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Height and Weight of Javanese in Malang (Indonesia): Increments of Two Times Measurements within 2 Years Abbreviated title (running headline): Height and Weight Increments of Javanese in Malang

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ABSTRACT

Background: It is commonly assumed that the main reason for variations in child growth among various countries are living conditions, especially those influencing nutritional status and health status. Although undoubtedly true, other factors may also diffrentiate growth among various populations. Objective: No studies have been found in East Java that included the adolescents' increments of growth. Therefore this study intended to provide Javanese adolescents' increments of growth to complement the lack of data from this area. Methods: A mixed-longitudinal growth study of well-off Javanese has been carried out in Malang. Heights and weights of 499 males and 617 females were measured in year 2000 and 2001. Results: Javanese males' peak height velocity (PHV) was 89.3 mm/year, and the females' was 69.7 mm/year. The age of PHV was around 13 years and 11 years in males and females respectively. The PHV of the males and females were comparable to those of NHANES that were computed from the averages. The peaks of weight velocities (PWV) of Javanese males and females were lower and earlier in timing than those of NHANES. Conclusion: The age of PHVs were similar to those of NHANES. Further studies—such as longitudinal study—in well-off children need to be done to better understand the characteristics of PHV and PWV in human.

Keywords: PHV, PWV, velocity, mixed-longitudinal, NHANES

INTRODUCTION

Child growth studies began at the 18th century, and were initially conducted in well-off families. Thereafter more children were measured in developed countries. Recently the interest grew to comparing children from developing countries to those from the developed countries in order to use child growth as one of the indicators of population health.

One of the themes of research related to child growth studies has been the documentation of growth variation among populations(1). It is commonly assumed that the main reason for variations in child growth among various countries and subgroups of populations are living conditions, especially those influencing nutritional status and health status. Although undoubtedly true, other factors may also diffrentiate growth among various populations. Until recently, it was difficult to separate environmental and genetic regulators of child growth in broad population surveys because populations of various countries, or provinces difer in both their genetic make-up and living conditions. With the socio-economic progress in developing countries, recently it became possible to find in those countries sizeable subgroups characterised by living standards directly comparable with those of developed countries. This

way an opportunity arose to test whether factors unrelated to socio-economic inequalities influence child growth at a population level.

Height and weight are often used in populational studies assessing nutritional status. Since children growing in optimal nutritional conditions may have different heights and weights at the same age, such "nutritional" status studies outside of Europe and North America should be treated with caution.

There are fewer growth studies of the velocity of growth, which need a longer period of study than a cross-sectional one, of children from well-off backgrounds in non-Western countries. Growth studies have been conducted in Japan (2, 3, 4, 5, 6, 7), Hong Kong (8, 9, 10, 11) and Taiwan (12, 13, 14, 15, 16) but there are few from other parts of Asia such as Indonesia.

Indonesian growth studies are mostly reported in Indonesian journals. Most of them were, again, cross-sectional studies. There are fewer growth studies of schoolchildren from Junior and Senior High Schools compared to those of newborns and toddlers. So far, no studies have been found in Indonesia that included the adolescents' increments of growth.

Therefore this paper includes some measurements of Javanese adolescents' increments of growth to complement the lack of data from this area.

SUBJECTS AND METHODS

Indonesia is an archipelago located on the equator between two continents, Asia to the north and Australia to the south. Java is one of five large islands, and is highly cultivated. Today Malang has almost 1 million inhabitants and is the second largest city in East Java, after the capital city of the province (Surabaya). Malang is located approximately 90 km south of Surabaya. The city of Malang is also the capital of Malang Regency, which is rich with agricultural products and crafts. Malang is considered the most desirable city in which to live in East Java, for its fertile land and cool climate. Rice is the primary food of the Javanese. Supplementary foods include meat (mostly from domesticated animals such as chickens, cattle and sometimes sheep), fish and vegetables. Varieties of fruit are also abundant.

The study was conducted in elementary, junior and senior high schools that serve higher socio-economic status communities in Malang. Participants were measured twice, the second measurement was conducted a year after the first measurement. Increments in height and weight were calculated for every individual (499 males and 617 females).

Height was measured using standard anthropometer, and weight was measured with a calibrated scales while the children were wearing light clothing.

For the purpose of health monitoring, Indonesian medical practitioners and auxologists following the recommendation of WHO, recently use NCHS reference charts for comparisons with the height and weight of the children. A newer growth reference (NHANES) was used in this study (17).

RESULTS AND DISCUSSION

Height increments of Javanese males declined slightly until about age 10 years, and then the rate increased at around puberty. The peak height velocity for Javanese males occurred at age 13 years. The growth in height had continued until the age 18 years when measurement stopped, although the decreased increments started at age 14 years (Figure 1).

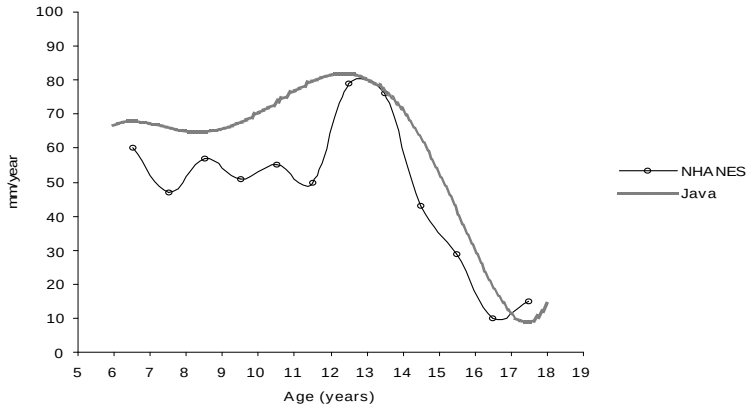

Figure 1. Height increments of Javanese males compared to NHANES

Weight increments increased from age 7 years until around age 11, later they started to decrease. The average of weight increments at age 12 years was lower than those at age 11 and 13 years, so that Javanese males seemed to have two peaks (Figure 2). This might be a result of the small number of individuals in age group 12 years.

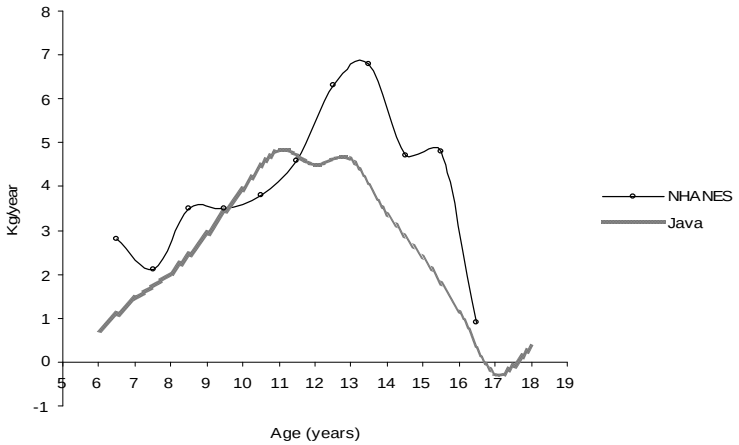

Figure 2. Weight increments of Javanese males compared to NHANES

The overall view of growth increments of Javanese females was that the rate of growth demonstrated a peak before menarche started, and slowed down after menarche (18). The coincidence of the timing of the peak and the start of menarche agrees with previous studies from other countries (13, 19).

The height increments for Javanese females reached their peak around age 11 (Figure 3), and the increments slowed down afterwards.

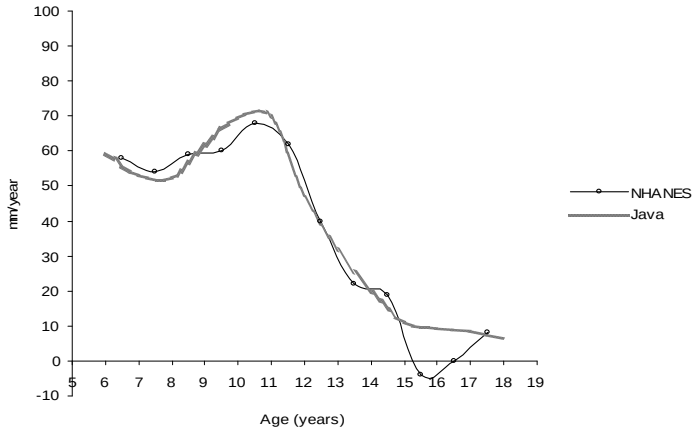

Figure 3. Height increments of Javanese females compared to NHANES

The peak weight velocity of Javanese females occurred at age 10 years (Figure 4). At age 15 (Table 2), Javanese females had already experienced a slow rate of weight increase.

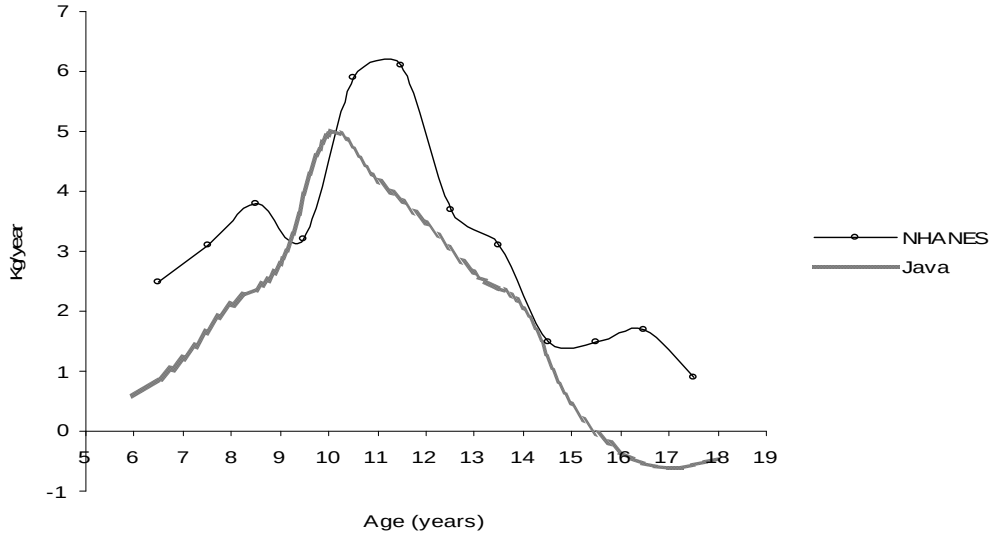

Figure 4. Weight increments of Javanese females compared to NHANES

Height of Javanese males grew relatively faster than in the females. The magnitude of PHV in males was 89.3 mm/yr compared to 69.7 mm/yr in females.

The averages of height of Javanese males and females were slightly below the 50th percentile of NHANES (20), but the peaks of height increments (Figures 1 and 3) were comparable to those of NHANES. Those peaks are calculated from cross-sectional NHANES data and thus underepresent actual velocities. It follows that high socio-economic status Javanese children experience lower peak growth velocities than their American counterparts. Although in early years (around age 7 years) the averages of Javanese's weight were similar to those of NHANES (20), the peaks of weight increments (PWV) were below those of NHANES. However, the age of PWV in Javanese males and females seemed to be younger than those of NHANES (Figures 2 and 4).

Some studies have been done to investigate the correlation between PHV, genetics and environment. Leuven Longitudinal Study has concluded that genetics was more influential in the timing and velocity of adolescent growth spurt (21). The age of PHV and PWV were not affected by socio-economic difference between Swedish schoolchildren (22).

CONCLUSION

The age of Javanese PHVs were similar to those of NHANES. Further studies—such as longitudinal study—in well-off children need to be done to better understand the characteristics of PHV and PWV in human. More studies should be conducted, such as comparing samples with similar genetic background living in different environments.]

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