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Growth studies in Turkey (1917–2007): an anthropological perspective

İzzet Duyar*

Department of Sociology, Gaziantep University, Gaziantep, Turkey

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Abstract

The purpose of this paper is to illustrate how economic, social, and cultural factors affect the growth process in an economically developing country, Turkey. Growth studies carried out in Turkey indicate that living in urban or rural areas affect children's physical growth rate. Furthermore, social and economic milieu influence children's physical growth. As a reflection of this fact, a positive secular trend can be observed in growth patterns accelerating after World War 2, the period when substantive attempts to integrate into the world trade system occurred. Children of families from upper socioeconomic classes grow at a faster rate than those from both low and middle socioeconomic classes and those living in rural regions. Additionally, when the physical growth rates of children from rural regions and those from shanty slums are compared, the growth rate in shanty slums proves greater. Yet, the opposite is true of villages that receive advanced health care services and have a developed economy. These studies also indicate that while growth rates of upper class Turkish children approach the norms of Europe and the USA, those of children from middle and lower classes fall well below them.

Keywords: *physical growth, human auxology, socioeconomic factors, secular trend, anthropometry, Turkey*

Historical considerations

The first studies on physical growth in Turkey date back to the pre-Republic era. It is possible to divide research on this subject into three periods. The first period starts with the publication of an article by Nafi A. Kansu, in the journal "Muallim," in 1917 (Duyar and Erişen-Yazıcı, 1996), concerning observations and studies on school children in Bursa. Studies on physical growth expanded with the foundation of the "Centre des Recherches Anthropologiques de la Turquie" in 1925. Among the research projects carried out under the auspices of this institution are the comparisons of height, weight and chest circumference among Turkish, Greek, Armenian, and Jewish children living in Istanbul made by Nureddin et al. (1926*a*,*b*) . The studies of

* Corresponding author: Department of Sociology, Faculty of Arts and Sciences, Gaziantep University, Şehitkamil, 27310 Gaziantep, Turkey (**e-mail:** izduyar@yahoo.com)

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Gökçül (1939), Çınar (1939), Kınay (1939) in Ankara and those of Kökten (1939) in Samsun on primary school children are also worth mentioning.

The studies cited above are significant in that they demonstrate the growth pattern and physique of the children of that period. Yet, the lack of differentiation between the sexes in some studies (Nureddin et al., 1926*a*,*b*) and the inadequate number of individuals in each age group (Gökçül, 1939; Çınar, 1939; Kınay, 1939; Kökten, 1939) make the comparison of these data with those of today fairly impractical. In addition, these investigations lack basic statistical interpretations such as standard deviation.

Toward the end of the 1930's, some studies were published using satisfactorily large numbers of individuals, but these studies lacked modern statistical analysis other than presenting mean values (Alantar, 1939; Tümay, 1939). In these studies, the subjects were children who had access to health care. Researchers working on the same subject at that time suggested that these data did not represent the whole population since children with access to free health care were probably from lower class families (Yalım, 1940; Soysal et al., 1960).

The second stage of Turkish physical growth studies spans from1940 to the mid 1970's. In this period, data were analyzed more accurately, in a statistical sense, presenting standard deviations and distributional ranges. Another significant improvement that occurred during this period was the appearance of studies concerning the effects of socioeconomic and environmental factors on growth (Binbaşıoğlu, 1950). The most noteworthy studies of this period were carried out in Istanbul (Yalım, 1940) and Ankara (Eckstein and Eppenstein, 1947; Bostancı, 1954, 1955, 1956, 1957). Eckstein and Eppenstein conducted a longitudinal study on 125 infants, 66 of whom were male, and monitored the rate of weight gain during the first year of life. Yalım investigated the physical growth of male subjects aged 7-20 and female subjects aged 7-18, taking both height and weight into account. In Bostancı's study, he collected data on height, chest size, and arm and leg length, as well as anthropometric values reflecting the transversal development of the human body between ages 9 and 16. His study was the first to give detailed information on the measurement technique, the posture of the subject during measurement, and the equipment used.

All investigations except those of Eckstein and Eppenstein (1947) are based on samples collected with cross-sectional techniques. The first comprehensive longitudinal study was performed by Soysal et al. (1960) on upper class Istanbul children aged 0-8 years. Significantly, this study calculated the percentile values for height and weight for the first time.

The third period of physical growth studies in Turkey spans the mid 1970's to the present. The studies of this period are characterized by their interest in various environmental factors influencing growth and by the employment of advanced statistical methods in both sample selection and data analysis. Moreover, it was in these years that nationwide studies were first conducted. The "National Nutrition, Health and Food Consumption Survey of Turkey, 1974," which was concerned with determining the nutritional profile of Turkey, is the most comprehensive study ever made involving anthropometric data (Köksal 1977). In this study, the weights of 14,362 and heights of 14,291 individuals aged 0-17 years were measured. Because the sample encompassed all socioeconomic strata, the anthropometric values from this study revealed the "actual status" of children in Turkey. The findings of this project are commonly used as standard reference values by many scholars studying nutrition profiles. Yet, the fact that data from the study lack percentile figures renders them unsuitable for use by investigators concerned with physical growth.

Table 1: Local growth studies carried out in Turkey between 1940 and mid-1990s

Reference	Date	Number of boys	Number of girls	Min. and max. sample size by age groups	Age groups	Province/ Locality
Yalım, 1940	--	6144	6133	266–749	7–20 yr	İstanbul
Eckstein & Eppenstein, 1947[a]	--	66	59	59–66	0–12 m	Ankara
Bostancı, 1954–1957	1950	832	847	100–123	9–16 yr	Ankara
Köksal & Yılmazsoy, 1961[b]	1953–59	416		26–96	2 m–5 yr	Bursa
Özgür et al., 1966	--	1723	1064	6–86	7–14 yr	İzmir
Nashed & Bertan, 1968	1968	692	560	10–129	7–14 yr	Etimesgut
Onat, 1975[a,c]	1966–73	--	169	17–140	8–19 yr	İstanbul
Özel, 1976[b]	--	598		7–32	2–27 m	Etimesgut
Neyzi et al., 1978[b]	1950–70	1851	1755	30–693	0–18 yr	İstanbul
Tümerdem, 1978	--	1107	818	10–420	6–14 yr	Erzurum
Erem, 1979	--	396	351	8–91	6–12 yr	Bursa
Aytekin & Dirican, 1983	--	698	579	24–132	6–12 yr	Gemlik
Korkmaz, 1989	1974	832	473	16–148	7–13 yr	Konya
Yalaz & Epir, 1983	1981	548	541	13–36	1–72 m	Ankara
Özer et al., 1986	1982–83	1422	1311	1–224	7–15 yr	Adana
Baki & Teziç, 1986	1984	1800	1800	300–300	6–11 yr	Trabzon
Erefe et al., 1986[c]	1985	--	403	33–77	12–18 yr	İzmir
Kınık et al., 1988[d]	--	879	--	16–198	8–19 yr	Ankara
Hatipoğlu & Kavak, 1989	--	515	490	84–121	7–11 yr	Diyarbakır
Günay et al., 1990a,b	1988	1671	1497	29–333	6–12 yr	Bursa
Şendemir et al., 1991; Oygucu et al., 1992	1989	608	599	7–145	6–12 yr	Gemlik
Uysal et al., 1992	--	1332	1249	215–286	12–16 yr	Samsun
Tacar & Doğruyol, 1995; Tacar et al., 1999	--	779	755	44–112	7–11 yr	Diyarbakır
Yakıncı et al., 1997	1995	4555	4092	127–497	6.5–14 yr	Malatya
Kavaklı et al., 1998	--	468	432	78–106	7–11 yr	Malatya

Another important study concerning the determination of standards for growth was performed in Istanbul on children of high socioeconomic status (Neyzi et al., 1978). This study included children 0-to-18-years-old born between 1950 and 1960 and used a semi-longitudinal technique for the 0-8 age group and cross-sectional technique for the older group. The raw data concerning the 0-8 age group in the study were published first (Soysal et al., 1960). In the study of Neyzi et al. (1978) the percentile values curve was smoothed by hand fitting of the raw data mentioned above. The inclusion of all age groups from birth to maturity, and the presentation of data in percentiles made the data of this study the best accepted standard reference of physical growth.

In another study Neyzi and her co-workers (1979) stated that infectious diseases and protein-energy malnutrition (PEM) disproportionately affect lower socio-economic stratus in Turkey. Hence, data from the middle and upper classes should be employed in the assessment of the physical growth and development of all children in Turkey.

Many studies concentrating on urban centers and specific age groups were carried out in the 1970s and 1980s. A general overview of these studies is presented in Table 1. The inadequate utilization of data from the 1974 National Nutrition Health and Food Consumption Survey for monitoring and assessing growth made the development of a new set of standards necessary. In order to fill this objective, two studies representing seven geographical regions were conducted (Saatçioğlu, 1988;

Duyar, 1992). In these two nationwide studies, using measurement techniques recommended by the International Biological Programme (IBP) (Weiner and Lourie, 1981), variables were examined acknowledging Gaussian distributions, and variables lacking this distribution were subjected to various transformations.

Upper class residential areas vs. shanty slums

It has been observed that the differences in children's physical growth between upper and lower socioeconomic strata tends to decrease in developed countries, due to the more even distribution of health services for all social classes and improvements in nutritional and educational standards. These differences have become insignificant in such countries as Sweden and Norway (Bielicki, 1986; Tanner, 1990). In these countries lower class children were able to "catch up" with upper class children. In developing countries, such as Turkey, marked differences in growth patterns persist (Neyzi et al., 1966; Duyar, 1990; Nebigil et al., 1997). This condition is expressed, naturally, in the subjects' adult stature.

The first study that monitored growth differences in relation to socioeconomic variables was conducted by Tümay (1939). In his study Tümay compared the bodily measurements of school children from lower and upper classes but could not find any differences in their growth patterns. However, Binbaşıoğlu (1950) who studied primary school children from different socioeconomic levels concluded that upper class children grow more rapidly and the social and economic milieu influences the extent to which their heights and weights develop.

The investigations made in subsequent years established that factors such as socioeconomic conditions, education and environment affect physical development. Two studies carried out in Istanbul (Neyzi et al., 1973; Güray and Tümerdem, 1978) are useful in elucidating the factors influencing the growth processes at different social levels. In both studies, the participants were selected from four distinct socioeconomic levels. Neyzi et al. (1973) worked on a group aged 9-19 years, while Güray and Tümerdem (1978) concentrated on group aged 7-12 years. The findings of these studies demonstrated that the economic and social/cultural environments affect growth and that growth retardation occurs more commonly as one climbs down the socioeconomic ladder.

The phenomenon of migration from rural to urban areas, which started during the 1950's and 1960's in Turkey, led to the establishment of unhealthy settlements in close vicinity to large cities. People who migrate to these illegitimate urban areas called "gecekondu" comprise the lowest socioeconomic class of society. The investigations on children from these shanty slums have demonstrated marked differences in the growth of lower and upper class children (Gürson and Neyzi, 1966; Neyzi et al., 1966; Özgür et al., 1966; Demirağ and Cin, 1969; Onat, 1975; Özgür, 1979; Duyar, 1990). Whereas upper class children show values close to the Western standards (Fig. 1a, 1b, 2a, and 2b), pronounced growth retardation is observable in children living in shanty slums. For example, the mean weight of shanty slum children is at approximately the third percentile of those from upper class districts (Neyzi and Gürson, 1969). Similarly, Onat's longitudinal study (1975) concluded that height, weight and bone development of children from low and middle classes significantly lagged those of upper class children.

Children living in Izmir's shanty slums have a growth curve equivalent to the third percentile of US values (Ozgür, 1979). In addition to growth retardation, lower class children also suffer from delayed sexual maturation (Neyzi et al., 1975*a*, 1975*b*; Onat, 1975). Finally, comparative studies on children from different socioeconomic

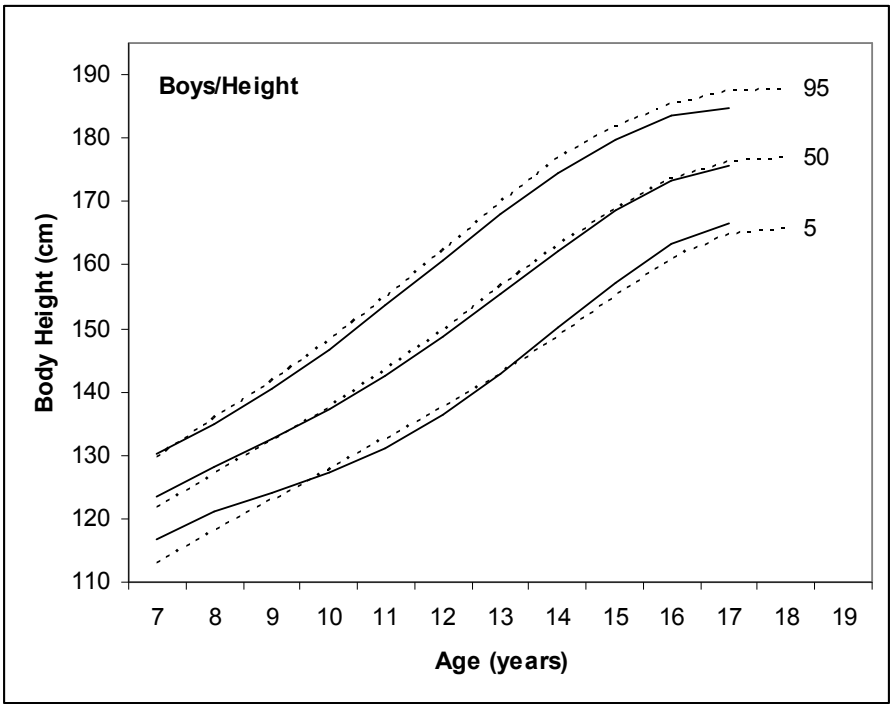

Figure 1a: A comparison of height percentiles of NCHS reference values with upper class Turkish boys. (Data from Hamill et al., 1979; Saatçioğlu, 1988; Duyar, 1992)

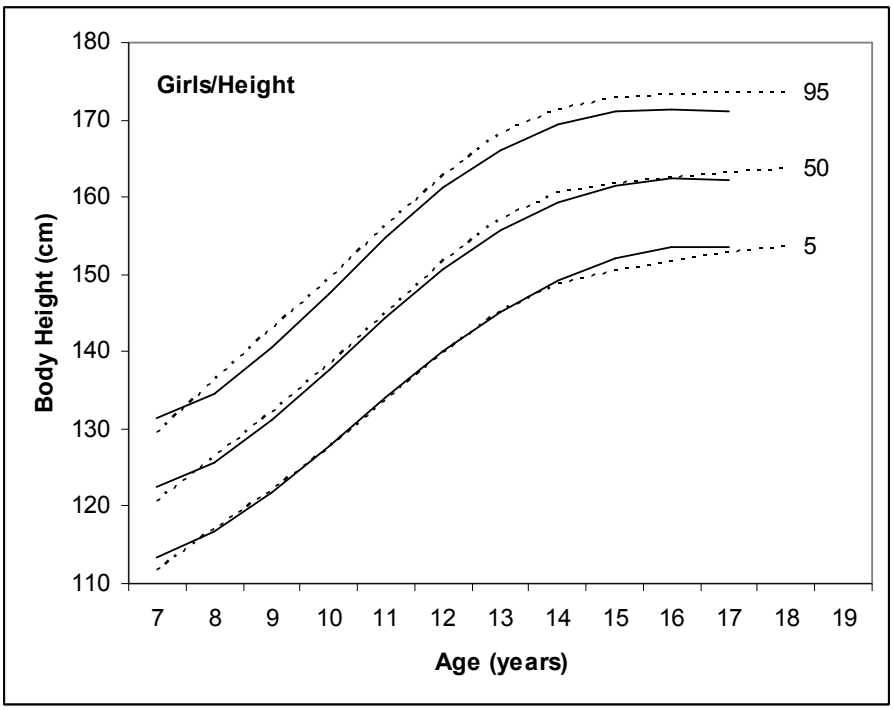

Figure 1b: A comparison of height percentiles of NCHS reference values with upper class Turkish girls. (Data from Hamill et al., 1979; Saatçioğlu, 1988; Duyar, 1992)

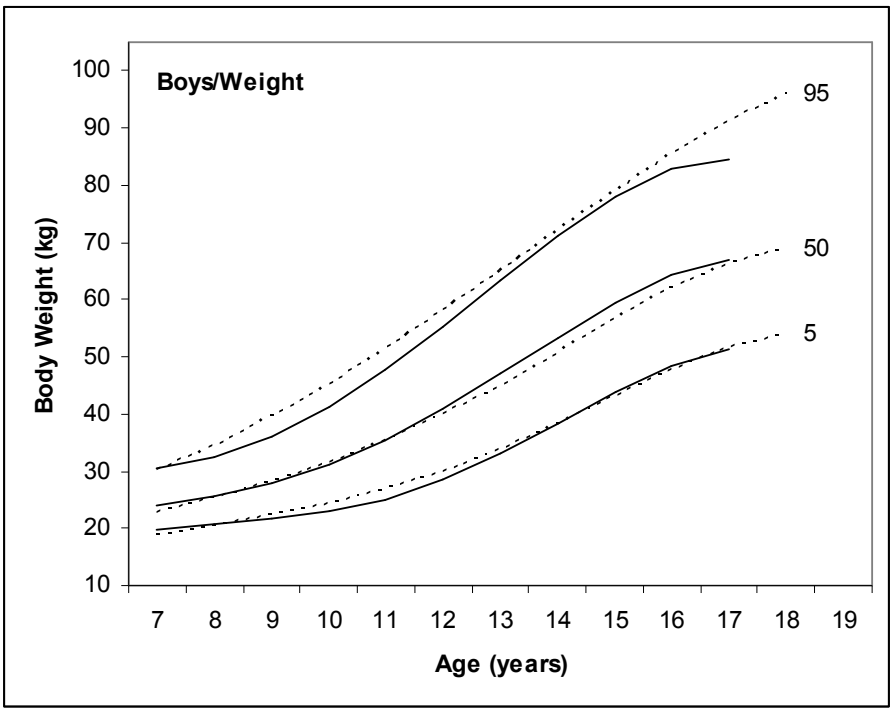

Figure 2a: A comparison of weight percentiles of NCHS reference values with upper class Turkish boys. (Data from Hamill et al., 1979; Saatçioğlu, 1988; Duyar, 1992)

Figure 2b: A comparison of weight percentiles of NCHS reference values with upper class Turkish girls. (Data from Hamill et al., 1979; Saatçioğlu, 1988; Duyar, 1992)

classes indicate a wider range of growth rate differences among boys than among girls (Duyar, 1990).

Urban-rural differences

Few detailed studies on differences in urban and rural children's physical growth have been conducted in Turkey. Köksal (1977) makes a comparison of this kind concerning children aged five and younger. In his study four different community types are taken into consideration: metropolitan areas, towns, village-towns and villages. In Fig. 3a and 3b, the numerical value of the difference between metropolitan and village children is shown. We see that city children under the age of five are both taller and weigh more than village children.

In other studies comparing urban-rural differences, metropolitan areas and rural areas in close proximity have been compared. A study conducted in the village Binkılıç, close to Istanbul, showed that the children there suffered from severe growth retardation at a rate higher than that of many shanty slum areas (Neyzi et al., 1967). Forty-five percent of the children were below the third percentile weight of US children, and 60 percent were below the third percentile height. Growth retardation was discovered not only in height and weight, but also in bone development, chest and head circumferences, and sitting height (Neyzi et al., 1967).

A similar study was carried out in the villages of Etimesgut, near Ankara (Nashed and Bertan, 1968). Pupils aged 6-14 years were measured in terms of height, weight and height-weight ratio. On average the children from Etimesgut were taller than children from Bursa, a fairly large city in Western Turkey, but there was no significant difference in weight (Köksal and Yilmazsoy, 1961). Another study on Ankara village infants aged 0-36 months determined them to be at the 50th percentile of the Harvard values in respect to height in the first six months (Oral, 1973). After six months the Ankara village infants start to show growth retardation and the mean height eventually falls below the 3rd percentile of Harvard growth curves. Similarly, the average weight falls to between the 10th to 25th percentiles between 9-36 months. The 1993 and 1998 Turkish Demographic and Health Surveys conducted by the Institute of Population Studies at Hacettepe University indicated that this growth pattern may characterize middle and lower class children across Turkey (Tunçbilek et al., 1996, 1999).

We have very little information concerning the growth patterns of children in the Eastern and South-Eastern Anatolian regions. The project conducted by Tümerdem (1978) is one of these rare studies and focuses on the rural areas of Erzurum. The study showed that children in this region were lower in both height and weight than children of low socioeconomic classes living in Istanbul. The children from Etimesgut (Ankara) were slightly superior to those Erzurum.

Studies conducted in the province of Izmir have shown that village children are underdeveloped in terms of height and weight when compared to children living in urban areas (Özgür, 1979; Erefe et al., 1982). In contrast to Istanbul, the children living in rural Izmir were found to be larger than children living in shanty slums. Özgür (1979) attributed the situation to the developmental status of the area, while Erefe et al. (1982) attributed it to the fact that the region has been a health socialization area since the 1960s.

All the studies conducted in rural and shanty slum areas of Istanbul reach a common conclusion. In both areas, growth is "normal" according to national standards in the first six months of the children's lives, followed by a longer period of growth retardation (Gürson and Neyzi, 1966; Neyzi et al., 1967; Tunçbilek et al., 1996,

1999). Researchers attribute this to the dominant use of mother's milk as the primary source of nutrition in the first six months of life (Neyzi et al., 1967; Tunçbilek et al., 1996, 1999).

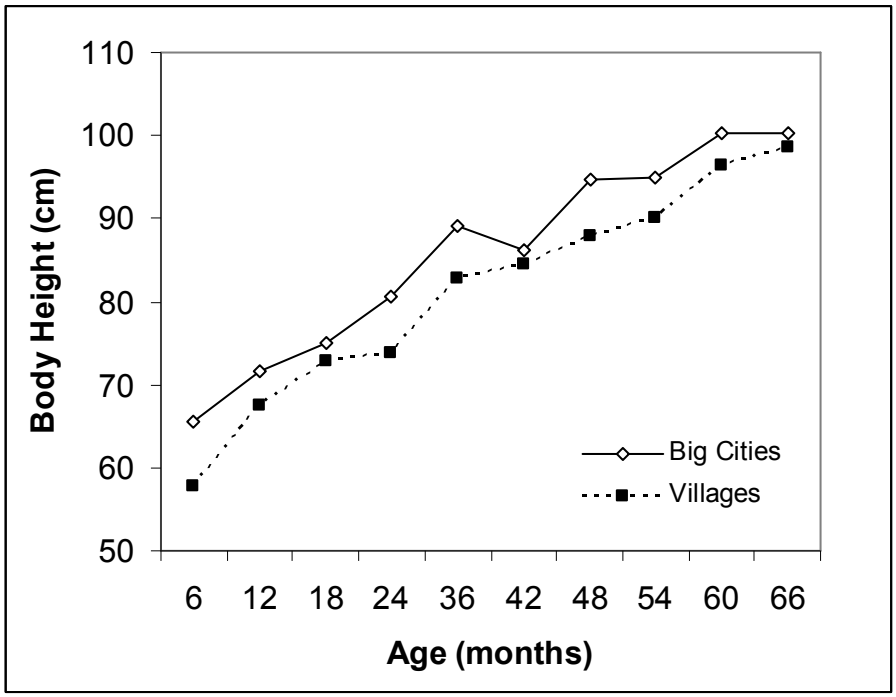

Figure 3a: A comparison of height values of pre-school children in cities with those of villages in Turkey; sexes combined. (Data from Köksal, 1977)

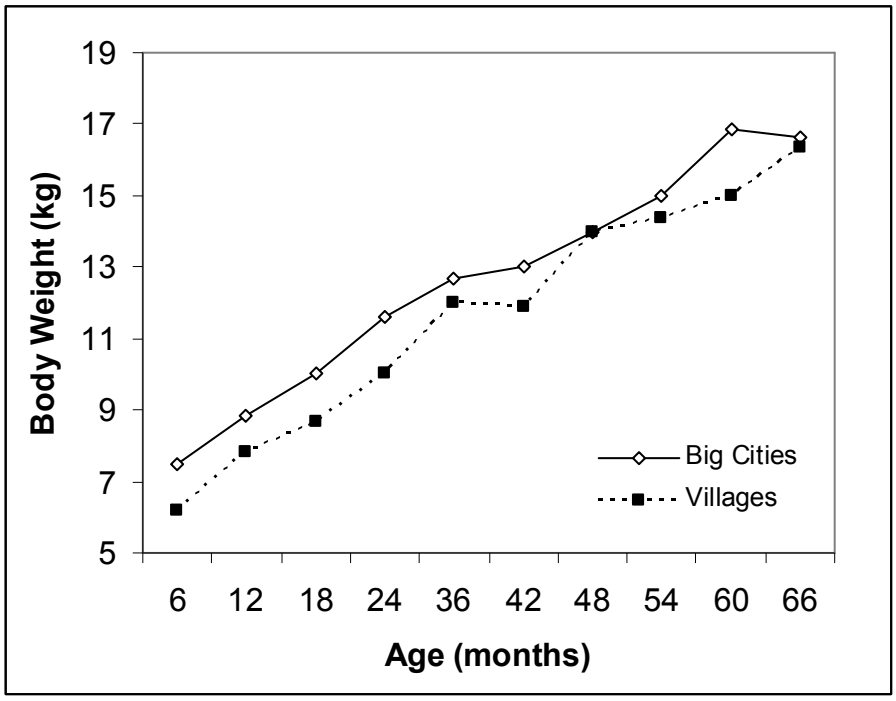

Figure 3b: A comparison of weight values of pre-school children in cities with those of villages in Turkey; sexes combined. (Data from Köksal, 1977)

When we consider the growth studies in rural, urban and shanty slum areas, it appears that children living in shanty slums are generally larger than their rural counterparts in terms of height and weight. This implies that shanty slum areas (gecekondu) offer relatively better conditions than rural areas in Central and Eastern Anatolia, in spite of their negative reputation. In contrast, the picture is the opposite in rural areas where living conditions are comparatively better, like in Western Anatolia. Torbalı, a shanty slum area in Izmir, is an example of such a place. Still, upper urban class children are significantly larger than children living in rural areas and shanty slums.

Local and national growth studies

Physical growth studies in Turkey are usually based on small samples and have local characteristics. Some of the studies conducted since 1940 are summarized in Table 1. The majority of these projects have been conducted in Ankara, Istanbul, Bursa and Izmir. In addition, studies concerning school-aged children have been carried out in Adana, Trabzon, Erzurum and Diyarbakır.

Among the regional studies there is only one following children from birth to the age of 18 (Neyzi et al., 1978). Other studies usually concern particular age groups, especially primary school students from an "average" socioeconomic background. Those carried out in Istanbul (Neyzi et al., 1978) and Trabzon (Baki and Teziç, 1986) is based on samples from the upper class.

Figure 4 shows the differences in average height development in the geographical regions of Turkey. When we consider children aged seven, those living in Western regions of Turkey are taller on average. Of the six settlements studied, five are cities, while sixth is a medium-sized town in the province of Bursa, Gemlik. The children living in Gemlik are shorter than children living in Bursa, a large city situated in North-Western Turkey. This phenomenon may be attributed to the fact that Gemlik is more rural than Bursa (Günay et al., 1990a).

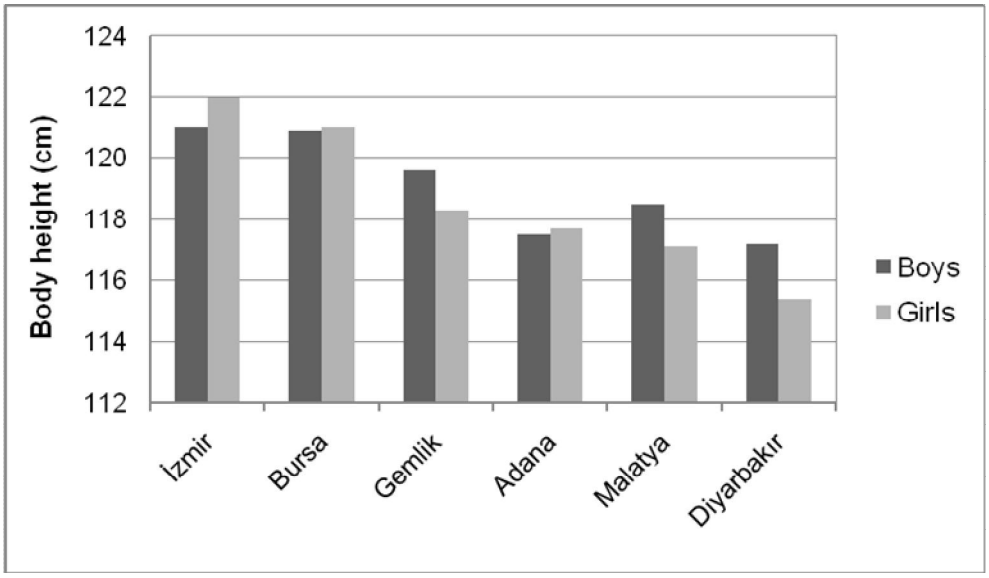

Figure 4: Regional differences in mean height of 7-year-old urban children in Turkey. The provinces on the X-axis were put just like geographical locations, from westward to eastward. It is clearly seen that there is a tendency to decrease in mean height in eastern regions of the country. (Data from Erefe et al., 1982; Günay et al., 1990a; Özer et al., 1986; Tacar and Doğruyol, 1995)

What kind of difference exists between the growth curves that represent the society in general and the "optimal" growth curves that represent the upper classes? Figures 5a, 5b, 6a, and 6b show the data of the National Nutrition, Health and Food Consumption survey of 1974, compared with data from the studies of Saatçioğlu (1988) and Duyar (1992). The values that represent the average are below the "optimal" curve, approximately at the 25th percentile. This data demonstrates that lower class individuals cannot realize their physical growth potential.

The growth curves developed by Neyzi et al. (1978) using Istanbul children are commonly used today, especially in medicine and related areas, as they are composed of data from upper class children. The comparison of the above study and the national standards are again "optimal" (Saatçioğlu, 1988; Duyar, 1992) and give us explanatory information on the differences between growth patterns on a national and regional basis (Fig. 7a, 7b, 8a, and 8b). Although the growth curves of the studies mentioned above are similar, some differences between the Istanbul data and the national data remain in respect to height, especially at the 3rd percentile. In the 50th percentile, no differences are observed up to age 15, but afterwards, on average, Istanbul children are shorter than the national average. This situation is also reflected at the 97th percentile. The most likely factor in explaining this difference is secular change. Namely, in the twenty years between the studies, improved nutrition and health services as well as changes in lifestyle have led to an increase in children's heights.

Secular trend in physical growth

In some regions of the World there is a tendency for children to become progressively larger at all ages during the last 100 to 150 years. For some authors like van Wieringen (1986) this trend can be explained by better nutrition and improved environmental circumstances. Tanner (1988) calculated the magnitude of positive secular trend in body height for these regions (Northern European and North American countries) and found that the average gain was about 1 cm at ages 5-7 years, about 2.5 cm during adolescence, and about 1 cm per decade for fully grown adults.

The phenomenon of secular change in the growth process in Turkey was investigated by several authors. Kenntner (1968, cited in Tobias, 1985) reported that there was no positive secular trend in Turkey, at least up to the beginning of the1960's. This view is consistent with the findings of Duyar (2006) who focused on the changes in stature of adults in Turkey during the last century.

Similarly, the studies on changes in growth pattern in Turkish children indicated that there is a clear positive secular trend in the second half of the twentieth century. For example, Neyzi (1984) reported height increases in children born in Istanbul between the decades of 1950-60 and 1970-80. Significant differences appear in weight as well, particularly at the 50th percentile. Children aged 9-13 living in Istanbul weigh on average more than the earlier generation (Neyzi 1984). Duyar (1995) analyzed the data of stature and sitting height of school children residing in Ankara between 1950 and 1986. He calculated that the mean height increased 0.96 cm and 0.92 cm per decade for boys and girls, respectively. It should be stated that these figures are quite similar to those of Tanner (1988) studying European and North American children mentioned above.

In order to understand these changes in growth (i.e., secular changes) it is necessary to look at the changes in socioeconomic circumstances and living conditions during the studied period. Human Development Index (HDI), developed by United Nations Development Programme, is a useful indicator for this type of evaluation.

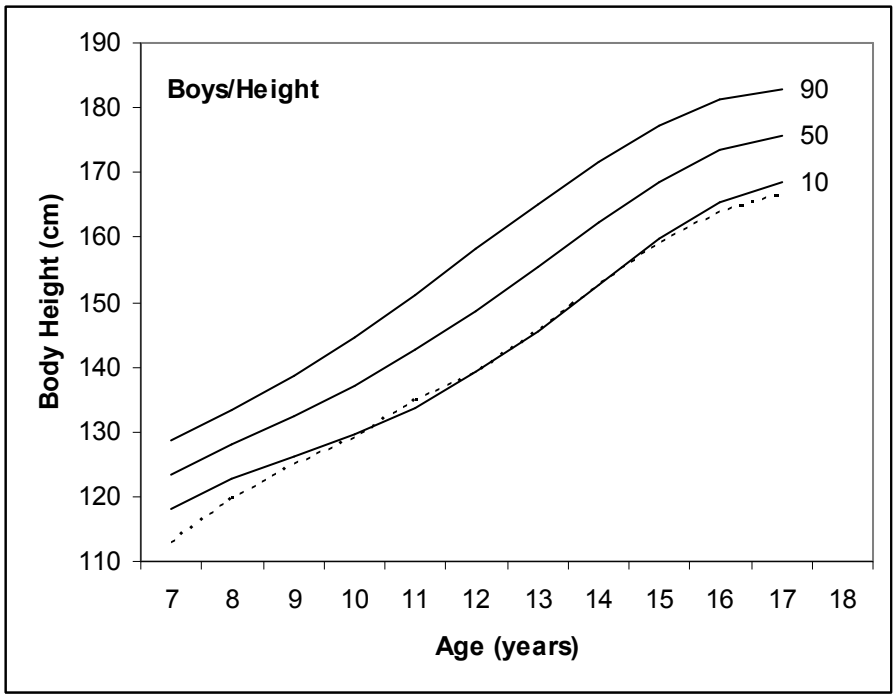

Figure 5a: Mean heights and optimal values in Turkish boys. (Data from Saatçioğlu, 1988; Duyar, 1992; Köksal, 1977)

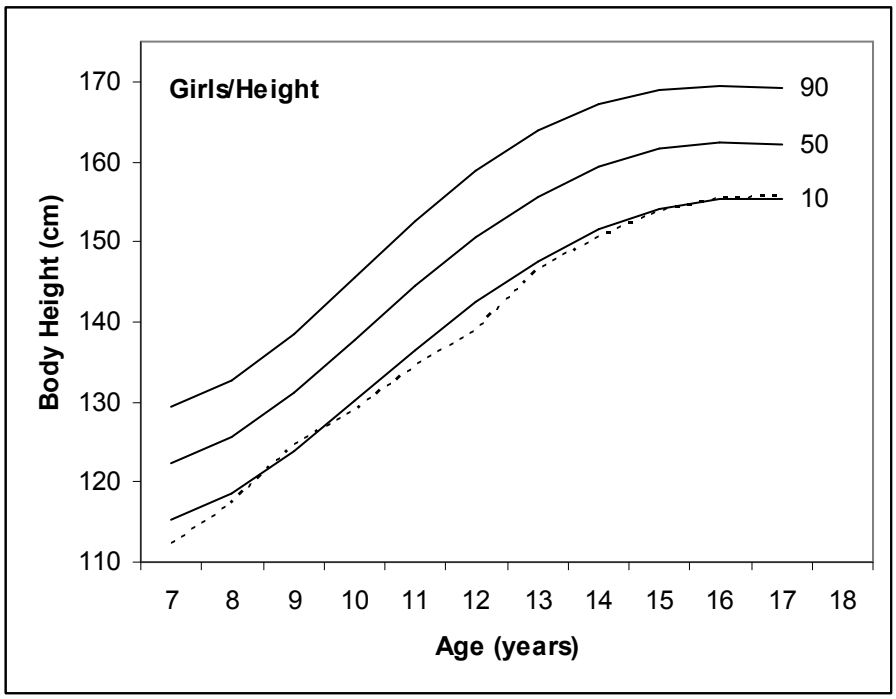

Figure 5b: Mean heights and optimal values in Turkish girls. (Data from Saatçioğlu, 1988; Duyar, 1992; Köksal, 1977)

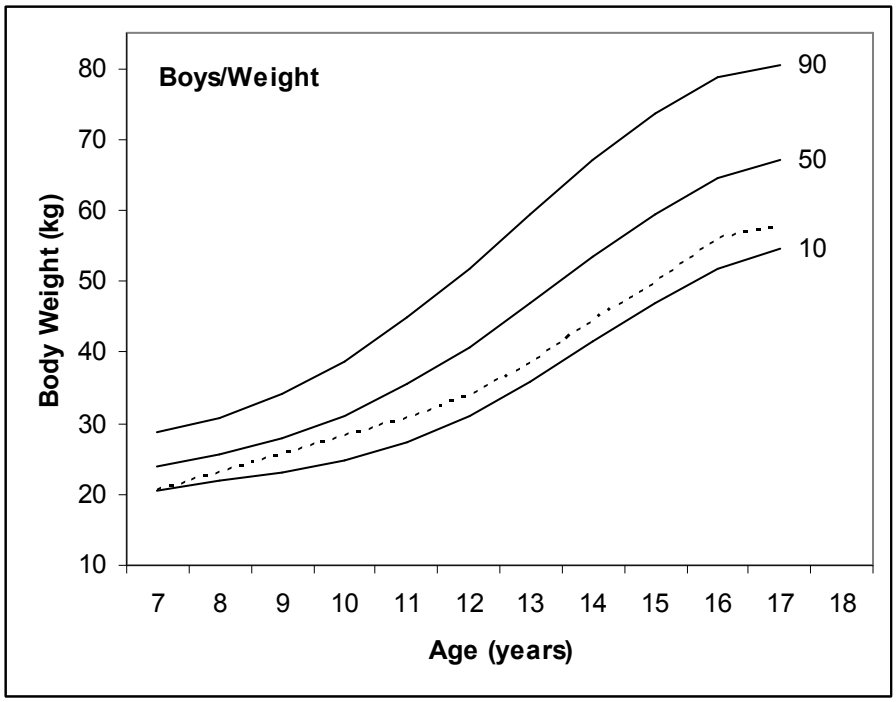

Figure 6a: Mean weights and optimal values for boys in Turkey. (Data from Saatçioğlu, 1988; Duyar, 1992; Köksal, 1977)

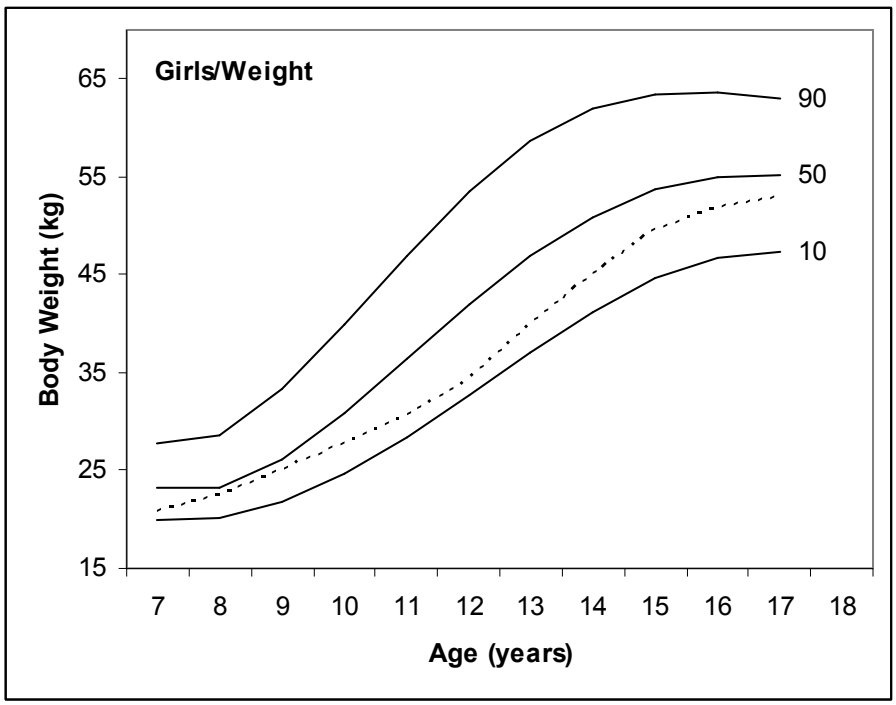

Figure 6b: Mean weights and optimal values for girls in Turkey. (Data from Saatçioğlu, 1988; Duyar, 1992; Köksal, 1977)

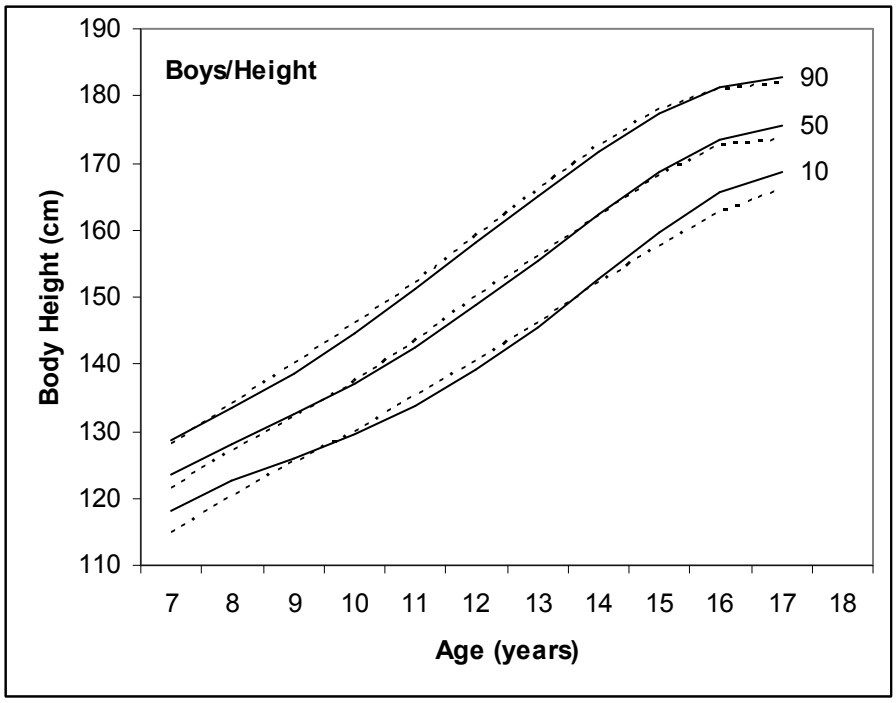

Figure 7a: Growth differences in height percentiles between national and local growth studies in Turkey; boys. (Data from Saatçioğlu, 1988; Duyar, 1992; Neyzi et al., 1978)

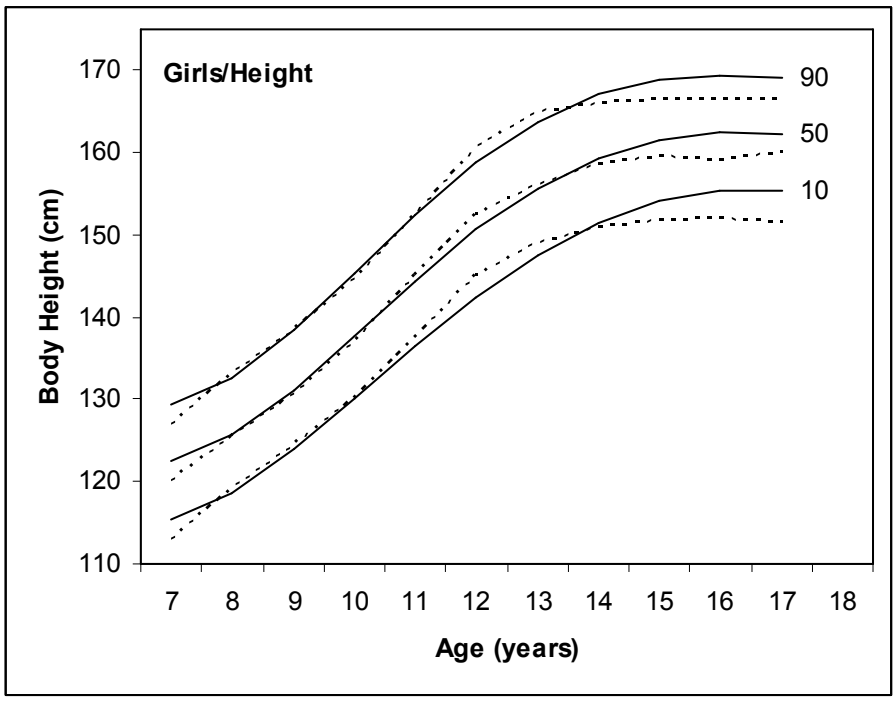

Figure 7b: Growth differences in height percentiles between national and local growth studies in Turkey; girls. (Data from Saatçioğlu, 1988; Duyar, 1992; Neyzi et al., 1978)

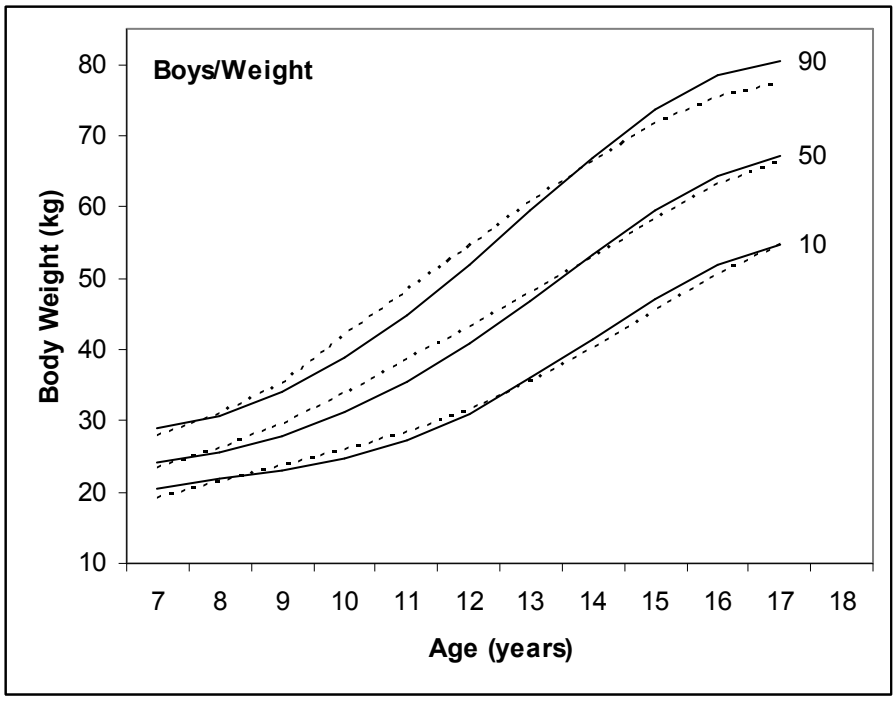

Figure 8a: Growth differences in weight percentiles between national and local growth studies in Turkey; boys. (Data from Saatçioğlu, 1988; Duyar, 1992; Neyzi et al., 1978)

Figure 8b: Growth differences in weight percentiles between national and local growth studies in Turkey; girls. (Data from Saatçioğlu, 1988; Duyar, 1992; Neyzi et al., 1978)

HDI is a measure of life expectancy, adult literacy, school enrollment (at the primary, secondary and tertiary level), and standard of living calibrated to values between 0.0 and 1.0. Values of HDI ≤ 0.499 are described as "low," between 0.500 and 0.799 as "medium," and ≥ 0.800 as "high" (UNDP, 2007).

According to the historical estimations the values of HDI for Turkey were 0.382 in 1950, 0.592 in 1975, and 0.735 in 1999 (Crafts, 2002). These figures indicate that while Turkey was a "low developed" country in 1950s (and possibly before that, see below), it shifted to the category of "medium developed" countries by 1975. Indeed, the most recent calculations (UNDP, 2007) confirmed this trend. This last estimation of HDI for Turkey is 0.775, placing it at 84th out of 177 countries.

There are no HDI values for Turkey in the first half of the twentieth century, but we can gain some knowledge using data on changes in income. For instance, Pamuk (2006) has examined economic growth in Middle Eastern countries since 1820. According to these estimations, GDP per capita for Turkey was 1200 PPP (purchasing power parity) dollars in 1913, and 1600 PPP dollars in 1950. Furthermore, the findings of this study indicated that annual change in GDP per capita between 1820 and 1950 increased relatively slowly, and then accelerated during the second half of the twentieth century. GDP per capita for the region as a whole increased at an annual rate of 2.3 percent per annum or by more than twofold from around 1,600 dollars in 1950 to more than 5,000 dollars in 2000, both in 1990 PPP adjusted dollars (Pamuk, 2006).

When we combine the findings of the above-mentioned studies, it can be concluded that socioeconomic changes in Turkey during the twentieth century can be divided into two periods, up to end of the World War 2, and the post-war period. In the earlier period economic changes (or development) in Turkey were relatively small, but after the World War 2 the pace of improvement in economic, social and living standards increased considerably.

These social and economic data can be used to explain, at least partly, the changes in growth patterns and the observable secular trend in Turkey. As we saw above there was no positive secular trend in physical growth pattern in children and adults living Turkey before 1960. Contrarily, a clear acceleration in growth can be seen during the second half of the twentieth century. These results correlate with the general economic development of the country.

HDI is clearly increased in the last decades in Turkey, but this value reflects the general (or average) characteristics of the population. These developments, however, increased the difference between social strata, especially after 1980. As pointed out by Tanner (1990), in some economically developed regions of the world such as Scandinavian countries the growth differences between higher and lowers social strata diminished, or even disappeared. However, the difference in growth patterns between social classes continued or even increased in Turkey in recent decades (Duyar, 1990). These differences between social classes in Turkey during the last twenty-five years may be explained by economic policies, which led to increased income inequality (Boratav, 2003).

Comparisons with NCHS Standards

Data from a nationwide anthropometric investigation in the USA (National Center for Health Statistics, NCHS) are accepted as a valid international reference. For this reason, some researchers have compared their findings to the NCHS values. For example, Burgut and Özer (1987), who compared school children in Adana aged 7-11 with the NCHS values, determined that 71 percent of the boys and 73 percent of the

girls were below the NCHS 50th percentile in height. Further, 14 percent of Adana children were below the 5th percentile of the NCHS reference values. This percentage falls to 3 percent when considering weight-to-height ratio. Their sample was drawn from all socioeconomic strata in the city.

Açkurt and Weltherilt (1991) studied a random sample of children aged 7-17 in the Western, Central and Eastern Anatolian regions. They found that 53-72 percent of the boys and 50-71 percent of the girls were below 50th percentile of the NCHS height values. According to the same study, 40-63 percent of boys and 20-63 percent of girls were below the 50th percentile of the NCHS weight norms. In regard to subcutaneous adipose tissue accumulation, Turkish children were between the 25th-50th percentiles on average, but approached the 50th percentile towards the age of 17.

When we take the findings of these two studies into consideration, it seems that "average" children in Turkey display differing growth patterns in regard to height and weight. While height remains far below the NCHS standards in both studies, weight-for-height is a little above the 50th percentile. Whether this difference is a typical characteristic of children living in Turkey remains to be investigated.

Concluding remarks

The first apparent finding in physical growth studies is the presence of a significant difference in growth of children of different socioeconomic strata. This gap can be narrowed by improving nutrition, health services, and other conditions of lower class children. Yet, in light of the current difference between the socioeconomic classes, we can say that the situation remains bleak.

Although there are no comprehensive studies comparing urban and rural children, findings of other studies indicate that rural children are underdeveloped physically compared to urban children. This growth retardation becomes more pronounced in eastern regions of Turkey. It suggests that Eastern regions have poorer access to health services, under-nutrition, etc. In fact, the National Nutrition, Health and Food Consumption Survey of Turkey sheds light on this subject to a certain extent. According to this study, grain comprises a larger percentage of the diet in rural areas than in urban areas and the consumption of protein rich food is lower in rural areas. Also, the proportion of low income families in the population rises as one moves towards the East (Köksal, 1977).

Factors such as the existence of a more effective and prevalent health service and developed educational facilities, along with the fact that food consumption does not change as much with seasonal variations ensure the acceleration of physical growth rates in urban areas. In countries such as Finland, Romania, Austria, Greece, and Poland, urban children are on average taller than rural children of the same age (Bielicki, 1986). The studies conducted in Turkey can be interpreted to mean that shanty slum areas have some advantages over rural areas, as expressed in the growth rates of children. However, the comparison of rural children and those living on the outskirts of cities yields different results when examined at a global scale. For example, in countries such as Nigeria and Costa Rica, children living in urban slums are not significantly different from children living in rural areas. In South Africa, rural children are reported to be superior in growth to children living under average conditions in urban areas (Cameron et al., 1992).

The growth patterns of upper class Turkish children greatly resemble the NCHS standards. This shows that children growing up in optimal conditions can develop at the same rate as American children. Yet, it must be emphasized that children from lower and middle classes display growth patterns inferior to the NCHS standards.

When we examine the common characteristics of the growth studies conducted in Turkey, we see that the majority of the studies were conducted at the regional level. Nationwide studies are rarer. The biggest gap in the field is the absence of a growth scale representing the entire society from birth to maturity. In addition, the impact of the development of shanty slums and the concomitant changes in ecological conditions must be investigated in detail, as our knowledge of how immigrating groups adapt biologically to shanty slum areas is severely limited.

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