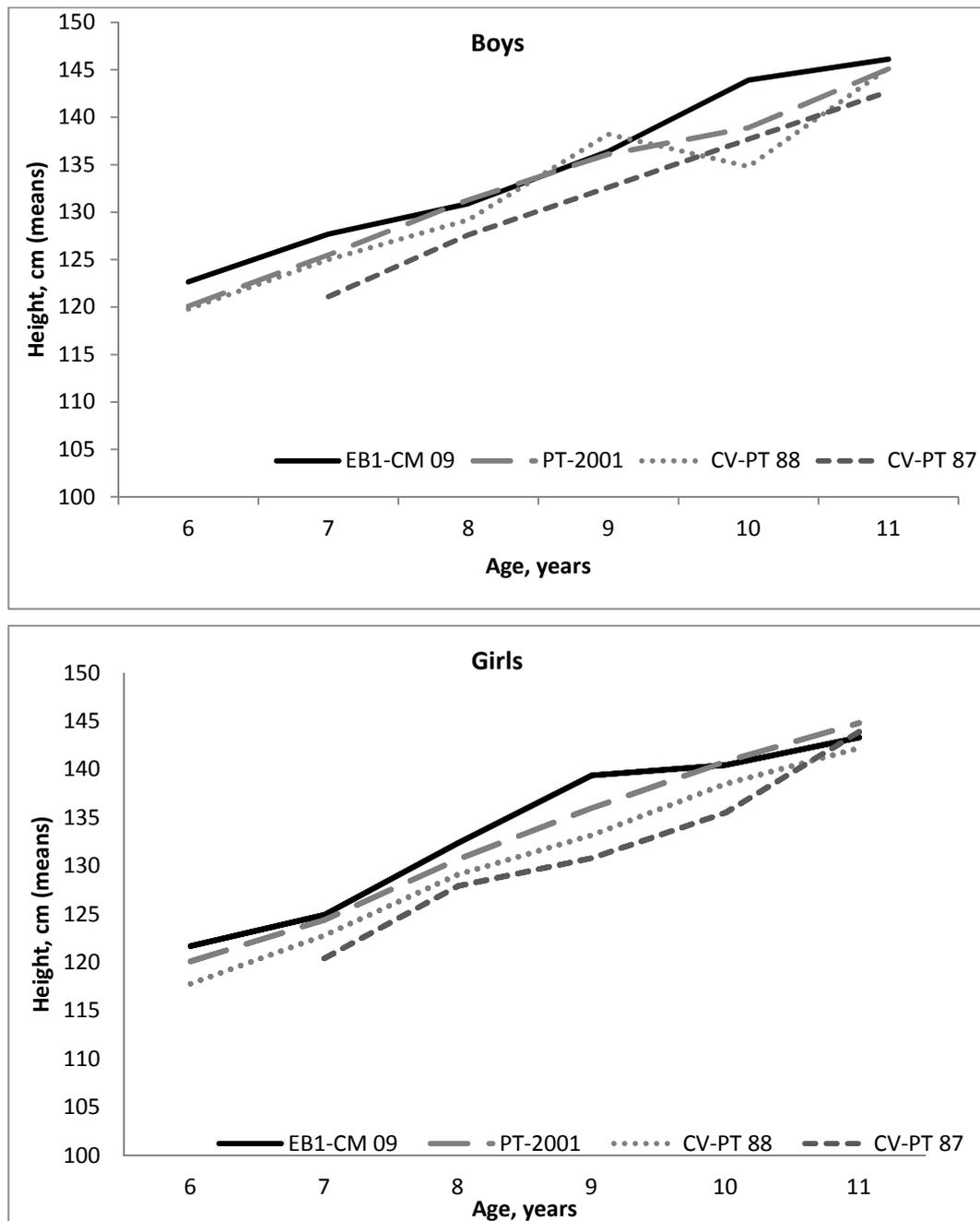


Figure 10 shows, on average, CV-PT-09 children are taller than CV-PT 87, CV-PT 88 and PT 01, except for eight-to-nine-year-old boys, and ten-to-eleven-year-old girls. The One-way Anova test shows, however, mean heights are significantly different for seven-to-ten-year-old boys, and nine-year-old girls (Table 22, Appendice B). Comparing CV-PT 09 to each of the mentioned groups evidences significant differences in mean heights for boys at age seven (CV-PT 87, CV-PT 88, and PT

01), eight (PT 01), and ten (CV-PT 87 and CV-PT 88), and for girls at age eight (CV-PT 87), and nine (CV-PT 87, CV-PT 88 and PT 01) (Table 13, Appendice B).

**Figure 11** – Mean Sitting Height Ratio-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in Portugal in 2001

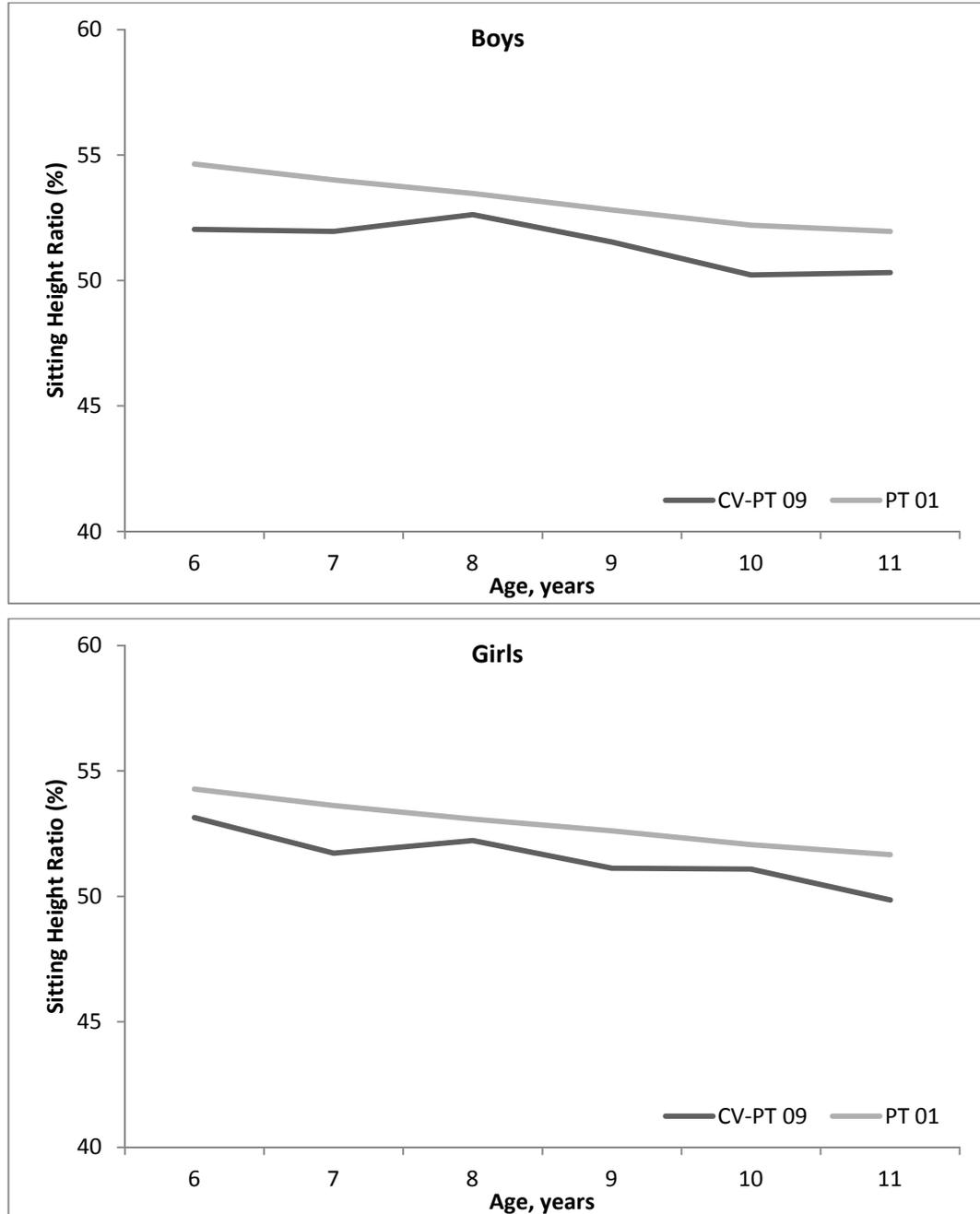


Figure 11 shows mean SHR-for-age for boys and girls CV-PT 09 and PT 01, as PT 01 is the only group with SHR data available to make comparisons. On average, PT 01 has a higher SHR than CV-PT 09. *T*-test confirms the mean difference between the two groups is significant for all ages and both sexes, except eight-year-old children. The effect size is, however, small (Table 15, Appendice B).

EB1-CV 09 versus PT 03

**Figure 12** – Mean height-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in Portugal in 2003

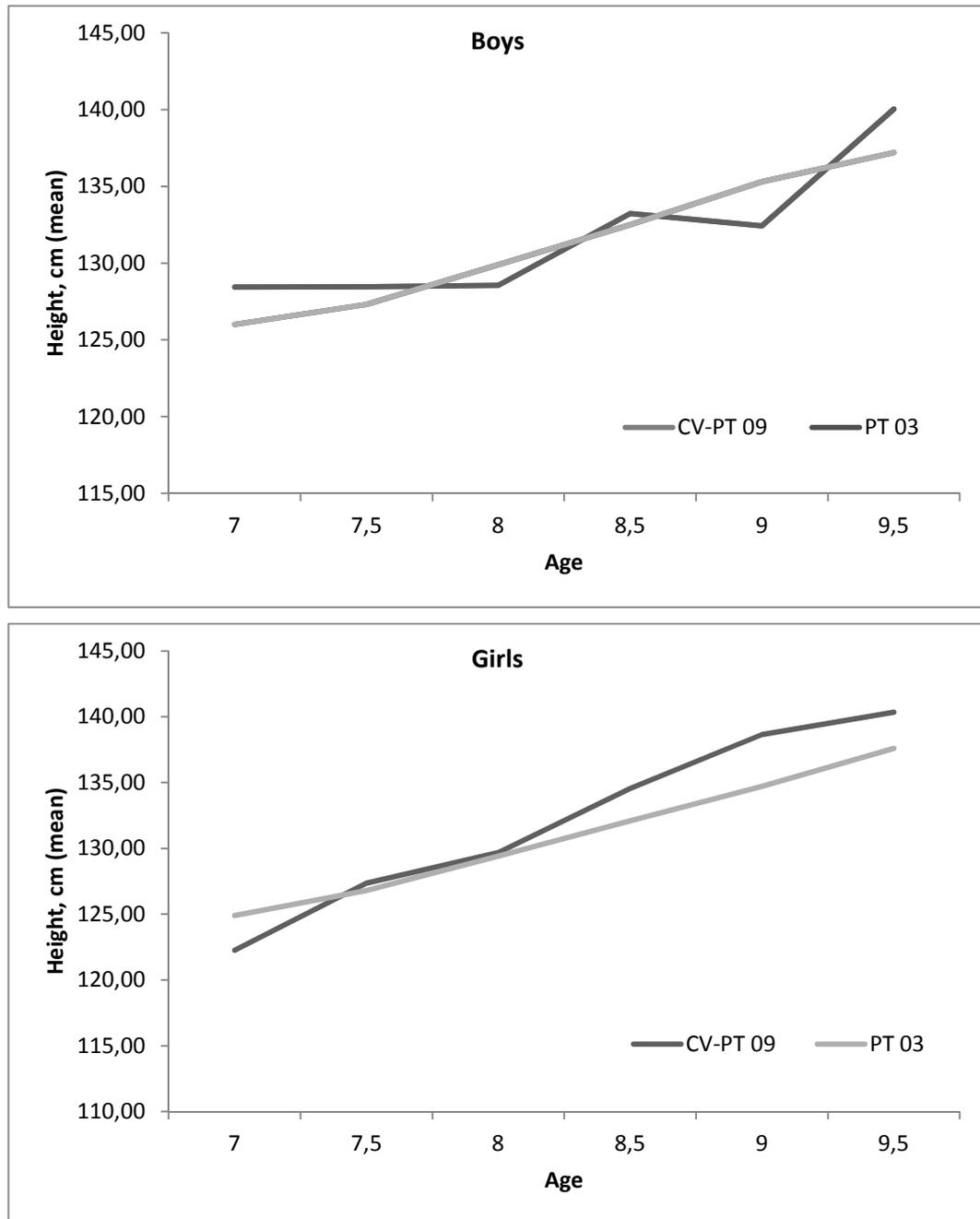


Figure 12 shows, on average, 7-to-7.5-year-old and 9-to-9.5-year-old boys CV-PT 09 are taller than boys PT 03. Girls CV-PT 09 are taller than girls PT 03, except for 7-year-old girl. The *t*-test only shows a significant difference for 9-year-old girls ( $t=-2.4$ ,  $p<.05$ ). The effect size is small, however ( $r=.11$ ).

EB1-CV 09 versus NHANES III

**Figure 13** – Z-scores for height-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in USA in 1994

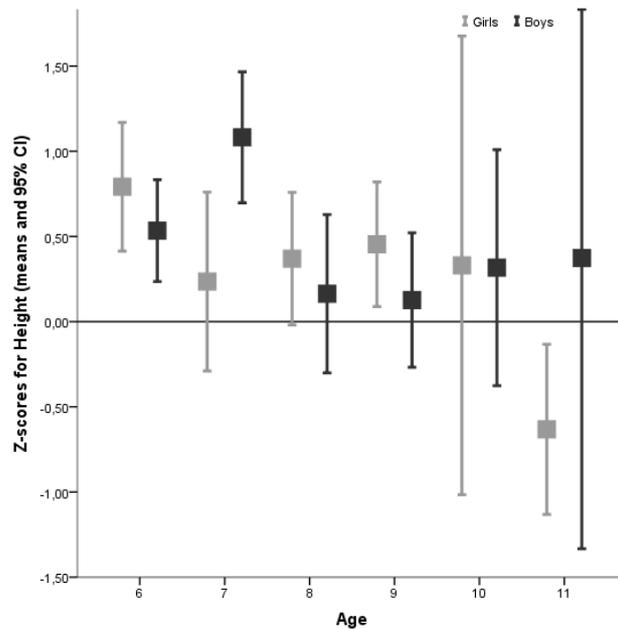
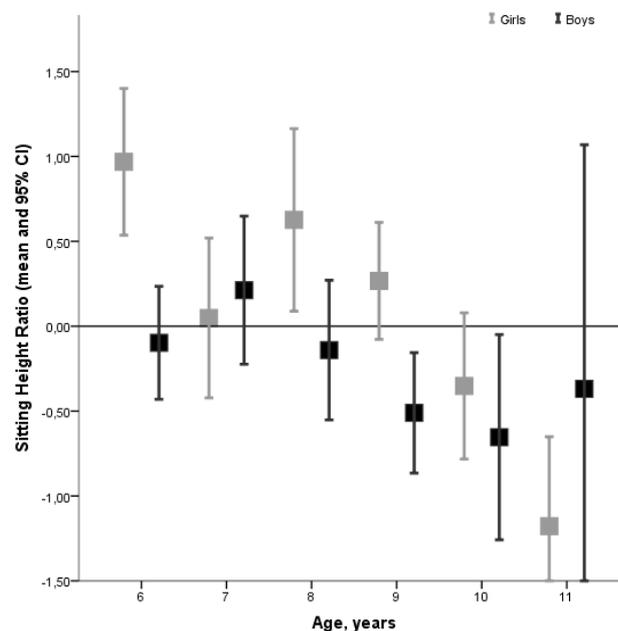


Figure 13 shows, on average, CV-PT 09 height is around the NHANES mean height (i.e. differences within +/- 1.5 SD). It also suggests on average six and nine-year-old girls and six-to-seven-year-old boys are taller than children measured in NHANES. Eleven-year-old girls are, however, shorter than NHANES children.

**Figure 14** – Z-scores for SHR-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in USA in 1994



As far as sitting height ration is concerned, the distribution presents a different shape: ^ type (Figure 14). On average, CV PT 09 children SHR falls into the

NHANES reference (i.e. differences within +/- 1.5 SD). Six-year-old, and eight-year-old girls deviate positively (i.e. have shorter legs), whereas nine-to-ten-year-old boys and eleven-year-old girls deviate negatively (i.e. have longer legs) from the NHANES mean reference.

### 5.2.2 Fat distribution

**Table 15** - Descriptive statistics (means and standard deviations) for weight-for-age, Body Mass Index (BMI)-for-age, arm and abdominal circumferences-for-age, and average of skinfolds-for-age for CV-PT 09 boys and girls

Sex	Age	N	Weight Km		BMI (kg/m <sup>2</sup> )		Arm circumference cm		Abdominal Circumference cm		Skinfolds mm	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Boys	6	26	23.51	3.05	15.65	1.02	17.9	1.12	55.14	2.33	4.90	0.76
	7	19	28.70	5.67	17.29	2.56	19.97	2.54	60.31	6.99	7.06	5.40
	8	16	29.2	5.79	16.99	2.9	19.66	2.79	58.96	7.07	6.06	2.16
	9	19	32.53	6.88	17.41	3.17	20.69	2.91	63.28	8.18	7.10	5.58
	10	8	36.46	6.58	17.55	2.75	21.41	3.18	63.68	6.00	7.07	4.92
	11	9	37.9	9	17.59	2.82	21.1	2.91	63.92	6.91	6.31	1.84
Girls	6	28	24.68	5.04	16.55	2.44	18.84	2.35	58.15	5.86	6.91	2.85
	7	21	25.96	5.19	16.69	2.13	19.68	2.3	58.62	6.11	7.33	3.01
	8	19	33.58	9.29	18.80	3.99	22.67	4.8	66.34	10.39	10.47	6.51
	9	21	34.94	5.7	17.98	2.36	21.44	2.47	64.59	6.40	8.62	5.30
	10	17	35.47	7.22	17.83	2.84	21.52	2.5	66.55	8.63	10.05	6.27
	11	8	37.83	5.18	18.37	1.94	22.34	2.37	68.96	5.67	9.18	3.36

Table 15 shows mean and standard deviation for measurements and indices related to fatness (i.e. weight, arm and abdominal circumferences, skinfolds and BMI). In general, the mean increases with age for all measurements in both sexes.

The mean weight increases from 23.5 to 37.9 kg for boys and from 24.7 to 37.8 kg. On average girls are heavier than boys at ages six, eight, and nine years old, and lighter at ages seven, ten and eleven years old. These differences are not, however, significant (Table 8, Appendice B).

As weight-for-age fails to distinguish between, for instance, a short child with adequate body weight and a tall child with inadequate body weight, it is complemented with other measures such as Body Mass Index (WHO 2011). Mean BMI increases from 15.7 to 17.6 for boys and from 16.6 to 18.4 for girls. On average, girls' BMI decreases at age eight-to-ten years old, whereas boys' BMI mean keeps increasing. Except for the seven-year-old girls, girls show a higher BMI mean than boys. Mean BMI for boys and girls is not significantly different for all ages (Table 9, Appendice B).

As BMI values do not provide information on the distribution of body fat in relation to lean body mass, skinfolds are recommended to assess fatness. Mean skinfolds (triceps + subscapular) increase from 4.90 mm to 7.10 mm for boys, and from 6.91 mm to 10.47 mm for girls. On average, girls’ skinfolds are ticker than those of the boys for all ages. Boys’ skinfolds decrease at ages seven-to-eight years old and nine-to-eleven years old. Girls’ skinfolds declines at age eight-to-nine and ten-to-eleven years old. Mean skinfolds for boys and girls are significantly different at the age of six ( $p=0.01$ ), eight ( $p=0.01$ ), and eleven ( $p<0.05$ ) (Table 10, Appendice B). For determining the contribution of fatness – as measured by skinfolds – to the BMI, multiple regression is conducted (Table 16). The multiple regression output shows BMI is a reliable indicator of fatness ( $\beta= 0.85, p<.001$ ). The standardized beta ( $\beta$ ) indicates that as the sum of skinfolds increase by one unit, the BMI increases by 0.85.

**Table 16** – Prediction of BMI from the average of subcutaneous skinfolds (SSF) in CV-PT 09 children

	<b>B</b>	<b>SE B</b>	<b>β</b>
SSF	0.50	0.02	.85*

$r^2=0.72, *p<.001$

The circumferences also contribute to a better assessment of fatness. Table 15 shows that the mean abdominal circumference increases from 55.14 to 63.92 cm for boys and from 58.15 for 68.96 cm for girls. The mean arm circumference increases from 17.9 cm to 21.41 cm for boys and 18.84 cm to 22.67 cm for girls. This tendency is reversed at ages seven-to-eight years old for boys and eight-to-nine years old for girls. On average, boys’s arm circumference decrease at age ten-to-eleven years old. Except for the seven-year-old girls, on average, girls show higher circumferences than boys. Means circumferences are significantly different at the age of six and eight years old ( $p<0.05$ ) (Tables 11 and 12, Appendice B).

**Table 17** – Prevalence of stunting, wasting, overweight, and obesity for CV-PT 09 boys and girls

<b>Sex</b>	<b>Stunting n (%)</b>	<b>Wasting</b>	<b>Overweight n (%)</b>	<b>Obesity n (%)</b>
Boys ( $n=97$ )			11 (5.2)	7(3.3)
Girls ( $n=114$ )	1 (0.5)		28 (13.3)	7 (3.3)

**Note:** no case of wasting.

Table 17 reinforces the above tendency of girls’ mean being higher than those of boys in all measures on fatness. 25% of the CV-PT 09 children are overweight or obese (16.6% girls and 8.5% boys). There is only one case of stunting and none of wasting (Box 9).

**Box 9 – The CV PT 09 stunted child**

The CV-PT 09 group registered only one case of stunted. This is a girl. She is the second-born child of a Sao Tome-born mother. Her mother was 40 years old when she was born. Twenty-seven months later the mother gave birth to another baby. She was still in her early childhood when her mother gave birth to another baby. Her ten-year older brother does not share the same father.

*EB1-CV 09 versus CV-PT 87, CV-PT 88, and PT-2001*

**Figure 15 – Mean weight-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, basic schools in Caparica in 1987, Buraca’s Basic School in 1988, and Lisbon Metropolitan Area in 2001**

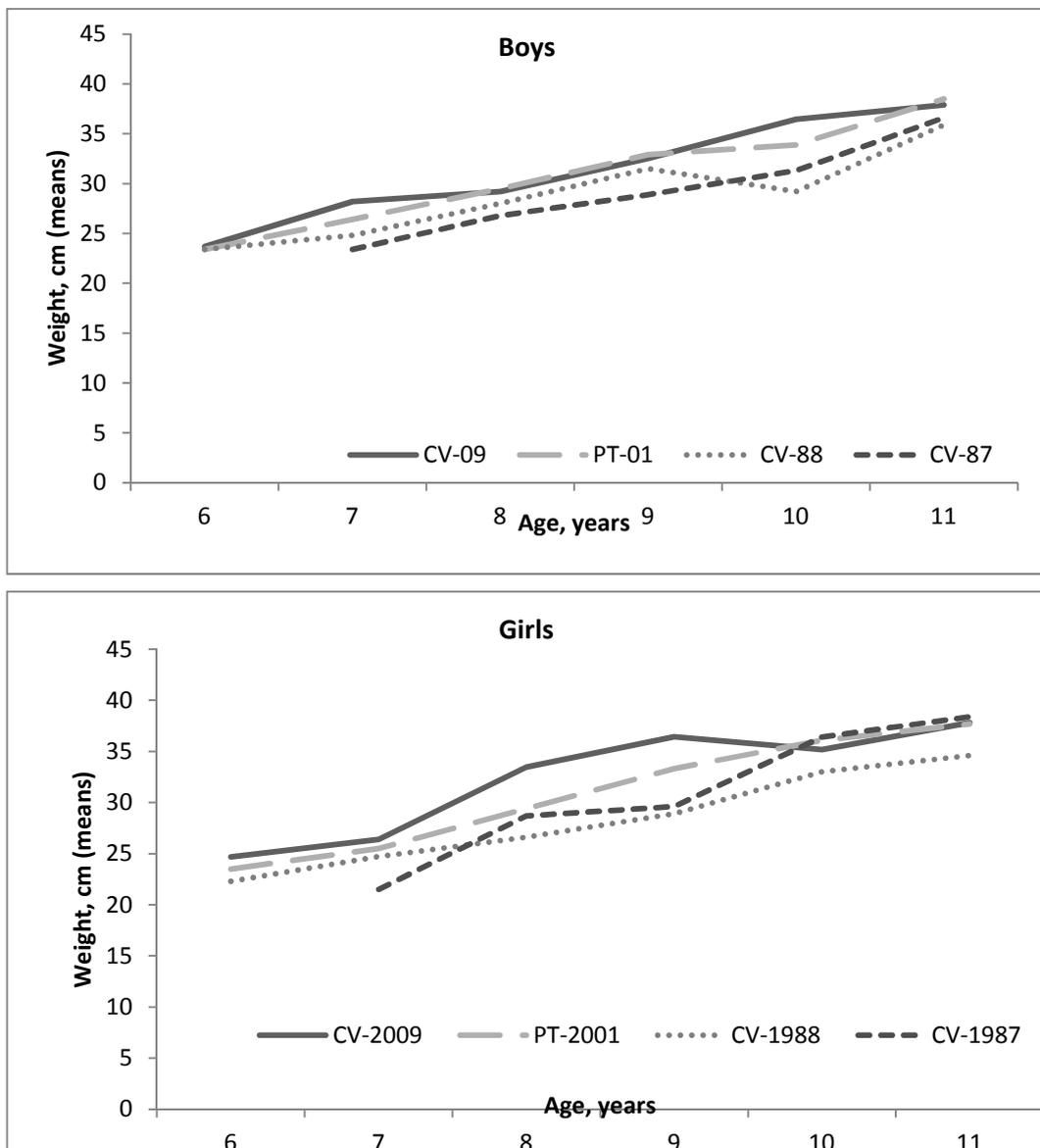


Figure 15 shows mean weight-for-age for boys and girls attending Cova da Moura in comparison with the other three groups of children attending basic schools in Lisbon Metropolitan Area. On average six, seven and ten-year-old boys and six-to-nine-year-old girls are heavier than boys and girls of the other three groups.

ANOVA tests demonstrate, however, mean weights are only significantly different for boys aged seven and ten years old. Mean weights are also significantly different for seven-to-ten year-old girls, in particular nine-to-ten-year-old-girls (Table 23, Appendice B). Comparing CV-PT 09 to each group evidences no significant difference when comparing CV-PT 09 to PT 01 boys, and significant differences between CV-PT 09 girls and other groups at age seven (CV-PT 87), eight (CV-PT 88 and PT 01), and nine (CV-PT 87) years old (Table 14, Appendice B).

**Figure 16** – Mean BMI-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, basic schools in Caparica in 1987, Buraca’s Basic School in 1988, and Lisbon Metropolitan Area in 2001

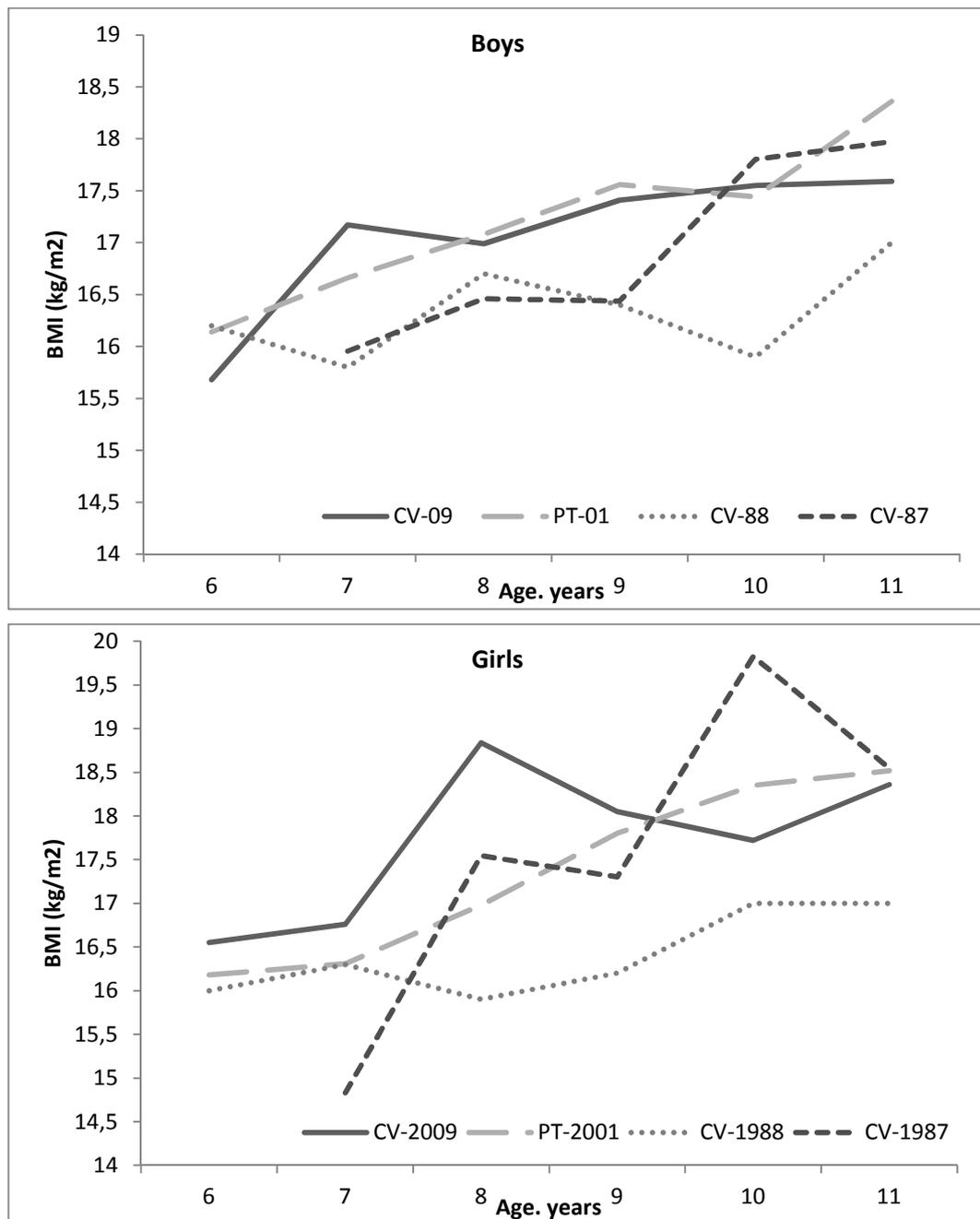


Figure 16 shows mean BMI-for-age for boys and girls attending Cova da Moura in comparison with the other three groups of children attending basic schools in Lisbon Metropolitan Area. On average, seven-year-old boys and six-to-nine-year-old girls have a higher body mass than boys and girls of the other three groups. ANOVA tests demonstrate, however, that mean are only significant different for ten-year-boy and eight-year-old girls (Table 24, Appendice B).

*EB1-CV 09 versus PT 03*

**Figure 17** – Mean weight-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in Portugal in 2003

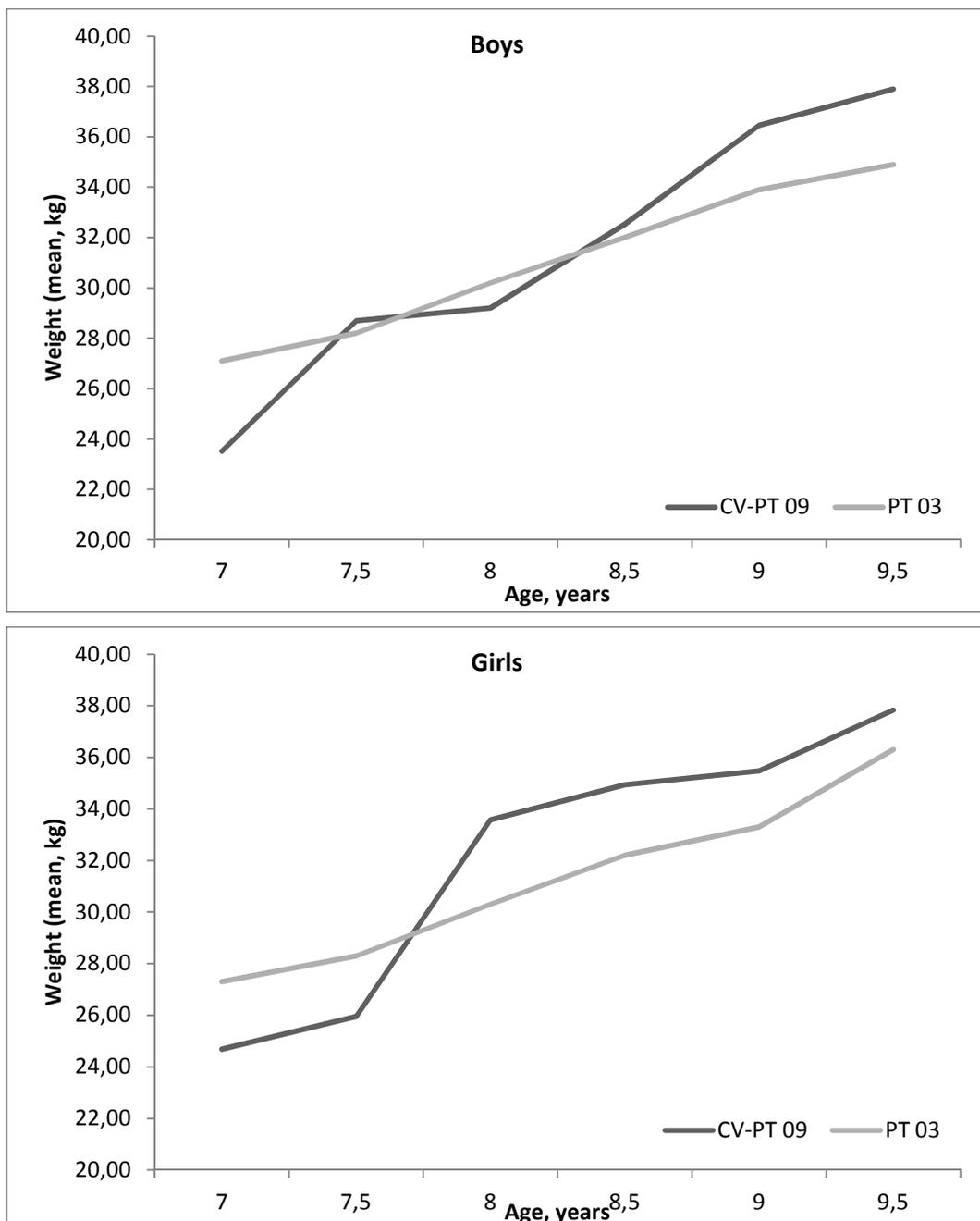


Figure 17 shows, on average, CV-PT 09 children are heavier than PT 03 children, except for seven and eight-year-old boys and seven-to-seven and half-year-old girls PT. Means are significantly different only for seven-year-old boys. However, the effect size is small ( $r=0.11$ ) (Table 17, Appendice B).

**Figure 18** – Mean BMI-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in Portugal in 2003

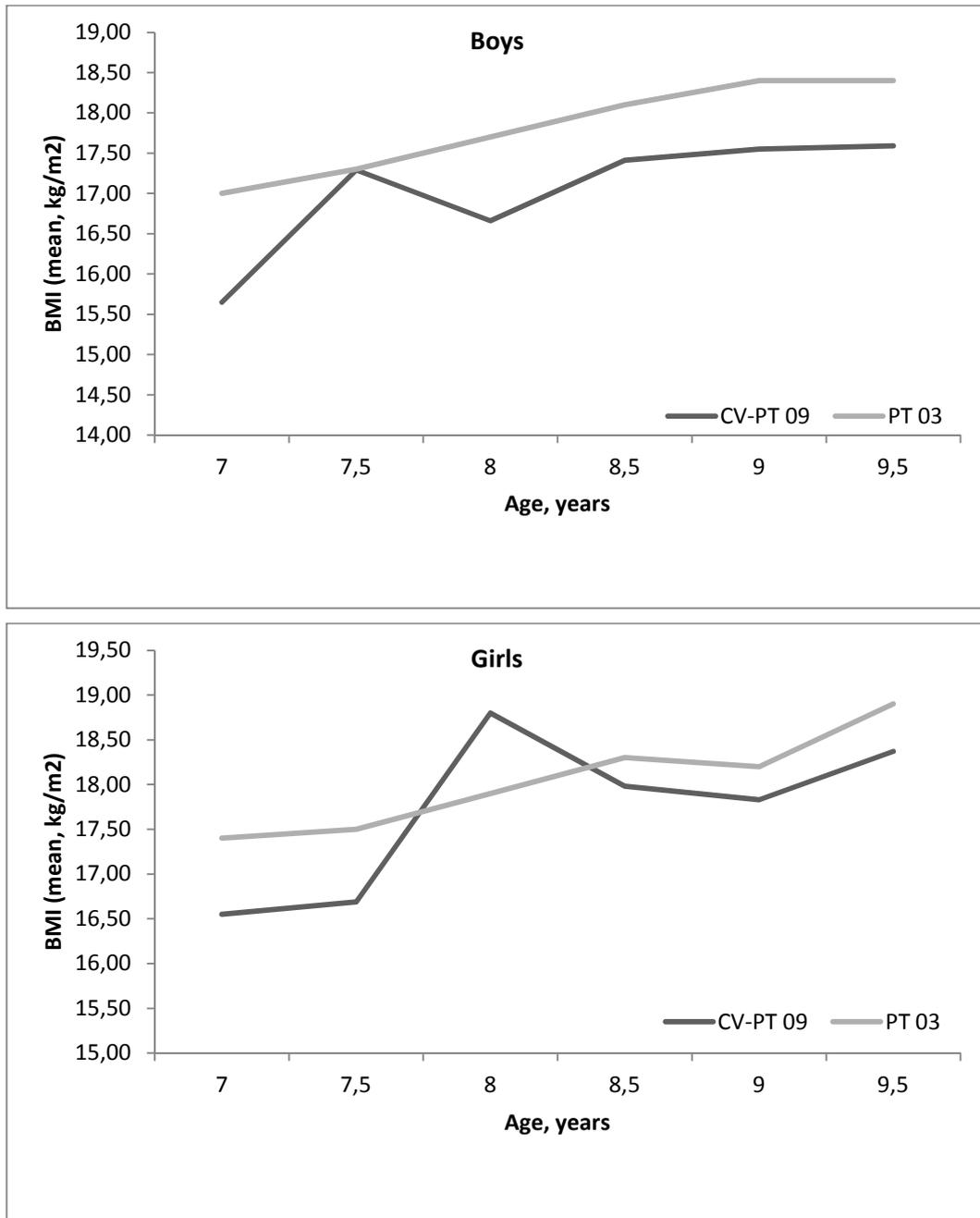


Figure 18 shows, on average, PT 03 children have a higher BMI than CV-PT 09 children, except for eight-year-old girls. Means are significantly different only for

seven-year-old boys ( $p < 0.05$ ). The effect is, however, small ( $r = 0.11$ ) (Table 18, Appendice B).

**Figure 19** – Mean Average of Subcutaneous Skinfolds-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in Portugal in 2003

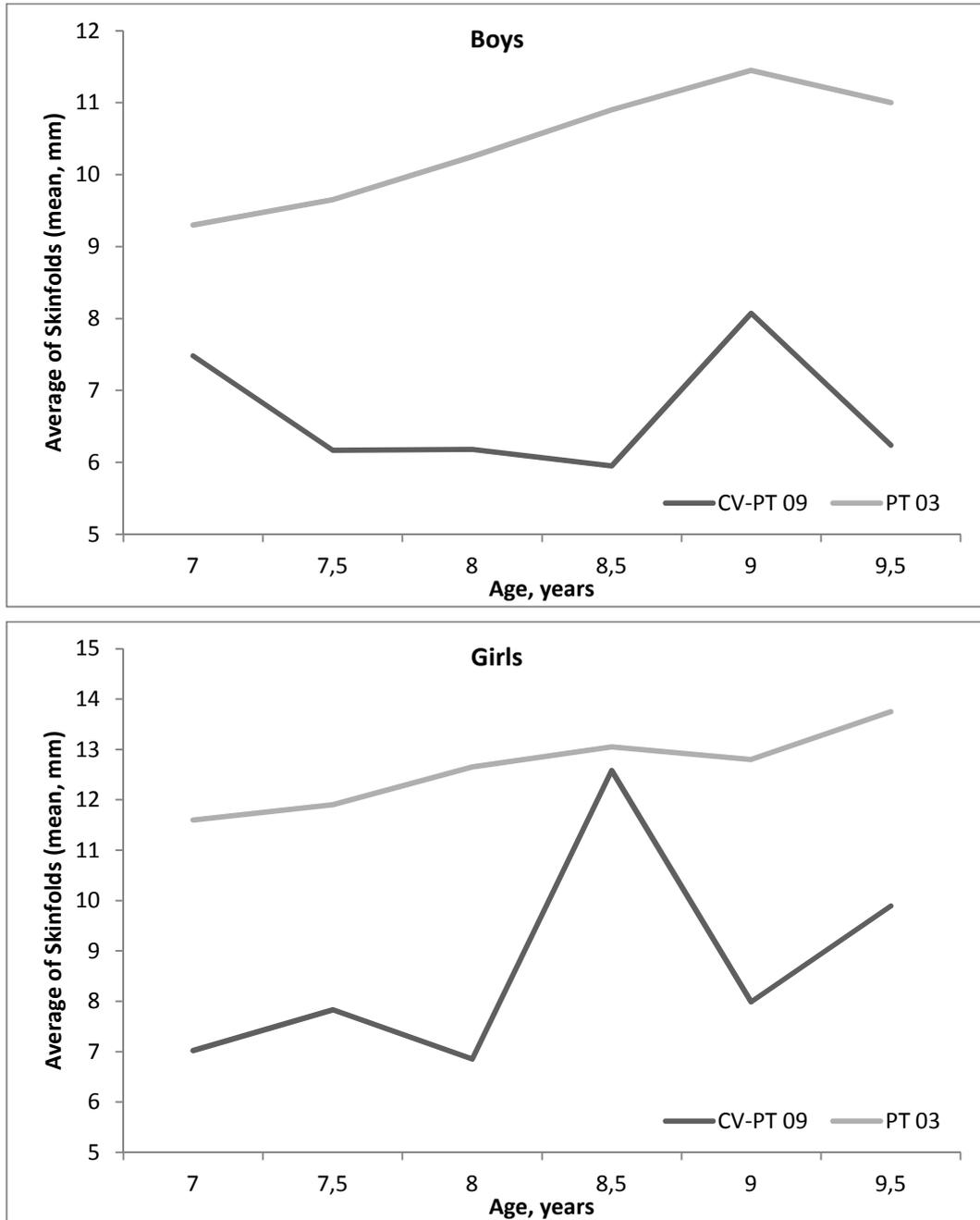


Figure 19 shows, on average, PT 03 children have higher skinfolds than CV-PT 09 children. Means are significantly different for boys aged eight-to-eight and half, and nine and half years old, and girls aged seven-to-eight and nine years old. The effect size is, however, small ( $r < 0.20$ ) in all cases (Table 19, Appendice B).

**Figure 20** – Mean Average of Arm circumference-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in Portugal in 2003

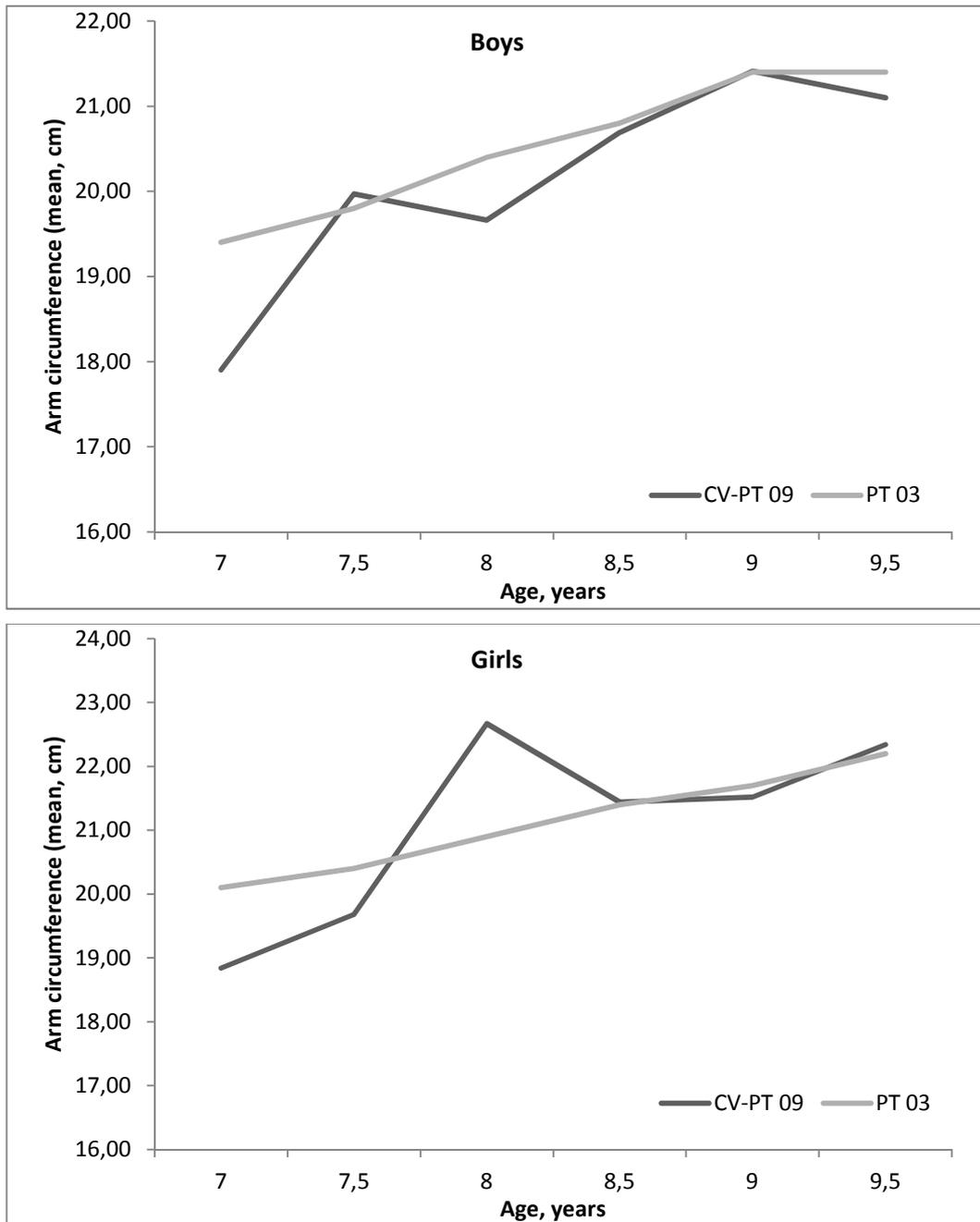


Figure 20 shows, on average, PT 03 boys have higher arm circumferences than CV-PT 09 boys, except at ages seven and half and nine years old. PT 03 girls have higher arm circumferences than CV-PT 09 girls at age seven-to-seven and half and nine years old. Mean arm circumferences are only significantly different for seven-year-old boys. The effect size is small ( $r=0.11$ ) (Table 20, Appendice B).

*EB1-CV 09 versus NHANES III*

**Figure 21** – Z-scores for weight-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in USA in 1994

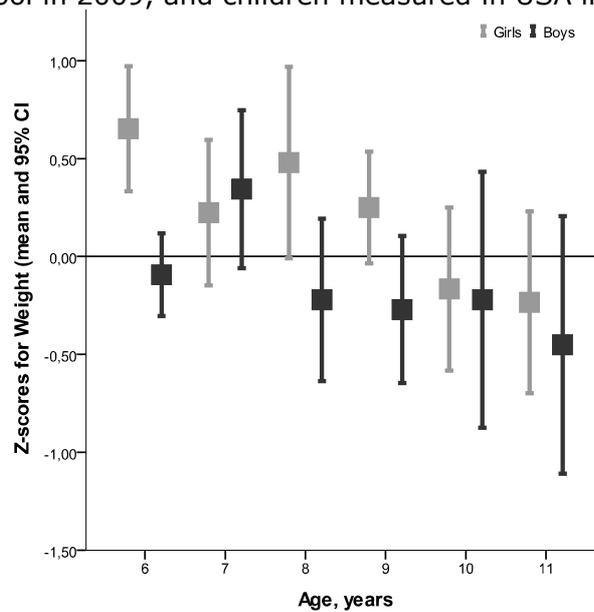


Figure 21 shows the CV-PT 09 mean weight tends to fall within the NHANES’ healthy range for all ages (+/- 1.00 standard deviations), although the 95% confidence intervals are relatively large for some ages and sexes. Six-year-old girls tend to be above the mean reference. Except for seven-year-old boys, boys’ mean weight tends to be below the mean reference.

**Figure 22** – Z-scores for BMI-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in USA in 1994

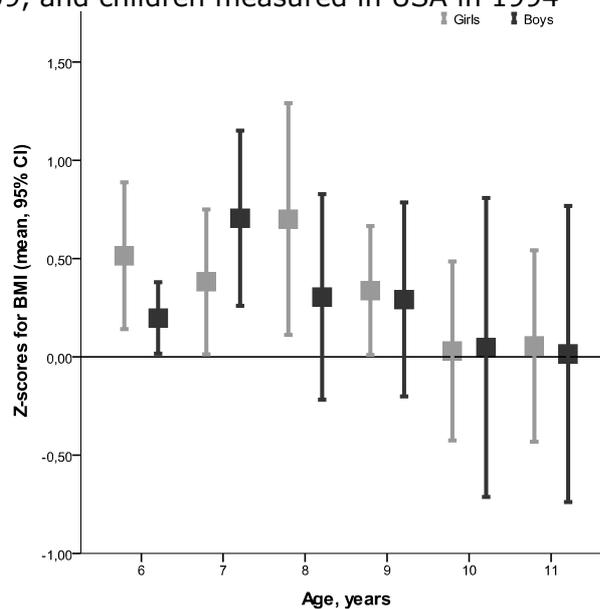


Figure 22 shows the mean BMI falls within the NHANES healthy range (+/- 1.00 standard deviations). On average, six and eight-year-old girls, and seven-year-old boys a have a slight higher BMI than the mean reference.

**Figure 23** – Z-scores for Sum of Skinfolts-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in USA in 1994

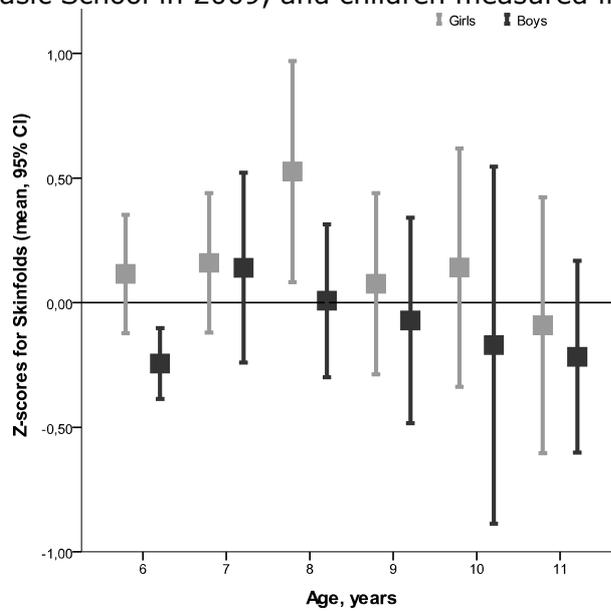


Figure 23 shows the Z-scores for the sum of skinfolts fall within the NHANES healthy range for all ages (+/- 1.00 standard deviations). Eight-year-old girls have slightly higher skinfolts, and six-year-old boys have slightly lower.

**Figure 24** – Z-scores for arm circumference-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in USA in 1994

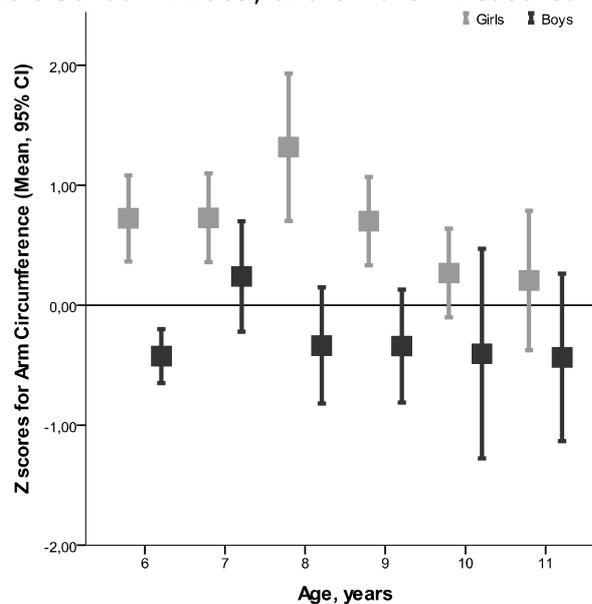


Figure 24 shows the Z-scores for the arm circumference-for-age falls within the NHANES healthy range. It indicates six-to-eight-year-old girls’ mean arm circumference is above the NHANES mean reference. Six-year-old boys’ mean arm circumference is below NHANES mean reference.

**Figure 25** – Z-scores for abdominal circumference-for-age for boys and girls attending Cova da Moura’s Basic School in 2009, and children measured in USA in 1994

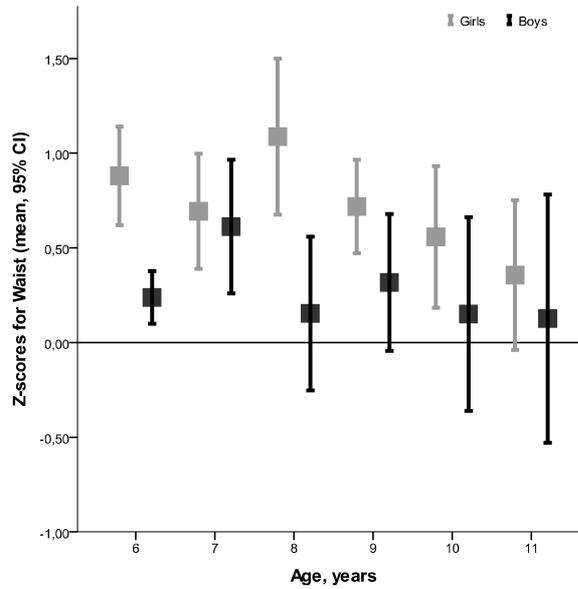


Figure 25 shows the Z-scores for the abdominal circumference-for-age fall within the NHANES healthy range ( $\pm 1.00$  standard deviations). It indicates that six-to-ten-year-old girls and six-to-seven-year-old boys mean abdominal circumferences are above the NHANES mean reference.

### 5.2.3 Cognitive Development

**Table 18** – Mean age by grade for children born in Portugal and PALOP

		Grades	N	%	Mean Age & SD	95% Confidence Interval
Sex	Boys	1	25	11.8	6.78 (0.90)	(6.54-7.22)
		2	34	16.1	7.82 (0.76)	(7.57-8.07)
		3	19	9.0	9.27 (0.67)	(8.96-9.55)
		4	19	9.0	10.75 (0.78)	(10.39-11.06)
		Total	97	46.0	8.41 (1.62)	(8.10-8.73)
	Girls	1	27	12.8	6.53 (0.26)	(6.44-6.63)
		2	27	12.8	7.67 (0.70)	(7.44-9.94)
		3	37	17.5	9.27 (0.83)	(9.00-9.54)
		4	23	10.9	10.49 (0.70)	(10.21-10.80)
Total	114	54.0	8.49 (1.59)	(8.21-8.70)		
Birthplace	Portugal	1	47	22.3	6.57 (0.26)	(6.50-6.64)
		2	55	26.1	7.73 (0.72)	(7.54-7.92)
		3	44	20.9	9.04 (0.66)	(8.86-9.26)
		4	27	12.8	10.59 (0.81)	(10.29-10.90)
		Total	173	82.0	8.20 (1.50)	(7.97-8.43)
	PALOP	1	5	2.4	7.43 (1.98)	(6.29-9.60)
		2	6	2.8	7.96 (0.87)	(7.26-8.67)
		3	12	5.7	10.07 (0.57)	(9.75-10.40)
		4	15	7.1	10.63 (0.61)	(10.33-10.92)
Total	38	18.0	9.61 (1.52)	(9.14-10.07)		
Total			221	100	8.45 (1.60)	(8.23-8.68)

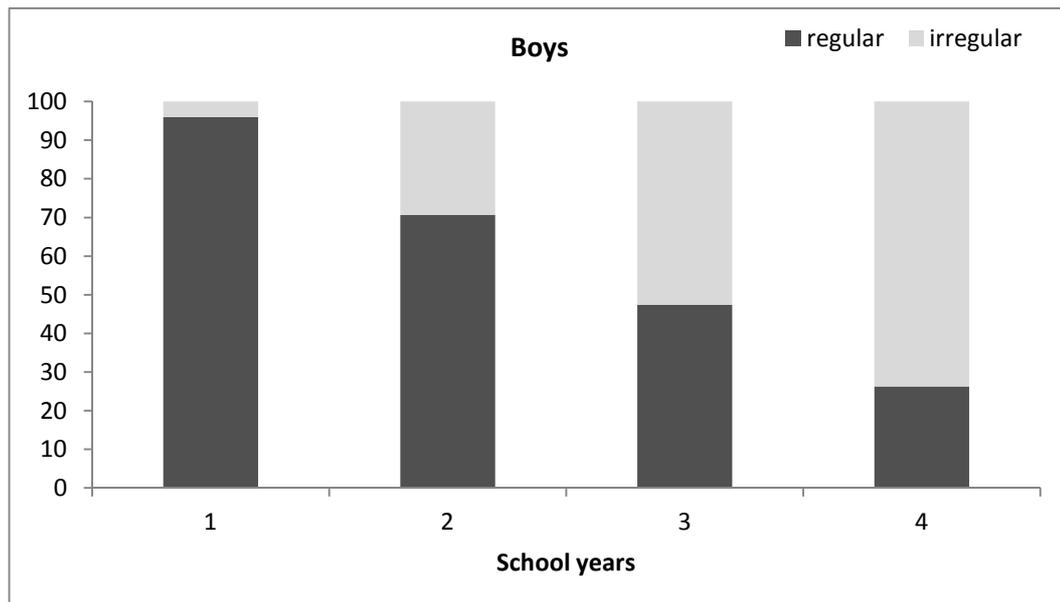
Figure 26 shows, on average, children born in Portugal are younger than children born in a PALOP country for all grades. Girls mean age is lower than boys' mean age for all grades, except for third grade. Birthplace-based mean differences are not significant. Sex-based differences are only significant for third grade and with a large effect ( $t(54)=-4.90, p<0.01, r=0.55$ ) (Table 21, Appendice B).

**Table 19** – Distribution of children by grade, and performance

		Achievement (n, %)		
		Regular	Non regular	Total
School Year	1	51 98.1	1 1.9	52 25.5
	2	47 77.0	14 23.0	61 27.6
	3	30 53.6	26 46.4	56 25.4
	4	14 33.3	28 66.7	42 19.0
	<b>Total</b>	<b>142</b> <b>67.3</b>	<b>69</b> <b>32.7</b>	<b>221</b> <b>100.0</b>

Table 19 indicates a prevalence of students in the second and third grades. The higher the grade, the greater the percentage of children having failed. In the fourth grade, the percentage of children who have failed is higher than that of children who have never failed.

**Figure 26** – Distribution of children by sex, grade, and performance



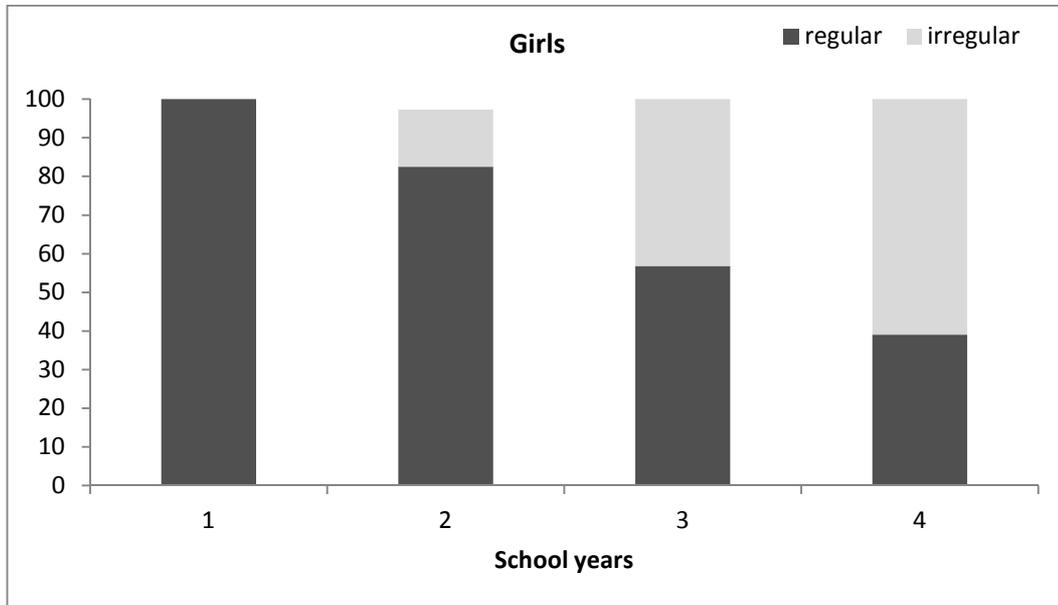


Figure 26 indicates the percentage of boys failing in the first cycle is higher than girls. In the third and fourth grade the percentage of boys who have already failed is higher than those who have not. The situation is slightly better for girls, in particular in the third grade.

A three-way loglinear analysis was conducted for examining the interaction sex - school achievement - school grade. The analysis shows this interaction was not significant ( $X^2(3)=0.65, p>0.05$ ). The final model retained only two effects: school achievement \* school year. The model produced a likelihood ratio of  $X^2(8)=10.29, p>0.05$ , which indicates that the model is a good fit of the data.

### 5.2.4 Determinants of growth and development

**Table 20** – Prediction of physical growth from children’s birthplace\*

Variable	B	SE B	$\beta$	$r^2$	P
Height	-0.48	0.22	-0.15	0.02	0.03
SHR	0.05	0.17	0.02	0.00	N.S.
Weight	-0.43	0.15	-0.20	0.04	0.00
BMI	-0.52	0.16	-0.22	0.05	0.00
Skinfolds	-0.19	0.13	-0.10	0.01	N.S.
Arm circumference	-0.42	0.18	-0.16	0.03	0.02
Abdominal circumference	-0.28	0.13	-0.15	0.02	0.03

\* Portugal = Reference

Table 20 shows birthplace is a significant predictor of physical growth for all measurements, except for SHR and skinfolds. The standardized beta ( $\beta$ ) indicates if mothers are born in a PALOP country, height, weight, BMI, and circumferences decrease.

**Table 21** –Prediction of school performance from the children’s birthplace

Variable	B (SE)	95% CI for Odds Ratio		
		Lower	Odds Ratio	Upper
Constant	-1,08 (0.18)			
Birthplace (Portugal=reference)	-1.73* (0.38)	2.66	5.64	11.97

Note:  $r^2=0.08$  (Hosmer and Lemeshow), 0.10 (Cox & Snell), 0.14 (Nagelkerke). Model  $X^2(1)=21.70$ ,  $p<0.01$ . \*  $p<0.01$ . Standardized residuals 1.96, Cook Distance<1, influential cases< maximum expected value, DBeta<1

Table 21 shows that birthplace contributes significantly to predict school performance. The odds of a PALOP-born child have not performed regularly in school as expected is 5.6 times higher than those of a Portugal-born child.

**Table 22** – Prediction of physical growth from parental presence in the household

Variable	B	SE B	$\beta$	$r^2$	P
Height					
Constant	0.50	0.14			
Bi-parental vs Monoparental	0.03	0.19	0.01		
Bi-parental vs Stepparent	-0.36	0.33	-0.08	0.02	N.S.
Bi-parental vs No parent	-0.46	0.32	-0.11		
SHR					
Constant	-0.18	0.11			
Bi-parental vs Monoparental	-0.01	-0.14	-0.01		
Bi-parental vs Stepparent	-0.16	0.26	-0.05	0.01	N.S.
Bi-parental vs No parent	-0.19	0.25	-0.06		
Weight					
Constant	0.16	0.01			
Bi-parental vs Monoparental	0.01	0.13	0.01		
Bi-parental vs Stepparent	-0.38	0.23	-0.12	0.01	N.S.
Bi-parental vs No parent	-0.26	0.22	-0.09		
BMI					
Constant	0.41	0.11			
Bi-parental vs Monoparental	-0.01	0.14	0.00		
Bi-parental vs Stepparent	-0.43	0.25	-0.13	0.02	N.S.
Bi-parental vs No parent	-0.27	0.24	-0.08		
Skinfolds					
Constant	0.04	0.09			
Bi-parental vs Monoparental	0.10	0.11	0.07		
Bi-parental vs Stepparent	-0.26	0.20	-0.10	0.21	N.S.
Bi-parental vs No parent	-0.12	0.19	-0.05		
Arm circumference					
Constant	0.27	0.12			
Bi-parental vs Monoparental	0.11	0.16	0.05		
Bi-parental vs Stepparent	-0.37	0.29	-0.10	0.17	N.S.
Bi-parental vs No parent	-0.15	0.28	-0.04		
Abdominal circumference					
Constant	0.61	0.09			
Bi-parental vs Monoparental	-0.05	0.11	-0.03		
Bi-parental vs Stepparent	-0.25	0.20	-0.09	0.01	N.S.
Bi-parental vs No parent	-0.18	0.19	-0.07		

Table 22 shows no significant prediction of z-scores for linear growth and fatness distribution measurements from the bi-parental presence. Despite not significant,

linear growth and fatness are affected negatively by households integrating stepparents or lacking both parents, and in case of height, and abdominal circumference also by the absence of one parent.

**Table 23** –Prediction of school performance from parental presence in the household

Variable	B (SE)	95% CI for Odds Ratio		
		Lower	Odds Ratio	Upper
Constant	-0.94 (0.26)			
Bi-parental vs monoparental	0.04 (0.34)	0.53	1.04	2.04
Bi-parental vs stepparent	1.45* (0.58)	4.25	1.36	13.24
Bi-parental vs no parent	0.94 (0.54)	2.55	0.89	7.35

Note:  $r^2=0.05$  (Cox & Snell), 0.06 (Nagelkerke). Model  $\chi^2(1)=9.53$ ,  $p<0.05$ . \*  $p<0.05$ . Standardized residuals  $<1.96$ , Cook Distance $<1$ , influential cases $<$  maximum expected value, DBeta $<1$

Table 23 shows bi-parental presence only contributes significantly to predict school performance when compared with stepparent households. The odds of children living in a stepparent household have not performed regularly in school as expected is 1.36 times higher than those of a child living in a bi-parental household.

**Table 24** – Prediction of physical growth from social support received

Variable	B	SE B	$\beta$	$r^2$	P
Height					
Constant	0.41	0.15			
None vs 1 <sup>st</sup> level	-0.04	0.19	-0.02	0.01	N.S.
None vs 2 <sup>nd</sup> level	0.22	0.26	0.07		
SHR					
Constant	-0.13	0.11			
None vs 1 <sup>st</sup> level	-0.20	0.14	-0.11	0.02	N.S.
None vs 2 <sup>nd</sup> level	0.12	0.19	0.05		
Weight					
Constant	0.02	0.10			
None vs 1 <sup>st</sup> level	0.08	0.13	0.05	0.01	N.S.
None vs 2 <sup>nd</sup> level	0.26	0.17	0.12		
BMI					
Constant	0.25	0.11			
None vs 1 <sup>st</sup> level	0.07	0.14	0.04	0.02	N.S.
None vs 2 <sup>nd</sup> level	0.37	0.19	0.15		
Skinfolds					
Constant	0.00	0.09			
None vs 1 <sup>st</sup> level	0.04	0.11	0.03	0.01	N.S.
None vs 2 <sup>nd</sup> level	0.20	0.15	0.10		
Arm circumference					
Constant	0.16	0.13			
None vs 1 <sup>st</sup> level	0.12	0.16	0.06	0.01	N.S.
None vs 2 <sup>nd</sup> level	0.30	0.22	0.11		
Abdominal circumference					
Constant	0.53	0.09			
None vs 1 <sup>st</sup> level	0.00	0.11	0.00	0.01	N.S.
None vs 2 <sup>nd</sup> level	0.14	0.15	0.07		

Table 24 shows no significant prediction of z-scores for linear growth and fatness distribution measurements from level of social support received for children’s education. Despite not significant, linear growth is negatively affected in case of families receiving first level social support (i.e. the poorer families).

**Table 25** –Prediction of school performance from social support for education received

Variable	95% CI for Odds Ratio			
	B (SE)	Lower	Odds Ratio	Upper
Constant	-0.58 (0.26)			
None vs 1 <sup>st</sup> level support	-0.26 (0.33)	0.40	0.77	1.46
None vs 2 <sup>nd</sup> level support	-0.02 (0.44)	0.96	0.98	2.31

*Note:*  $r^2=0.00$  (Hosmer and Lemeshow), 0.00 (Cox & Snell), 0.06 (Nagelkerke). Model  $X^2(1)=0.76$ , N.S. Standardized residuals 1.96, Cook Distance<1, several influential cases> maximum expected value, DBeta<1

Table 25 shows the social support for education does not contribute significantly to predict school performance. The odds of children living in poorer households (i.e. 1<sup>st</sup> level of social support) have not performed regularly in school as expected are, however, lower than those of children living in better-off households.

### 5.3 Parental Investment in embodied capital

This section presents data on parental investment in infancy of the 75 children whose mother was interviewed and its effect on the children’s prepubertal embodied capital. Parental Investment is assessed through feeding, protection, and learning practices. Stature and school performance are used as proxy for embodied capital. They are the outcome of accumulated capital over a child’s lifespan and reliable indicators of the environmental quality in which the child was brought up. Environmental quality represents to a great extent the choices and decisions regarding parental allocation of resources to an individual offspring in terms of physical growth and cognitive development.

#### 5.3.1 Parental Investment in infancy and its determinants

As mentioned in section 4.3, Parental Investment is a variable composed of the sum of seven components. Two components are to feeding (i.e. exclusive feeding and introduction of complementary food), four are related to protection (i.e. birth space, infant development screening at first and second years, and housing habitability), and one is related to learning (i.e. caring).

**Figure 27** – Parental Investment-for-Age for Boys and Girls

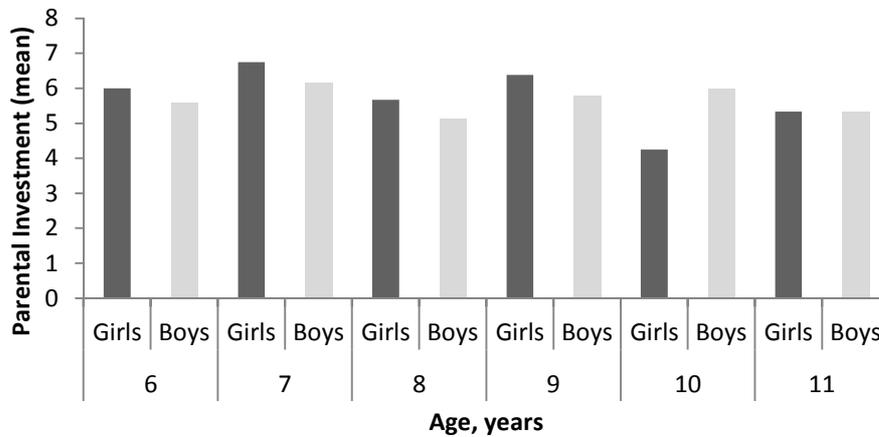


Figure 27 shows parental investment in infancy for the Cape Verdean children under analysis is medium for all ages and both sexes. Mean parental investment ranges from 4 to 7 scores. On average, girls have received a higher parental investment in infancy than boys, except for ages ten-to-eleven. Ten-year-old boys have received a higher parental investment in infancy than girls. Both girls and boys have received the same amount of parental investment at age eleven-year-old.

**Table 26** – Predictors of Parental Investment in Infancy

Predictors		B	SE B	B
Model 4	Constant	5.21	3.02	
	Sex (reference=girls)	-0.19	0.55	-0.06
	Parity at birth	-1.82	0.71	** -1.10
	Birthweight	0.00	0.00	-0.05
Household	Father presence (reference: yes)	0.74	0.87	0.18
	Grandmother presence (reference: yes)	-0.02	0.71	-0.01
	Parental presence (reference: both)			
	Vs monoparental	-0.17	0.79	-0.05
Vs stepparent	1.50	2.13	0.12	
Vs no parent	-1.27	1.60	-0.24	
Siblings	Number of older siblings	2.05	0.82	** 1.26
	Number of younger siblings	-0.17	0.64	-0.06
	Adolescent siblings	-0.47	0.68	-0.19
Mother	Maternal age at birth	0.11	0.09	0.47
	Mother's education	0.16	0.14	0.33
	Mother's birthplace (Portugal=reference)	-0.90	0.94	-0.25
	Mother's migration	9.21	0.05	0.00
	Occupation requiring basic qualifications			
	Vs not employed	1.32	1.09	0.25
Vs intellectual	-1.65	4.21	-0.13	
Vs personal services	0.33	0.69	0.09	

$R^2 = 0.39, p > 0.05$  (N.S). \*\*  $p = 0.01$

Table 26 shows the predictors above chosen explain 40% of parental investment, although not significantly. Parity at birth and the number of older siblings in the

household during infancy are the only variables to contributing significantly to estimate parental investment. Parity at birth contributes negatively whereas the number of older siblings in the household contributes positively.

Parental investment is not predicted from child characteristics alone, nor by adding household and mother’s characteristics. Only the third model, in which sibship characteristics are added to child and household characteristics, contributes significantly to predict parental investment (Table 25, Appendice B).

Despite not contributing significantly to estimate parental investment, the model indicates parental investment is negatively affected by boys, mother being born in a PALOP country, mother performing intellectual work, presence of only one parent, absence of both parents, grandmother absence, birthweight, number of younger siblings and number adolescent siblings. On the contrary, parental investment is positively affected by father absence, stepparent presence, maternal age at birth, mother’s education, mother being unemployed or working in personal services sector.

### 5.3.2 Parental Investment in infancy, stature and school performance in prepuberty

**Table 27** – Z-scores for height-for-age for boys and girls of the qualitative study, stratified by forms of parental investment in infancy

Recommendations	N	%	Mean & Standard Deviation	95% Confidence Interval
<b>Feeding</b>				
Exclusive breastfeeding (N=73)				
4-6 months	22	30.1	0.42 (0.93)	(0.02-0.81)
< 4 months	51	69.9	0.38 (0.88)	(0.13-0.60)
<i>t</i> (71)=0.17, <i>p</i> >0.05 (N.S.)				
Introduction to complementary food (N=73)				
≥ 6 months	32	43.8	0.58 (0.90)	(0.26-0.88)
< 6 months	41	56.2	0.25 (0.86)	(-0.01-0.51)
<i>t</i> (71)=1.60, <i>p</i> >0.05 (N.S.)				
<b>Protection</b>				
Birth Space (N=75)				
≥ 24 months	61	81.3	0.43 (0.87)	(0.02-0.81)
< 24 months	14	18.7	0.22 (1.00)	(-0.35-0.74)
<i>t</i> (73)=0.84, <i>p</i> >0.05 (N.S.)				
Infant Development Screening 1 <sup>st</sup> Year (N=56)				
≥ 5 visits	33	58.9	0.63 (0.81)	(0.35-0.92)
< 5 visits	23	41.1	0.26 (1.05)	(-0.17-0.66)
<i>t</i> (54)=1.49, <i>p</i> >0.05 (N.S.)				
Infant Development Screening 2 <sup>nd</sup> Year (N=56)				
≥ 3 visits	16	28.6	0.33 (0.97)	(-0.15-0.77)
< 3 visits	40	71.4	0.54 (0.92)	(0.25-0.83)
<i>t</i> (54)=-0.78, <i>p</i> >0.05				

**Table 27** - Z-scores for height-for-age for boys and girls of the qualitative study, stratified by forms of parental investment in infancy (cont.)

Level of House Rehabilitation (N=73)				
Small	8	11	0.28 (0.53)	(-0.09-0.66)
Medium	26	35.6	0.36 (1.02)	(-0.39-0.77)
Severe	16	21.9	0.54 (0.87)	(0.11-0.96)
Different house	23	31.5	0.40 (0.92)	(0.02-0.78)
<i>f</i> (74)=0.17, <i>p</i> >0.05 (N.S.)				
Learning				
Main childminder during daytime (N=75)				
Parent/alloparent	36	48	0.55 (1.01)	(0.21-0.88)
Formal Institution	14	18.7	0.25 (0.69)	(-0.11-0.60)
Informal Institution	17	22.7	0.33 (0.90)	(-0.11-0.83)
Mixed	8	10.6	0.07 (0.46)	(-0.24-0.40)
<i>f</i> (74)=0.89, <i>p</i> >0.05 (N.S.)				
PARENTAL INVESTMENT (N=75)				
Small	11	14.7	-0.14 (0.58)	(-0.52-0.18)
Medium	47	62.7	0.39 (0.91)	(0.13-0.64)
High	17	22.7	0.77 (0.86)	(-0.44-1.18)
<i>F</i> (74)=3.78, <i>p</i> <0.05				

Table 27 shows the majority of infants were not fed according to the World Health Organization. 69.9% of the infants were exclusive breastfed for less than four months, and 56.2% were introduced to complementary food before the age of six months. Protection measures were partially followed. 81.3% of the mothers have waited twenty-four months between the infant birth and next pregnancy, and 58.9% of the infants were screened regularly in the first year. Only 28.6% of the infants were screened in the second year. Most of the children lived in a house which required a medium (35.6%) rehabilitation or lived in a different house (31.5%). Parents often explained they have moved into the present house because the family was living in worse conditions. Last, most of the infants were cared for a parent or a blood-related female alloparent (48%). The alloparent is mostly grandmothers. About 40% of the households integrated a grand-mother (38.7%). On average, z-scores for height are higher in case of infants fed, partially protected (i.e. birth space and infant development screened in the first year), and cared according to the recommendations, although the means are not significantly different from those of infants not fed, protected and cared according to the recommendations. Furthermore, infants whose development screening during the second year of life fell below the recommendations, or infants who lived in a house requiring severe rehabilitation, have higher mean z-scores for height than their peers whose screening visits fell into the recommendations, or who lived in a house requiring irrelevant rehabilitation. Again, means are not significantly different. On average, the higher the parental investment in infancy, the higher the mean Z-scores for height in prepuberty. Children receiving a high or medium parental

investment in infancy are taller than the NHANES mean references, whereas children receiving a low parental investment are shorter than those references. The means for the three levels are significantly different.

**Table 28** – Prediction of Z-scores for height-for-age from Parental Investment in infancy

Variables	<i>B</i>	<i>SE B</i>	$\beta$
Constant	-1.99	0.33	
Parental Investment	0.10	0.05	0.22*

$r^2=0.05, p=0.057$

Table 28 confirms parental investment is an adequate predictor for Z-scores for height. The level of significance is at the limit ( $P=0.057$ ), and the effect size is small ( $r^2=0.05$ ). It shows as parental investment increases by one unit, the z-scores for height increases by 0.22.

**Table 29** – Prediction of school performance from parental investment in infancy

Variable	<i>B (SE)</i>	95% CI for Odds Ratio		
		Lower	Odd Ratio	Upper
Constant	0.58 (0.81)			
Parental Investment	-0.26 (0.14)	0.58	0.77	1.02

Note:  $r^2=0.05$  (Cox & Snell), 0.07 (Nagelkerke). Model  $X^2(1)=3.59, p=0.058$ . Standardized residuals  $\pm 1.96$ , Cook Distance $<1$ , three influential cases> maximum expected value, DBeta $<1$

Table 29 shows parental investment is an adequate predictor for Z-scores for school performance. The level of significance is at the limit ( $P=0.058$ ), and the effect size is small ( $r^2=0.05$ ). The odds ratio value indicates as parental investment increases, the odds of the not performing regularly in school as expected decreases.

**Table 30** –Prediction of school performance from main childminder in infancy

Variable	<i>B (SE)</i>	95% CI for Odds Ratio		
		Lower	Odd Ratio	Upper
Constant	-1.10 (0.39)			
Alloparent vs formal institution	-0.69 (0.89)	0.09	0.50	2.67
Alloparent vs informal institution	0.49 (0.64)	0.47	1.64	5.70
Alloparent vs mixed caring	-1.61 (0.83)	1.00	5.00*	25.22

Note:  $r^2= 0.08$  (Cox & Snell), 0.11 (Nagelkerke). Model  $X^2(1)=6.14, N.S.$  \* $p=0.05$ . Standardized residuals  $>\pm 1.96$ , Cook Distance $<1$ , several influential cases> maximum expected value, DBeta $<1$

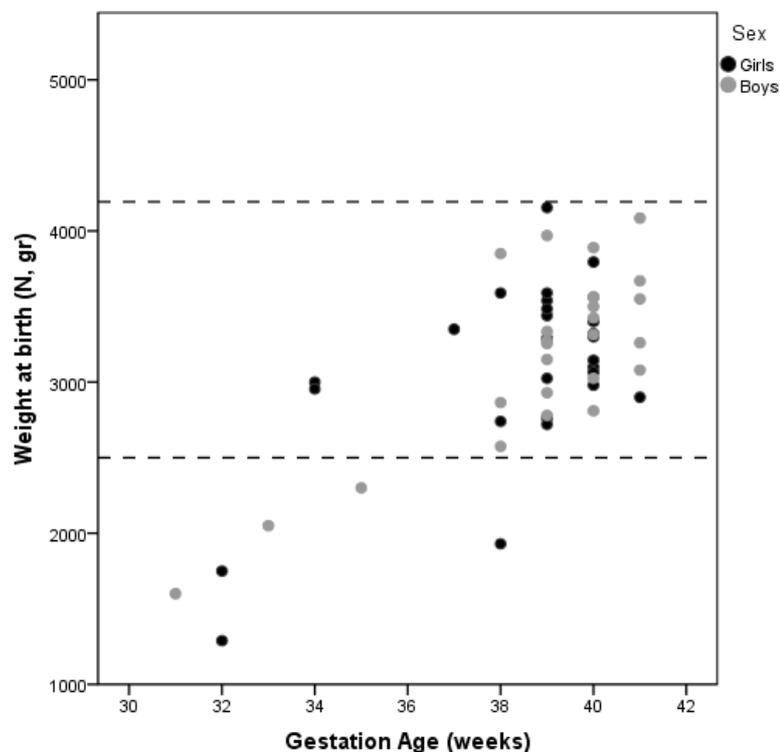
Looking into the contribution of the main childminder in infancy to school performance, we found informal childminders contribute significantly to school performance. The odds of schoolchildren cared by mixed childminders have not

performed regularly in school as expected are 5 times higher than schoolchildren cared by one type of childminder (Table 29).

### 5.3.3 Pre-natal Parental Investment

Birth implies the transition from the intrauterine to the extrauterine environments. The size at birth is acknowledged to be an adequate indicator of prenatal parental investment as adjusted for the gestational age. It reflects the average growth rate for the infant from conception. It also is a good predictor of impaired development from birth into childhood (Saenger *et al.* 2007).

**Figure 28** – Distribution of birthweight for gestational age-for-sex



*Note:* Dotted lines represent the upper and lower threshold for appropriate gestational age according to the study on birthweight in Hospital Fernando Fonseca, Amadora, conducted between 2000 and 2004

Figure 28 shows the birthweight for 52 children who still hold their birth health booklet. The birth weight of the majority falls into the local reference, regardless of the sex of the child. Six cases fall below the reference: three boys and three girls (Box 10). But one child, all are children of PALOP-born Cape Verdean mothers and are preterm (less than 37 weeks gestational age). These SGA cases are also known as low birth weight (LBW) cases; that is, they are cases in which weight is below 2500 grams.

**Box 10 – Small for Gestational Age Neonates**

The six cases of small for gestational age are all children of PALOP-born mothers, except for one case. The child is a boy. He is a first-born child of Portugal-born mother married with a Cape Verde-born father. His mother has concluded basic education, and his father only concluded the first cycle of basic education. He lives a bi-parental household, along with two siblings sharing the same mother and father: a girl younger 16 months and a boy younger 41 months. His mother gave birth at the age of twenty-one years old. Although it was a risky pregnancy, the mother worked in a supermarket until the end of pregnancy. The birth was forceps pre-term. His size at birth was 2050 grams. In postnatal life, he received a high parental investment. Despite not being fed because of his mother lack of breastmilk and his parents not following the birthspace recommendations, his mother followed the recommendations regarding the introduction of complementary feeding, development screening, and caring. At the age of eight years old, he is taller than the NHANES references (1.48). The SHR suggests, however, a not so good linear growth (54.9).

The remaining five cases are children born of PALOP mothers who migrated in adulthood. Two children are girl twins. Both parents were born in Cape Verde. They live a bi-parental household, along with an older sibling (birth interval > 10 years) sharing the same mother and father. This was a risk pregnancy, so the mother stopped working as a cleaner at the sixth month. At the age of thirty-nine, the mother gave birth to two pre-term children weighting 1289 grams and 1750 grams. They received a medium parental investment. Their investment differed only in terms of exclusive breastfeeding. The smaller girl was breastfed, whereas the other was bottlefed. Both girls were introduced to complementary food according to the recommendations. Their development was screened regularly. They were cared by a former childcare formal institution upon their mother resuming work. At the age of seven years old, the differences in growth are still present: although the mean height falls into the NHANES healthy range, the child who was born smaller is shorter than the reference (-0.59), whereas the other is taller than the reference (0.29). However, the latter has shorter legs (51.7) than the former (51.2).

Two cases are boys, one child of a mother migrating in late adolescence and the other child of migrating as middle adulthood. The former is a first-born child. The latter is third-born, who has two older siblings (i.e. 67 months birth interval from the next older sibling) with whom he does not share the father. Born in Cape Verde, still in early childhood, the siblings were left behind when their mother migrated.

At the age of nineteen, one year upon her arrival, the first mother gave birth to a pre-term boy weighting 1600 grams. At the age of thirty-five, seven years upon her arrival, in her 35<sup>th</sup> week of pregnancy, the second mother gave birth to a boy weighting 2300 grams. The first mother had a normal pregnancy, whereas the second mother had a risky pregnancy. Both children received a medium parental investment. Differences in investment lie in exclusive breastfeeding and childcare. The first was bottlefed because the mother had no breastmilk, whereas the second was breastfed for four months, until his mother resumed her work as a cleaner. From the fourth month until entering the school, the first child was cared by a babysitter, because the mother could not find a place in the nurseries located in the neighbourhood, whereas the second child was cared by a babysitter from the 4<sup>th</sup> to the 24<sup>th</sup> months, and afterwards by a formal childcare institution. Households also differed. The first child has lived in bi-parental extended household, whereas the second child has lived in a monoparental extended household. At the age of seven, both children are taller than the NHANES children (1.27 for the first boy and 1.06 for the second). The first child (i.e. the one bottlefed and cared by babysitter) has longer legs (0.32) than the NHANES children, whereas the second child (i.e. the one breastfed and cared by a mixture of informal and formal institutions) has shorter legs (-0.88).

The last child is a girl. She is a third-born child. The birthspace between the child and first-born is sixty-five months and between the child and the second-born is 37 months. Both siblings were born in Portugal and share the same father.

**Box 10 – Small for Gestational Age Neonates (cont.)**

Her mother gave birth at the age of thirty-six. She had a normal pregnancy, allowing her to perform her cleaning worker until the end of her pregnancy. The girl was born at 38<sup>th</sup> gestational week, weighting 1930 grams. She was breastfed for a month because she rejected breastmilk. From then onwards, she was bottlefed with liquid milk bought at the pharmacy. She was introduced to infant cereals and broths at the fourth month. Infant screening was less than expected in the first year. In the first six months she regular screening, after which she stayed eight months without being screened. The infant was cared by a formal childcare institution, located in the neighbourhood when her mother resumed work. At the age of seven, the girl is taller (1.15) and has shorter legs (-1.16) than the NHANES children.

Because of their negative influence in the normal distribution these cases are excluded further analysis. The mean birthweight for different socioeconomic, cultural, and biological factors and its potential effect on children’s linear growth and school-oriented cognitive development are analysed in the remaining section.

**Table 31 – Mean birthweight by potential confounding factors, among children of Portugal-born mothers and PALOP-born mothers**

At Birth (N=46)	Portugal-Born Mothers				PALOP-born Mothers			
	N	%	Mean	(95% CI)	n	%	Mean	(95% CI)
	17		3227	(3029-3422)	29		3328	(3196-3455)
<b>Gender</b>								
Boys	4	23.5	3064	(2575-3565)	19	65.5	3393	(3234-3563)
Girls	13	76.5	3277	(3068-3512)	10	34.5	3204	(3034-3351)
<b>Prenatal Visits</b>			*					
0	2	11.8	3220	(2900-3540)	9	31.0	3402	(3116-3719)
1-5	10	58.8	3212	(2904-3566)	7	24.1	3324	(3100-3584)
≥6	5	29.4	3260	(2941-3565)	13	44.8	3279	(3128-3420)
<b>Gestational Age</b>								
34 weeks	1	5.9	3000	(3000-3000)	1	3.4	2955	(2955-2955)
37 weeks					1	3.4	3350	(3350-3350)
38 weeks	3	17.6	2968	(2575-3590)	2	6.9	3357	(2865-3850)
39 weeks	7	41.2	3312	(2955-3718)	9	31	3279	(3053-3518)
40 weeks	5	29.4	3374	(3125-3657)	11	37.9	3302	(3110-3478)
41 weeks	1	5.9	2900	(2900-2900)	5	17.2	3529	(3170-3860)
<b>Maternal Age</b>							*	
>20	7	41.2	3144	(2910-3417)				
20-34	9	52.9	3254	(2914-3591)	21	72.4	3322	(3194-3451)
≥35	1	6.7	3565	(3565-3565)	8	27.6	3344	(3031-3710)
<b>Parity</b>								
1	4	23.5	3168	(2839-3565)	7	24.1	3449	(3220-3660)
2	6	35.3	3345	(2928-3770)	7	24.1	3394	(3183-3614)
≥3	7	41.2	3160	(2840-3475)	15	51.7	3240	(3051-3438)
<b>Bi-parental Household</b>								
Yes	12	70.6	3153	(2912-3416)	22	75.9	3344	(3193-3423)
No	5	29.4	3404	(3163-3680)	7	24.1	3277	(3099-3461)
<b>Maternal Education</b>								
None					7	24.1	3389	(3099-3679)
1 <sup>st</sup> cycle	1	5.9	3590	(3590-3590)	8	27.6	3549	(3340-3754)
2 <sup>nd</sup> cycle	3	17.6	2800	(2575-3065)	7	24.1	3118	(2874-3362)
3 <sup>rd</sup> cycle	9	52.9	3332	(3064-3619)	5	17.2	3228	(2903-3512)
Secondary or higher	4	23.5	3222	(2835-3565)	2	6.9	3215	(3080-3350)
<b>Maternal Occupation</b>								
Not employed	4	23.5	3224	(2808-3795)	2	6.9	3645	(3320-3970)
Intellectual	1	5.9	3565	(3565-3565)				
Personal services & sales	6	35.3	3226	(2963-3462)	6	20.7	3034	(2849-3206)
Elementary qualification	6	35.3	3174	(2745-3690)	21	72.4	3381	(3242-3512)

\*P<0.05

Table 31 lists mean birth weights for 46 children by mothers' birthplace. On average, PALOP-born Cape Verdean mothers gave birth to heavier babies than Portugal-born Cape Verdean mothers.

The analysis of social and biological factors influencing birthweight distributions demonstrates no consistent pattern. On average, girls were heavier than boys for Portugal-born mothers. The opposite occurs for PALOP-born mothers. Excluding those situations in which there is only one or two cases, children of Portugal-born mothers were likely to be heavier when they were second-born, were delivered at 40th week, received more than 5 prenatal visits, and integrated a monoparental household. They were also heavier when mother was older than 34 years old, completed basic education and worked in the sector of personal services and sales. Rather, children of PALOP-born mothers were likely to be heavier when they were first born, were delivered at 41st week, received no prenatal visit, integrated a biparental household. They were also heavier when mother was older than 34 years old, completed basic education and performed a basic qualified job.

Mean differences are not, however, significant, except for the number of prenatal visits received for children of Portugal-born mothers and maternal age at birth for children of PALOP-born mothers.

**Table 32** – Predictors for birthweight of children born in Portugal

<b>Variables</b>	<b>B</b>	<b>SE B</b>	<b>β</b>
<b>Model 1</b>			
Constant	1265.18	1690.75	
Sex	64.08	125.19	0.09
Prenatal visits	-7.79	12.59	-0.10
Gestational age	53.942	42.90	0.21
Parity at birth	-41.15	59.88	-0.11
<b>Model 2</b>			
Constant	-57.7	1879.74	
Sex (reference: girls)	-38.2	144.83	-0.05
Prenatal visits	-13.8	14.45	-0.17
Gestational age	64.63	44.80	0.25
Maternal age at birth	40.93	20.48	0.80*
Parity at birth	-102.78	85.80	-0.28
Mother's education	29.90	28.01	0.28
Mother's migration	1.49	9.15	0.03
Biparenthood (reference=yes)	-61.48	127.13	-0.08
Mother's Occupation			
Elementary vs none	183.69	197.17	0.17
Elementary vs intel.	-1018.90	814.47	-0.40
Elementary vs services/shop	-183.82	165.26	-0.22
Mother's birthplace (reference: Portugal)	-201.94	222.13	-0.26

$r^2=0.09$ , N.S.,  $\Delta r^2=0.15$ , N.S.\*  $p<0.05$

Table 32 shows the examined predictors do not contribute significantly size at birth. Only maternal age at birth contribute significantly to birthweight. As maternal age at birth increases one year, the birthweight increases 0.80.

Despite not significant, PALOP-born mothers, boys, prenatal visits, parity at birth, absence of one parent, mother’s occupation related to intellectual tasks or services/shop, negatively affect birthweight.

**Table 33** – Prediction of Z-scores for height-for-age from Z-scores for birthweight

Variables	<i>B</i>	<i>SE B</i>	$\beta$
Constant	0.41	0.13	
Z-scores for height-for-age	0.37	0.17	0.31*

$r^2=0.10, p<0.05. *p<0.05$

Table 33 shows birthweight contributes significantly to z-scores for height. As birthweight increases one gram, the z-scores for height increases 0.31.

**Table 34** – Prediction of school performance from Z-scores for birthweight

	B (SE)	95% CI for Odds Ratio		
		Lower	<i>Exp (B)&lt;1</i>	Upper
Constant	-1.87 (3.15)			
Birthweight	0.00 (0.00)	1.00	0.99	1.29

Note:  $r^2=0.00$  (Cox & Snell), 0.0 (Nagelkerke). Model  $\chi^2(1)=0.04, p>0.05$ . Standardized residuals  $>\pm 1.96$ , Cook Distance $<1$ , DBeta for constant $>1$

Table 34 shows birthweight does not significantly contribute to the school performance. The odds ratio value suggests as birthweight increases, the odds of children have not performed regularly in school as expected decreases. However, as CI for the odds ratio crosses 1, this suggestion is not reliable. The Cox & Snell and Nagelkerke’s  $r^2$  confirm the model is inadequate.

## 5.4 Summary

This chapter explored the data collected during the quantitative and qualitative studies in order to assess how parental investment in infancy affects the offspring’s prepubertal embodied capital, as well as to understand the factors influencing parental investment.

The findings confirmed the significant contribution of parental investment to linear growth and school-oriented cognitive development. However, only sibship structure is found to predict parental investment.

## Chapter 6 – Discussion

CV-PT 09 children show an adequate linear growth. On average, these children are taller than CV-PT 87, CV-PT 88, and PT 01. They are taller than PT 03 children for most ages (i.e. 7, 7.5, and 8.5 years for boys and 7.5-9.5 for girls). However, the mean height is only significantly different for seven (CV-PT 87, CV-PT 88, and PT 01), eight (PT 01), and ten-year-old boys (CV-PT 87 and CV-PT 88), and eight (CV-PT 87 and CV-PT 88), and nine-year-old girls (CV-PT 87, PT 01 and PT 03), that is, children born between 1998 and 2001.

The sitting height ratio indicates CV-PT 09 children's linear growth is healthier than PT 01 children. CV-PT 09 children have significantly longer legs than PT 01 for all ages.

CV-PT 09 children show some signs of fatness, in particular girls. About a quarter of children are overweight or obese. However, this prevalence of overweight and obesity is lower than that at national level in 2008: 21.6% for girls and 23.5% for boys (IASO website).

On average, CV-PT 09 children are heavier than CV-PT 87 and CV-PT 88 children. They are heavier than six-to-seven and ten-year-old boys, and six-to-nine-year-old girls PT 01. They are also heavier than PT 03 children for most ages (i.e. 7.5, 8.5-9 years for boys, and 8 - 9-5 for girls). However, the mean weight is only significantly different for seven (CV-PT 87, CV-PT 88, PT 03), and ten-year-old boys (CV-PT 87 and CV-PT 88), and seven (CV-PT 87), eight (CV-PT 88 and PT 01), and nine-year-old girls (CV-PT 87 and CV-PT 88). The lack of adequate data to compare fatness of CV-PT 09 children with CV-PT 87, CV-PT 88 and PT 01 does not reach a reliable conclude. We can only conclude PT 03 children are fatter than CV-PT 09 children. On average, PT 03 children have higher BMI and skinfolds than CV-PT 09 children for all ages and both sexes, except for eight-year-old girls.

Time explains to a certain extent the healthier physical growth of children. About twenty years elapsed between measuring of the CV-PT 09 and CV-PT 87 and CV-PT 88 children, and more than five years between measuring of the CV-PT 09 and PT 01 and PT 03. CV-PT 09 children were born between 1997 and 2002. Their infancy occurred between 1997 and 2005, a decade from Portugal's accession to the European Union (EU).

CV-PT 09 were born and raised in a period when the effects of Portugal accession to European Union were already visible. Since the end of dictatorship, Portugal went through substantial changes in the economic and social environment. However, Portugal accession to European Union was the positive milestone for the country's social and economic development. The effects at the household level were not

uniform. They varied between households and within households, depending in particular on the age of household members. Cape Verdean migration was not immune to the benefits of the accession to EU. Indeed, Cape Verdean parents interviews show  $\frac{3}{4}$  of the parents migrated into Portugal following its accession to EU (Table 1, Appendice B).

The accession to the EU meant access to the European Regional Development Fund (ERDF) to promote basic infrastructure in transport, communications, energy, environment and urban renewal, social infrastructure in education, social integration, health and arts, modernization of economic activity through infrastructure and incentive systems to the business sector, and scientific and technological research and development action. It also meant access to the European Social Fund (ESF), under the Community Support Framework II (1994-9), and III (2000-6) to promote educational and vocational training policies aimed at promoting employment and the integration of the labour market, such as PRODEP for education, POEDFS for work, training, and social development, POCTI for science, technology and innovation, POSI for information and Saúde XXI for health (QCA online). Despite not being in possession of a detailed report, we believe Cova da Moura has greatly benefited from these funds to build infrastructures (e.g. basic school and nurseries), and services (e.g. pedagogic activities), in particular those aimed at children.

In the wake of promoting basic infrastructures, it was created a huge demand of labour to perform tasks requiring elementary or middle-level qualifications. Migrants in general and Cape Verdeans in particular benefited from this labour market. Later, they benefit also from the World Fair 98, hosted by the Portuguese state in 1998 requiring a large pool of elementary and middle-level qualified labour, in particular to perform tasks related to servicing and construction of infrastructures such as accommodation, the new bridge linking the southern and northern regions of the Lisbon Metropolitan Area, and the international/national train hub and the correspondent underground.

From 1995 to 2002, Portugal was ruled by a socialist government. It introduced substantial changes in the social protection in order to increase parental resources. In 1996, a social benefit (Rendimento Mínimo Garantido/Guaranteed Minimum Income) aimed at every person with a valid document to live in Portugal, regardless of his or her previous contribution to social protection system, was introduced. This social benefit, extended in the following year to all Portuguese territory, guaranteed a minimum income to poor families, combined with a social integration programme. Furthermore, maternity/paternity law underwent considerable changes during the 13<sup>th</sup> (10-1995-10.1999) and 14<sup>th</sup> (10.1999-4.2002) constitutional governments.

Successive changes to Law 04/84, April 5, regulated by DL 136/85, May 3, were introduced<sup>19</sup>, in particular to extend maternity/paternity (from 90 to 120 days). Important changes in migratory policy also were introduced. Undocumented migrants were granted the opportunity to obtain valid documentation. In 2001, the Government created an exceptional procedure to legalize foreign workers who had not been expelled, convicted to sentences longer than 6 months and identified as inadmissible in the SIS system. From 2001-2004, foreigners who had entered with a valid documentation in Portugal, but remained without an adequate visa, and held a labour contract were allowed to apply for a staying permit. This extraordinary regularization, which legalized about 8,678 Cape Verdeans, not only grant them access to social protection rights, but also relieved undocumented migrants from their vulnerability to stressful situations due to lack of a valid documentation. The law does not reflect in migrant perceptions. Often the immigrant country grants basic civil and social rights to documented immigrants or even some basic rights to undocumented immigrants, such as the case of Portugal, where holders of a staying permit are granted the same socioeconomic rights (i.e. education, training, labour, health, juridical) as nationals, and undocumented immigrants are granted basic education and health. Indeed, the Migration Integration Policy Index classified Portugal out of thirty-one countries as the second best country with better integration policies for migrants, as it is the first in terms of access to Portuguese nationality and migrant family reunification, second in integration in the labour market, fourth in education and long term residence, fifth in antidiscrimination policies, and seven in political participation (MIPEX 2011). However, there is a divide between policies and their implementation and the way the beneficiaries perceive it. For instance, since 2001 the Portuguese law grants foreign nationals legally residing in Portugal access, on equal treatment as Portuguese nationals, to the National Health Service. Also, upon presentation of a document issued by the Parish council confirming their staying in Portugal for a period longer than 90 days,

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<sup>19</sup> The milestone of the legal framework protection on maternity and paternity in post-dictatorship period was modified by Law 17/95, June 9, Law 102/97, September 13, Law 18/98, April 18, Law 118/99, August 11, and Law 142/99, August 31, DL 70/2000, May 9, and DL 230/2000, September 23. Eventually, the Law 99/2003, August 27 (approving the Labour Code) and Lei 35/2004, July 29 (regulation of Labour Code), revoked the Law 4/84. The new Labour Code integrates measures approved regarding protection in pregnancy, maternity, paternity, adoptions and other situations regarding conciliation and family lives (4th section, articles 32 -52).

Besides the above legal framework, other laws were enacted changing the social protection for pregnancy, maternity, and paternity leaves as defined by the DL 154/88, April 29 (i.e. DL 333/95, December 23, DL 347/98, November 9), including unemployed or non active parents. In 2003, the 15th Government extended child allowance to families not paying for social protection and, in case of six-to-sixteen-year-old students integrating the first level of child allowance, an additional month was granted to cover educational expenses (DL 176/2003, August 2)

an undocumented foreigner might have access to the national health services. In case of prenatal, puerperium, infant and juvenile visits, as well as cases endangering public health, the medical visits are free of charge, regardless of holding or not a valid visa (Despacho 25.360/2001, Diário da República 286, December 2001). The effect of this legal framework on immigrant communities fell short of expectations, in particular amongst the undocumented migrants. The latter are afraid to use the health services. They use it as a last resource, mostly as a treatment and when alternative treatments proved ineffective. In a survey on migrant access to the Portuguese health, the number of years of living in Portugal and the legal migrant status was found to influence the use of the health services, in particular the health centers. Migrants avoid health centers because of the type of service and personnel involved. Early closing time, difficulty to book a medical appointment (i.e. they have to wait hours on a queue, often without success, hours meaning no work and, as a consequence, no money), rude behavior of personnel towards migrants, cultural barriers, are some of the reasons explained for preferring hospitals to health centers and preventive medicine. Hospitals are resorted to in case of treatment and as a last resource (Gonçalves et al 2003).

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CV-PT 09 children school-oriented cognitive development is not adequate. About a third of the CV-PT 09 children have failed along the way (31.2%). This is a high percentage bearing in mind the Portuguese educational system is organized in such a way not allowing retention in the first grade. Thus, if children attending the 1<sup>st</sup> grade (23.1%) are added to children automatically transferred to the 2<sup>nd</sup> grade (21.3%), the percentage of children who never failed corresponds to less than a quarter of the school population (24.4%).

The high rate of failure might be explained by the presence of several Cape Verdean children migrating to conclude the first cycle of basic education in Portugal. Indeed, the relationship between cognitive development and birthplace is significant. Their integration in the Portuguese educational system usually required them to attend a lower grade than they attend in Cape Verde.

Failure in Portugal-born children or children raised in Portugal before entering school might be explained by a deficient investment in deficient school readiness. In infancy, mothers tended to be the first caregiver. Those worker mothers living live with or nearby their parents and, to a lesser extent, their parents-in-law benefit from their help if the latter were not employed. Not many mothers could resort to these alloparents. There was a shortage of grandmothers in the neighbourhood, in particular in families in which mothers have migrated from late 1990s: «*grannies*», *the transmitters of values and costumes, have stayed in Africa*» (Moinho da

Juventude online). Mothers who could not benefit from the help of a grandmother resorted to the various babysitters in the neighbourhood. These babysitters were Cape Verdean women offering childcare services without any official authorization from the Regional Social Security Centre. In 2000, the neighbourhood was found to offer 18 services of this kind. At the time, only one service was officially recognized as nursery. On the whole, 27 childminders took care of 249 children (about 9 children per childminder). Besides the quantity of the unofficial services, these services seldom met the pedagogical criteria requested by the National Institute for Social Security: *«childminders do not have any appropriate training to carried out those services [...] In several cases, groups composed of 12 to 14 children are trapped in a tiny room which serves as a bedroom, living room and a hall, where people go forward and backwards. Children have no toy that they can use to promote their own learning and development. Some children are the offspring of undocumented migrants who leave the newborn in order to ensure their job. Because of the employment, where pay is irregular and often the salary is not received for months, parents cannot regularly pay the childminder [...]. Children stayed from 5 am to 10 pm, others stay all week. Their mothers had a precarious job far away from home. There are also children with physical and psychological problems – some came from Africa to receive treatment – who are not receiving the required medical and psychological pos-treatment support* (Moinho da Juventude online). From this description, childminders who were not official recognized could have negatively affected the growth and development during infancy.

The majority of these childminders are unlikely to be prepared to stimulate school-oriented cognitive development, due to their low level of education. The interviews showed the majority of the parents completed the first four years of basic education. However, the level of education completed varied with parents' birthplace. Portugal-born parents attended a higher school grade than PALOP-born parents. In fact, illiteracy was only found in PALOP-born parents (Tables 1, Appendice B).

The Service for Foreigners and Borders' data points in the same direction of the above educational profile. In 2001, 58.5% of Cape Verdean nationals living in Portugal had basic schooling, 19.5% were illiterate, and 13.4% could read and write but had not attended any school (ACIME n.d.). IESE/Geoideia evidenced a bipolarity in the education profile of the Cape Verdeans living in Portugal. On one hand, a higher percentage of Cape Verdeans has only concluded the basic education, are illiterate or can read and write without having attended formal school. On the other hand, a high number of Cape Verdeans have attained secondary school (20.2%) or university level (8.8) (IESE/GEOIDEIA 1998).

EB1-CM staff confirmed children attending pre-school in EB1-CM were less likely to fail in the second grade (i.e. the first grade the educational system allows children to be retained). Children attending EB1-CM pre-school were better prepared than those attending pre-school in other institutions or not attending pre-school at all. The EB1-CM pre-school curriculum is designed to concur for a positive performance in the first cycle of basic education, whereas those provided by other childcare institutions tend not share the same standards.

In 2008/9, the municipality recorded a decrease in failure and dropouts rates. Only 3 children failed in EB1-CM. This was the best performance in Damaia's borough (Table 2, Appendix B). Should it not be for the progressive changes introduced in the educational system to reduce failure rate in basic education<sup>20</sup>, the percentage of failure in 2008/9 would have surprised us. Over the years, the percentage of failure in EB1-CM has been higher than two digits: about 12.5% in 2003/4, 12.2% in 2004/5 and 12.5% in 2005/6 (IBC 2008).

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Based on assumption bi-parental households and households receiving no child allowance/social support for education are better off than monoparental or no parental households and households receiving child allowance, we expected children living in richer households to be taller and have a better school performance. Linear and logistic regression analysis showed that parental resources in prepuberty do not contribute significantly to linear growth, nor to school-oriented cognitive development. As linear growth and cognitive development are the outcome of accumulative investments, the present resources *per se* are ineffective if they are recent. By assessing parental investment in infancy, some light might be shed on parental resources.

Regression analysis showed that parental investment in an infant's feeding, protection, and learning is an adequate predictor of linear growth and school-

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<sup>20</sup> Besides no retention in the first grade, the curricula have been increasingly adapted to the local needs. Since 2005, the Education Ministry has been introducing profound changes in the first cycle of the basic education to improve the integration of the four grades. These changes involved the reorganization and requalification of the schools, the expansion of full time schooling and activities to enrich the educational *curricula*, the expansion of government-funded school meals and transportation, promotion of ongoing training for Maths, Portuguese, and Natural Sciences teachers, a definition of guidelines for *educational curricula*. These changes have positively affected the reduction of failure, according to the international evaluation panel (Matthews, Klaver et al. 2009).

Despite the reduction in failures, the basic educational system still faces a high rate in the second grade. According to the evaluational panel, this is due to school sizes and teacher's stability. The reduction in size and the improvement of conditions to maintain teachers in the schools would halve the rates of failures. In 2008, the Ministry of Education reinforced its stance that «*retention should be used as a last resource [...] after all activities to improve educational performance in the classroom and school proved ineffective* (DL 50/2005, October 20<sup>th</sup>).

oriented cognitive development. The effect size is, however, small for both. Data show one childminder is better than a mixed childcare to school-oriented school performance.

Most of the predictors of parental investment proposed in literature on parental investment were not found significant in this study. Sibship structure is found to be the only reliable predictor of parental investment. It appears to contribute to the current reproductive success of the parents and, as a consequence, to the embodied capital of their offsprings. The results are somehow contradictory. They indicate as parity at birth (equivalent in this study to birth order) increases, parental investment decreases, whereas as the number of older siblings increases, parental investment increases. It suggests children of higher birth order receive less investment, but also the higher the number of older siblings, the higher the investment.

The sibship structure contribution to parental investment is consistent to some extent with studies on birth order finding significant associations between first-born children and parental investment (see Draper and Hames 2000, Sulloway 2007) as well as studies on cooperative breeding emphasizing the benefits of older siblings rather than sibling competition in modern societies – where different institutions (i.e. parents, governments, charities, and so on) contribute with resources to parenting (Gibson and Lawson 2011, Lawson and Mace 2011, Sear and Mace 2008).

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The examination of the size of birth might also contribute to explain prepubertal embodied capital. Regression analysis confirmed the significant contribution of birthweight to prepubertal linear growth, but not to school-oriented cognitive development.

Literature on birthweight associated constraining environments to poorer weight at birth. Indeed, we expected from mothers exposed to a constraining environment since birth, in particular among immigrants from PALOP, to give birth to lighter babies. The findings show, however, that PALOP-born mothers give birth to heavier babies than Portugal-born mothers, in spite of giving birth to low birth weight and preterm babies more often than Portugal-born mothers.

These findings are surprising taking into account the historical and socioeconomic context in which both groups were born and raised during their childhood. On average, PALOP-born mothers were born in late sixties whereas Portugal-born mothers were born a decade later. The former were born and raised under colonialism, whereas the latter were born years after the end of a forty-year dictatorship. Besides the socioeconomic constraints caused by colonialism, the

former were brought up in a period when Cape Verde was affected by one of the most severe droughts in the Sahel region. This long-lasting drought (1960s-1987) had a devastated impact on the population nutritional status, in spite of not causing the dead toll registered in previous droughts. In 1977 Stabile-Wolcan found that 24% children aged 0-5 suffered from moderate malnutrition and 2% from severe malnutrition (Stabile-Wolcan 1977). In 1979 Pina *et al.* sustained those findings: 20% of the children were moderately malnourished and 2-10% were suffering from severe malnutrition (Pina *et al.* 1979). In the same year, Legrain & Cap found that 31-46% of children aged 0-6 years in Santiago were found suffering malnutrition, in particular in rural areas (Legrain & Cap 1979). In 1983, Wenneberg reported a strong tendency towards chronic, moderate nutritional deprivation in preschool-age children (0-6 years old): 13.1% low height-for-age, 17.2% low weight-for-age, 2.5% low weight-for-height (wasting) and 0.6% severe wasting.

Portugal-born mothers were born and raised in a better off context than PALOP-born mothers. However, it is noteworthy to remember almost a third of the mothers were raised between 1976 and 1987, roughly between the end of dictatorship (1974) and the accession to the European Union (1986). In this period, Portugal underwent a serious socioeconomic and political instability. Between April 25th 1974 and July 22nd 1976, Portugal was ruled by six provisional military governments and, between July 22nd 1976 and November 6th 1985 by 10 constitutional governments. The Portuguese economy went through a difficult crisis due to a combination of political (i.e. domestic political instability), economic (i.e. international oil crisis, private sector nationalization and high inflation), and social (absorption of about one million people from former African colonies) insults. This crisis compelled Portugal to sign agreements with the International Monetary Fund (1978 and 1983), involving the implementation of austerity measures which would affect working conditions (i.e. salaries, benefits, and occupation), and the population well-being (Portugal – MF 1989). As a matter of fact, Cape Verdean mothers mostly migrated into Portugal in the nineties following the accession of Portugal to the European Community (76.5%). Until then, Portugal lacked the pull factors usually associated with immigration countries to lure individual migrant women who aimed to earn money to improve their own or their family's well-being. Only mothers migrating during infancy, childhood/adolescence did so before 1986. Selective migration is another factor to take into account. Migration from a developing country to a developed country does not reflect a situation in which the migrant who leaves the developing country is in a poorer condition than the sedentary who lives in the developed country, in particular if the former lives in a deprived neighbourhood. Migration is selective, in particular if the movement involves long

distances. Only people endowed with capital are able to execute the movement. This capital might be economical or social. Social capital, as defined by Bourdieu, is the aggregate of resources associated to a more or less institutionalized membership in a group (e.g. family, class, tribal, school, party, congregations). By integrating the group, a member is «entitled» to credit the capital owned by the group (Bourdieu 1986). In other words, even if not in possession of economic capital, the potential migrant can mobilize enough financial resources to migrate, as it is often mentioned in literature on Cape Verdean transnationalism (see Batalha & Carling 2008, Góis 2008, Meintel 2002).

Birthweight differences between PALOP-born mothers and Portugal-born mothers are consistent with differences found in a study on birthweight conducted in 2001/2 at the Hospital Fernando Fonseca, located in the municipality of Amadora. This study found that foreign-born mothers were more likely to give birth small preterm babies and heavier term babies than Portugal-born African mothers and white Portuguese mothers. A combination of biologic factors (parity, gestational age, and maternal age) and lifestyle (e.g. smoking) were to explain this condition (Harding *et al.* 2006).

Maternal age was the only variable found to predict birthweight in this study. As maternal age increases, birthweight increases. Mother aged 35, or older, tend to produce heavier babies, whether they were born in Portugal or not. However, this tendency is more frequent amongst PALOP-born mothers. Getting pregnant at an older age in the context of immigration is common among Cape Verdeans who migrate in late adolescence or adulthood. This late pregnancy ought not to be understood as the first pregnancy. The Reproductive Health Survey 2005 reported the mean age for the first child in Cape Verde is 20 years old for females aged 25-29 years and 22 years old for females at the end of their reproductive life. This mean age decreases if the female lives in an urban area, has received no formal education and/or only basic education. However, 15% of females aged 15 to 19 years has already given birth, and 4% is pregnant. Early pregnancy decreases if female lives in an urban area, in the island of S. Vicente or S. Nicolau, and/or attended secondary or higher education (CV-INE 2005).

The mothers interviewed mostly had already given birth before migrating. They migrate alone, leaving their offspring behind under the care of a family member. Once they were “adequately” settled, they sent for their children. Family reunification is allowed only before the offspring reaches 16 years old.

## Chapter 7 – Conclusion

This cross-sectional study explores parental allocation of resources to an individual offspring in migratory contexts. As resources are finite, parents make trade-offs in order to optimize their limited resources, such as higher quantity vs better quality of offspring. Parental decisions on whether, how and when to allocate these resources depend on a variety of factors ranging from the offspring to the environment where he or she and their parents were born and raised.

In migratory contexts, the parental decision mechanisms are more complex. Migrant parents' decisions involved different factors from parents descendants of migrants. In general, Cape Verdean migrant parents have to take decisions taking into account households in the country of origin as well as in the immigration country. These decisions will affect the offspring embodied capital.

The strength of this research lies in using both quantitative and qualitative methods and an analysis based on a geographical and historical perspective. This combination enables us to frame the offspring embodied capital in sociocultural and economic background. The focus on a specific neighbourhood, for which exists some documentation, also enables us to gain a better understanding of its socioeconomic and sociocultural dynamics.

This study shows three relevant and one less relevant limitation. First, a higher number of interviews needed to be conducted to be able to conduct specific statistic tests. Often the relationship between two variables was not possible because of the high percentage of cells with less than expected. The grouping of the categories did not contribute to solve the problem because we were grouping categories within a homogeneous group. Second, the quantitative analysis presented is valid only for children living in the neighbourhood. These children attend a school that is located in the neighbourhood and, as a consequence, parents from the surrounding neighbourhoods avoid to sending their children to that school. Third, the parental investment indicator requires refinement. Feeding, protection and learning, according to the international recommendations, should be complemented with other variables and confronted with other individual goals (i.e. gain enough money to invest in the country of immigration or in the country of origin, or to return to the country of origin). Fourth, the variable "culture" requires a deep analysis to explore how the main culture and sub-cultures present in the neighbourhood influence parental decisions.

Future research is suggested to assess this children's growth. It will be enhanced if it includes a higher number of interviews to mothers as well as if it includes children living in Cova da Moura, but attending the basic school outside the neighbourhood.

Last, it would be worth added to infancy also early childhood to assess which stage is more important in prepubertal embodied capital.

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- International Association for the Study of Obesity - <http://www.iaso.org>
- Instituto Nacional de Estatística - Portugal - <http://www.ine.pt>
- Instituto Nacional de Estatística Cabo-Verde - <http://www.ine.cv>
- Quadro comunitário de Apoio - <http://www.qcp.com>

# APPENDICES

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# APPENDIX A

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# Anthropometric Assessment Form

## Parental Care During Infancy and Later School Performance

### 1. General Information

		Code
<b>Sex:</b>	Female <input type="checkbox"/> Male <input type="checkbox"/>	<input type="checkbox"/>
<b>Date of birth:</b>	__ / __ / 19 __	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/>
		years
<b>Place of birth:</b>	_____	<input type="checkbox"/> <input type="checkbox"/>
<b>Nationality:</b>	_____	<input type="checkbox"/> <input type="checkbox"/>
<b>Mother's birth place:</b>	_____	<input type="checkbox"/> <input type="checkbox"/>
<b>Father's birth place:</b>	_____	<input type="checkbox"/> <input type="checkbox"/>
<b>Language spoken at home:</b>	_____	<input type="checkbox"/> <input type="checkbox"/>
<b>Residential area:</b>	_____	<input type="checkbox"/> <input type="checkbox"/>

### 2. Measurements

<b>Height (cm):</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ,
<b>Sitting Height (cm):</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ,
<b>Weight (kg):</b>	<input type="checkbox"/> <input type="checkbox"/> ,
<b>Arm circumference (mm):</b>	<input type="checkbox"/> <input type="checkbox"/> ,
<b>Triceps skinfold (mm):</b>	<input type="checkbox"/> <input type="checkbox"/> ,
<b>Subscapular skinfold (mm):</b>	<input type="checkbox"/> <input type="checkbox"/> ,

### 3. Education

<b>School:</b>	_____		
<b>Grade:</b>	<input type="checkbox"/>		
<b>Failures:</b>	<input type="checkbox"/> yes <input type="checkbox"/> no		If yes: <input type="checkbox"/> grade
<b>Date of the interview:</b>	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		

## **Interview Topic**

### **1. Parents profile**

Birthplace, Birth date, Nationality, Formal/Informal marriage  
School attainment, Profession, Labor Relation  
Residence, Immigration Date  
Household members, Birth Date of the household members

### **2. Parental Investment in Infancy**

Mother's age at first birth  
Mother's age at schoolchild birth  
Offspring number, their age and sex  
Pregnancy (planning and prenatal care)  
Birth  
Infancy (feeding, protection, caring, and learning)  
Household members  
Presence of both parents or only one

## APPENDIX B

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**Table 35** – Descriptive Statistics for Biological, Sociocultural, and Economic Variables

Indicators	Categories	Sub-categories		N	%
sex	Boy			114	54.0
	Girl			97	46.0
	Total			211	100
Grade	1st			52	24.6
	2nd			61	28.9
	3rd			56	26.5
	4th			42	19.9
	Total			211	100.0
Performance	Regular			142	67.3
	Irregular			69	32.7
	Total			211	100.0
Birthplace	Child	Portugal		174	82.5
		Cabo Verde		25	11.8
		Guinea Bissau		3	1.4
		São Tome		4	1.9
		Angola		3	1.4
		Other		2	0.9
	Total		211	100.0	
	Mother	PALOP		50	66.6
		Portugal		25	33.4
Total			75	100	
Father	PALOP		68	90.7	
	Portugal		7	9.3	
	Total		75	100	
Migration	Mother	<1975		4	7.8
		1975-1986		9	17.7
		1986-1995		13	25.5
		1996-2005		23	45.1
		>2006		2	3.9
	Total		51	51	
Parents' Education	None	Mother		9	11.7
		Father		2	3.0
	1st cycle	Mother		21	29.6
		Father		36	56.3
	2nd cycle	Mother		12	25.6
		Father		10	15.6
	3rd cycle	Mother		24	31.4
		Father		12	18.8
	Secondary	Mother		8	10.4
		Father		3	4.7
	University or equivalent	Mother		1	1.3
Father			1	1.6	
Total	Mother		75	100	
	Father		67	100	

Descriptive Statistics

Indicators	Categories	Sub-categories		N	%
Parents' Education by birthplace	None	Mother	PALOP	9	11.7
			PT		
		Father	PALOP	2	3.0
			PT		
	1st cycle	Mother	PALOP	17	10.4
			PT	4	5.2
		Father	PALOP	33	51.6
			PT	7	10.9
	2 nd cycle	Mother	PALOP	8	10.4
			PT	4	5.2
		Father	PALOP	7	10.9
			PT	3	4.7
	3rd cycle	Mother	PALOP	12	15.7
			PT	12	15.7
		Father	PALOP	11	10.9
			PT	1	1.6
	Secondary	Mother	PALOP	3	3.9
			PT	5	6.5
		Father	PALOP		
			PT	3	4.7
University or equivalent	Mother	PALOP			
		PT	1	1.3	
	Father	PALOP			
		PT	1	1.6	
Total	Mother	PALOP	49	66.2	
		PT	26	33.8	
	Father	PALOP	57	89.1	
		PT	7	10.9	
Mother Occupation	Technicians and associate professionals		PALOP		
			PT	1	1.4
	Clerks		PALOP		
			PT	2	2.7
	Service workers and shop/market sales workers		PALOP	9	12.3
			PT	17	23.3
	Elementary occupations		PALOP	11	15.1
			PT	33	42.5
	Total		PALOP	50	68.5
			PT	23	31.5
Father Occupation	Technicians and associate professionals		PALOP	3	4.5
			PT		
	Clerks		PALOP	1	1.5
			PT		
	Service workers and shop/market sales workers		PALOP	1	1.5
			PT	1	1.5
	Craft and related trades		PALOP	2	3.0
			PT		
Plant and machine operators and assemblers		PALOP	7	10.4	
		PT	50	74.6	
Elementary occupations		PALOP	2	3.0	
		PT			

## Descriptive Statistics

	Total		PALOP	59	88.1
			PT	8	11.9
Indicators	Categories	Sub-categories		N	%
Biparental household	Yes			105	51.2
	No			100	48.8
	Total			221	100.0
Social support	None			67	31.8
	1st level			110	83.9
	2nd level			34	16.1
House owners hip	Own			12	16.2
	Parents			25	33.8
	Rented			37	50.0
	Total			137	100.0
Household Household	Same father	Bi-parental	PALOP	17	
			PT	15	
			Total	32	
	Different fathers	Monoparent	PALOP	6	
			PT		
			Total		
	Different fathers	Bi-parental	PALOP	9	
			PT	3	
			Total	14	
	Different fathers	Monoparent	PALOP	5	
			PT		
			Total		

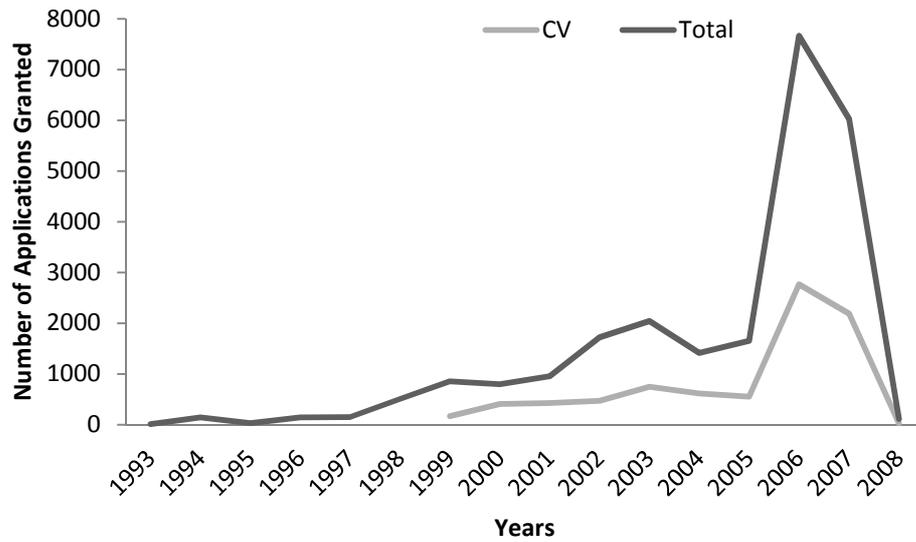
**Table 36 - School Failure and Drop-outs in Amadora Basic Schools  
(2008/9)**

Groups of Schools	Schools	1st Year		2nd Year		3rd Year		4th Year		TOTAL	
		F	D	F	D	F	D	F	D	F	D
Alfornelos	EB1/JI Orlando Gonçalves	0	0	0	0	0	0	0	0	0	0
	EB1 Alice Leite	0	0	0	0	0	0	0	0	0	0
	EB1 M <sup>a</sup> Irene Lopes Azevedo	0	0	0	0	0	0	0	0	0	0
	EB1/JI Santos Mattos	0	0	0	0	0	0	0	0	0	0
<b>TOTAL:</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Almeida Garrett	EB1/JI Alfragide	0	0	0	0	0	0	4	3	4	3
	EB1/JI Quinta Grande	0	1	0	3	0	0	0	0	4	0
	EB1/JI Alto Moinho	3	3	0	7	1	4	4	1	14	5
<b>TOTAL:</b>		<b>3</b>	<b>4</b>	<b>0</b>	<b>10</b>	<b>1</b>	<b>8</b>	<b>4</b>	<b>4</b>	<b>22</b>	<b>8</b>
Cardoso Lopes	EB1 Mina	1	1	0	7	0	1	0	9	1	1
	EB1 Mina de Água	0	5	0	1	0	0	0	6	0	0
	EB1 Aprigio Gomes	0	4	1	10	0	6	0	20	1	1
<b>TOTAL:</b>		<b>1</b>	<b>10</b>	<b>1</b>	<b>18</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>35</b>	<b>2</b>	<b>2</b>
Damaia	EB1 Padre Himalaia	0	5	0	0	0	1	0	6	0	0
	EB1/JI Águas Livres	0	7	0	0	0	3	0	10	0	0
	EB1/JI Cova da Moura	0	0	0	3	0	0	0	3	0	0
	EB1/JI Alice Vieira	0	3	0	3	0	6	0	12	0	0
<b>TOTAL:</b>		<b>0</b>	<b>15</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>31</b>	<b>0</b>	<b>0</b>
Roque Gameiro	EB1/JI Terra dos Arcos	0	7	0	5	0	0	0	12	0	0
	EB1 Gago Coutinho	0	2	0	0	0	3	0	5	0	0
	EB1/JI Vasco M. Rebolo	0	0	0	2	0	5	0	7	0	0
<b>TOTAL:</b>		<b>0</b>	<b>9</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>24</b>	<b>0</b>	<b>0</b>
Dr. Azevedo Neves	EB1/JI José Ruy	0	0	0	0	0	0	0	0	0	0
	EB1/JI Condes da Lousã	0	0	0	0	0	0	0	0	0	0
<b>TOTAL:</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Francisco M. Melo	EB1/JI Manuel Heleno	0	4	0	4	0	4	0	12	0	0
	EB1Venteira	0	11	0	4	0	6	0	21	0	0
	EB1/JI Raquel Gameiro	0	1	0	2	0	0	0	3	0	0
<b>TOTAL:</b>		<b>0</b>	<b>16</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>36</b>	<b>0</b>	<b>0</b>
José Cardoso Pires	EB1/JI Casal da Mira	1	0	19	1	2	0	4	1	26	2
	EB1/JI José Garcês	0	0	0	0	0	0	0	0	0	0
	EB1/JI A-da-Beja	0	0	0	0	0	0	0	0	0	0
	EB1/JI Moinhos da Funcheira	0	2	0	0	0	1	0	3	0	0
<b>TOTAL:</b>		<b>1</b>	<b>0</b>	<b>21</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>1</b>	<b>29</b>	<b>2</b>
Miguel Torga	EB1 Boba	1	0	13	2	12	0	2	0	28	2
	EB1 Artur Martinho Simões	1	0	6	0	4	0	3	0	14	0
<b>TOTAL:</b>		<b>2</b>	<b>0</b>	<b>19</b>	<b>2</b>	<b>16</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>42</b>	<b>2</b>
Mães d'Água	EB1 Artur Bual	0	4	1	1	0	1	1	6	2	2
<b>TOTAL:</b>		<b>0</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>6</b>	<b>2</b>	<b>2</b>
Sophia M. Breyner	EB1/JI Sacadura Cabral	0	4	0	1	0	15	0	20	0	0
	EB1/JI Brandoa	0	6	0	3	0	3	0	12	0	0
<b>TOTAL:</b>		<b>0</b>	<b>10</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>18</b>	<b>0</b>	<b>32</b>	<b>0</b>	<b>0</b>
<b>TOTAL</b>		<b>3</b>	<b>4</b>	<b>108</b>	<b>5</b>	<b>74</b>	<b>1</b>	<b>72</b>	<b>6</b>	<b>257</b>	<b>16</b>

**F** – Failure; **D** – Dropout

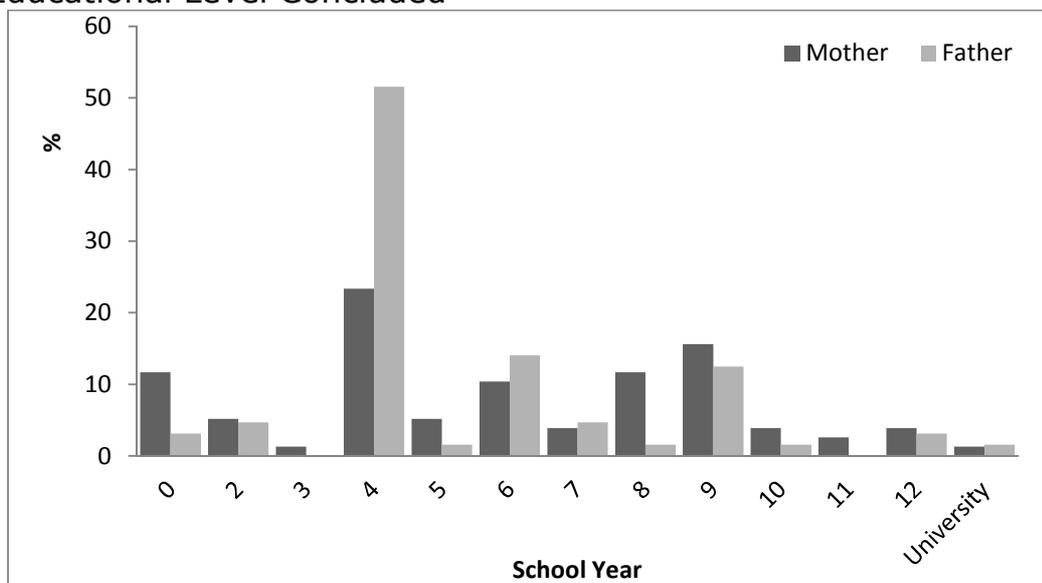
**Source:** Departamento de Educação, Quadro 4 – Escolas do 1º Ciclo- Insucesso Escolar, *Caracterização Escolar 2009-2010*, Amadora: Câmara Municipal da Amadora

**Figure 29** – Evolution of naturalizations granted in Portugal: 1993-2008

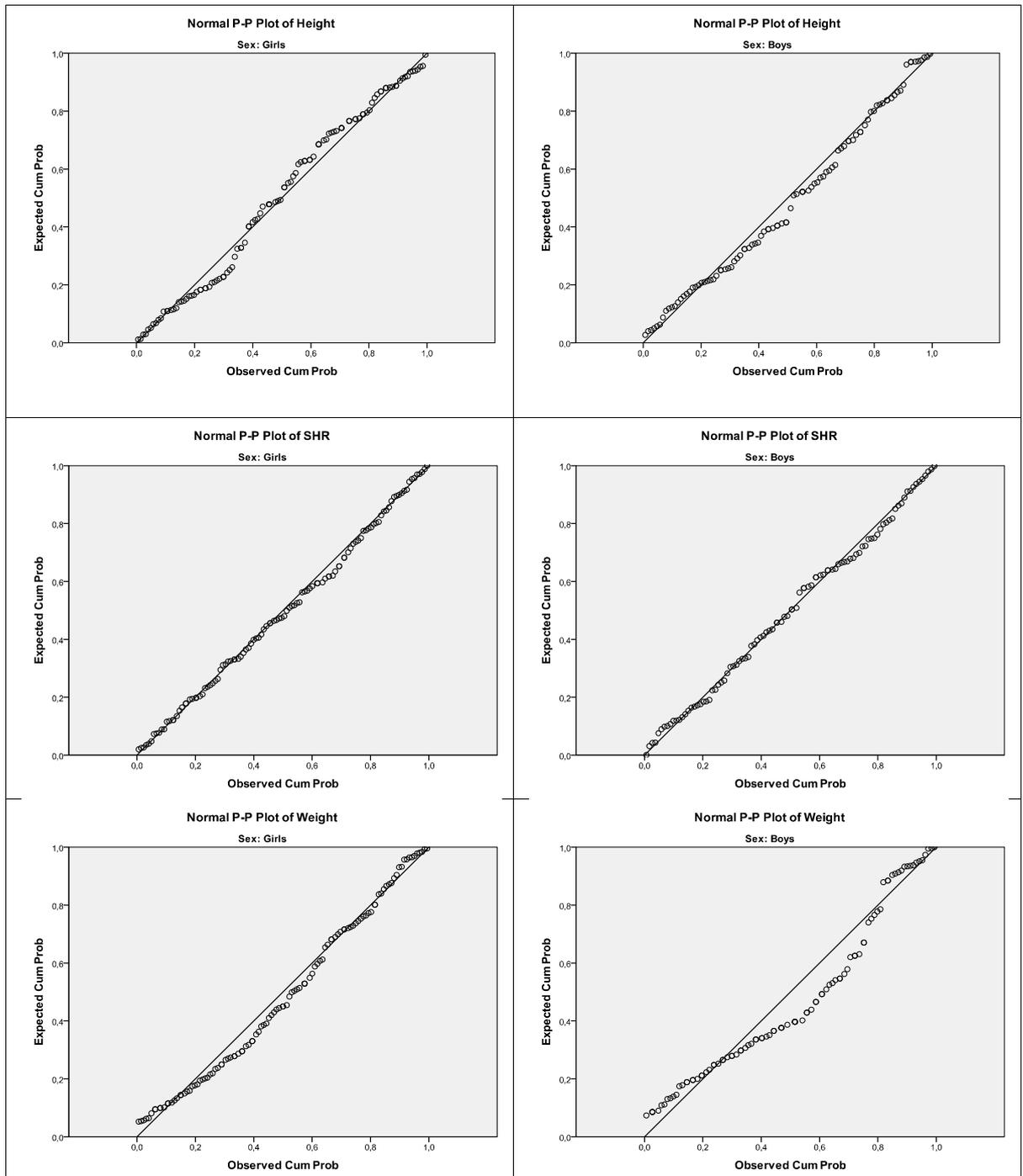


**Source:** Adapted from data provided in *Serviços de Estrangeiras e Fronteiras* website, <http://www.sef.pt>

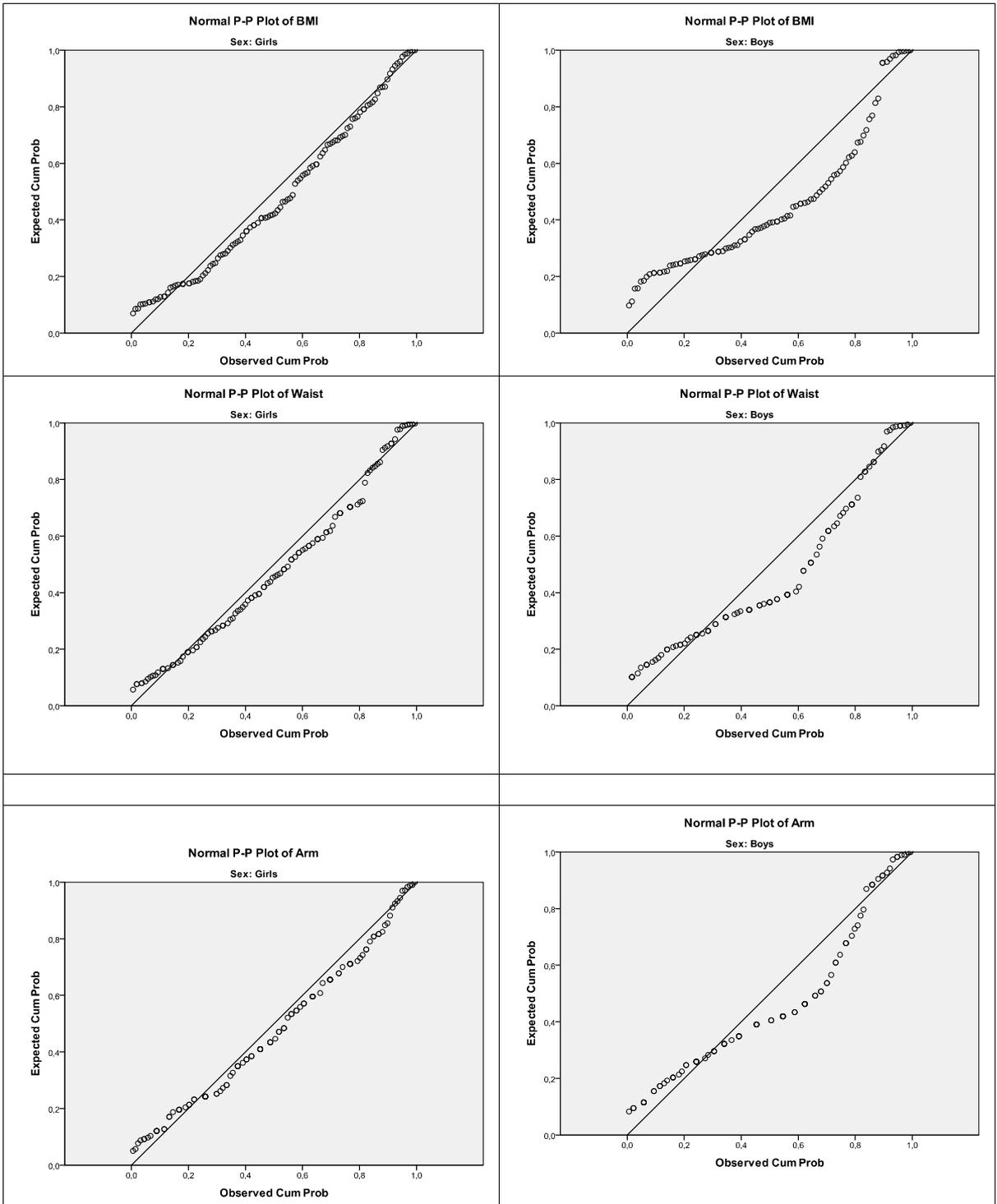
**Figure 30** – Distribution of CV-PT 09 Mothers and Fathers Interviewed by Educational Level Concluded

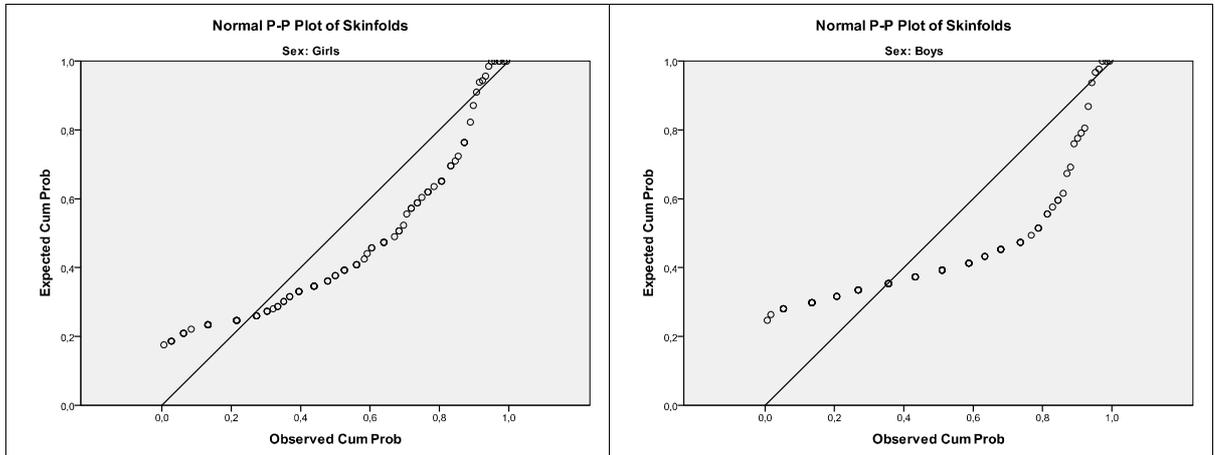


**Figure 31** – P-P Plots for Height, SHR, Weight, BMI, Abdominal and Arm Circumferences, and Skinfolts for Boys and Girls

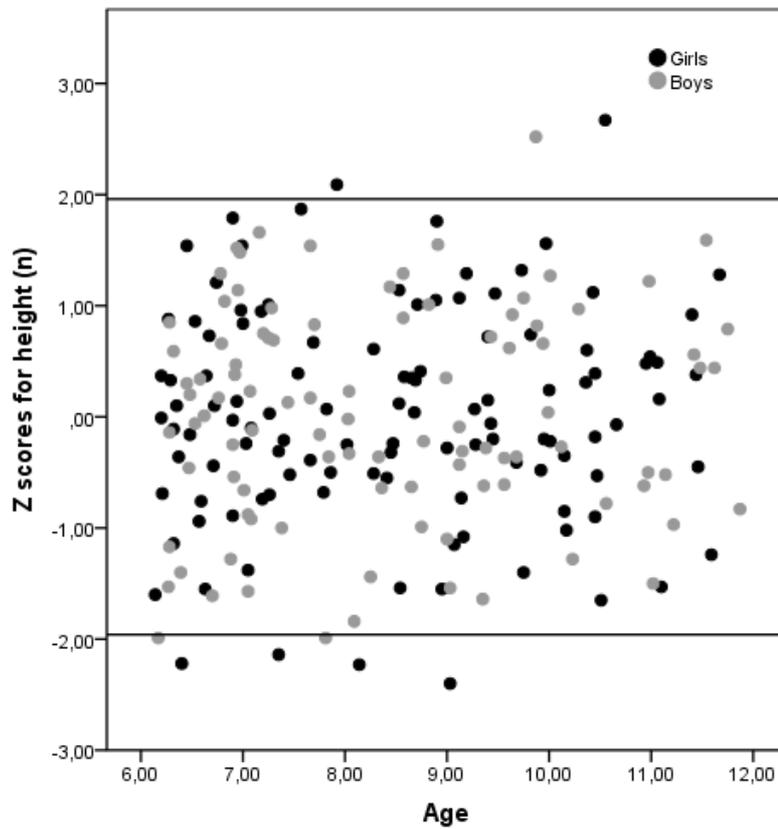


# Normal Distribution

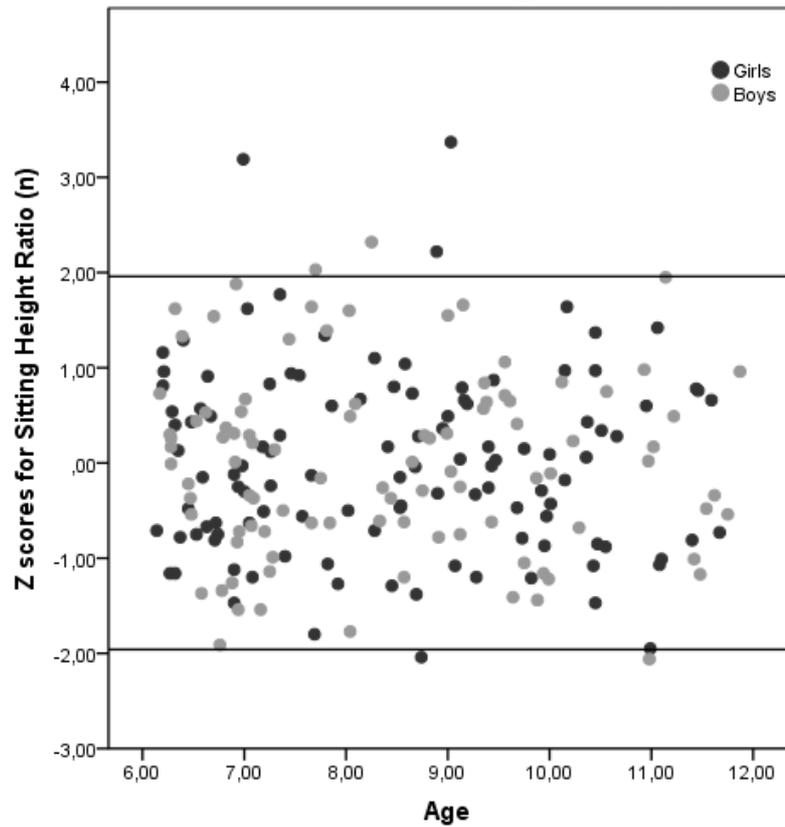




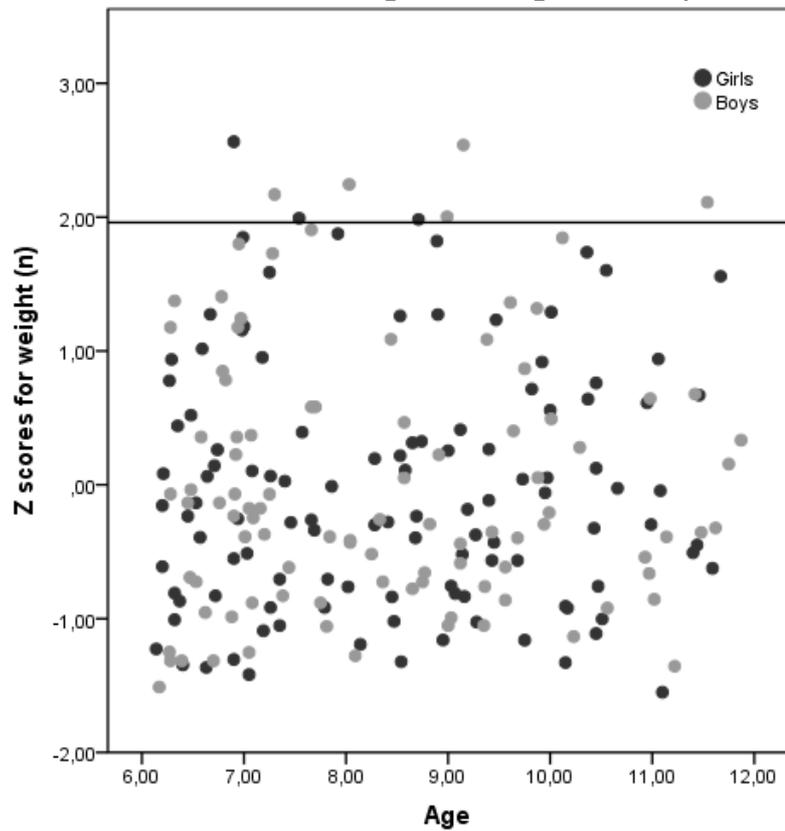
**Figure 32 – Z-scores for Height-for-Age for Boys and Girls**



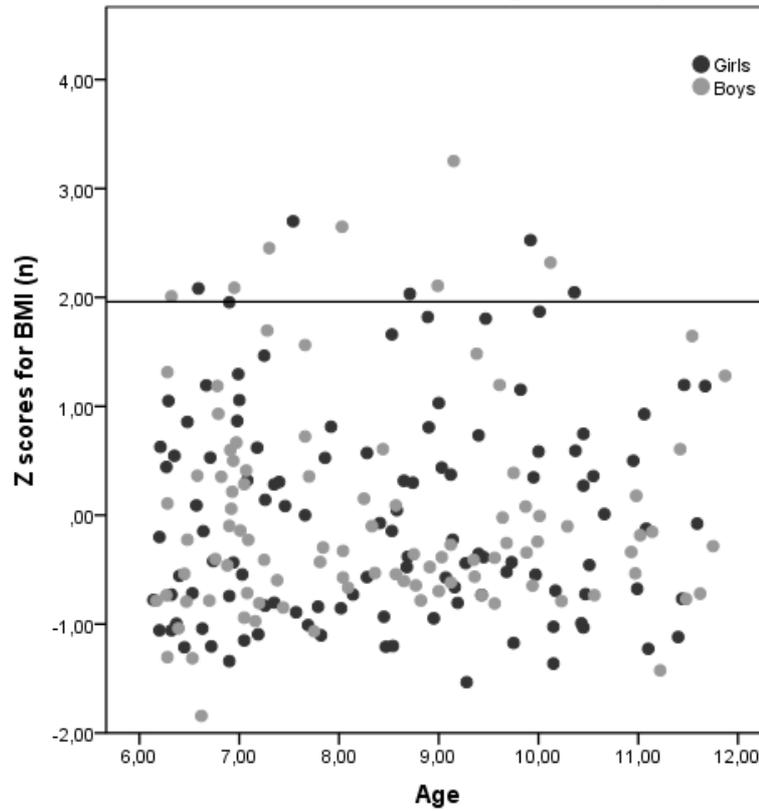
**Figure 33** – Z-scores for SHR-for-Age for Boys and Girls



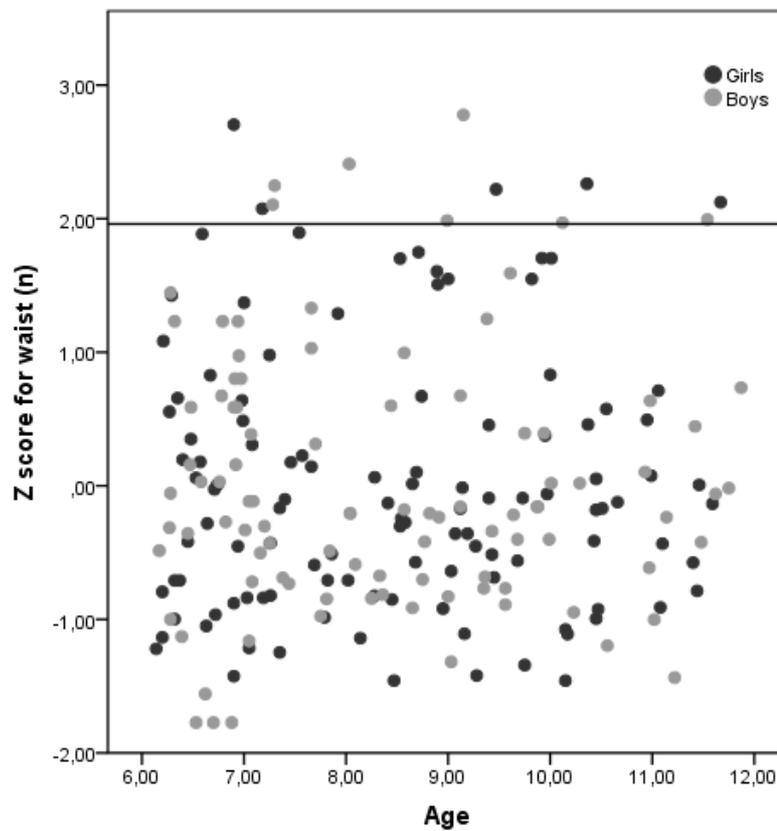
**Figure 6** – Z-scores for Weight-for-Age for Boys and Girls



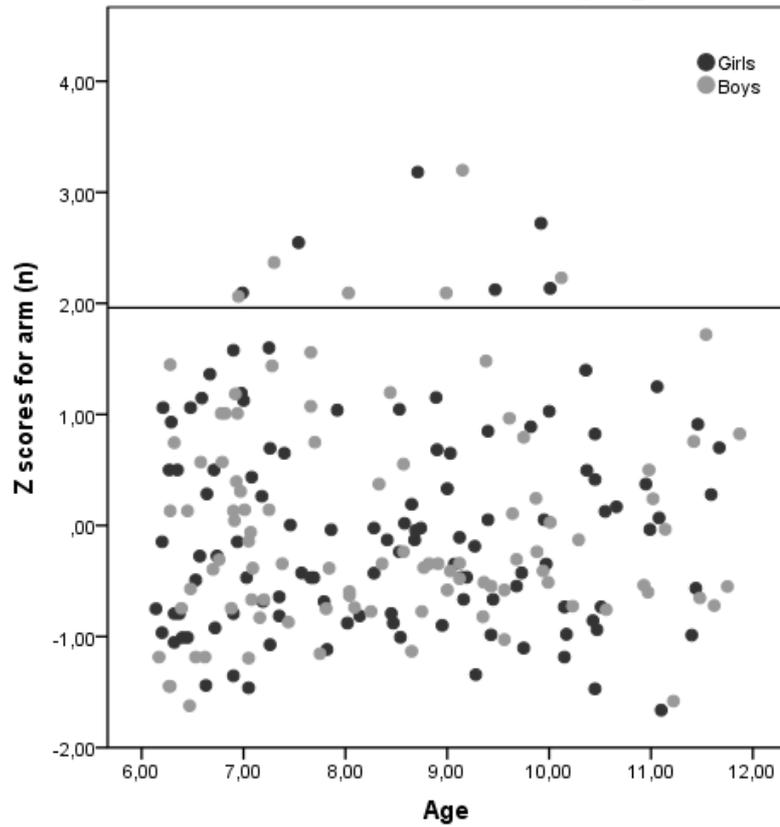
**Figure 34** – Z-scores for BMI-for-Age for Boys and Girls



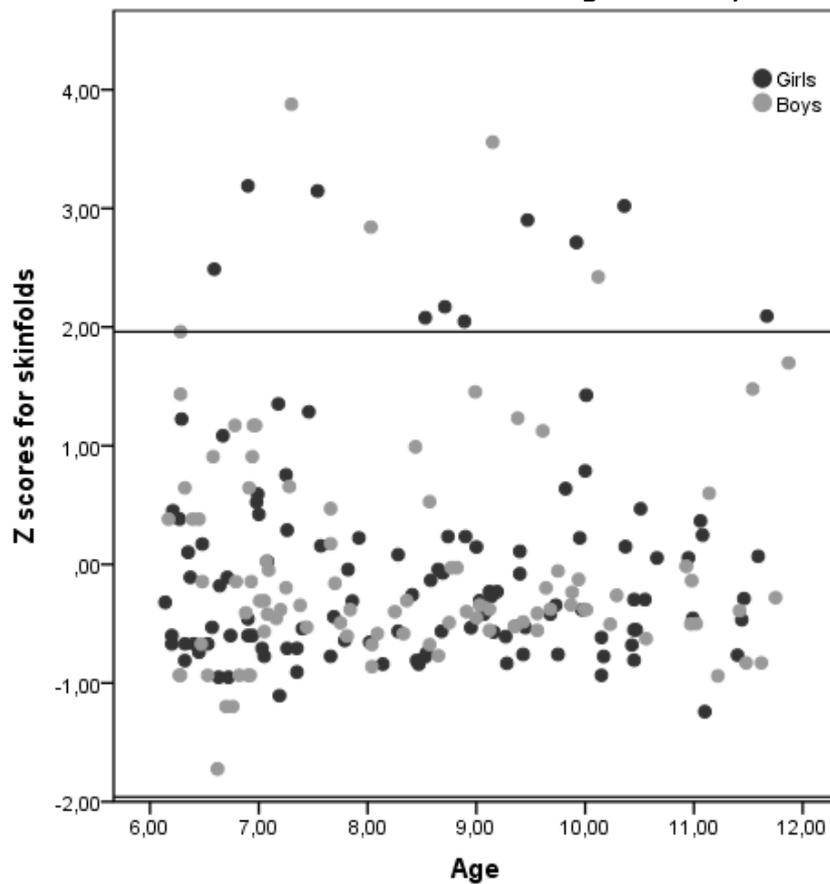
**Figure 8** – Z-scores for Abdominal circumference-for-age for Boys and Girls



**Figure 35** – Z-scores for Arm Circumference by Age for Boys and Girls



**Figure 36** – Z-scores for Skinfolts-for-Age for Boys and Girls



**Table 37** - Skewness and Kurtosis Height, SHR, Weight, BMI, Abdominal and Arm Circumferences, and Skinfolds by age for Boys and Girls

Sex	Age	Distribution	Height	Weight	BMI	SHR	Waist	Arm	Skinfolds
<b>Girls</b>	6	Kurtosis	-0.36	0.19	-0.86	2.69	0.66	-1.24	4.18
		Skewness	-0.47	1.54	1.29	2.60	1.88	0.90	4.22
	7	Kurtosis	0.54	-0.41	1.04	-0.84	-0.41	0.62	3.90
		Skewness	0.52	1.48	1.88	0.28	1.57	1.80	3.49
	8	Kurtosis	0.33	-0.42	-0.25	0.41	-0.62	4.88	1.13
		Skewness	-1.10	1.21	1.56	0.08	1.30	3.68	2.88
	9	Kurtosis	-0.04	-0.27	0.80	5.80	0.13	2.12	5.22
		Skewness	-0.69	1.05	1.98	3.68	1.74	2.80	4.68
	10	Kurtosis	2.41	-1.04	-0.21	-0.52	0.31	-0.41	4.28
		Skewness	1.79	0.56	1.19	-0.49	1.26	0.80	3.64
	11	Kurtosis	-0.66	-0.33	-1.28	-1.44	1.73	-0.54	1.76
		Skewness	-0.65	0.19	0.12	0.23	2.13	-0.67	1.70
	<b>Total</b>	<b>Kurtosis</b>	<b>-1.49</b>	<b>-0.82</b>	<b>2.15</b>	<b>1.58</b>	<b>1.13</b>	<b>13.01</b>	<b>11.61</b>
		<b>Skewness</b>	<b>-0.38</b>	<b>2.25</b>	<b>4.30</b>	<b>1.94</b>	<b>3.81</b>	<b>6.94</b>	<b>9.87</b>
<b>Boys</b>	6	Kurtosis	-0.81	-1.32	-0.24	-0.53	-0.88	-0.94	-1.23
		Skewness	-0.91	0.26	0.81	-0.14	-1.11	0.12	0.38
	7	Kurtosis	-0.51	0.30	0.71	-0.43	0.58	0.23	13.87
		Skewness	-0.44	2.04	2.26	1.25	2.32	1.90	6.84
	8	Kurtosis	-0.71	0.88	2.96	0.99	1.41	0.59	3.18
		Skewness	-0.22	2.27	3.52	1.17	2.72	2.27	3.33
	9	Kurtosis	0.90	0.66	5.73	-1.20	2.12	4.99	9.11
		Skewness	1.10	2.15	4.43	0.05	2.71	4.05	5.60
	10	Kurtosis	-1.23	0.04	3.61	1.28	0.91	2.63	4.75
		Skewness	0.46	1.01	2.90	-1.77	1.30	2.54	3.46
	11	Kurtosis	-0.70	1.33	-0.41	0.22	0.82	-0.16	-0.51
		Skewness	-0.04	1.46	0.68	1.20	0.97	0.29	1.34
	<b>Total</b>	<b>Kurtosis</b>	<b>0.05</b>	<b>2.74</b>	<b>8.50</b>	<b>1.61</b>	<b>3.63</b>	<b>4.76</b>	<b>38.25</b>
		<b>Skewness</b>	<b>2.16</b>	<b>4.65</b>	<b>8.00</b>	<b>0.18</b>	<b>5.65</b>	<b>5.88</b>	<b>16.48</b>

**Table 38** – Test of Normality for Height, SHR, Weight, BMI, Abdominal and Arm Circumferences, and Skinfolds for Boys and Girls

Sex		Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Girls	Height	.080	114	.071	.983	114	.148
	Weight	.073	114	.182	.967	114	.007
	BMI	.086	114	.038	.935	114	.000
	SHR	.055	114	.200 <sup>*</sup>	.985	114	.254
	Waist	.092	114	.019	.942	114	.000
	Arm	.078	114	.082	.906	114	.000
	Skinfolds	.193	114	.000	.737	114	.000
Boys	Height	.089	97	.055	.975	97	.057
	Weight	.144	97	.000	.912	97	.000
	BMI	.186	97	.000	.791	97	.000
	SHR	.044	97	.200 <sup>*</sup>	.990	97	.660
	Waist	.195	97	.000	.870	97	.000
	Arm	.187	97	.000	.878	97	.000
	Skinfolds	.290	97	.000	.519	97	.000

a. Lilliefors Significance Correction

\*. This is a lower bound of the true significance.

**Table 39** – Test of Homogeneity of Variance for Height, SHR, Weight, BMI, Abdominal and Arm Circumferences, and Skinfolds for Boys and Girls

		Test of Homogeneity of Variance			
		Levene Statistic	df1	df2	Sig.
Height	Based on Mean	1.010	1	209	.316
	Based on Median	1.037	1	209	.310
	Based on Median and with adjusted df	1.037	1	205.991	.310
	Based on trimmed mean	1.029	1	209	.312
Weight	Based on Mean	1.737	1	209	.189
	Based on Median	2.447	1	209	.119
	Based on Median and with adjusted df	2.447	1	205.806	.119
	Based on trimmed mean	2.027	1	209	.156
BMI	Based on Mean	3.300	1	209	.071
	Based on Median	4.036	1	209	.046
	Based on Median and with adjusted df	4.036	1	206.158	.046
	Based on trimmed mean	3.920	1	209	.049
SHR	Based on Mean	.230	1	209	.632
	Based on Median	.238	1	209	.626
	Based on Median and with adjusted df	.238	1	208.830	.626
	Based on trimmed mean	.236	1	209	.628
Waist	Based on Mean	2.052	1	209	.153
	Based on Median	3.258	1	209	.073
	Based on Median and with adjusted df	3.258	1	208.632	.073
	Based on trimmed mean	2.353	1	209	.127
Arm	Based on Mean	1.966	1	209	.162
	Based on Median	2.873	1	209	.092
	Based on Median and with adjusted df	2.873	1	208.396	.092
	Based on trimmed mean	2.418	1	209	.121
Skinfolds	Based on Mean	6.640	1	209	.011
	Based on Median	5.754	1	209	.017
	Based on Median and with adjusted df	5.754	1	206.303	.017
	Based on trimmed mean	6.825	1	209	.010

**Table 40 – T-Test – Height-for-age for boys and girls CV-PT 09**

**Group Statistics**

Age	Sex	N	Mean	Std. Deviation	Std. Error Mean
6	Height Girls	28	121.6821	6.06294	1.14579
	Boys	26	122.2731	4.76911	.93530
7	Height Girls	21	124.2048	7.15531	1.56142
	Boys	19	128.4368	5.05231	1.15908
8	Height Girls	19	132.7579	6.15624	1.41234
	Boys	16	130.8938	5.74055	1.43514
9	Height Girls	21	139.2048	6.08568	1.32800
	Boys	19	136.4316	6.78274	1.55607
10	Height Girls	17	140.6059	6.35241	1.54069
	Boys	8	143.9125	5.16539	1.82624
11	Height Girls	8	143.3125	4.44022	1.56985
	Boys	9	146.1222	8.74068	2.91356

Age	Assumption of equal variances	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
6	Assumed	1.020	.317	-.396	52	.694	-.59093	1.49227	-3.58539	2.40352
	Non assumed			-.400	50.672	.691	-.59093	1.47906	-3.56074	2.37887
7	Assumed	1.186	.283	-2.139	38	.039	-4.23208	1.97827	-8.23688	-.22728
	Non assumed			-2.176	35.977	.036	-4.23208	1.94460	-8.17601	-.28815
8	Assumed	.000	.997	.920	33	.364	1.86414	2.02598	-2.25775	5.98603
	Non assumed			.926	32.624	.361	1.86414	2.01353	-2.23422	5.96251
9	Assumed	.184	.670	1.363	38	.181	2.77318	2.03440	-1.34525	6.89162
	Non assumed			1.356	36.394	.184	2.77318	2.04571	-1.37416	6.92052
10	Assumed	.005	.942	-1.282	23	.213	-3.30662	2.57933	-8.64237	2.02914
	Non assumed			-1.384	16.789	.185	-3.30662	2.38932	-8.35247	1.73924
11	Assumed	6.191	.025	-.818	15	.426	-2.80972	3.43410	-10.12933	4.50988
	Non assumed			-.849	12.149	.412	-2.80972	3.30957	-10.01086	4.39142

**Table 41 – T-Test – SHR for age for boys and girls CV-PT 09**

Group Statistics

Age	SHR	Sex	N	Mean	Std. Deviation	Std. Error Mean
6	SHR	Girls	28	53.1339	1.28939	.24367
		Boys	26	52.0392	1.34207	.26320
7	SHR	Girls	21	51.7152	1.12866	.24629
		Boys	19	51.9500	1.44933	.33250
8	SHR	Girls	19	52.2216	1.07398	.24639
		Boys	16	52.6200	1.61277	.40319
9	SHR	Girls	21	51.1248	1.21318	.26474
		Boys	19	51.5253	1.15658	.26534
10	SHR	Girls	17	51.0853	1.20175	.29147
		Boys	8	50.2175	1.76079	.62253
11	SHR	Girls	8	49.8488	.89897	.31784
		Boys	9	50.3133	1.29040	.43013

Age	Assumption of Equal Variances	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
6	Assumed	.037	.849	3.057	52	.004	1.09470	.35814	.37604	1.81336
	Non assumed			3.052	51.316	.004	1.09470	.35868	.37473	1.81467
7	Assumed	1.180	.284	-.575	38	.569	-.23476	.40861	-1.06195	.59243
	Non assumed			-.567	33.968	.574	-.23476	.41378	-1.07570	.60618
8	Assumed	1.525	.226	-.872	33	.389	-.39842	.45667	-1.32753	.53069
	Non assumed			-.843	25.349	.407	-.39842	.47251	-1.37090	.57406
9	Assumed	.524	.473	-1.066	38	.293	-.40050	.37574	-1.16115	.36014
	Non assumed			-1.069	37.886	.292	-.40050	.37482	-1.15936	.35836
10	Assumed	.620	.439	1.450	23	.161	.86779	.59844	-.37018	2.10577
	Non assumed			1.262	10.191	.235	.86779	.68739	-.65992	2.39551
11	Assumed	.620	.443	-.850	15	.409	-.46458	.54656	-1.62955	.70038
	Non assumed			-.869	14.262	.399	-.46458	.53482	-1.60969	.68052

**Table 42 - T-Test – Weight for age for boys and girls CV-PT 09**

Group Statistics						
Age	Weight	Sex	N	Mean	Std. Deviation	Std. Error Mean
6	Weight	Girls	28	24.6786	5.04134	.95272
		Boys	26	23.5115	3.05501	.59914
7	Weight	Girls	21	25.9524	5.18966	1.13248
		Boys	19	28.7000	5.67215	1.30128
8	Weight	Girls	19	33.5789	9.28473	2.13006
		Boys	16	29.2000	5.79195	1.44799
9	Weight	Girls	21	34.9429	5.70286	1.24447
		Boys	19	32.5368	6.87614	1.57750
10	Weight	Girls	17	35.4706	7.22225	1.75165
		Boys	8	36.4625	6.58243	2.32724
11	Weight	Girls	8	37.8250	5.18507	1.83320
		Boys	9	37.9000	9.00139	3.00046

Age	Assumption of equal variances	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
6	Assumed	4.917	.031	1.019	52	.313	1.16703	1.14528	-1.13115	3.46521
	Non assumed			1.037	44.981	.305	1.16703	1.12545	-1.09977	3.43384
7	Assumed	.100	.753	-1.600	38	.118	-2.74762	1.71723	-6.22397	.72873
	Non assumed			-1.593	36.663	.120	-2.74762	1.72506	-6.24401	.74877
8	Assumed	3.418	.073	1.635	33	.111	4.37895	2.67755	-1.06856	9.82645
	Non assumed			1.700	30.631	.099	4.37895	2.57562	-.87664	9.63453
9	Assumed	.709	.405	1.209	38	.234	2.40602	1.99029	-1.62312	6.43515
	Non assumed			1.197	35.130	.239	2.40602	2.00927	-1.67249	6.48452
10	Assumed	.236	.632	-.329	23	.745	-.99191	3.01567	-7.23030	5.24648
	Non assumed			-.341	15.063	.738	-.99191	2.91279	-7.19812	5.21430
11	Assumed	1.211	.288	-.021	15	.984	-.07500	3.62843	-7.80881	7.65881
	Non assumed			-.021	13.015	.983	-.07500	3.51616	-7.67033	7.52033

**Table 43 – T-Test – BMI for age for boys and girls CV-PT 09**

**Group Statistics**

Age		Sex	N	Mean	Std. Deviation	Std. Error Mean
6	BMI	Girls	28	16.5532	2.43737	.46062
		Boys	26	15.6527	1.01592	.19924
7	BMI	Girls	21	16.6943	2.13318	.46550
		Boys	19	17.2942	2.55670	.58655
8	BMI	Girls	19	18.8068	3.99165	.91575
		Boys	16	16.9900	2.90603	.72651
9	BMI	Girls	21	17.9819	2.35821	.51460
		Boys	19	17.4105	3.16570	.72626
10	BMI	Girls	17	17.8324	2.84120	.68909
		Boys	8	17.5475	2.74742	.97136
11	BMI	Girls	8	18.3688	1.94884	.68902
		Boys	9	17.5889	2.81894	.93965

Age	Assumption of equal variances	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
6	Assumed	24.704	.000	1.747	52	.086	.90052	.51538	-.13365	1.93470
	Non assumed			1.794	36.662	.081	.90052	.50186	-.11667	1.91771
7	Assumed	.580	.451	-.809	38	.424	-.59992	.74196	-2.10195	.90210
	Non assumed			-.801	35.235	.428	-.59992	.74882	-2.11974	.91989
8	Assumed	2.343	.135	1.513	33	.140	1.81684	1.20106	-.62673	4.26042
	Non assumed			1.554	32.391	.130	1.81684	1.16893	-.56307	4.19676
9	Assumed	.178	.675	.651	38	.519	.57138	.87711	-1.20424	2.34700
	Non assumed			.642	33.102	.525	.57138	.89010	-1.23932	2.38208
10	Assumed	.705	.410	.236	23	.815	.28485	1.20606	-2.21007	2.77977
	Non assumed			.239	14.241	.814	.28485	1.19096	-2.26546	2.83517
11	Assumed	.925	.351	.655	15	.523	.77986	1.19128	-1.75929	3.31901
	Non assumed			.669	14.218	.514	.77986	1.16520	-1.71564	3.27537

**Table 44 - T-Test – Average of Skinfolds for age for boys and girls CV-PT 09**

Group Statistics

Age	Sex	N	Mean	Std. Deviation	Std. Error Mean
6	Girls	28	6,9071	2,84747	,53812
	Boys	26	4,9077	,75521	,14811
7	Girls	21	7,3286	3,01217	,65731
	Boys	19	7,0632	5,39632	1,23800
8	Girls	19	10,4737	6,51262	1,49410
	Boys	16	6,0625	2,16237	,54059
9	Girls	21	8,6190	5,29827	1,15618
	Boys	19	7,1053	5,58823	1,28203
10	Girls	17	10,0588	6,26728	1,52004
	Boys	8	7,0750	4,92102	1,73984
11	Girls	8	9,1750	3,36102	1,18830
	Boys	9	6,3111	1,83878	,61293

Age	Assumption of equal variance	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
6	Assumed	14,141	,000	3,467	52	,001	1,99945	,57673	,84216	3,15674
	Non assumed			3,582	31,053	,001	1,99945	,55813	,86121	3,13769
7	Assumed	,502	,483	,195	38	,847	,26541	1,36439	-2,49665	3,02748
	Non assumed			,189	27,605	,851	,26541	1,40168	-2,60765	3,13847
8	Assumed	7,423	,010	2,587	33	,014	4,41118	1,70537	,94159	7,88078
	Non assumed			2,776	22,557	,011	4,41118	1,58889	1,12074	7,70162
9	Assumed	,004	,949	,879	38	,385	1,51378	1,72166	-1,97153	4,99909
	Non assumed			,877	37,099	,386	1,51378	1,72637	-1,98385	5,01142
10	Assumed	,632	,435	1,182	23	,249	2,98382	2,52541	-2,24038	8,20803
	Non assumed			1,292	17,344	,213	2,98382	2,31032	-1,88318	7,85082
11	Assumed	,968	,341	2,216	15	,043	2,86389	1,29247	,10906	5,61872
	Non assumed			2,142	10,566	,056	2,86389	1,33706	-,09379	5,82156

**Table 45 - T-Test – Arm circumference for age for boys and girls CV-PT 09**

Group Statistics

Age	Sex	N	Mean	Std. Deviation	Std. Error Mean
6	Girls	28	18.8393	2.32528	.43944
	Boys	26	17.8462	1.14061	.22369
7	Girls	21	19.5905	2.31709	.50563
	Boys	19	20.1526	2.46675	.56591
8	Girls	19	22.6053	4.67683	1.07294
	Boys	16	19.6625	2.78756	.69689
9	Girls	21	21.3714	2.51220	.54821
	Boys	19	20.6947	2.91956	.66979
10	Girls	17	21.5941	2.44527	.59306
	Boys	8	21.4125	3.17780	1.12352
11	Girls	8	22.3375	2.37363	.83920
	Boys	9	21.1000	2.91204	.97068

Age	Assumption of equal variances	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
6	Assumed	20.036	.000	1.968	52	.054	.99313	.50462	-.01946	2.00572
	Non assumed			2.014	39.911	.051	.99313	.49309	-.00352	1.98978
7	Assumed	.045	.833	-.743	38	.462	-.56216	.75646	-2.09353	.96922
	Non assumed			-.741	36.993	.464	-.56216	.75889	-2.09983	.97552
8	Assumed	.909	.347	2.206	33	.034	2.94276	1.33426	.22820	5.65733
	Non assumed			2.300	29.987	.029	2.94276	1.27940	.32984	5.55569
9	Assumed	.180	.674	.788	38	.436	.67669	.85894	-1.06213	2.41552
	Non assumed			.782	35.754	.439	.67669	.86554	-1.07912	2.43250
10	Assumed	.080	.780	.158	23	.876	.18162	1.15308	-2.20371	2.56694
	Non assumed			.143	11.068	.889	.18162	1.27044	-2.61250	2.97573
11	Assumed	.303	.590	.952	15	.356	1.23750	1.29948	-1.53228	4.00728
	Non assumed			.964	14.909	.350	1.23750	1.28315	-1.49893	3.97393

**Table 46 - T-Test – Abdominal circumference for age for boys and girls  
CV-PT 09**

Group Statistics

Age	Sex	N	Mean	Std. Deviation	Std. Error Mean
6	Girls	28	58.1500	5.86455	1.10830
	Boys	26	55.1346	2.33409	.45775
7	Girls	21	58.6238	6.11195	1.33374
	Boys	19	60.3105	6.98227	1.60184
8	Girls	19	66.3368	10.38510	2.38250
	Boys	16	58.9625	7.06879	1.76720
9	Girls	21	64.5857	6.39893	1.39636
	Boys	19	63.2789	8.17819	1.87621
10	Girls	17	66.5529	8.62997	2.09308
	Boys	8	63.6750	6.00089	2.12164
11	Girls	8	66.9625	5.67021	2.00472
	Boys	9	63.9222	6.91751	2.30584

Age	Assumption of equal variances	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
6	Assumed	14.176	.000	2.447	52	.018	3.01538	1.23244	.54232	5.48845
	Non assumed			2.515	35.870	.017	3.01538	1.19911	.58318	5.44759
7	Assumed	.188	.667	-.815	38	.420	-1.68672	2.07030	-5.87781	2.50438
	Non assumed			-.809	36.026	.424	-1.68672	2.08441	-5.91399	2.54055
8	Assumed	2.280	.141	2.407	33	.022	7.37434	3.06396	1.14067	13.60801
	Non assumed			2.486	31.730	.018	7.37434	2.96636	1.33004	13.41865
9	Assumed	.777	.383	.566	38	.575	1.30677	2.31010	-3.36978	5.98331
	Non assumed			.559	34.059	.580	1.30677	2.33880	-3.44594	6.05947
10	Assumed	1.231	.279	.847	23	.406	2.87794	3.39684	-4.14895	9.90483
	Non assumed			.966	19.270	.346	2.87794	2.98032	-3.35402	9.10990
11	Assumed	.172	.684	.983	15	.341	3.04028	3.09328	-3.55290	9.63345
	Non assumed			.995	14.922	.336	3.04028	3.05545	-3.47525	9.55581

**Table 47 - T-test - Height for children CV-PT 87, CV-PT 88, PT 01 and CV-PT 08/9**

<i>Boys</i>																		
CV-PT 87 - CV-PT 08/9							CV-PT 88 - CV-PT 08/9						PT 01 - CV-PT 08/9					
age	87	08-9	df	t	p	effect size	88	08-9	df	t	p	effect size	01	08	df	T	P	Effect size
	(X)	(X)			(2 tailed)	(d)	X	X			(2 tailed)	(d)	X	X			(2 tailed)	(d)
6	.00	122.65					119.80	122.65	34	-1.76	.09	-.66	120.80	122.65	236	-	.11	0.10
7	121.10	127.66	48	-5.21	.00	-1.55	125.00	127.66	41	-2.00	.05	-.63	124.54	127.66	333	1.62	.03	0.12
8	127.60	139.89	48	-1.01	.32	-.31	129.20	139.89	39	-.09	.93	-.03	131.33	139.89	394	2.22	.00	0.25
9	132.60	136.43	36	-1.80	.08	-.60	138.20	136.43	38	.78	.44	.25	136.04	136.43	298	5.18	.79	0.01
10	137.70	143.91	35	-2.49	.02	-1.02	134.80	143.91	24	-3.54	.00	-1.56	140.05	143.91	276	0.26	.13	0.09
11	142.70	146.12	20	-.97	.34	-.44	145.20	146.12	17	-.27	.79	-.13	146.08	146.12	186	1.53	.99	0.00
																0.01		

<i>Girls</i>																		
CV-PT 87 - CV-PT 08/9							CV-PT 1988 - CV-PT 08/9						PT 01 - CV-PT 08/9					
age	87	08-9	df	t	p	effect size	88	08-9	df	t	p	effect size	01	08	df	t	P	Effect size
	(X)	(X)			(2 tailed)	(d)	X	X			(2 tailed)	(d)	X	X			(2 tailed)	(d)
6	.00	121.68					117.80	121.68	32	-1.42	.17	-.71	119.92	121.68	252	-1.56	.12	0.10
7	120.40	124.91	38	-1.84	.07	-.60	122.80	124.91	38	-1.03	.31	-.34	124.39	124.91	373	-0.36	.72	0.02
8	127.90	132.47	32	-2.54	.02	-.90	129.10	132.47	33	-1.83	.08	-.64	130.77	132.47	381	-1.12	.26	0.06
9	130.80	139.38	43	-4.35	.00	-1.33	133.20	139.38	41	-3.73	.00	-1.17	135.98	139.38	344	-2.34	.02	0.02
10	135.50	140.46	28	-1.53	.14	-.59	138.50	140.46	29	-.78	.44	-.29	141.84	140.46	238	0.78	.44	0.05
11	143.90	143.31	23	.23	.82	.10	142.20	143.31	23	-.38	.71	-.17	147.29	143.31	185	1.43	.16	0.11

**Table 48 - T-test - Weight for children CV-PT 87, CV-PT 88, PT 01 and CV-PT 08/9**

<i>Boys</i>																		
CV-PT 87 - CV-PT 08/9							CV-PT 88 - CV-PT 08/9					PT 01 - CV-PT 08/9						
age	87	08-9	df	t	p	effect	88	08-9	df	t	p	effect	01	08	df	T	P	Effect
	(X)	(X)			(2 tailed)	(d)					(2 tailed)	(d)					(2 tailed)	(d)
6	.00	23.51					23.40	23.51	34	-26	.80	-.10	23.47	23.51	236	0.04	.97	0.00
7	23.40	28.80	48	-4.37	.00	-1.30	24.80	28.80	41	-2.77	.01	-.87	26.50	28.80	333	1.51	.13	0.08
8	26.80	29.20	48	-1.39	.17	-.43	28.00	29.20	39	-3.37	.71	-.12	29.74	29.20	394	-	.77	0.01
9	28.90	32.53	36	-1.85	.07	-.62	31.50	32.53	38	-5.1	.62	-.16	32.74	32.53	298	-	.91	0.01
10	31.30	36.46	35	-2.84	.01	-1.17	29.20	36.46	24	-3.11	.00	-1.38	34.57	36.46	276	0.61	.54	0.04
11	36.60	37.90	20	-.41	.68	-.19	35.90	37.90	17	-5.7	.58	-.28	39.53	37.90	186	-	.62	0.04
																0.50		

<i>Girls</i>																		
CV-PT 87 - CV-PT 08/9							CV-PT 1988 - CV-PT 08/9					PT 01 - CV-PT 08/9						
age	87	08-9	df	t	p	effect	88	08-9	df	t	p	effect	01	08	df	T	P	Effect
	(X)	(X)			(2 tailed)	(d)					(2 tailed)	(d)					(2 tailed)	(d)
6	.00	24.68					22.30	24.68	32	-1.04	.31	-.52	23.44	24.68	252	1.09	.28	0.07
7	21.50	25.96	38	-3.24	.00	-1.06	24.70	25.96	38	-1.07	.29	-.35	25.47	25.96	373	0.36	.72	0.02
8	28.70	33.58	32	-1.33	.19	-.47	26.60	33.58	33	-2.44	.02	-.85	29.32	33.58	381	2.40	.02	0.12
9	29.60	34.94	43	-2.57	.01	-.79	28.90	34.94	41	-4.17	.00	-1.31	33.26	34.94	344	0.86	.39	0.05
10	35.40	35.47	28	-.10	.92	-.04	33.00	35.47	29	-1.03	.31	-.38	37.27	35.47	238	-	.45	0.05
11	38.40	37.83	23	.18	.86	.08	34.60	37.83	23	-1.38	.18	-.61	40.52	37.83	185	-	.45	0.06
																0.76		
																0.76		

**Table 49 - T- Test - SHR for age for CV-PT 09 and PT 01 boys and girls**

Sex	Age	CV-PT 09	PT 01	df	t	significance (2-tailed)	r
Boys	6	52.03	54.64	223	-6.63	.00	0.40
	7	51.95	54.00	320	-3.45	.00	0.19
	8	52.62	53.46	386	-1.63	.10	0.08
	9	51.53	52.81	287	-2.42	.02	0.14
	10	50.22	52.20	277	-3.25	.00	0.19
	11	50.31	51.95	187	-2.71	.01	0.19
Girls	6	53.14	54.27	237	-2.64	.01	0.20
	7	51.72	53.62	360	-3.73	.00	0.19
	8	52.22	53.08	369	-1.65	.10	0.09
	9	51.12	52.61	335	-3.74	.00	0.20
	10	51.09	52.06	235	-2.36	.02	0.15
	11	49.85	51.66	184	-2.83	.01	0.20

**Table 50- T- Test - Height for age for CV-PT 09 and PT 03 boys and girls**

Sex	Age	CV-PT 09	PT 03	df	t	significance (2-tailed)	r
Boys	7	128,43	126,00	322	1,75	,08	0,10
	7,5	128,45	127,30	412	,54	,59	0,03
	8	128,56	129,90	419	-,71	,48	0,03
	8,5	133,23	132,50	413	,37	,71	0,02
	9	132,43	135,30	385	-1,52	,13	0,08
	9,5	140,03	137,20	325	1,52	,13	0,08
Girls	7	122,27	124,90	321	-1,77	,08	0,10
	7,5	127,36	126,80	427	,32	,75	0,02
	8	129,69	129,40	402	,13	,89	0,01
	8,5	134,55	132,10	431	1,47	,14	0,07
	9	138,64	134,70	423	2,38	,02	0,11
	9,5	140,34	137,60	319	1,14	,26	0,06

**Table 51 - T- Test - Weight for age for CV-PT 09 and PT 03 boys and girls**

Sex	Age	CV-PT 09	PT 03	df	t	significance (2-tailed)	R
Boys	7	23,51	27,10	322	-2,62	,01	0,14
	7,5	28,70	28,20	412	,21	,83	0,01
	8	29,20	30,20	419	-,42	,68	0,02
	8,5	32,53	32,00	413	,20	,84	0,01
	9	36,46	33,90	385	1,01	,31	0,05
	9,5	37,90	34,90	325	1,18	,24	0,07
Girls	7	24,68	27,30	321	-1,58	,12	0,09
	7,5	25,96	28,30	427	-1,06	,29	0,05
	8	33,58	30,30	402	1,21	,23	0,06
	8,5	34,94	32,20	431	1,29	,20	0,06
	9	35,47	33,30	423	1,07	,29	0,05
	9,5	37,83	36,30	319	,47	,64	0,03

**Table 52 - T- Test - BMI for age for CV-PT 09 and PT 03 boys and girls**

Sex	Age	CV-PT 09	PT 03	df	t	significance (2-tailed)	R
Boys	7	15,65	17,00	322	-1,93	,05	0,11
	7,5	17,29	17,30	412	-,01	,99	0,00
	8	16,66	17,70	419	-1,01	,31	0,05
	8,5	17,41	18,10	413	-,61	,54	0,03
	9	17,55	18,40	385	-,79	,43	0,04
	9,5	17,59	18,40	325	-,79	,43	0,04
Girls	7	16,55	17,40	321	-1,04	,30	0,06
	7,5	16,69	17,50	427	-,79	,43	0,04
	8	18,80	17,90	402	,76	,45	0,04
	8,5	17,98	18,30	431	-,03	,73	0,00
	9	17,83	18,20	423	-,44	,66	0,02
	9,5	18,37	18,90	319	-,40	,69	0,02

**Table 53 – T- Test - Average of Skinfolds for age CV-PT 09 and PT 03 for boys and girls**

Sex	Age	CV-PT 09	PT 03	Df	t	significance (2-tailed)	r
Boys	7	7,48	9,30	322	-1,51	,13	0,08
	7,5	6,17	9,65	412	-1,91	,06	0,09
	8	6,18	10,25	419	-2,27	,02	0,11
	8,5	5,95	10,90	413	-2,50	,01	0,12
	9	8,07	11,45	385	-1,73	,08	0,09
	9,5	6,24	11,00	325	-2,52	,01	0,14
	Girls	7	7,02	11,60	321	-3,13	,00
7,5		7,83	11,90	427	-2,08	,04	0,10
8		6,85	12,65	402	-2,62	,01	0,13
8,5		12,58	13,05	431	-,26	,79	0,01
9		7,99	12,80	423	-3,12	,00	0,15
9,5		9,89	13,75	319	-1,55	,12	0,09

**Table 54 – T- Test - Arm circumference for age for CV-PT 09 and PT 03 boys and girls**

Sex	Age	CV-PT 09	PT 03	df	t	significance (2-tailed)	r
Boys	7	17,90	19,40	322	-2,07	,04	0,11
	7,5	19,97	19,80	412	,15	,88	0,01
	8	19,66	20,40	419	-,67	,50	0,03
	8,5	20,69	20,80	413	-,10	,92	0,00
	9	21,41	21,40	385	,01	,99	0,00
	9,5	21,10	21,40	325	-,27	,79	0,01
	Girls	7	18,84	20,10	321	-1,54	,12
7,5		19,68	20,40	427	-,67	,50	0,03
8		22,67	20,90	402	1,53	,13	0,08
8,5		21,44	21,40	431	,04	,97	0,00
9		21,52	21,70	423	-,21	,83	0,01
9,5		22,34	22,20	319	,11	,91	0,01

**Table 55 – T- Test – Grade for age of CV-PT 09 childrer by sex and birthplace**

**Group Statistics**

School Grade	Sex	N	Mean	Std. Deviation	Std. Error Mean
1	Decimal age	Girls	27	6,5344	,25712
		Boys	25	6,7768	,90190
2	Decimal age	Girls	27	7,6704	,70129
		Boys	34	7,8200	,75551
3	Decimal age	Girls	37	9,2670	,82565
		Boys	19	9,2563	,66842
4	Decimal age	Girls	23	10,4913	,70211
		Boys	19	10,7453	,77550

**Independent Samples Test**

School Grade	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
1	1,435	,237	-1,340	50	,186	-,24236	,18091	-,60572	,12101
			-1,296	27,604	,206	-,24236	,18704	-,62575	,14104
2	1,093	,300	-,793	59	,431	-,14963	,18872	-,52726	,22800
			-,800	57,517	,427	-,14963	,18709	-,52420	,22494
3	1,052	,310	,049	54	,961	,01071	,21924	-,42884	,45026
			,052	43,810	,959	,01071	,20479	-,40207	,42349
4	,694	,410	-1,113	40	,272	-,25396	,22818	-,71514	,20722
			-1,102	36,818	,278	-,25396	,23040	-,72088	,21296

*Independent T-test*

**Group Statistics**

School Grade	Birthplace_R	N	Mean	Std. Deviation	Std. Error Mean
1	Decimal age	Portugal	47	6,5679	,25531
		Abroad	5	7,4320	1,97678
2	Decimal age	Portugal	55	7,7311	,71850
		Abroad	6	7,9617	,87128
3	Decimal age	Portugal	44	9,0425	,66381
		Abroad	12	10,0733	,57350
4	Decimal age	Portugal	27	10,5933	,81134
		Abroad	15	10,6293	,61025

**Independent Samples Test**

School Grade	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
1	47,890	,000	-3,010	50	,004	-,86413	,28713	-1,44084	-,28741
			Eq. variances assumed						
1	47,890	,000	-,977	4,014	,384	-,86413	,88483	-3,31738	1,58912
			Eq. variances not assumed						
2	,483	,490	-,732	59	,467	-,23058	,31501	-,86091	,39976
			Eq. variances assumed						
2	,483	,490	-,625	5,766	,556	-,23058	,36866	-1,14158	,68043
			Eq. variances not assumed						
3	,001	,982	-4,896	54	,000	-1,03083	,21053	-1,45291	-,60876
			Eq. variances assumed						
3	,001	,982	-5,329	19,830	,000	-1,03083	,19345	-1,43458	-,62708
			Eq. variances not assumed						
4	3,628	,064	-,150	40	,882	-,03600	,24060	-,52228	,45028
			Eq. variances assumed						
4	3,628	,064	-,162	36,200	,872	-,03600	,22183	-,48580	,41380
			Eq. variances not assumed						

Table 56 - Analysis of Variance for Height in CV-PT 09, CV-PT 87, CV-PT 88, and PT 01

Boys						Girls					
6 years						6 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	153.921	2	76.960	2.590	0.077	Between	92.162	2	46.081	1.497	0.226
Within	7,220.442	243	29.714			Within	7,787.752	253	30.782		
Total	7,374.363	245				Total	7,879.914	255			
7 years						7 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	665.100	3	221.700	6.347	0.000	Between	319.698	3	106.566	2.624	0.050
Within	13,413.196	384	34.930			Within	16,448.508	405	40.614		
Total	14,078.296	387				Total	16,768.206	408			
8 years						8 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	500.909	3	166.970	3.915	0.009	Between	208.356	3	69.452	1.718	0.163
Within	18,635.934	437	42.645			Within	16,129.955	399	40.426		
Total	19,136.843	440				Total	16,338.312	402			
9 years						9 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	326.664	3	108.888	2.724	0.044	Between	1,033.630	3	344.543	8.288	0.000
Within	13,430.051	336	39.970			Within	16,171.142	389	41.571		
Total	13,756.715	339				Total	17,204.772	392			
10 years						10 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	525.740	3	175.247	4.102	0.007	Between	379.447	3	126.482	2.420	0.068
Within	10,167.859	238	42.722			Within	9,459.944	181	52.265		
Total	10,693.599	241				Total	9,839.392	184			
11 years						11 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	75.245	3	25.082	0.403	0.751	Between	92.758	3	30.919	0.514	0.674
Within	5,972.048	93	62.280			Within	5,473.995	91	60.154		
Total	5,867.293	96				Total	5,566.753	94			

One-way ANOVA

**Table 57** - Analysis of Variance for Weight in CV-PT 09, CV-PT 87, CV-PT 88, and PT 01

Boys						Girls					
6 years						6 years					
	SS	df	MS	F	p		SS	df	MS	F	p
Between	1.888	2	0.944	0.037	0.964	Between	43.331	2	21.666	0.691	0.502
Within	6,198.822	242	25.615			Within	7,929.983	253	31.344		
Total	6,200.710	244				Total	7,973.314	255			
7 years						7 years					
	SS	df	MS	F	p		SS	df	MS	F	p
Between	335.683	2	167.841	4.691	0.010	Between	306.056	3	102.019	2.910	0.034
Within	12,952.153	361	35.779			Within	14,233.814	406	35.059		
Total	13,287.836	364				Total	14,539.870	409			
8 years						8 years					
	SS	df	MS	F	p		SS	df	MS	F	p
Between	264.773	3	88.258	1.846	0.138	Between	430.156	3	143.385	2.582	0.053
Within	20,891.632	437	47.807			Within	22,101.957	398	55.533		
Total	21,156.404	440				Total	22,532.113	401			
9 years						9 years					
	SS	df	MS	F	p		SS	df	MS	F	p
Between	310.473	3	103.491	1.821	0.143	Between	952.126	3	317.375	4.345	0.005
Within	19,036.284	335	56.825			Within	28,487.910	390	73.046		
Total	19,346.758	338				Total	29,440.036	393			
10 years						10 years					
	SS	df	MS	F	p		SS	df	MS	F	p
Between	565.651	3	188.550	2.825	0.039	Between	1,186.840	3	395.613	4.831	0.003
Within	15,887.015	238	66.752			Within	14,741.394	180	81.897		
Total	16,452.666	241				Total	15,928.234				
11 years						11 years					
	SS	df	MS	F	p		SS	df	MS	F	p
Between	86.298	3	28.766	0.391	0.760	Between	155.108	3	51.703	0.612	0.609
Within	7,068.520	96	73.630			Within	7,692.827	91	84.537		
Total	7,154.818	99				Total	7,847.934	94			

**Table 58** - Analysis of Variance for BMI in CV-PT 09, CV-PT 87, CV-PT 88, and PT 01

Boys						Girls					
6 years						6 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	4.880	2	2.440	0.367	0.693	Between	3.650	2	1.825	0.322	0.725
Within	1,263.710	190	6.651			Within	1,449.922	256	5.664		
Total	1,268.590	192				Total	1,453.572	258			
7 years						7 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	34.288	3	11.429	1.677	0.172	Between	43.189	3	14.396	1.661	0.175
Within	1,799.030	264	6.815			Within	3,535.207	408	8.665		
Total	1,833.318	267				Total	3,578.396	411			
8 years						8 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	13.262	3	4.421	0.515	0.673	Between	84.174	3	28.058	2.588	0.053
Within	2,447.997	285	8.589			Within	4,434.348	409	10.842		
Total	2,461.259	288				Total	4,518.521	412			
9 years						9 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	53.602	3	17.867	1.803	0.147	Between	61.496	3	20.499	1.595	0.190
Within	2,903.131	293	9.908			Within	5,013.666	390	12.856		
Total	2,956.733	296				Total	5,075.162	393			
10 years						10 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	65.339	3	21.780	2.597	0.055	Between	59.984	3	19.995	1.403	0.242
Within	1,215.914	145	8.386			Within	3,734.333	262	14.253		
Total	1,281.253	148				Total	3,794.317	265			
11 years						11 years					
	SS	df	MS	F	<i>p</i>		SS	df	MS	F	<i>p</i>
Between	16.172	3	5.391	0.522	0.669	Between	36.243	3	12.081	0.946	0.419
Within	660.671	64	10.323			Within	2,771.664	217	12.773		
Total	676.842	67				Total	2,807.908	220			

**Table 59 – Predictors of Parental Investment in Infancy**

	Predictors	B	SE B	B
Model 1	Constant	6.13	1.43	
	Sex (reference=girls)	-0.37	0.50	-0.11
	Parity at birth	0.03	0.24	0.47
	Birthweight	6.33	0.00	0.02
$R^2=0.01, p>0.05$ (N.S.)				
Model 2	Constant	6.05	1.59	
	Sex (reference=girls)	-0.29	0.53	-0.09
	Parity at birth	0.10	0.29	0.06
	Birthweight	-7.19	0.00	-0.00
Household	Father presence (reference: yes)	1.00	0.78	0.24
	Grandmother presence (reference: yes)	0.04	0.64	0.01
	Parental presence (reference: both)			
	Vs monoparental	-0.22	0.63	-0.07
Vs stepparent	0.88	2.02	0.07	
Vs no parent	-0.32	1.03	-0.60	
$\Delta R^2 = 0.06, p>0.05$ (N.S.)				
Model 3	Constant	8.30	1.77	
	Sex (reference=girls)	-0.37	0.49	-0.11
	Parity at birth	-1.49	0.66	*-0.90
	Birthweight	0.00	0.00	-0.04
Household	Father presence (reference: yes)	1.11	0.74	0.27
	Grandmother presence (reference: yes)	-0.20	0.63	-0.01
	Parental presence (reference: both)			
	Vs monoparental	-0.33	0.66	-0.09
Vs stepparent	0.47	1.95	0.04	
Vs no parent	-1.08	1.08	-0.21	
Siblings	Older siblings	1.83	0.76	*1.12
	Younger siblings	-0.35	0.54	-0.12
	Adolescent siblings	-0.48	0.55	-0.20
$\Delta R^2 = 0.19, p<0.05$ . * $p<0.05$				
Model 4	Constant	5.21	3.02	
	Sex (reference=girls)	-0.19	0.55	-0.06
	Parity at birth	-1.82	0.71	** -1.10
	Birthweight	0.00	0.00	-0.05
Household	Father presence (reference: yes)	0.74	0.87	0.18
	Grandmother presence (reference: yes)	-0.02	0.71	-0.01
	Parental presence (reference: both)			
	Vs monoparental	-0.17	0.79	-0.05
Vs stepparent	1.50	2.13	0.12	
Vs no parent	-1.27	1.60	-0.24	
Siblings	Number of older siblings	2.05	0.82	**1.26
	Number of younger siblings	-0.17	0.64	-0.06
	Adolescent siblings	-0.47	0.68	-0.19
Mother	Maternal age at birth	0.11	0.09	0.47
	Mother's education	0.16	0.14	0.33
	Mother's birthplace (Portugal=reference)	-0.90	0.94	-0.25
	Mother's migration	9.21	0.05	0.00
	Occupation requiring basic qualifications			
Vs not employed	1.32	1.09	0.25	
Vs intellectual	-1.65	4.21	-0.13	
Vs personal services	0.33	0.69	0.09	
$\Delta R^2 = 0.14, p>0.05$ (N.S.). ** $p=0.01$				