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Growth of urban school children in Malawi

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Summary. The objective of this cross-sectional study was to assess growth pattern of urban school children in Malawi from low socio-economic strata and to compare anthropometric measurements of the children to data from the region of South-Central Africa and to international standards. A total of 493 urban school children aged 6–17 years were selected randomly from two primary schools in semi-urban Blantyre, the largest city in Malawi. Anthropometric measurements included height, weight, mid-upper arm circumference, triceps skinfold thickness, mid-upper arm muscle circumference and maximal grip strength of the stronger hand. All parameters of Malawian children of both sexes were lower than medians of WHO/NCHS reference data. Expressed as percentage of WHO/NCHS references, the relative means of height, weight, mid-upper arm circumference and mid-upper arm muscle circumference of Malawian girls were considerably higher than those of boys, and older girls had better parameters than younger ones. Older pupils of both sexes had higher triceps skinfold thickness relative to the international references than the younger children. Mean maximal grip strength values of boys and girls were not significantly different. For girls, the relative values increased with age, while for boys they decreased. It is concluded that younger primary school pupils have similar body sizes to their counterparts from the region. Adolescents, particularly girls, have more favourable anthropometric parameters which approach WHO/NCHS reference data.

1. Introduction

At present there are only a few studies on growth of school children in the region of Southern and South-Central Africa (Corlett 1986, Shamssain 1991, Cameron, Kgamphe, Leschner *et al.* 1992) and these few refer mainly to the Republic of South Africa. The pattern of growth reported in these studies were generally characteristic of the usual growth pattern of developing countries with some regional differences, which might be accounted for by ethnical and environmental diversity of the region (Hiernaux, Rudan and Brambati 1975). Most of the countries in the region have a high urbanization rate but contrary to the developed countries, urbanization in the region does not provide better environment for growth of children (Cameron *et al.* 1992).

Reported studies of anthropometric parameters of Malawians were concentrated on pre-school children and adults and aimed at assessment of nutritional status rather than growth and development. Pelletier, Low and Msukwa (1991) and Quinn, Chiligo-Mpoma, Simler *et al.* (1995) demonstrated a very high level of stunting prevalence among rural children in Malawi aged from birth to 60 months compared to other African countries. At the same time, weight-for-age and height-for-age of children from urban upper socio-economic communities closely resembled the NCHS/WHO standards (Chimwaza 1982, Quinn *et al.* 1995), which indicated that these standards are relevant for Malawi and high prevalence of stunting in the country is due to environmental but not genetic factors. However, low height and weight values of adults reported by Eveleth and Tanner (1976) and Pelletier *et al.* (1991) showed that genetic factors might contribute to high level of stunting in the

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country when Malawians are compared with North Americans or Europeans. The present paper is focused on anthropometric parameters of urban school children in Malawi. The growth pattern of rural school children needs further investigation.

2. Materials and methods

2.1. Site of survey and subjects

The study was conducted at two randomly chosen governmental primary schools in densely populated semi-urban areas of Blantyre, the largest city in Malawi. Both schools enrol pupils from low-income families with casual business being the main source of income in over half of the households. To some extent both schools are typical for urban and semi-urban areas in Malawi. The total enrolment in two schools was above 8000 children at the time of the study. The schools were not different in terms of the number of standards and classes, gender ratio and the number of children per class. Approximately 52% of pupils in both schools were girls. There were 128 classes in both schools with 6–10 classes in each of eight standards in each school. The number of children per class varied from 50 to 80. One class in each standard (of eight standards) was selected randomly for the study. Thus the final selection was of 16 classes with 1006 pupils in both schools. A further 50% of pupils was selected from each of the 16 classes from class records of boys and girls by proportionate random sampling. Prior to investigation permission was obtained from health and educational authorities. The purpose and procedure of study were fully explained to pupils and their parents and informed consent was obtained. None of the selected children refused to participate in the study. Nine volunteers exhibiting obvious physical deformities or medical problems were excluded from the study population. Four hundred and ninety-three children including 266 girls and 227 boys aged 6–17 years participated in the survey.

Since age is very important for such type of a study, every effort was made to record age of pupils correctly. Most children do not have birth certificates in Malawi. Dates of birth of pupils are recorded at the enrolment and are generally thought to be reliable. Therefore, ages of children in this study were obtained from the schools' registers and reported to the nearest whole year. In cases of unreliable age, children, teachers and parents were independently questioned. Using this method, the ages of children in questionable cases have been estimated. The deference between estimated and correct age in such cases was probably not larger than ± 3 months (Davies, Mbelwa and Dore 1974). Therefore, misclassification of children by age was possible but we feel that this type of error was probably random and did not affect our data significantly.

2.2. Procedure

Children were seen in small groups at schools in April and September 1999. All measurements were done between 9 am and 12 noon. The following measurements were made on each subject: weight, standing height, triceps skinfold thickness (TSF), mid-upper arm circumference (MUAC) and maximal grip strength (MGS) of the stronger hand. Anthropometric measurements were performed by one of the authors (M.G.) and two trained technicians. The actual collection of data was categorized into three parts and each observer performed respective measurements on all subjects of the study sample. Forty-one children (8.3%) were tested a second time at 2–4 days interval. Test–retest correlation coefficients were high for stature (0.99) and weight

(0.97) and moderately high for MUAC (0.89), TSF (0.86) and MGS (0.84). These coefficients were all significant and within the range of comparative data (Benefice and Malina 1996).

Anthropometric measurements were taken using methods recommended by Gibson (1990) and MGS was measured using procedures described by Weiner and Lourie (1969). Weight was measured before a meal using a beam balance (Vogel and Halke CmbH and Co, Germany) with a scale accurate to 100 g. The accuracy of the balance was checked before each session and unloaded scale was adjusted to zero. Besides, the balance was regularly checked using a set of standard weights. The subjects wore only light school uniform (short-sleeved shirt and shorts for the boys, and light blouse and dress for the girls) during weight measurements. The type of clothing worn by children during weight measurements was not different in April and September. Nude weights of children were obtained by subtraction of representative weight of clothing at each age group from the observed weight of each pupil. The mean weights of clothing was calculated by measuring the weight of clothes of 5–8 children randomly selected in each age group of boys and girls using triple beam balance (Ohaus Corporation, USA). The weights varied from 0.48 to 0.88 kg in different groups of pupils. Corrections of body weights were done in a similar manner on both occasions. TSF was measured using a Harpenden skinfold caliper and MUAC was measured using a steel tape measure. Stature, MUAC and TSF were registered to the nearest millimetre and weight was registered to the nearest 0.1 kg. The following equation (Gibson 1990) was used for calculation of mid-upper arm muscle circumference (MUAMC):

$$\text{MUAMC} = \text{MUAC} - \pi \times \text{TSF}$$

MGS was measured to the nearest 0.1 kg using a hand grip dynamometer. The handle on a dynamometer was accordingly adjusted to suit the sizes of the subjects' hands. Two attempts on each hand were made by each subject while standing and not holding on to anything for support. Prior to the exercise, adequate demonstrations were made on the apparatus and subjects were further encouraged during the exercise to pull on the handle harder. The maximal grip strength of the stronger hand was taken for the analysis.

Weight-for-age, height-for-age and weight-for-height of Malawian children were compared to WHO reference data (WHO 1982). MUAC, MUAMC and TSF were compared to NCHS reference data (Gibson 1990) and MGS values were compared to USA norms (Mathiowetz, Weimer and Federman 1986).

Data were analysed using Epi Info 6 statistical package and were expressed as means and standard deviations for each age group and sex separately.

3. Results

Sample size per age group, the means and standard deviations for all the measurements are given in tables 1 and 2. The mean values for height, weight, triceps skinfold thickness and mid-upper arm muscle circumference expressed as percentage of WHO/NCHS medians are also given in figure 1.

The mean values for heights and weights increased with age in both sexes. Gender differences in heights were negligible in most age groups between 6 and 14 years of age. Older boys were significantly taller than girls. Girls aged 9 years and 11–15 years were heavier than boys. For the other age groups gender differences in weight were insignificant. The mean values of height and weight of the Malawian children were

Table 1. Sample size per age group, means and standard deviations of anthropometric parameters of Malawian boys.

Age (years)	*n*	Height (cm)	Weight (kg)	TSK (mm)	MUAC (cm)	MUAMC (cm)	MGS (kg)
6	11	111.4 ± 8.2	18.6 ± 1.7	7.3 ± 1.6	15.8 ± 0.7	13.5 ± 0.9	4.9 ± 1.5
7	21	115.7 ± 5.4	20.0 ± 2.2	7.1 ± 1.5	16.3 ± 0.8	14.1 ± 1.1	6.8 ± 2.6
8	20	121.2 ± 5.1	22.4 ± 3.4	7.5 ± 2.7	16.5 ± 1.4	14.1 ± 1.6	10.3 ± 2.8
9	16	127.0 ± 6.1	24.8 ± 2.3	7.1 ± 1.9	17.0 ± 0.8	14.8 ± 1.0	12.8 ± 3.1
10	16	130.5 ± 5.0	27.1 ± 3.0	7.3 ± 2.8	18.0 ± 1.4	15.7 ± 1.3	15.2 ± 5.4
11	13	134.4 ± 7.6	27.2 ± 4.1	7.5 ± 1.6	17.9 ± 1.1	15.6 ± 1.3	17.5 ± 4.8
12	21	140.2 ± 8.3	30.1 ± 3.8	7.5 ± 1.7	18.5 ± 1.1	16.0 ± 1.4	19.3 ± 4.7
13	31	145.0 ± 6.7	35.6 ± 5.8	7.7 ± 1.9	19.7 ± 1.8	17.3 ± 1.6	21.6 ± 4.8
14	27	152.3 ± 7.4	40.4 ± 5.9	8.6 ± 2.0	20.9 ± 1.4	18.2 ± 1.8	25.6 ± 6.6
15	20	157.7 ± 5.3	46.6 ± 5.1	8.5 ± 1.9	22.6 ± 2.1	19.9 ± 1.8	30.3 ± 6.3
16	19	163.9 ± 7.2	51.5 ± 7.5	7.9 ± 2.1	23.3 ± 2.4	20.8 ± 2.1	32.1 ± 5.3
17	12	164.7 ± 6.1	53.2 ± 7.0	8.0 ± 3.6	23.9 ± 2.8	21.4 ± 3.1	33.5 ± 8.4

TSK = triceps skinfold thickness, MUAC = mid-upper arm circumference, MUAMC = mid-upper arm muscle circumference, MGS = maximal grips strength.

Table 2. Sample size per age group, means and standard deviations of anthropometric parameters of Malawian girls.

Age (years)	*n*	Height (cm)	Weight (kg)	TSK (mm)	MUAC (cm)	MUAMC (cm)	MGS (kg)
6	15	111.5 ± 3.2	18.3 ± 1.1	7.6 ± 2.3	16.3 ± 3.1	13.9 ± 2.6	4.7 ± 1.9
7	26	116.1 ± 4.0	19.3 ± 1.9	7.4 ± 1.9	16.2 ± 2.3	13.9 ± 2.1	6.8 ± 3.1
8	16	122.3 ± 5.9	22.4 ± 3.0	7.9 ± 1.5	16.6 ± 1.1	14.1 ± 1.3	8.5 ± 3.4
9	23	122.8 ± 5.7	22.6 ± 3.3	9.0 ± 2.8	17.2 ± 2.8	14.6 ± 2.6	8.6 ± 2.1
10	16	128.9 ± 6.4	25.4 ± 2.2	8.3 ± 3.1	17.7 ± 6.3	15.1 ± 4.2	10.9 ± 3.2
11	28	137.5 ± 7.7	30.9 ± 5.6	9.1 ± 2.9	19.2 ± 1.9	16.3 ± 2.3	14.6 ± 3.8
12	27	141.7 ± 8.1	34.0 ± 4.7	8.9 ± 3.0	20.1 ± 1.4	17.3 ± 2.4	18.6 ± 4.9
13	22	148.9 ± 7.6	42.6 ± 5.6	11.3 ± 3.9	21.5 ± 1.6	17.9 ± 2.5	23.0 ± 5.0
14	23	153.5 ± 5.5	45.6 ± 5.4	12.1 ± 4.3	22.6 ± 2.0	18.8 ± 3.1	24.1 ± 5.4
15	32	154.2 ± 5.4	50.8 ± 4.3	14.1 ± 3.9	24.3 ± 1.3	19.9 ± 1.9	28.3 ± 5.4
16	24	155.6 ± 5.7	52.0 ± 5.0	15.2 ± 3.6	24.8 ± 2.0	20.0 ± 2.2	29.2 ± 5.2
17	14	159.0 ± 5.4	55.5 ± 5.3	14.6 ± 3.1	25.6 ± 1.6	21.1 ± 2.1	32.4 ± 3.4

TSK = triceps skinfold thickness, MUAC = mid-upper arm circumference, MUAMC = mid-upper arm muscle circumference, MGS = maximal grip strength.

lower than WHO medians for all age groups with means for heights being closer to the reference values than means for weights. Differences in weights and heights between Malawian boys and WHO medians increased with age and peaked at the age of 11–13 years. Then the differences decreased progressively. Girls exhibited similar pattern of age-related changes in weight and height but the maximal differences between the girls and WHO reference data occurred in the younger age groups. At the age of 17 years the mean values of height and weight of girls were closer to WHO medians than those of boys.

Figures 2 and 3 show proportions of Malawian children of different age groups below 5th and above 50th WHO height-for-age and weight-for-age percentiles. Twenty-eight per cent of children were below 5th percentile for height-for-age and heights of only 13% of children were above the WHO medians. Weight-for-age of Malawian children had similar pattern of distribution over WHO percentiles. The proportions of boys with low heights and weights tended to increase with age. For

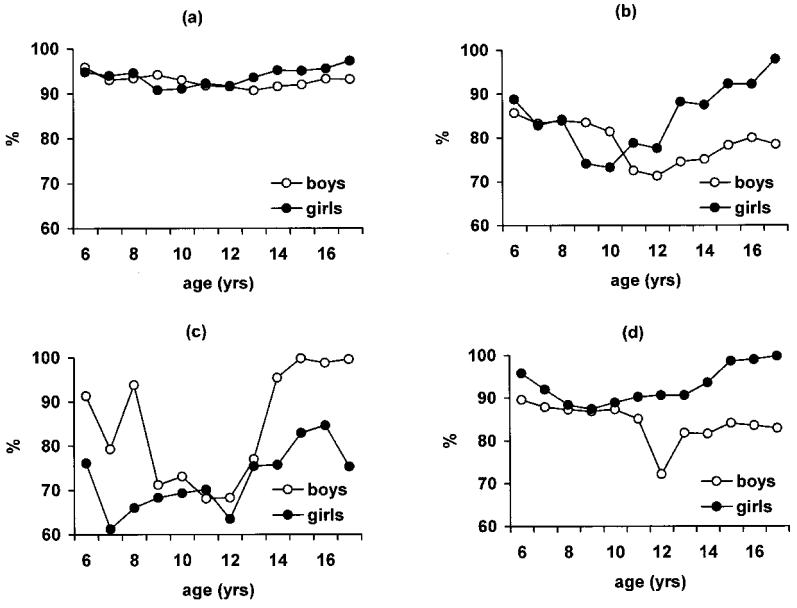

Figure 1. Mean height (a), weight (b), triceps skinfold thickness (c), and mid-upper arm muscle circumference (d) of Malawian children relative to international reference values (%). Reference values: (a, b) WHO 1982, (c, d) NCHS 1981.

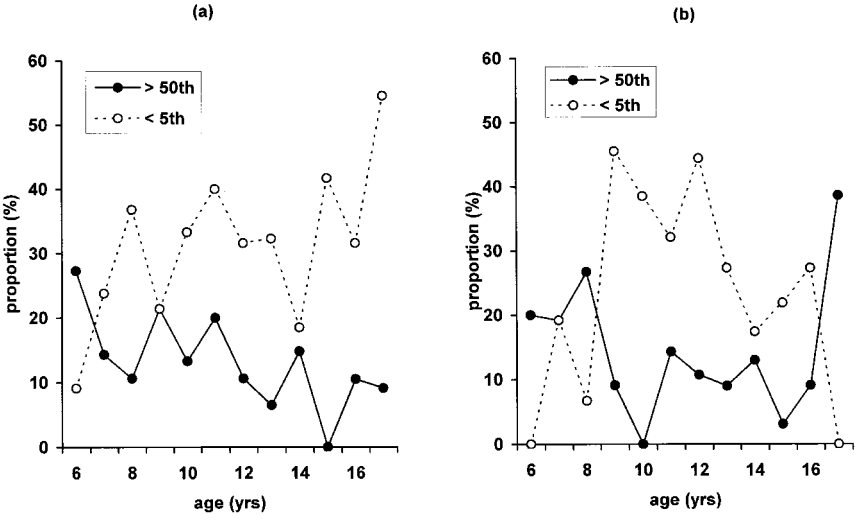

Figure 2. Proportions of Malawian boys (a) and girls (b) below 5th and above 50th percentiles of WHO height-for-age reference values.

girls the pattern of age-related changes in weight and height was more complex. Generally 6–8 and 14–17-year-old girls had better distribution over WHO percentiles than girls aged between 9 and 13 years. However, distribution of the Malawian children over WHO weight for height percentiles (figure 4) was considerably better with only 7% of children below the 5th percentile and 38% above the 50th percentile. Girls had better pattern of distribution than boys had and older girls were distributed over higher percentile groups than the younger ones.

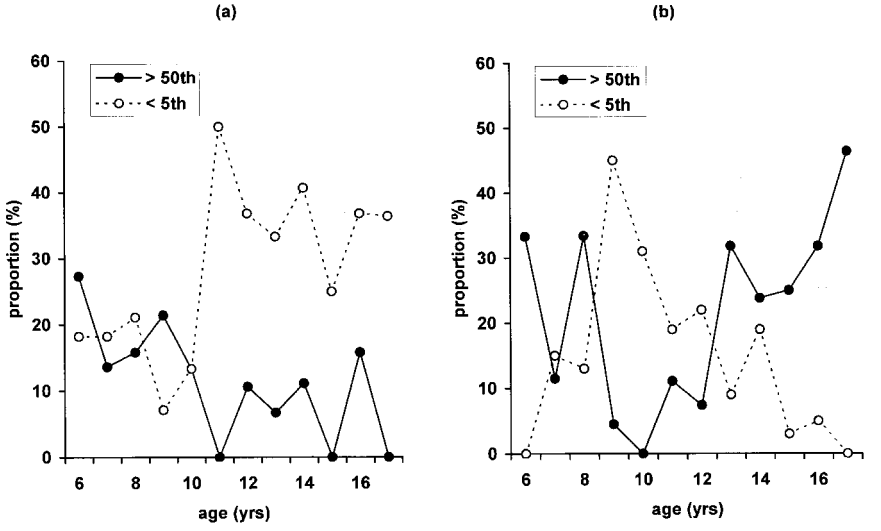

Figure 3. Proportions of Malawian boys (a) and girls (b) below 5th and above 50th percentiles of WHO weight-for-age reference values.

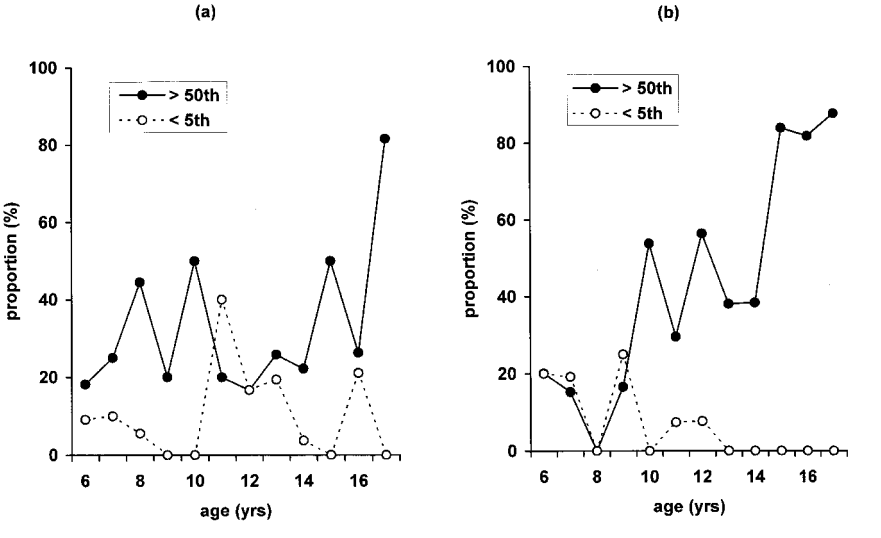

Figure 4. Proportions of Malawian boys (a) and girls (b) below 5th and above 50th percentiles of WHO weight-for-height reference values.

Age did not affect TSF measurements for the boys. For the girls, changes in TSF were more variable, but generally TSF measurements in older girls were higher than in younger ones. Gender differences in TSF thicknesses only appeared for the children aged 10 years and older. The differences between NCHS medians and TSF means for the girls were higher than those for the boys.

Mean MUAC and MUAMC values for both sexes steadily increased with age but were lower than NCHS medians. The differences between the mean values of girls and NCHS references decreased with age and the values of older girls approximate NCHS medians. For boys, differences between Malawians and NCHS medians

showed a steady increase with age. MUAMC values of the boys and girls were similar in all age groups but MUAC values of girls aged 11 years and older were significantly higher than those of the boys.

The absolute MGS values of Malawian children were lower than in reference population (Mathiowetz *et al.* 1986). For boys, the differences increased progressively with age and mean MGS values of 17-year-olds were only 62% of values of North American counterparts. For girls, the differences decreased with age and MGS values of 17-year-olds approximated North American norms. The differences in MGS values between boys and girls were non-significant for most age groups.

4. Discussion

The study was designed to assess growth of Malawian children from urban Blantyre. Children were randomly selected from two state schools in densely populated areas in the city. Education and occupation of parents were not registered for each child. The type and location of schools were used as criteria of socio-economic background of children. Families from lower socio-economic strata reside in densely populated areas in Blantyre and cannot afford to educate their children in private schools and send them to neighbouring state schools which provide free education at present. Middle class families are not numerous in Malawi and do not reside in densely populated areas. Clothing of children also indicated poor economic conditions of their families. Hence it is reasonable to assume that the children came from lower socio-economic class.

The proportion of girls in the study sample was relatively higher than boys and relatively more older children were girls, which reflected the overall sex ratio in the two schools. Variability in sample sizes from one age group to another also reflected the sampling procedure where all randomly selected children of both sexes were included in the study sample regardless of their age. The normal age of enrolment is 6 years in Malawi and the leaving age is 14 years. The presence of older pupils in primary school can be attributed to older entry age and repeating of the year due to unsatisfactory academic performance. It is worth mentioning that introduction of free primary education in Malawi in 1994 allowed children of various ages to resume primary education after periods of absence from a school. This consequently increased the number of older children, particularly girls, in primary schools. Pupils resuming study came from particularly poor families which were not able to afford payment of school fees when primary education was not free.

Anthropometric measurements in the two schools were conducted at 5-month intervals. However, the impact of seasonal effects on nutritional status of children should be minimal as urban families depend more on earnings from casual business rather than on farming. Besides, both months fall in the dry season with similar availability of staple food. The important shortcoming of this study is that sexual maturation of adolescent children was not assessed due to lack of necessary conditions at schools. However, some data (Lema, Mtimavalye and Msisha 1998) indicate that the mean age of menarche is 15.0 years in urban girls in Malawi that is higher than in most other African countries (Pasque, Manguelle-Dicoum Biyong, Ricong-Adie *et al.* 1999). Available evidence indicates that puberty in boys is also heavily delayed.

The growth of Malawian children of school ages from urban Blantyre reported in this study exhibited the typical pattern for all developing countries. Generally, Malawian children were both shorter and lighter than children from well nourished populations. Low weight-for-height values also indicated small body sizes of Malawians. However, this parameter was not as affected as weight-for-age and height-for-age were. Nevertheless, some differences between anthropometric parameters of Malawian children and limited data from the region were found. The heights, weights and triceps skinfold of the younger Malawians of both sexes were similar to those of 'average' urban children from Soweto in South Africa (Wagstaff, Reinach, Richardson *et al.* 1987), East Africans (Davies *et al.* 1974) and Tswana children (Corlett 1986). The older Malawian boys and girls were taller and heavier than East African children. Comparison with older Tswana and urban 'average' South African children was not possible due to lack of published data on these age groups. Malawian children of all ages tended to be smaller and less overweight than South African urban well-off children (Cameron *et al.* 1992) but their heights, weights and triceps skinfolds were close to South African rural Ubombo children that had relatively good growth pattern (Cameron *et al.* 1992).

Undernutrition is the main environmental factor that is likely to affect growth of Malawian children. The prevalence of chronic childhood malnutrition is still high in Malawi (Pelletier *et al.* 1991, Quinn *et al.* 1995) with resulting short stature as physiological reaction to nutritional stress (Balam and Gurri 1994). Poverty, poor quality of water, household overcrowding, inadequate health services in semi-urban Blantyre increase risk of repetitive infections which also contribute to growth retardation (Ibrahim, Wall and Persson 1998). At present it is not possible to assess growth potential of urban Malawian children due to scarcity of published data on adult anthropometry. According to the reported data (Eveleth and Tanner 1976, Pelletier *et al.* 1991), adult Malawians of both sexes from rural areas are among the shortest and leanest Africans. However, it is difficult to disentangle the effects of genetic factors on growth from those of environmental conditions. It is well known that adults from poor socio-economic groups, particularly from rural areas, have short stature as adults. Older Malawian school boys from the study sample had the same height as rural Malawian adults aged 18–29 years (Pelletier *et al.* 1991) but were considerably lighter. Older girls were both taller and heavier than rural young women. Taking into consideration possibility of late increments in height for children from low socio-economic groups (Hulanicka and Kotlarz 1983), the differences between urban and rural Malawians might increase with further growth of children from the studied sample.

Generally, the differences between Malawian and Western children progressively increase as they approach adolescence but during late adolescence the differences decrease and values of Malawians approach the 50th percentile of WHO/NCHS references. This is consistent with data from South Africa (Cameron *et al.* 1992), Senegal (Simondon, Simon and Simon 1997) and Gambia (Billewicz and McGregor 1982). Several factors might contribute to late growth in African children. They enter the period of rapid growth during late adolescence and probably have longer growth period due to delayed sexual maturation (Cameron, Gordon-Larsen and Wrchota 1994, Simondon, Simondon, Simon *et al.* 1998). It is not possible to assess annual increments in anthropometric parameters in a cross-sectional study. However, differences in weight and height between 16- and 17-year-old children of both sexes in this study might be considered as an indicator of late 'compensatory growth'

(Cameron *et al.* 1994). Improved nutrition after prolonged periods of nutritional deprivation due to migration, or regular work in children of African descent and Africans also increases growth rate as humans have a remarkable capacity for catch-up growth (Steckel 1987, Simondon *et al.* 1997). However, we believe that there was no considerable socio-economic differences between older and younger children in this study. Therefore, nutritional factors are unlikely to play the major role in catch-up growth of Malawian children.

Age-related gender differences in anthropometric parameters and maximal grip strength values are the most striking features of this study. Relative to reference values of well nourished populations, weight, height, mid-upper arm circumference and mid-upper arm muscle circumference of girls were higher than those of boys, and adolescent girls exhibited considerably higher catch-up for these parameters than the boys. However, mean triceps skinfold thickness values of the boys were closer to reference values than those for girls. The gender differences were particularly big for weight, mid-upper arm muscle circumference and maximal grip strength values. For example, mean maximal grip strength values of 17-year-old Malawian boys were about 30% lower than North American norms while for girls this difference was only 5%. Our data on gender differences in anthropometric characteristics concur with some other studies conducted in Africa. Simonden *et al.* (1998) demonstrated evidence of catch-up growth in stunted girls aged 16–17 years but not the boys. Data from Senegal (Benefice and Malina 1996) showed more favourable growth status of girls compared with boys in prepubertal ages. Corlett (1986) demonstrated weight spurt in older Tswana girls that did not occur in boys. It was proposed that girls have better resistance to adverse environmental conditions (Hiernaux and Boedhi Hartono 1980, Benefice and Malina 1996) and their growth is less sensitive to inadequate nutrition than boys. Late compensatory growth of Malawian girls might be more prolonged or might have higher velocity than that of boys. An additional longitudinal study is required to prove this suggestion. It is unlikely that the older girls came from better-off families than boys of similar ages. However, girls probably have better access to food in Malawi due to participation in domestic activities, particularly cooking. Girls are also more involved in domestic physical work than boys, which might result in upper limb muscle hypertrophy. Our data on MUAMC and maximal grip strength values of adolescent girls support this suggestion. The similar differences in upper limb muscle area between sexes were described for Malawian adults (Pelletier *et al.* 1991) and other communities in developing countries (Little, Galvin and Magambi 1983, Black, Heirholzer, Black *et al.* 1997).

The present results do not represent the growth pattern of average urban children in Malawi but rather describe anthropometric parameters of urban children from low-income families attending state schools. With the increasing rate of urbanization in the country and relatively poor socio-economic conditions in towns, this population of children will rapidly expand.

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Zusammenfassung. Das Anliegen dieser Querschnittsuntersuchung bestand darin, Wachstumsmuster von städtischen Schulkindern niedriger sozioökonomischer Schichten aus Malawi zu ermitteln und die anthropometrischen Messungen der Kinder mit Daten aus der Region Süd-Zentralafrika und mit internationalen Standards zu vergleichen. Insgesamt wurden 493 städtische Schulkinder zwischen 6 und 17 Jahren aus zwei Grundschulen im semi-urbanen Blantyre, der größten Stadt in Malawi, mittels Randomisierung ausgewählt. Die anthropometrischen Messungen beinhalteten die Körperhöhe, das Körpergewicht, den Umfang am mittleren Oberarm, die Hautfaltendicke am Trizeps, den Muskelumfang am mittleren Oberarm und die maximale Handdruckkraft der stärkeren Hand. Alle Parameter der Kinder beiderlei Geschlechts aus Malawi waren niedriger als die Medianwerte der WHO/NCHS Referenzdaten. Ausgedrückt in Prozent der WHO/NCHS Referenzdaten waren die relativen Mittelwerte der Körperhöhe, des Körpergewichts, des Umfangs am mittleren Oberarm und des Muskelumfangs am mittleren Oberarm der Mädchen aus Malawi beträchtlich höher als diejenigen der Jungen und die älteren Mädchen wiesen bessere Parameter auf als jüngere. Ältere Kinder beiderlei Geschlechts hatten größere Trizepshautfaltendicken relativ zu den internationalen Referenzdaten als jüngere Kinder. Die mittleren Werte der maximalen Handdruckkraft von Jungen und Mädchen waren nicht signifikant voneinander verschieden. Bei den Mädchen erhöhten sich die relativen Werte mit dem Alter während sie sich bei den Jungen verringerten. Es wird geschlussfolgert, dass jüngere Grundschulkinder ähnliche Körpergrößen haben wie ihre Altersgenossen aus der Region. Jugendliche, besonders Mädchen, weisen günstigere anthropometrische Parameter auf, die sich den WHO/NCHS Referenzdaten annähern.

Résumé. L'objectif de cette étude transversale est d'apprécier les modalités de croissance d'écoliers de milieu socio-économique modeste du Malawi et de comparer leurs mesures anthropométriques à celles des enfants de la partie méridionale de l'Afrique Centrale ainsi qu'aux standards internationaux. 493 écoliers urbains âgés de 6 à 17 ans ont été choisis au hasard dans deux écoles primaires demi urbaines de Blantyre, la plus grande ville du Malawi. Les mesures anthropométriques comprenaient la stature, le poids, la circonférence du bras, le pli cutané tricipital, la circonférence maigre du bras et la force dynamométrique maximum de la main la plus forte. Toutes les valeurs des enfants malawi des deux sexes, étaient inférieures aux médianes des données de référence de l'OMS/NCHS. Exprimées en pourcentages de ces références, les valeurs moyennes relatives de la stature, du poids, de la circonférence du bras et de la circonférence maigre du bras des filles malawi, étaient considérablement plus élevées que celles des garçons et les filles les plus âgées présentaient de plus fortes valeurs que celles des plus jeunes. Les élèves les plus âgés dans les deux sexes, avaient une épaisseur de pli tricipital plus grande que les plus jeunes relativement aux références internationales. La force dynamométrique maximum ne différait pas significativement entre filles et garçons. Ses valeurs relatives chez les filles augmentaient avec l'âge alors qu'elles diminuaient pour les garçons. La conclusion est que les jeunes écoliers ont des formats corporels similaires à ceux de leurs homologues de la région. Les adolescents, en particulier les filles, ont des valeurs anthropométriques plus élevées qui les approchent des données de référence OMS/NCHS.