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Anatomical and Physical Characteristics for Asian Reference Man

— A Proposal —

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ABSTRACT

Asian Reference Man was proposed that might represent people who inhabit Asia and are North, South East Mongoloid and South Caucasoid. They live in the region of average temperature, 10-30 ^{o}C and live primarily on foods of plant-origin. Reference values were proposed for dimensions (body height, chest girth, sitting height and upper and lower limbs, etc.), masses (body weight, weight of internal organs and tissues) and body composition (body lipid, LBM, mineral, protein, body water) in relation to growth and maturation. Six age groups of interest in current radiation protection were taken, i.e. 0, 1 (infant), 5, 10 (child), 15 (adolescent or teen) and 20-50 years (adult). Some data were also given to the fetus. For females, however, data on masses of organs were somewhat limited.

FOREWORD

This publication deals with characteristics of Asian Reference Man hopefully for use in radiation protection:

-reference values that are aggregated and or adjusted figures to represent Asian populations,

-that were prepared under the original guidelines of the Task Group on Reference Man Revision to select only one among possibly available Asian man data, and

-that are comprehensive and consistent as those of current ICRP Reference Man.

The need of this type of reference man has repeatedly been referred to by the Task Group on Reference Man Revision of ICRP Committee 2 from its conception at the Oak Ridge National Laboratory in 1986.

It includes part of the data submitted to the Task Group on Reference Man Revision and other data presently supplemented by the author, Dr. Tanaka, originally Member of the Task Group and who is Senior Research Counselor, Division of Radioecology, NIRS. He is solely responsible for these data presented.

It should be added that the whole work aims to cope with problems in internal dose assessment through co-operation between National Institute of Radiological Sciences and Asian Center for Reference Man Studies, and Oak Ridge National Laboratory.

It is hoped that this report will offer a guideline to form possibly a unified framework for reference man for Asian populations.

H. Kawamura (editor)
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Editor's note

This publication contributes in part to the Project Research on Assessment of Radiation Exposure of the Public to Radioactivities Related to the Environment and Food Chain.

Division of Radioecology

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CONTENTS

FIGURES

1. INTRODUCTION

1.1 Need for new data on characteristics of man

For the purpose of radiation protection, quantitative description of the physical, physiological and metabolic characteristics and life style of man should be the basis for calculating equivalent doses and annual limits on intake for radionuclides (ICRP 1979). This seems to be the same approach adopted in the revised basic recommendation by the ICRP (ICRP 1990).

The ICRP recommended the use of Reference Man to replace Standard Man as model of man to be applied in radiation protection, and compiled as much data as available on the anatomical, chemical and physiological parameters (ICRP 1975). Committee 2 of the ICRP set up the Task Group on Reference Man Revision to revise and extend Reference Man in the light of newly accumulated data with special consideration on both sexes and ages (Richmond 1985). This means it will consider radiation risks for not only radiation workers but also members of the public. As a result, the revision are being carried out to cover data for women and children. Some anatomical data for mathematical phantoms were given for the male and female of the following discrete ages: 0, 1, 5, 10, 15 years and adult, to cover practically all ages (ICRP 1989).

1.2 Need for Asian Reference Man

Recent interest in variation of human characteristics has lead also to consideration of and establishing reference values for Asians, one of non-European populations.

ICRP Reference Man, according to the definition, is primarily for Caucasoid populations (Western Europeans and North Americans) that contributes approximately 13% of the world population. A speculative world population dose when assuming a uniform exposure all over the world at a level of 10 uSv, will be 5×10^4 man Sv in total. To this, all regions of Caucasoid populations may contribute about 22% at maximum. Asian populations will share about 58% (2.9×10^4 man Sv) of the world population dose (Tanaka 1989). Therefore, about eighty per cent in total of the world population can be covered in scientific dose assessment, if reference man data for Asians are made available. Thus the significance of establishing Asian Reference Man is evident.

1.3 Significance of Asian population in radiation protection

Variations in the population of the world during the period from 1950 to 2020 were reported by United Nations (1991). The "medium variation" estimated

for the Asian regions is reproduced in Table 1. The total number of population inhabiting these regions is estimated to be 3.11 billion in 1990 and accounts for roughly 60% of that of the world. The variation in populations of the East, South Eastern, Southern and Western Asia as well as in their total number is graphically shown in Fig. 1. It should be noted that the rates of increase of the Southern Asian population is among the highest in the world.

As the economic development in Asian regions continues to progress, their industrial structure may shift rather rapidly from primary industries including agriculture to the secondary (and then tertiary) industries. This will necessitate increased demand for energy supply in Asia, and it is reasonably expected that the share of nuclear power would grow in the total energy production possibly in a near future. With such a situation to come in mind, it may be apparently urgent to establish models of man including phantoms to be used for dose assessment to cope with problems in the radiological protection.

It should also be stressed that the construction of a single, common Asian Reference Man to cover as many populations as practicable be made by systematically analyzing the obtained raw data using the common basic idea of the ICRP Reference Man and in cooperation with ICRP and IAEA.

It has been observed that differences exist for habitat, race, body sizes, customs and pattern of food consumption between Asian, and Western European and North American populations for that Reference Man has been recommended by the ICRP (Tanaka et al. 1979; ICRP 1975).

1.4 Dietary pattern

One of such differences between Asian and European populations, for example, lies in the fact that Asians generally consume more foods of plant-origin, i.e. foods with lower calories than Western Europeans and North Americans. This is in contrast to the typical food habit for Western European and North American populations, or dependence on foods of animal-origin as shown in Fig. 2 (see next page).

2. ASIAN REFERENCE MAN

2.1 Definition

Asian Reference Man is defined as a group of reference man and woman of specific ages who represent the populations living in Asia and have customs and food habit there.

Their somatological and anatomical data are closely alike each other and

Table 2. Asian Reference Man as proposed and compared with current ICRP Reference Man

	Asian Reference Man	Current ICRP Reference Man*
Age (y)	35 (20-50)	20-29
Body weight (kg)	60	70
Height (cm)	170	170
Habitat and food habit of	Asia	Western Europe and North America
Race	Mongoloid and South Caucasoid	Caucasoid

*) ICRP Publication 23 (1975).

their dietary habit is similar in type and quantity. Comparatively speaking, they are more vegetarian than Western peoples are.

Asian Reference adult male is 170 cm high (approximate range: 165-172 cm) and weighs 60 kg (approximate range: 55-62 kg). In comparison, current ICRP Reference Man is 170 cm tall and weighs 70 kg, respectively as shown in Table 2 while slightly larger values are proposed recently, e.g. 176 cm and 73 kg.

2.2 Nature of the data involved

Asian Reference Man is based on the scientific concept common with the ICRP Reference Man for Caucasians. The reference values were established by the same system as was used by ICRP. The data were obtained from the following publications and chosen on the basis of reliability:

a) publications of international bodies, i.e. United Nations, FAO, WHO, ICRP, IAEA, UNSCEAR,

b) official statistics published by governments,

c) scientific journals, reports published by national laboratories, and

d) other academic publications.

The reference values are, therefore, based on data of proper scientific standards.

The reference values proposed in this publication can easily be renewed in any case where the ICRP Reference Man is revised, following the common concepts.

The present system would be consistent with any ICRP's and other publications when applied to dose assessment.

The values in this publication came from extremely large amount of data inputs which were repeatedly tested for accuracy and consistency with statistics using appropriate programs for universal and personal computers. They can duly be called reference values.

2.3 Structure of ICRP Reference Man and Asian Reference Man

The data are classified as anatomical (i.e. masses, dimensions and other physical characteristics of the body, organs and tissues), chemical (i.e. concentrations and contents of elements in the body and tissues) and physiological (i.e. intakes and excretion of elements and other metabolic and physiological data) parameters. The ICRP Reference Man also include quantitative information in relation to dosimetric models for the respiratory and digestive tracts. Data obtained from normal and healthy subjects should be the basis for Asian Reference Man and ICRP Reference Man.

In summary, Asian Reference Man has the same basic concept and system as those of ICRP Reference Man (ICRP 1975), but was constructed sometimes with different parameters or reference values.

2.4 Population studied

Generally speaking, the body height and other physical measurements tend to be comparatively shorter or smaller in peoples of the south and relatively higher or larger in those of the north. This appears to be the case also with the Asian peoples. The data used in this report was mainly from Japan and partly from China because of availability.

Concerning origin of the Japanese population, a "dual structure model" in anthropology is worth being referred to (Hanihara 1991). According to this model, people from somewhere in the southeast Asia first inhabited the Japanese Archipelago in the Upper Palaeolithic age. The people gave rise to Jomo-

nese in the Neolithic Jomon age. Later, in Aeneolithic age, people began to migrate from the northeast Asia into the Archipelago (through Korean Peninsula, and some other routes from the continent).

During one thousand and several hundred years since its beginning, the immigrants (gradually increased in number and) were mixed with the pre-occupant Jomonese to form a "dual structure" of the modern Japanese people. Therefore, the populations in Japan can, strictly speaking, not be said homogeneous.

Assuming the above hypothesis, it can be inferred that physical measurements of the Japanese people can probably be suitable in setting reference values to represent peoples living in East Asia and hopefully in South Eastern Asia.

3. OBSERVED AND REFERENCE VALUES FOR ASIAN REFERENCE MAN

3.1 Measurement of physique

3.1.1 Fetus

The body height and weight of the fetus of various gestational ages are shown in Table 3 and 4. The gestational week as expressed in the Western way is shown in the first column while in the second column, the normal week for parturition is denoted as 0, the prenatal week being expressed as minus. This is to facilitate recognition of the fetal age because a difference exists between the European and Japanese methods of counting weeks of pregnancy. The observed data points were fitted with polynomial equations by the least square method and the resultant curves are shown in Fig. 3.

3.1.2 Newborn, infants and children under 6 years old

Substantial number of data were obtained from the publication which are made available in every five years under the supervision of the Ministry of Health and Welfare (Mothers' and Children's Health and Welfare Association 1991). The values for body height, body weight and chest girth of males and females, newborn to under 6 years are shown in Table 5, 6 and 7, respectively.

3.1.3 Children, adolescents and adults

Concerning measurements physique or anthropometric measurements of Japanese, annually reported data were available in the School Health Survey carried out by the Ministry of Education, Science and Culture (1977a-1991) and the data in the National Nutrition Survey yearly conducted by the Ministry of Welfare were also referred to (1979-1990) as described elsewhere (Tanaka 1992). The number of data in the former statistics for the children and adolescents

amounted to 7.78×10^6 in total during the period from 1976 to 1988. That for the latter study was approximately 20,000.

Data from China was available through a national surveillance of the physical measurements first carried out in 1979 (State Education Commission et al. 1988) where the number of subjects studied in this single study was 9.85×10^5. Also available were the results of a joint study on Japanese and Chinese students (Asami and Chen 1986). Wang et al. reviewed recent Chinese data (1992).

Means and standard deviations of lengths and weights of the total body, and sitting heights and chest girths of the Japanese male and female, as averaged for the period from 1976 to 1988, were described previously (Tanaka 1992). Frequency distributions in Japanese of these physical measurements for the age 17 during 11 years starting from 1975 were obtained to analyze distribution patterns (Gaussian or skewed) (Ministry of Education, Science and Culture 1977a-1986).

Height and weight of the body of Japanese and Chinese of various ages from birth to 18 and 20 years are shown in Table 8 and 9. Comparison of the above Japanese and Chinese data showed no appreciable difference. Similar conclusion was drawn also from the results of a joint study on children and youth (Asami and Chen 1986).

Consequently, from the both data, reference values for Asian Reference Man were obtained and the results are also shown in Tables 8-9.

Secular trends in growth of Japanese since early 1900s has been known (Matsumoto 1982). However, analysis of data from the Japanese school statistics revealed only slight changes during the past thirteen years in the frequency distribution of four types of anthropometric measurement. This suggests that the growth of Japanese is coming to nearly a steady state. The statistics for physical measurements for healthy subjects aged 0-80 years by the Ministry of Health and Welfare showed similar values.

Taking statistical variation into consideration, a man of 65 kg or another man of 55 kg in weight, for instance, is within one sigma range and can be regarded to belong to the typical physique of Japanese or Asian.

Acceleration of growth in Koreans and Japanese was studied comparatively and the acceleration rate in Koreans was found 1.3 to 1.4 times faster than in Japanese by analyzing the Statistics on Education in Korea (Song et al. 1985).

Reference values for the male adult, 15, 10, 5, 1 and 0 (3 month) year-old children are listed later in Table 18.

The percentiles (10, 25, 50, 75 and 90th) body weights for different age

groups, i.e. 5-13, 14, 15, 16, 17, 20-39 and over 40 year-old, were obtained by analyzing the data published during recent ten years (Ministry of Education, Science and Culture; Ministry of Health and Welfare) with the total number of samples of more than five millions. The 50th percentile figures were considered, for the purpose of the present report, to be "reference body weights" for each of body heights in the seven age groups. The data was used later in estimating body lipid content.

3.2 Lengths of upper and lower limbs

These parameters are important since they are to be used in designing phantoms as well as estimating lengths of bone in the limbs. The lengths of interest were obtained using the established equations (Hoshi 1989) and shown in Table 10 and 11.

3.3 Body surface

Body surface is an important parameter in relation to metabolism. Reference values of the body surface for males of different ages were obtained by using the Fujimoto's equation (Ministry of Health and Welfare 1979b) and are shown in Table 18. The detailed estimates for ages 0 to 79 years obtained by using different methods are compared elsewhere (Tanaka 1992, Table 76).

3.4 Skinfold thickness

Averages and standard deviations of skinfold thickness for males and fe males from 15 to over 70 years (Ministry of Health and Welfare 1978-1991) were summarized and the results are shown for the two periods, from 1975 to 1980 and 1981 to 1989 in Table 12a and 12b. No noticeable difference was seen between the two periods. Skinfold thickness of males and females, 0 to over 70 years, are shown in Table 13. The observed values of skinfold in relation to age are graphically shown in Fig. 4 along with fitted polynomial curves for both sexes.

3.5 Mass of organs

Reference values for masses and dimensions of organs are essential parameters in the assessment of equivalent doses following intake and deposition of radionuclides in the body. It is impossible so far to obtain measurements of organ weights in vivo, while the measurements at autopsy for the pathological studies are generally not appropriate for radiation protection purposes

since those patients who died of diseases are regarded as somehow different from normal and healthy subjects who were socially active.

The weight and size of twelve organs in the male and eleven organs in the female were measured in autopsy cases during the period between 1971 and 1976 (Tanaka et al. 1977; 1978; 1979). Autopsy was carried out at the Tokyo Medical Examiner's Office 12 to 24 h after death for normal subjects who died of sudden deaths. From the protocols of 10,598 cases, 2,880 cases were selected, then the results were put into and statistically analyzed by a computer (CDC 6600).

The above data were supplemented recently: 5,370 cases with no or little pathological change, from the approximately 18,000 autopsy cases in total during the period between 1970 and 1980, were selected and analyzed as shown in Table 14 (Tanaka, Nakahara, Nakajima 1989). Ages less than one year were included. The data, from individuals regarded as practically normal and healthy, will be most appropriate for use in considering mass of organs in Asian Reference Man.

Means and standard deviations of masses of twelve and eleven organs for healthy normal Japanese males and females, respectively, of ages from 0-1 months (regarded as newborn) to 80-89 years were described in detail elsewhere

Table 14. Number of autopsy cases for normal Japanese children and adults of both sexes*.

Age (y)	0	1-19+	20-30	31-50	50-	Total
Male	200	550	1000	1300	850	3900
Female	150	370	250	300	400	1470
Sum	350	920	1250	1600	1250	5370

*) Sudden deaths of subjects who supposedly lived normal lives until death.

+) For ages 2-18 y, cases from another source of the same nature are added.

(Tanaka 1992, Tables 8-22). Relative weights of organs to the total body weight as measured for every subjects at autopsy were also shown although the body weight appeared to be subject to change after death. The observed values of organ masses at various ages were, furthermore, processed by use of ICSVKU in a program package CMSL to obtain cubic spline approximation functions on an IBM 3084 computer (Tanaka 1992). The "smoothed" growth curves for each organ thus obtained will, although they were obtained from a cross sectional study, and not from a longitudinal one, provide invaluable quantitative information on the growth of individual organs which was mentioned briefly (ICRP 1975).

Representative weights of these organs in males and females at any discrete age, i.e. 0-1 and 2-3 months, 1, 5, 10 and 15 years, and adult (20-50 years) were also given (Tanaka 1992, Table 77).

The results for the adults were compared with the corresponding data obtained in 1952 for the Japanese who were normal but in low-levels of nutrient intakes after the World War 2 (Aimi, Yasoshima, Sugai, Sato, Sakai, Nakajima 1952). Since that time, weights of the liver increased by 8%, and weights of the kidney, heart, spleen and adrenal gland by 15-20%. However, pituitary gland showed an 18% decrease while almost the same values were found for the brain and thyroid gland during the past about 30 years. The data will be useful to consider effects of nutritional levels on masses and dimensions of internal organs in a population.

3.6 Regression analysis of organ masses in relation to body height

Interest in correlations between the organ mass on the one hand and body weight or height, or both on the other has led to the present study in which a regression analysis was made on the organ masses in relation to the body height. The body weight is of the primary interest, but, however, the total body weights actually obtained appeared to be slightly less than the expected ones perhaps due to some dehydration after death.

The data were taken from those obtained in the previous study (Tanaka, Nakahara and Nakajima 1989) as shown in Table 15 (see next page).

All statistical analyses were performed to obtain basic statistics, regression coefficients and correlation coefficients for eight age groups, 0-2, 3-7, 8-12, 13-19, 20-34, 35-49 and 20-49 years, by using HALBAU or High Quality Analysis Libraries for Business and Academic Users (Yanai, H. and Takagi, H. 1986).

The results of analysis are shown in Figs. 5-34 including a scatter plot,

Table 15. Data used for regression analysis

Age group (y)	Sex	Sample no.* of organ	Av. age ± S.d. (y)
0-2.9	M	93-201	0.69 ± 0.55
	F	109-196	0.62 ± 0.52
3-7.9	M	47-53	4.97 ± 1.16
	F	69-74	4.73 ± 1.13
8-12.9	M	30-35	10.07 ± 1.10
	F	45-54	9.93 ± 1.07
13-19.9	M	70-87	16.9 ± 1.6
	F	78-95	16.3 ± 1.7
20-34.9	M	314-651	27.8 ± 4.0
	F	147-354	27.1 ± 4.1
35-49.9	M	185-1024	42.6 ± 3.5
	F	186-383	42.4 ± 3.6
20-49.9	M	499-1669	36.8 ± 8.1
	F	333-735	35.1 ± 8.5
0-49.9	M	911-2125	30.2 ± 14.7
	F	788-1251	23.5 ± 16.0

*) No. of available data varies with organ.

fitted regression line, linear correlation coefficient (r) for each age group. Estimated organ masses for a few specified body heights (representing ages of interest) are also shown in the same figures.

Correlation coefficients were generally low except for the age groups 0-2.9 years; in the adult groups, correlation coefficients were less than 0.4. However, the fitted regression line will be useful to estimate an organ mass for a specified body height, which is in turn a function of age in case of a child who is growing.

3.7 Mass of the skeleton

3.7.1 Mineral bone and other tissues

Skeleton consists of bone, marrow, skeletal cartilage and periarticular tissues (ICRP 1975).

Weights of 17 complete sets of bone samples of Japanese were measured by a rapid method (Tanaka, G. and Hoshi, H., Unpublished data). The weights obtained included 9.7% of water content, and, adjusted to the water content of mineral bone, 17% (ICRP 1975). Masses of mineral bone of various parts of the skeleton are shown in Table 16.

Weights of different parts of bone were previously estimated from those of dry bone referred to in the selected literatures and the measurements made on more than one hundred skeletons (Nomura, Tanaka, Hanihara and Hoshi, Unpublished data). Conversion factors for the dry bone to estimate weights of the wet bone were calculated and shown in Table 17.

Mass of the cartilage and periarticular tissue are 900 and 700g, respectively and weight of the skeleton including marrows is 8.4 kg as shown in Table 22.

3.7.2 Bone marrow

Bone marrow consists of active red marrow and yellow marrow. The former is located mostly inside the trabecular type bone and is highly important in view of radiation risks to man.

Relative distribution of the red marrow in different types of bone was taken from Ellis's data for a Caucasoid skeleton (Ellis 1961) rather than Hashimoto's for the Japanese (Hashimoto 1960; 1963) because of the apparently too small distribution of the red marrow in vertebral bones in the latter data. Also the marrow weights were normalized to blood contents (ICRP 1975). The weight of the red bone marrow for Asian Reference Man is 1000 g as shown in Table 22. Another value, i.e. 765 g reported by Hashimoto et al. was not adopted following discussions in the ICRP Task Group on Reference Man in 1988. It is currently 1,500 g for ICRP Reference Man.

Reference mass of the yellow marrow is 1300 g (see Table 22).

3.8 Body composition

The contents of water, lipid (or fat) and mineral were determined for some number of tissue samples from normal Japanese subjects (Tanaka and Nomura, Unpublished data), but they were not adopted for the present paper.

In considering composition of the body and tissues, it is most appropriate to use a concept of Lean Body Mass (LBM) which can be obtained by subtracting the mass of the body lipid from the body weight (Forbes 1987), as a measure of mass of active tissues. The Lean Body Mass was used as the basis for estimating the contents of blood, water and muscle in Asian Reference Man. The "gross contents" or contents of body constitutents of ICRP Reference Man (ICRP 1975) were taken into consideration in the present report.

3.8.1 Lipid (body fat)

The lipid content is usually estimated by using the results of whole body counting of potassium-40 or by using measurements of skinfold thickness. Using the data on skinfold thicknesses obtained for various ages as shown in Tables 12-13, the lipid content in per cent body weight was estimated by Nagamine's equations, which were modified from Brozeck's to apply to the Japanese of different ages (Nagamine, Suzuki 1964; Nagamine 1982). The results are shown for the males and females from newborn to 70-79 years in Table 19. The equations are referred to elsewhere (Tanaka 1992). Body lipid content of males and females, 15 to over 70 years, were first estimated in Table 12a and 12b.

Body lipid is approximately 16.2 and 23.9% of the body weight in the Japanese adult male and female of 20-30 years, respectively. In the male and female of 20-50 years, it is 16.8 and 25.7% in average, respectively. In recent years, however, there is a slight tendency of obesity in Japanese as compared with other populations in Asian countries.

3.8.2 LBM, mineral (ash), protein and body water

The data for LBM, contents of mineral or ash, protein and body water for the males and females from newborn to 79 years old are presented in Table 19. The body water, in general, shows decreasing tendency with increasing age. Mineral content refers to that of the hard tissue, i.e. skeleton and teeth.

The total content of water, mineral, lipid and protein in Asian Reference Man (adult male) is 37.2, 3.2 and 10.0 and 9.2 kg, respectively as shown in Table 18.

These are compared with that of ICRP Reference Man as shown in Table 20. The ratio between Asian Man and Reference Man is 0.857 for the body weight,

and 0.741 for the body lipid (Tanaka 1988; 1990). The content of fat in Asian Reference Man, when normalized to body weight, is 86% of that in ICRP Reference Man. Part of explanation for this difference may come from the difference in consumption of animal fat between the two populations. The relative weight of red marrow of Asian Man is, however, only 67% as presently estimated.

3.9 Physical properties, blood content and composition of organs and total body of Asian Reference Man in comparison with ICRP Reference Man

Reference values for Asian Reference Man (adult male) on physical properties of the 114 tissues, organs and their contents are summarized in Table 22. A few other organs and tissues which are not defined in Reference Man (ICRP 1975), such as penis, was included. The weight of total body is 60 kg, the total volume of blood is 4.5 liters.

These figures are compared with those of ICRP Reference Man for Caucasoids as shown in Table 22 (for the the latter data, refer to Table 105, ICRP Publication 23 in details). The values in this table are based on essentially the same assumptions on the structure of the body, composition of organs and tissues, and their specific activities as those made in the construction of ICRP Reference Man.

However, Asian Reference Man was constructed on the firm basis of observed physical and anatomical data for healthy Asian populations, and, therefore the Table 22 will provide the most suitable basis for dose calculation at least for the Asian adult male.

3.10 Masses of organs and tissues of Asian Reference Man (male) of different ages

The observed weights of 12 organs in the male adult, 15, 10, 10, 5, 1 and 0 (3months) years, reference masses of all organs, tissues and contents as well as their relative weights to the total body weight are presented in Table 23. The reference values in this table and in Table 19 will facilitate more realistic internal dose assessment for Asian male adults, adolescents, children and infants, for whom no suitable data on organ masses did not exist.

For females, lack of data on masses of breast and uterus, for instance, has made construction of Asian Reference female, adults to infants, still to be completed. However, some reference values were presented in this report.

4. PATTERN OF FOOD CONSUMPTION IN ASIANS AND ITS POSSIBLE ROLE IN UPTAKE AND METABOLISM OF RADIONUCLIDES

Geographical differences as well as trends in per caput net coloric intakes, protein and fat in the world are shown in Fig. 2, the data of which were taken from the FAO statistics (FAO 1985). While net supply of energy or calorie per person per day is relatively lower in Asians than North Americans, Western Europeans, and peoples of Old USSR and Eastern Europe, the relative contribution of foods of vegetable or plant origin is by far larger in Asians than in the Westerners. This is also the case with per caput net supply of protein and fat.

An important characteristics of Asians is that they are, comparatively speaking, "vegetarians": a fact which may suggest different pathways of transfer of radionuclides from the environment to the human body.

Furthermore, the intake of much larger amounts of certain elements may cause smaller values of the fractional deposition and biological half-life in organs than those presumed by the ICRP. For instance, 20% or lower of the ingested radioiodine is taken up by the thyroid gland and the biological half-life of the deposited radioiodine is approximately 35 days (Tanaka et al. 1979; Uchiyama et al. 1982; Yoshizawa and Kusama 1976).

Comparison of the thyroidal uptake and retention of ^{131}I was made between the two normal, healthy Japanese male adults who took meals with and without marine algae commonly eaten in Japan before and during an oral administration study. The peak value of thyroidal uptake was 10.3% in the former and was 28.9% in the latter, and this was associated with much larger urinary excretion of stable iodine in the former subject. This effect of lowering internal irradiation is more conspicuous with long lived ^{129}I (Kai 1983).

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Table 1. Variation of the number of population in Asia for the period from 1950 to 2020 ("medium variation", United Nations 1991).

Region and country or Area	Population (thousands) 1950	1960	1970	1980	1990	2000	2010	2020
Asia	1,380,000	1,670,000	2,100,000	2,580,000	3,110,000	3,710,000	4,240,000	4,700,000
Eastern Asia	671,000	792,000	987,000	1,180,000	1,340,000	1,510,000	1,620,000	1,700,000
China	555,000	657,000	831,000	996,000	1,140,000	1,300,000	1,340,000	1,480,000
Hong Kong	1,970	3,080	3,940	5,040	5,850	6,340	6,510	6,510
Japan	83,600	94,100	104,000	117,000	123,000	128,000	131,000	129,000
Korea	30,100	35,800	46,500	56,400	64,600	72,500	78,800	83,100
D.P.R. of Korea	9,730	10,800	14,600	18,300	21,800	26,100	29,300	31,900
Republic of Korea	20,400	25,000	31,900	38,100	42,800	46,400	49,500	51,200
Macau	188	169	245	323	479	656	780	820
Mongolia	761	959	1,260	1,660	2,190	2,850	3,610	4,420
South-eastern Asia	182,000	225,000	287,000	360,000	445,000	535,000	616,000	691,000
Brunei Darusslam	46	84	130	185	266	333	377	399
Cambodia	4,350	5,430	6,940	6,400	8,250	10,000	11,500	13,300
East Timor	433	501	605	581	737	876	978	1,100
Indonesia	79,500	96,200	120,000	151,000	184,000	219,000	247,000	273,000
Lao People's D.R.	1,760	2,180	2,710	3,210	4,140	5,460	6,840	8,050
Malaysia	6,110	8,140	10,900	13,800	17,900	22,000	25,200	28,500
Myanmar	17,800	21,700	27,100	33,800	41,700	51,100	60,600	68,700
Philippines	21,000	27,600	37,500	48,300	62,400	77,500	92,100	105,000
Singapore	1,020	1,630	2,080	2,420	2,720	3,000	3,170	3,290
Thailand	20,000	26,400	35,700	46,700	55,700	63,700	71,600	78,100
Viet Nam	30,000	34,700	42,700	53,700	66,700	82,400	97,400	111,000
Southern Asia	481,000	596,000	755,000	948,000	1,200,000	1,500,000	1,790,000	2,040,000
Afghanistan	8,960	10,800	13,600	16,100	16,600	26,500	32,400	37,900
Bangladesh	41,800	51,400	66,700	88,200	116,000	151,000	188,000	220,000
Bhutan	734	868	1,050	1,250	1,520	1,910	2,390	2,860
India	358,000	442,000	555,000	689,000	853,000	1,040,000	1,220,000	1,370,000
Iran	16,900	21,600	28,400	38,900	54,600	68,800	87,800	106,000
Maldives	82	92	114	155	215	283	350	409
Nepal	8,180	9,400	11,500	14,900	19,100	24,100	28,900	33,100
Pakistan	39,500	50,000	65,700	85,300	123,000	162,000	205,000	248,000
Sri Lanka	7,680	9,890	12,500	14,800	17,200	19,400	21,500	23,700
Western Asia	42,400	55,900	73,700	98,600	132,000	172,000	217,000	264,000
Bahrain	116	156	220	347	516	683	827	943
Cyprus	494	573	615	629	701	762	819	874
Democratic Yemen	992	1,210	1,500	1,860	2,491	3,430	4,580	5,800
Gaza Strip	245	303	350	441	592	760	947	1,140
Iraq	5,160	6,840	9,360	13,300	18,900	26,300	35,300	45,100
Israel	1,260	2,110	2,970	3,880	4,600	5,320	6,010	6,620
Jordan	1,240	1,700	2,300	2,920	4,010	5,560	7,280	9,040
Kuwait	152	278	744	1,380	2,040	2,640	3,150	3,590
Lebanon	1,440	1,860	2,470	2,670	2,700	3,330	3,900	4,450
Oman	413	505	654	984	1,500	2,180	3,110	4,200
Qatar	25	45	111	229	368	499	631	781
Saudi Arabia	3,200	4,080	5,750	9,370	14,100	20,700	29,600	39,700
Syrian Arab Republic	3,500	4,560	6,260	8,800	12,500	17,800	24,300	30,900
Turkey	20,800	27,500	35,300	44,400	55,900	66,800	75,300	83,700
United Arab Emirates	70	90	223	1,020	1,590	1,950	2,280	2,560
Yemen	3,320	4,040	4,840	6,360	9,200	13,200	18,500	25,000

Table 3. Body height of the fetus by gestational age (cm).

Gestational week		Male			Female			Polynomial fitting	
		n	Ave(cm)	S.D.	n	Ave(cm)	S.D.	Male	Female
-23	-15	3	30.5	1.4	7	29.8	2.5	30.65	29.99
24-25	-14	3	35.2	2.1	1	34.5	-	34.83	33.88
26-27	-13	6	37.2	1.6	4	35.5	6.3	37.96	36.83
28	-12	7	41.1	7.3	5	40.1	1.7	40.26	39.06
29	-11	12	41.8	3.7	10	41.2	5.2	41.95	40.74
30	-10	9	43.4	3.9	7	42.2	4.3	43.19	42.05
31	-9	18	44.0	3.6	14	42.7	4.6	44.14	43.10
32	-8	15	44.5	2.7	15	42.8	1.7	44.92	44.01
33	-7	29	45.9	2.6	19	45.4	2.6	45.63	44.86
34	-6	41	46.1	2.4	37	45.4	2.5	46.33	45.71
35	-5	51	46.4	3.6	36	47.2	3.2	47.08	46.58
36	-4	23	48.2	3.6	35	47.4	2.5	47.87	47.48
37	-3	63	49.5	1.9	55	48.7	2.7	48.71	48.40
38	-2	130	49.7	2.1	130	49.4	2.0	49.54	49.29
39	-1	250	50.2	2.1	220	49.9	2.2	50.32	50.08
40	0	243	51.0	2.0	238	50.8	1.8	50.93	50.67
41	1	161	50.7	2.2	141	50.6	1.7	51.26	50.94
42	2	39	51.0	2.2	47	50.5	2.4	51.17	50.74
43	3	39	50.8	2.6	26	50.2	2.3	50.47	49.91

Table 4. Body weight of the fetus by gestational age (g).

Gestational week		Male			Female			Polynomial Fitting	
		n	Ave(g)	S.D.	n	Ave(g)	S.D.	Male	Female
-23	-15	6	800	454	9	639	242	637	578
24-25	-14	6	850	231	5	830	147	917	844
26-27	-13	20	1,065	297	12	925	317	1132	1058
28	-12	13	1,435	739	14	1,207	199	1303	1236
29	-11	24	1,504	483	20	1,450	355	1447	1391
30	-10	30	1,677	427	16	1,638	522	1579	1536
31	-9	35	1,861	501	30	1,700	414	1710	1678
32	-8	42	1,910	362	31	1,766	216	1847	1825
33	-7	55	2,025	385	44	2,030	370	1997	1981
34	-6	76	2,201	361	59	2,168	427	2160	2147
35	-5	79	2,339	401	63	2,307	514	2337	2323
36	-4	49	2,452	563	60	2,380	475	2524	2506
37	-3	80	2,824	421	76	2,650	544	2712	2689
38	-2	156	2,991	500	151	2,920	473	2893	2865
39	-1	268	3,113	433	235	3,092	417	3052	3024
40	0	263	3,270	499	261	3,147	458	3174	3154
41	1	155	3,314	503	150	3,233	474	3239	3238
42	2	47	3,220	557	48	3,273	474	3226	3259
43	3	41	3,174	649	26	3,178	458	3107	3198

Table 5. Body height of the newborn, infant and child under 6 years (cm).

Age		n	Male					Age		n	Female				
			Percentile								Percentile				
Year	Month/Day		10	25	50	75	90	Year	Month/Day		10	25	50	75	90
0	Newborn	2052	47.00	48.50	49.90	50.80	51.80	0	Newborn	1887	46.50	48.00	49.00	50.00	51.00
0	30 day	780	51.80	53.00	54.30	55.60	56.70	0	30 day	718	50.90	52.10	53.40	54.60	55.80
0	1-2 month	129	53.50	55.00	56.80	58.20	60.10	0	1-2 month	121	52.40	53.90	55.30	57.10	59.10
	2-3	161	57.90	59.10	60.50	62.00	63.60		2-3	162	55.90	57.30	58.50	60.20	61.40
	3-4	170	59.80	61.50	62.70	64.40	65.70		3-4	141	58.60	59.90	61.50	63.00	64.50
	4-5	166	61.90	63.80	65.50	67.00	68.00		4-5	151	60.90	62.50	63.50	65.10	66.60
	5-6	152	64.00	65.40	66.80	68.40	69.70		5-6	160	62.30	63.70	65.40	66.00	68.40
	6-7	146	65.60	66.70	68.60	70.10	71.40		6-7	151	64.00	65.40	67.00	68.00	69.50
	7-8	148	67.50	68.60	69.80	71.10	72.70		7-8	157	65.50	66.70	68.00	69.40	70.50
	8-9	158	68.20	69.40	70.80	72.70	74.00		8-9	168	65.50	67.80	69.40	71.10	72.50
	9-10	175	68.90	70.70	72.50	74.00	75.20		9-10	157	67.40	68.90	70.30	71.90	73.90
	10-11	173	70.20	71.50	73.30	75.00	75.80		10-11	178	69.00	70.30	71.90	73.70	75.00
	11-12	182	71.80	73.10	74.60	76.00	77.50		11-12	143	70.30	71.80	73.50	75.00	76.50
1	0-1 month	170	72.40	73.80	75.50	77.00	78.20	1	0-1 month	168	70.90	72.60	74.40	76.40	77.70
	1-2	186	73.30	75.00	76.50	78.40	80.20		1-2	170	72.20	73.60	75.40	77.10	78.60
	2-3	164	74.10	75.50	77.30	79.40	81.10		2-3	125	73.30	74.80	76.80	78.40	79.30
	3-4	168	75.50	76.60	78.40	80.10	82.10		3-4	197	74.00	75.60	77.90	79.50	81.00
	4-5	189	75.80	77.50	79.40	80.90	83.30		4-5	150	74.80	76.10	77.80	79.50	81.30
	5-6	169	77.30	79.30	80.90	82.50	84.10		5-6	146	75.50	77.30	79.60	81.00	83.10
	6-7	155	78.10	79.50	81.30	83.70	85.50		6-7	152	76.00	78.40	80.40	81.80	83.20
	7-8	183	78.70	80.00	81.70	84.10	85.30		7-8	167	77.50	79.00	81.00	82.70	84.00
	8-9	156	79.70	81.20	83.10	85.10	87.00		8-9	172	78.30	80.10	82.20	84.30	85.20
	9-10	190	80.10	82.00	83.90	85.60	87.90		9-10	170	79.10	81.20	83.20	84.80	86.90
	10-11	180	80.70	83.30	85.20	87.00	88.30		10-11	180	79.60	81.40	83.60	85.10	86.60
	11-12	175	81.60	83.50	85.40	87.60	89.40		11-12	174	80.60	82.10	83.90	86.30	88.30
2	0-6 month	278	82.80	84.80	87.10	89.20	91.40	2	0-6 month	294	82.00	83.60	85.20	87.80	90.00
	6-12	258	86.30	88.70	91.70	94.00	95.90		6-12	238	86.20	88.10	90.00	92.40	94.30
3	0-6 month	268	90.50	92.90	95.00	97.20	99.50	3	0-6 month	263	89.30	91.50	93.70	95.90	98.10
	6-12	271	94.20	96.20	98.60	101.40	103.80		6-12	252	92.50	95.10	98.10	100.40	102.40
4	0-6 month	308	97.10	99.90	102.40	105.30	107.60	4	0-6 month	276	95.90	98.90	101.60	104.30	106.00
	6-12	283	100.10	102.00	104.70	107.40	109.90		6-12	274	99.80	102.00	104.90	107.40	109.90
5	0-6 month	282	103.20	105.60	108.10	111.10	113.20	5	0-6 month	265	102.90	105.30	107.80	110.40	112.60
	6-12	265	105.70	108.70	111.20	114.50	118.00		6-12	297	104.80	107.50	110.70	113.60	115.80
6	0-6 month	279	109.50	111.70	114.50	117.80	120.40	6	0-6 month	277	107.80	110.80	113.70	117.20	119.80

Table 6. Body weight of the newborn, infant and child under 6 years (kg).

Age		n	Male					Age		n	Female				
			Percentile								Percentile				
Year	Month/Day		10	25	50	75	90	Year	Month/Day		10	25	50	75	90
0	Newborn	2152	2.64	2.90	3.16	3.42	3.65	0	Newborn	1984	2.59	2.82	3.05	3.31	3.54
0	1 day	1747	2.56	2.81	3.05	3.29	3.54	0	1 day	1665	2.51	2.72	2.94	3.18	3.43
	2 day	1901	2.54	2.76	3.02	3.26	3.50		2 day	1783	2.49	2.69	2.90	3.16	3.38
	3 day	1845	2.55	2.78	3.03	3.29	3.52		3 day	1732	2.48	2.69	2.91	3.16	3.40
	4 day	1854	2.56	2.79	3.04	3.30	3.54		4 day	1743	2.50	2.71	2.93	3.17	3.40
	5 day	1852	2.58	2.82	3.07	3.32	3.56		5 day	1762	2.52	2.73	2.95	3.20	3.43
	6 day	1697	2.60	2.85	3.10	3.37	3.60		6 day	1602	2.53	2.75	2.97	3.23	3.46
	7 day	1131	2.61	2.87	3.12	3.40	3.65		7 day	1068	2.54	2.77	2.99	3.25	3.49
0	30 day	796	3.73	4.03	4.39	4.72	4.98	0	30 day	736	3.55	3.81	4.09	4.42	4.66
0	1-2 month	129	4.30	4.77	5.11	5.44	5.82	0	1-2 month	121	4.03	4.38	4.72	5.05	5.37
	2-3	161	5.25	5.73	6.10	6.54	7.06		2-3	162	4.76	5.19	5.62	5.96	6.40
	3-4	170	5.86	6.38	6.83	7.33	7.80		3-4	141	5.40	5.85	6.30	6.72	7.21
	4-5	166	6.30	6.81	7.34	7.88	8.37		4-5	151	5.87	6.34	6.80	7.24	7.81
	5-6	152	6.68	7.15	7.72	8.28	8.77		5-6	160	6.25	6.71	7.17	7.70	8.26
	6-7	146	7.06	7.53	8.04	8.61	9.09		6-7	151	6.53	7.00	7.47	8.04	8.61
	7-8	148	7.38	7.87	8.33	8.93	9.42		7-8	157	6.80	7.23	7.75	8.35	8.92
	8-9	158	7.66	8.13	8.61	9.23	9.80		8-9	168	7.04	7.46	8.02	8.61	9.23
	9-10	175	7.87	8.34	8.86	9.50	10.13		9-10	157	7.25	7.70	8.27	8.87	9.51
	10-11	173	8.07	8.53	9.09	9.74	10.42		10-11	178	7.45	7.94	8.52	9.13	9.78
	11-12	183	8.23	8.70	9.30	9.94	10.66		11-12	143	7.62	8.16	8.76	9.38	10.01
1	0-1 month	170	8.39	8.86	9.49	10.12	10.83	1	0-1 month	168	7.80	8.30	8.92	9.60	10.22
	1-2	186	8.54	9.05	9.66	10.30	11.06		1-2	170	7.98	8.49	9.12	9.80	10.41
	2-3	164	8.69	9.24	9.84	10.51	11.29		2-3	125	8.16	8.68	9.31	9.98	10.60
	3-4	168	8.86	9.43	10.05	10.73	11.50		3-4	197	8.33	8.86	9.50	10.17	10.87
	4-5	189	9.02	9.62	10.25	10.95	11.72		4-5	150	8.50	9.05	9.70	10.37	11.06
	5-6	169	9.18	9.80	10.45	11.16	11.95		5-6	146	8.67	9.23	9.90	10.57	11.29
	6-7	155	9.36	9.98	10.65	11.37	12.18		6-7	152	8.83	9.41	10.10	10.79	11.53
	7-8	183	9.54	10.15	10.84	11.60	12.42		7-8	167	9.00	9.58	10.29	11.01	11.78
	8-9	156	9.72	10.32	11.03	11.83	12.67		8-9	172	9.16	9.74	10.48	11.23	12.02
	9-10	190	9.89	10.48	11.22	12.05	12.92		9-10	170	9.32	9.91	10.66	11.45	12.25
	10-11	180	10.04	10.64	11.40	12.26	13.15		10-11	180	9.48	10.07	10.83	11.66	12.45
	11-12	175	10.18	10.79	11.59	12.47	13.38		11-12	174	9.63	10.22	11.00	11.87	12.64
2	0-6 month	278	10.67	11.29	12.23	13.12	14.04	2	0-6 month	294	10.16	10.82	11.61	12.51	13.40
	6-12	258	11.47	12.13	13.25	14.24	15.24		6-12	238	11.06	11.80	12.61	13.61	14.46
3	0-6 month	268	12.29	13.04	14.20	15.29	16.39	3	0-6 month	263	11.93	12.75	13.62	14.76	15.68
	6-12	271	13.11	14.01	15.11	16.32	17.55		6-12	252	12.79	13.69	14.63	15.86	16.95
4	0-6 month	308	13.95	14.99	16.01	17.34	18.72	4	0-6 month	276	13.63	14.61	15.65	17.01	18.28
	6-12	283	14.81	15.94	16.94	18.40	19.95		6-12	274	14.45	15.50	16.67	18.11	19.66
5	0-6 month	283	15.67	16.83	17.91	19.51	21.26	5	0-6 month	265	15.25	16.38	17.70	19.26	21.04
	6-12	265	16.55	17.70	18.97	20.70	22.69		6-12	297	16.03	17.24	18.73	20.36	22.42
6	0-6 month	279	17.44	18.60	20.15	22.02	24.20	6	0-6 month	277	16.79	18.08	19.76	21.51	23.80

Table 7. Chest girth of the newborn, infant and child under 6 years (cm).

Age		n	Male					Age		n	Female				
			Percentile								Percentile				
Year	Month/Day		10	25	50	75	90	Year	Month/Day		10	25	50	75	90
0	Newborn	2065	30.00	31.00	32.00	33.20	34.00	0	Newborn	1907	30.00	31.00	32.00	33.00	34.00
0	30 day	776	34.20	35.40	36.50	37.50	38.40	0	30 day	710	34.00	35.00	36.00	37.00	38.00
0	1-2 month	129	36.10	37.20	38.50	40.10	41.50	0	1-2 month	121	35.00	36.50	37.90	39.00	40.30
	2-3	161	39.00	40.00	41.00	42.40	43.50		2-3	163	36.90	38.00	39.50	40.90	42.30
	3-4	170	39.50	40.50	41.80	43.30	44.50		3-4	141	38.50	39.70	41.00	42.00	43.50
	4-5	166	40.60	42.00	43.10	44.60	45.70		4-5	151	39.20	40.50	41.60	43.50	45.00
	5-6	152	41.50	42.20	43.30	45.00	45.60		5-6	160	40.00	41.30	42.50	44.10	45.20
	6-7	146	41.50	43.00	44.10	45.50	47.00		6-7	151	40.50	41.50	43.00	44.20	45.20
	7-8	148	42.60	44.00	44.90	46.00	47.50		7-8	157	41.00	42.20	43.50	44.60	46.00
	8-9	158	42.00	43.50	45.00	46.40	47.50		8-9	168	41.50	42.50	43.90	45.30	47.20
	9-10	175	43.40	44.30	45.50	46.80	48.00		9-10	157	42.20	43.40	44.40	46.00	47.50
	10-11	173	43.30	44.90	46.00	47.00	48.30		10-11	178	42.00	43.30	45.00	46.00	47.50
	11-12	183	43.50	44.80	46.00	47.60	49.00		11-12	143	42.60	44.00	45.00	46.00	48.00
1	0-1 month	170	44.00	45.00	46.40	47.60	49.00	1	0-1 month	168	43.00	44.00	45.20	46.80	48.30
	1-2	186	44.00	45.20	46.90	48.00	49.70		1-2	170	43.10	44.40	45.50	47.00	48.00
	2-3	164	44.40	45.50	46.80	48.00	49.00		2-3	125	43.50	44.50	45.60	47.20	49.20
	3-4	168	45.00	46.00	47.10	48.30	49.50		3-4	197	43.00	44.80	46.00	47.10	48.10
	4-5	189	45.00	46.20	47.50	48.80	50.00		4-5	150	43.90	44.50	46.00	47.20	48.60
	5-6	169	45.10	46.20	47.40	48.90	50.10		5-6	146	44.00	45.00	46.20	48.00	49.50
	6-7	155	45.50	46.70	48.00	49.30	50.60		6-7	152	44.50	45.20	46.30	48.00	49.50
	7-8	183	45.50	46.80	47.80	49.00	51.00		7-8	167	44.50	45.50	46.50	47.90	49.50
	8-9	156	45.80	46.80	48.30	49.90	51.00		8-9	172	44.50	45.80	47.20	48.80	49.70
	9-10	190	46.00	47.00	48.60	50.00	51.70		9-10	170	45.30	46.20	47.50	49.00	50.00
	10-11	180	46.60	48.00	49.00	50.20	51.50		10-11	180	45.00	46.20	47.50	49.00	50.50
	11-12	175	46.50	47.50	48.80	50.50	52.00		11-12	174	45.80	46.60	47.70	49.20	50.40
2	0-6 month	278	47.00	48.00	49.20	50.50	52.00	2	0-6 month	294	45.90	46.80	48.20	49.70	51.30
	6-12	258	48.20	49.20	50.50	52.00	53.50		6-12	238	46.50	47.70	49.00	50.70	52.00
3	0-6 month	268	48.50	50.50	51.50	53.30	54.80	3	0-6 month	263	47.50	48.50	50.00	51.20	52.50
	6-12	271	49.50	51.00	52.70	54.30	56.30		6-12	252	48.20	49.50	51.30	52.90	55.00
4	0-6 month	308	50.50	52.00	53.50	55.00	57.00	4	0-6 month	276	49.40	50.80	52.50	54.00	55.60
	6-12	283	51.30	52.50	54.10	56.00	58.00		6-12	274	50.30	51.70	53.20	55.10	56.70
5	0-6 month	283	52.00	53.60	55.00	57.00	58.50	5	0-6 month	265	51.00	52.30	54.00	56.00	58.00
	6-12	264	53.00	54.50	56.00	58.10	60.20		6-12	297	51.50	53.00	55.00	57.00	59.40
6	0-6 month	279	53.80	55.30	57.10	59.40	61.50	6	0-6 month	277	52.80	54.00	55.60	58.00	61.00

Table 8. Body height of males and females, newborn to 79 years and reference values for Asian Reference Man (cm).

	Male				Female			
	Japanese		Chinese	RAM	Japanese		Chinese	RAM
Age	Mean	S.D.	Mean	value	Mean	S.D.	Mean	value
Newborn	49.70	1.80	50.20	49.95	49.30	1.80	49.60	49.45
0-1month	55.15	2.36	56.50	54.64	54.45	2.31	55.60	54.25
2-3	61.30	2.30	61.25	60.08	59.70	2.53	59.95	60.01
4-5	65.75	2.50	65.40	66.43	64.35	2.15	63.95	65.71
6-11	71.30	2.52	71.23	74.11	69.98	2.43	69.67	71.84
1year	80.40	4.23	81.60	81.49	79.10	3.89	80.40	79.49
2	89.20	4.39	89.80	90.78	88.30	4.14	88.45	88.44
3	96.60	4.35	96.80	98.48	95.70	4.06	95.75	96.25
4	103.10	4.25	103.70	105.15	102.20	4.39	102.85	103.16
5	110.46	4.64	110.10	110.91	109.59	4.62	109.20	110.02
6	116.03	4.82	116.20	116.47	115.23	4.80	115.10	114.57
7	121.66	5.03	119.51	121.40	120.89	5.03	118.47	119.88
8	127.11	5.27	123.96	126.04	126.44	5.36	123.12	125.66
9	132.26	5.50	128.86	130.70	132.12	5.86	128.31	131.64
10	137.38	5.86	133.51	135.69	138.44	6.56	133.79	137.56
11	143.01	6.69	138.27	141.35	145.15	6.75	139.74	143.12
12	149.81	7.78	142.92	147.81	150.64	6.04	145.08	148.06
13	157.33	7.89	151.02	154.45	154.16	5.37	151.47	152.11
14	163.45	6.96	157.25	160.49	155.96	5.11	153.99	154.98
15	167.15	5.93	162.29	165.13	156.65	5.03	155.43	156.58
16	168.96	5.69	165.76	167.92	157.07	5.00	156.44	157.23
17	169.86	5.61	167.54	169.25	157.13	5.03	156.97	157.27
18	169.00	5.48	168.21	169.61	156.50	5.01	157.10	157.06
19	169.70	6.16		169.50	156.30	4.96		156.87
20	169.20	5.47	169.60	169.32	156.40	4.97	158.19	156.71
21	168.90	6.28		169.14	156.00	4.87		156.58
22	168.90	5.01		168.96	155.70	4.95		156.47
23	168.80	5.32		168.78	155.60	4.67		156.37
24	168.40	6.20		168.61	155.50	5.12		156.28
25-29	168.30	5.11		168.43	155.70	5.18		156.20
30-39	167.70	5.72		167.56	154.90	5.19		155.74
40-49	165.90	5.95		165.80	153.60	5.42		154.28
50-59	163.30	5.97		163.93	151.80	5.04		152.24
60-69	161.40	5.97		161.84	149.60	5.76		149.80
70-79	159.30	6.43		159.40	147.00	6.81		147.13
20-29	168.57	5.38		168.70	155.77	5.05		156.34
20-49	167.39	5.68		167.35	154.76	5.22		155.46

Table 9. Body weight of males and females, newborn to 79 years and reference values for Asian Reference Man (kg).

	Male				Female			
	Japanese		Chinese	RAM	Japanese		Chinese	RAM
Age	Mean	S.D.	Mean	value	Mean	S.D.	Mean	value
Newborn	3.23	0.39	3.21	3.22	3.16	0.40	3.12	3.19
0-1month	4.71	0.59	4.90	4.42	4.44	0.52	4.60	4.22
2-3	6.50	0.74	6.38	5.78	5.93	0.74	5.88	5.74
4-5	7.57	0.82	7.58	7.02	7.08	0.75	7.01	6.98
6-11	8.87	0.91	8.94	8.76	8.34	0.88	8.31	8.64
1year	10.93	1.45	10.88	10.66	10.30	1.21	10.33	10.36
2	13.05	1.74	12.69	12.80	12.53	1.55	12.11	12.43
3	14.83	1.86	14.35	14.72	14.48	1.77	13.85	14.34
4	16.75	1.91	16.05	16.58	16.45	2.04	15.67	16.22
5	19.02	2.74	17.85	18.46	18.60	2.55	17.26	18.00
6	20.95	3.15	19.81	20.41	20.50	3.08	19.08	19.80
7	23.38	3.58	20.91	22.51	22.87	3.52	20.11	21.83
8	26.16	4.34	22.74	24.82	25.66	4.28	22.02	24.20
9	29.17	5.22	25.02	27.40	28.84	5.12	24.35	27.04
10	32.49	6.17	27.40	30.33	32.75	6.25	27.12	30.54
11	36.27	7.21	30.05	33.81	37.56	7.16	30.67	34.79
12	41.45	8.34	33.02	38.23	42.65	7.50	34.56	39.48
13	47.02	8.98	38.83	43.58	46.64	7.20	40.47	44.00
14	52.49	8.94	43.86	49.04	49.46	6.92	43.75	47.26
15	57.23	9.15	48.56	53.70	51.60	7.11	46.31	49.46
16	59.41	8.65	52.39	56.75	52.35	6.75	48.29	50.73
17	60.85	7.69	54.78	58.29	52.44	6.63	49.43	51.26
18	61.63	8.88	56.09	58.94	51.65	5.58	50.07	51.35
19	61.40	10.20		59.25	51.65	7.74		51.10
20	62.35	8.27	57.41	59.40	50.23	6.02	50.43	50.92
21	62.10	9.60		59.46	50.60	7.46		50.71
22	62.13	8.72		59.49	50.43	6.75		50.46
23	63.30	10.13		59.53	49.85	6.33		50.51
24	63.68	6.90		59.56	50.33	8.12		50.60
25-29	63.91	8.46		59.59	51.19	6.94		50.67
30-39	64.35	9.36		59.73	52.48	7.5		50.81
40-49	63.23	8.56		59.72	53.80	7.78		51.42
50-59	61.13	8.96		58.98	53.08	7.56		50.93
60-69	58.33	8.73		57.11	51.25	7.81		49.68
70-79	53.73	8.59		53.69	46.40	8.46		47.72
20-29	63.31	8.59		59.54	50.74	6.94		50.65
20-49	63.63	8.84		59.67	52.34	7.41		50.96

Table 10. Lengths of upper and lower limbs, and, hand and foot of males: newborn to 79 years (cm).

Age	Body Height (BH)	Sitting Height (SH)	Head Length (HL)	BH-SH	Lower Limb Length (LLL)		Thigh Length	Lower Leg Length	Foot Height	Upper Limb Length (ULL)		Upper Arm Length	Forearm Length	Hand Length	Foot Length (FL)	FL/LLL	Foot Length
	Observed	Observed	Observed	Observed	Observed	Calculated				Observed	Calculated				Observed	Calculated	
Newborn	49.95	33.29	5.27	16.66	(18.0)	18.99	9.44	8.01	1.52	(15.5)	15.76	6.57	5.34	3.85	(5.5)	(0.29)	5.51
0-1month	54.64	35.55	6.14	19.09	(21.5)	21.76	10.82	9.18	1.74	(18.0)	18.06	7.53	6.12	4.41	(6.2)	(0.29)	6.31
2-3	60.08	38.61	7.53	21.47	(24.3)	24.48	12.16	10.33	1.96	(20.3)	20.31	8.47	6.89	4.96	(7.0)	(0.29)	7.10
4-5	66.43	42.87	9.44	23.56	(26.7)	26.86	13.35	11.33	2.15	(22.0)	22.29	9.30	7.56	5.44	(7.7)	(0.29)	7.79
6-11	74.11	47.36	11.18	26.75	(30.2)	30.50	15.16	12.87	2.44	(25.2)	25.31	10.55	8.58	6.18	(8.6)	(0.29)	8.84
1year	81.49	50.29	13.14	31.20	(35.4)	35.57	17.68	15.01	2.85	(29.3)	29.52	12.31	10.01	7.20	(10.2)	(0.29)	10.31
2	90.78	53.94	14.59	36.84	(41.9)	42.00	20.87	17.72	3.36	(34.5)	34.86	14.54	11.82	8.51	(12.0)	(0.29)	12.18
3	98.48	56.74	15.69	41.74	(47.6)	47.58	23.65	20.08	3.81	(39.5)	39.49	16.47	13.39	9.64	(13.8)	(0.29)	13.80
4	105.15	59.51	16.10	45.64	(52.0)	52.03	25.86	21.96	4.16	(43.1)	43.18	18.01	14.64	10.54	(15.0)	(0.29)	15.09
5	110.91	62.17	16.39	48.74	(55.3)	55.56	27.61	23.45	4.44	(46.0)	46.11	19.23	15.63	11.25	(16.1)	(0.29)	16.11
6	116.47	64.67	16.62	51.80	(58.7)	59.05	29.35	24.92	4.72	(48.8)	49.01	20.44	16.61	11.96	(17.0)	(0.29)	17.12
7	121.40	67.09	16.83	54.31	61.3	61.92	30.77	26.13	4.95	51.5	51.39	21.43	17.42	12.54	19.0	0.31	17.96
8	126.04	69.25	16.96	56.79	64.0	64.74	32.18	27.32	5.18	53.7	53.73	22.41	18.22	13.11	19.6	0.31	18.77
9	130.70	71.44	17.09	59.26	67.7	67.55	33.57	28.51	5.40	56.4	56.07	23.38	19.01	13.68	20.4	0.30	19.59
10	135.69	73.47	17.23	62.22	70.3	70.93	35.25	29.93	5.67	58.1	58.87	24.55	19.96	14.37	21.0	0.30	20.57
11	141.35	75.69	17.37	65.66	74.3	74.85	37.20	31.59	5.99	61.2	62.13	25.91	21.06	15.16	21.8	0.29	21.71
12	147.81	78.41	17.52	69.40	79.1	79.11	39.32	33.39	6.33	64.6	65.66	27.38	22.26	16.02	23.2	0.29	22.94
13	154.45	82.20	17.68	72.25	83.3	82.37	40.94	34.76	6.59	68.1	68.36	28.51	23.18	16.68	24.1	0.29	23.89
14	160.49	85.52	17.84	74.97	84.7	85.46	42.48	36.07	6.84	70.6	70.94	29.58	24.05	17.31	24.5	0.29	24.78
15	165.13	88.18	18.02	76.95	86.8	87.72	43.60	37.02	7.02	71.9	72.81	30.36	24.68	17.76	24.6	0.28	25.44
16	167.92	89.68	18.18	78.24	87.5	89.19	44.33	37.64	7.14	72.8	74.03	30.87	25.10	18.06	24.9	0.28	25.87
17	169.25	90.55	18.32	78.70	88.8	89.72	44.59	37.86	7.18	73.0	74.47	31.05	25.24	18.17	24.9	0.28	26.02
18	169.61	90.85	18.42	78.76	87.9	89.79	44.63	37.89	7.18	73.3	74.53	31.08	25.26	18.18	25.0	0.28	26.04
19	169.50	90.93	18.47	78.57	87.4	89.57	44.52	37.80	7.17	73.0	74.35	31.00	25.20	18.14	24.8	0.28	25.98
20	169.32	91.02	18.47	78.30	87.5	89.26	44.36	37.67	7.14	73.0	74.09	30.89	25.12	18.08	24.8	0.28	25.89
21	169.14	90.97	18.47	78.17	(87.5)	89.11	44.29	37.61	7.13	(73.7)	73.97	30.84	25.07	18.05	(24.8)	(0.28)	25.84
22	168.96	90.74	18.47	78.22	(87.5)	89.17	44.32	37.63	7.13	(73.9)	74.01	30.86	25.09	18.06	(24.8)	(0.28)	25.86
23	168.78	90.71	18.47	78.07	(87.5)	89.00	44.23	37.56	7.12	(73.8)	73.87	30.80	25.04	18.02	(24.8)	(0.28)	25.81
24	168.61	90.59	18.47	78.02	(87.4)	88.94	44.20	37.53	7.12	(73.7)	73.82	30.78	25.02	18.01	(24.8)	(0.28)	25.79
25-29	168.43	90.44	18.41	77.99	(86.8)	88.91	44.19	37.52	7.11	(73.6)	73.79	30.77	25.02	18.01	(24.7)	(0.28)	25.78
30-39	167.56	90.06	18.28	77.50	(86.8)	88.34	43.91	37.28	7.07	(73.2)	73.33	30.58	24.86	17.89	(24.7)	(0.28)	25.62
40-49	165.80	89.23	18.04	76.57	(86.3)	87.29	43.38	36.83	6.98	(72.6)	72.45	30.21	24.56	17.68	(24.6)	(0.28)	25.31
50-59	163.93	88.05	17.73	75.88	(86.1)	86.50	42.99	36.50	6.92	(71.9)	71.80	29.94	24.34	17.52	(24.5)	(0.28)	25.09
60-69	161.84	86.57	17.42	75.27	(85.7)	85.81	42.65	36.21	6.86	(71.2)	71.22	29.70	24.14	17.38	(24.4)	(0.28)	24.88
70-79	159.40	85.16	17.24	74.24	(84.4)	84.64	42.06	35.72	6.77	(70.0)	70.25	29.29	23.81	17.14	(24.3)	(0.28)	24.54
20-29	168.70	90.62	18.47	78.07	(87.2)	89.00	44.23	37.56	7.12	(73.8)	73.87	30.81	25.04	18.03	(24.8)	(0.28)	25.81
20-49	167.35	89.97	18.29	77.38	(86.8)	88.21	43.84	37.23	7.06	(73.2)	73.22	30.53	24.82	17.86	(24.7)	(0.28)	25.58

Parentheses show estimated values.

Table 11. Lengths of upper and lower limbs, and, hand and foot of females: newborn to 79 years (cm).

Age	Body Height (BH)	Sitting Height (SH)	Head Length (HL)	BH-SH	Lower Limb Length (LLL)		Thigh Length	Lower Leg Length	Foot Height	Upper Limb Length (ULL)		Upper Arm Length	Forearm Length	Hand Length	Foot Length (FL)	FL/LLL	Foot Length
	Observed	Observed	Observed	Observed	Observed	Calculated				Observed	Calculated				Observed	Calculated	
Newborn	49.45	32.96	5.32	16.49	(18.7)	18.80	9.34	7.93	1.50	(15.5)	15.60	6.51	5.29	3.81	(5.4)	(0.29)	5.45
0-1month	54.25	34.71	6.21	19.54	(22.1)	22.28	11.07	9.40	1.78	(18.4)	18.49	7.71	6.27	4.51	(6.5)	(0.29)	6.46
2-3	60.01	38.44	7.61	21.57	(24.6)	24.59	12.22	10.38	1.97	(20.2)	20.41	8.51	6.92	4.98	(7.1)	(0.29)	7.13
4-5	65.71	43.02	9.51	22.69	(25.7)	25.87	12.86	10.92	2.07	(21.5)	21.47	8.95	7.28	5.24	(7.4)	(0.29)	7.50
6-11	71.84	46.61	11.25	25.23	(28.6)	28.76	14.29	12.14	2.30	(23.6)	23.87	9.95	8.09	5.82	(8.2)	(0.29)	8.34
1year	79.49	49.18	13.15	30.31	(34.3)	34.55	17.17	14.58	2.76	(28.7)	28.68	11.96	9.72	7.00	(10.1)	(0.29)	10.02
2	88.44	52.99	14.55	35.45	(40.5)	40.41	20.09	17.05	3.23	(33.2)	33.54	13.99	11.37	8.18	(11.7)	(0.29)	11.72
3	96.25	56.18	15.61	40.07	(45.5)	45.68	22.70	19.28	3.65	(37.8)	37.91	15.81	12.85	9.25	(13.3)	(0.29)	13.25
4	103.16	58.86	16.12	44.30	(50.3)	50.50	25.10	21.31	4.04	(41.7)	41.92	17.48	14.21	10.23	(14.5)	(0.29)	14.65
5	110.02	61.93	16.40	48.09	(54.7)	54.82	27.25	23.13	4.39	(45.5)	45.50	18.97	15.42	11.10	(15.8)	(0.29)	15.90
6	114.57	63.86	16.56	50.71	(57.8)	57.81	28.73	24.40	4.62	(48.0)	47.98	20.01	16.27	11.71	(16.5)	(0.29)	16.77
7	119.88	66.22	16.64	53.66	61.1	61.17	30.40	25.81	4.89	50.8	50.77	21.17	17.21	12.39	18.5	0.30	17.74
8	125.66	68.87	16.70	56.79	64.5	64.74	32.18	27.32	5.18	53.3	53.74	22.41	18.22	13.11	19.3	0.30	18.78
9	131.64	71.68	16.81	59.96	68.1	68.36	33.97	28.85	5.47	55.8	56.74	23.66	19.23	13.84	20.1	0.29	19.82
10	137.56	74.53	16.93	63.03	71.8	71.85	35.71	30.32	5.75	58.5	59.64	24.87	20.22	14.55	20.9	0.29	20.84
11	143.12	77.28	17.06	65.84	75.3	75.06	37.31	31.68	6.00	61.9	62.30	25.98	21.12	15.20	21.7	0.29	21.77
12	148.06	79.79	17.17	68.27	78.3	77.83	38.68	32.84	6.23	63.7	64.60	26.94	21.90	15.76	22.2	0.29	22.57
13	152.11	81.94	17.27	70.17	82.4	79.99	39.75	33.76	6.40	65.8	66.39	27.69	22.51	16.20	22.6	0.28	23.20
14	154.98	83.59	17.33	71.39	82.3	81.38	40.45	34.34	6.51	66.9	67.55	28.17	22.90	16.48	22.6	0.28	23.60
15	156.58	84.68	17.39	71.91	80.4	81.98	40.74	34.59	6.56	66.8	68.04	28.37	23.07	16.60	22.7	0.28	23.77
16	157.23	85.28	17.45	71.95	(80.5)	82.02	40.76	34.61	6.56	(66.8)	68.08	28.39	23.08	16.61	(22.7)	(0.28)	23.79
17	157.27	85.53	17.49	71.74	(81.7)	81.78	40.65	34.51	6.54	(66.8)	67.88	28.31	23.01	16.56	(22.8)	(0.28)	23.72
18	157.06	85.55	17.52	71.52	(81.6)	81.53	40.52	34.41	6.52	(66.7)	67.67	28.22	22.94	16.51	(22.6)	(0.28)	23.64
19	156.87	85.46	17.53	71.41	(81.6)	81.41	40.46	34.35	6.51	(66.7)	67.57	28.18	22.91	16.49	(22.6)	(0.28)	23.61
20	156.71	85.37	17.52	71.34	(81.5)	81.33	40.42	34.32	6.51	(66.6)	67.50	28.15	22.88	16.47	(22.6)	(0.28)	23.59
21	156.58	85.29	17.52	71.29	(81.5)	81.26	40.39	34.29	6.50	(66.6)	67.45	28.13	22.87	16.46	(22.6)	(0.28)	23.57
22	156.47	85.23	17.52	71.24	(81.3)	81.21	40.36	34.27	6.50	(66.5)	67.41	28.11	22.85	16.45	(22.5)	(0.28)	23.55
23	156.37	85.17	17.52	71.20	(81.0)	81.17	40.34	34.25	6.49	(66.5)	67.37	28.09	22.84	16.44	(22.5)	(0.28)	23.54
24	156.28	85.11	17.52	71.17	(81.0)	81.13	40.32	34.24	6.49	(66.5)	67.34	28.08	22.83	16.43	(22.5)	(0.28)	23.53
25-29	156.20	85.06	17.46	71.14	(81.0)	81.10	40.31	34.22	6.49	(66.5)	67.31	28.07	22.82	16.42	(22.5)	(0.28)	23.52
30-39	155.74	84.78	17.34	70.97	(81.0)	80.90	40.21	34.14	6.47	(66.4)	67.15	28.00	22.76	16.38	(22.4)	(0.28)	23.46
40-49	154.28	83.97	17.11	70.32	(80.3)	80.16	39.84	33.83	6.41	(66.4)	66.53	27.75	22.56	16.23	(22.3)	(0.28)	23.25
50-59	152.24	82.91	16.87	69.33	(79.2)	79.04	39.28	33.35	6.32	(66.4)	65.60	27.36	22.24	16.01	(22.2)	(0.28)	22.92
60-69	149.80	81.71	16.58	68.09	(77.8)	77.62	38.58	32.76	6.21	(65.0)	64.43	26.87	21.84	15.72	(22.1)	(0.28)	22.51
70-79	147.13	80.47	16.41	66.66	(76.4)	76.00	37.77	32.07	6.08	(64.0)	63.08	26.30	21.38	15.39	(22.0)	(0.28)	22.04
20-29	156.34	85.15	17.34	71.19	(81.2)	81.16	40.34	34.25	6.49	(66.5)	67.36	28.09	22.84	16.44	(22.5)	(0.28)	23.54
20-49	155.46	84.63	17.34	70.83	(80.8)	80.74	40.13	34.07	6.46	(66.4)	67.02	27.95	22.72	16.35	(22.4)	(0.28)	23.42

Parentheses show estimated values.

Table 12a. Skinfold thickness of males: 15 to over 70 years.

	Total of 1975-1980								1981-1989							
		triceps		subscapular		Total				triceps		subscapular		Total		
Age	n	Ave (mm)	S.D.	Ave (mm)	S.D.	Ave (mm)	S.D.	Fat (%)	n	Ave (mm)	S.D.	Ave (mm)	S.D.	Ave (mm)	S.D.	Fat (%)
15	796	11.65	5.94	11.25	4.87	22.90	5.40	15.21	1010	12.06	6.31	11.52	5.62	23.58	5.96	15.60
16	704	12.10	6.42	11.86	5.46	23.97	5.94	15.83	883	12.27	6.19	12.06	5.56	24.33	5.88	16.05
17	698	12.34	6.47	12.51	5.66	24.85	6.06	16.36	864	11.80	6.37	12.46	6.05	24.26	6.21	16.01
18	578	11.92	6.64	12.40	5.18	24.31	5.91	16.04	673	12.00	6.13	12.73	5.58	24.74	5.85	16.29
19	391	12.14	6.76	13.12	5.91	25.26	6.33	16.12	497	12.04	6.89	13.26	6.67	25.30	6.78	16.14
20	350	11.77	6.64	12.95	5.45	24.72	6.04	15.87	455	12.13	6.34	13.94	6.69	26.07	6.52	16.50
21	387	11.87	7.01	13.06	6.05	24.93	6.53	15.96	411	11.48	6.27	13.09	5.35	24.57	5.81	15.80
22	403	11.78	7.00	13.26	5.72	25.04	6.36	16.02	408	11.47	6.34	13.48	5.69	24.96	6.02	15.98
23	422	12.02	6.94	13.30	5.67	25.32	6.30	16.15	440	11.21	5.64	13.68	6.08	24.90	5.86	15.95
24	423	11.49	6.57	13.29	5.32	24.78	5.94	15.90	446	11.20	6.15	14.10	6.23	25.29	6.19	16.14
25	489	11.23	7.15	13.50	6.07	24.72	6.61	15.87	439	11.67	6.40	13.93	6.21	25.60	6.30	16.28
26-29	2437	11.92	7.29	14.19	6.20	26.11	6.75	16.52	2079	11.53	6.16	14.27	6.31	25.80	6.23	16.37
30-39	6590	12.33	7.31	15.19	6.65	27.51	6.98	17.18	8055	11.82	6.57	15.26	6.66	27.07	6.61	16.97
40-49	6830	12.21	7.40	15.69	6.87	27.89	7.13	17.36	7848	11.82	6.50	15.81	6.60	27.63	6.55	17.24
50-59	5015	11.64	6.96	15.01	6.77	26.65	6.86	16.78	7584	11.48	6.38	15.82	6.82	27.30	6.60	17.08
60-69	3632	10.88	6.46	14.14	6.71	25.02	6.59	16.01	5410	10.97	6.23	14.89	6.64	25.85	6.43	16.40
70-	2304	10.77	6.40	13.35	6.47	24.12	6.43	15.58	3813	10.09	5.76	13.32	6.23	23.41	5.99	15.25

Table 12b. Skinfold thickness of females: 15 to over 70 years.

	Total of 1975-1980								1981-1989							
		triceps		subscapular		Total				triceps		subscapular		Total		
Age	n	Ave (mm)	S.D.	Ave (mm)	S.D.	Ave (mm)	S.D.	Fat (%)	n	Ave (mm)	S.D.	Ave (mm)	S.D.	Ave (mm)	S.D.	Fat (%)
15	768	17.98	5.94	16.67	6.34	34.65	6.14	26.21	981	17.24	5.55	15.73	5.77	32.97	5.66	25.08
16	721	18.69	6.40	17.31	6.57	36.00	6.48	27.13	910	17.79	5.72	16.54	5.82	34.32	5.77	25.99
17	703	18.43	5.94	17.27	6.17	35.70	6.05	26.93	862	17.61	5.58	16.75	6.03	34.36	5.81	26.02
18	588	18.22	5.85	17.00	5.69	35.22	5.77	26.60	729	17.98	5.65	20.34	6.04	34.99	5.84	26.44
19	497	18.06	5.75	16.91	6.06	34.98	5.90	23.88	557	17.47	6.00	16.76	6.12	34.23	6.06	23.47
20	502	17.93	5.83	16.83	6.16	34.76	5.99	23.76	504	17.25	5.54	16.64	6.52	33.89	6.03	23.28
21	500	18.14	6.05	17.16	6.56	35.30	6.30	24.06	568	17.10	6.11	16.65	6.43	33.74	6.27	23.19
22	569	17.61	6.18	16.69	6.51	34.30	6.34	23.50	559	16.68	5.91	16.04	6.48	32.72	6.19	22.63
23	545	17.71	6.37	16.80	6.44	34.51	6.40	23.62	582	16.44	5.71	15.64	6.00	32.07	5.86	22.27
24	586	17.91	6.85	17.05	6.85	34.96	6.85	23.87	594	16.72	6.14	16.14	6.72	32.86	6.43	22.70
25	667	17.59	6.01	16.87	6.68	34.47	6.35	23.60	690	16.74	6.24	16.56	7.01	33.30	6.63	22.95
26-29	3452	18.21	6.71	17.72	7.22	35.93	6.96	24.42	3203	17.16	6.26	17.01	7.15	34.17	6.71	23.44
30-39	9609	19.25	7.23	19.29	8.02	38.54	7.63	25.88	12271	18.40	6.56	18.63	7.63	37.03	7.10	25.03
40-49	9137	20.21	7.28	21.50	8.59	41.71	7.94	27.67	11600	19.71	6.82	20.92	8.06	40.63	7.44	27.06
50-59	7017	19.70	7.39	21.19	8.52	40.89	7.96	27.21	10300	19.59	7.00	21.36	8.37	40.95	7.68	27.25
60-69	4903	18.05	7.64	19.42	8.79	37.47	8.21	25.28	7564	18.21	7.08	19.82	8.40	38.03	7.74	25.59
70-	3125	15.34	7.13	16.22	7.98	31.56	7.56	21.98	5399	15.13	6.73	16.33	7.94	31.46	7.33	21.93

Table 13. Skinfold thickness of males and females: 0 to over 70 years.

Sex	Age (Y)	0	1	2	3	4	5	6	7
Male	thickness (mm)	9.0	9.5	10.0	10.8	11.9	13.0	14.5	16.3
	(%)	8.61	8.84	9.07	9.43	9.93	10.43	11.12	11.95
Female	thickness (mm)	9.2	9.7	10.3	11.2	12.3	13.5	15.3	17.2
	(%)	8.70	8.93	9.20	9.61	10.11	10.66	11.49	12.37

Sex	Age (Y)	8	9	10	11	12	13	14	15
Male	thickness (mm)	18.2	20.3	22.5	21.6	19.4	17.6	18.8	21.3
	(%)	12.83	13.80	14.83	14.41	13.38	12.55	13.11	14.27
Female	thickness (mm)	19.0	21.2	23.8	23.5	23.0	24.3	27.4	30.2
	(%)	13.20	14.22	15.44	15.30	15.06	15.67	17.13	18.46

Sex	Age (Y)	16	17	18	19	20	21	22	23
Male	thickness (mm)	23.3	24.9	25.2	25.3	25.4	25.4	25.3	25.2
	(%)	15.20	15.95	16.09	16.14	16.19	16.19	16.14	16.09
Female	thickness (mm)	33.1	34.9	35.0	34.8	34.4	34.2	33.8	33.4
	(%)	19.84	20.70	20.75	20.65	20.46	20.36	20.17	19.98

Sex	Age (Y)	24	25	26-29	30-39	40-49	50-59	60-69	70-
Male	thickness (mm)	24.9	24.8	25.6	26.7	27.8	27.6	26.8	24.0
	(%)	15.95	15.88	16.28	16.80	17.32	17.22	16.85	15.53
Female	thickness (mm)	33.2	34.4	36.9	39.8	41.6	41.5	40.6	38.0
	(%)	19.89	20.46	21.66	23.07	23.94	23.89	23.45	22.19

Table 16. Masses of the mineral bone and active red marrow for Asian Reference Man (adult male).

		ARM							Ellis	
		Mineralized bone (g)			Red marrow (g)		Red marrow ratio		Red marrow (g)	
		Observed		Asian Reference Man					Observed	
		Mean	S.D.	wet wt.	Mean				Mean	
Whole skeleton		4167.2	122.9	4500		962.4		0.214	1045.7	
1	Head	694.9	51.7	730		135.0		0.185	136.6	
	Cranium	602.3	50.8		632		122.8	0.194		124.3
	Mandible	92.6	11.7		98		12.2	0.124		12.3
2	Clavicles	48.1	2.9	52		14.4		0.277	16.2	
3	Scapulae	130.3	9.3	140		45.0		0.321	50.5	
4	Ribs	283.5	23.4	307		92.4		0.301	82.6	
	1	13.1	2.8		14		4.2	0.300		4.1
	2	16.8	2.0		18		5.4	0.300		5.0
	3	19.9	2.1		22		6.6	0.300		6.4
	4	25.9	2.1		28		8.4	0.300		7.4
	5	28.5	3.1		31		9.3	0.300		9.5
	6	32.5	2.8		35		10.8	0.309		9.4
	7	36.1	3.6		39		11.7	0.300		10.0
	8	33.1	3.5		36		10.8	0.300		9.6
	9	29.8	3.2		32		9.6	0.300		8.5
	10	24.4	3.3		26		7.8	0.300		6.4
	11	15.8	2.2		17		5.1	0.300		4.5
	12	8.1	1.6		9		2.7	0.300		1.8
5	Sternum	20.8	3.5	23		20.8		0.904	23.4	
6	Vertebrae	372.1	31.7	406		264.9		0.652	297.8	
	Cervical	61.7	3.8		71		46.5	0.655		35.8
	1	9.9	0.9		11		7.2	0.655		5.0
	2	11.6	0.8		13		8.5	0.654		6.3
	3	7.0	0.6		9		5.9	0.656		4.1
	4	7.5	0.8		9		5.9	0.656		4.3
	5	7.9	0.8		9		5.9	0.656		4.4
	6	8.2	0.6		9		5.9	0.656		5.3
	7	9.6	0.8		11		7.2	0.655		6.4
	Thoracic	166.8	14.6		179		116.6	0.651		147.9
	1	12.7	1.3		14		9.1	0.650		8.1
	2	12.2	1.3		13		8.5	0.654		8.8
	3	10.9	1.2		12		7.8	0.650		8.5
	4	10.8	1.0		12		7.8	0.650		9.1
	5	10.9	1.2		12		7.8	0.650		10.1
	6	12.0	1.1		13		8.5	0.654		11.5
	7	12.8	1.2		14		9.1	0.650		12.1
	8	13.9	1.5		15		9.8	0.653		13.9
	9	15.2	1.4		16		10.4	0.650		14.8
	10	16.8	1.6		18		11.7	0.650		15.9
	11	18.2	1.9		19		12.4	0.653		16.3
	12	20.4	2.0		21		13.7	0.652		18.8
	Lumbar	144.8	16.2		156		101.8	0.653		114.1
	1	23.5	2.1		26		17.0	0.654		20.8
	2	27.1	3.4		29		18.9	0.652		21.8
	3	30.5	4.2		33		21.5	0.652		23.8
	4	31.5	3.7		34		22.2	0.653		24.1
	5	32.1	4.4		34		22.2	0.653		23.6
7	Sacrum	94.6	10.5	102		129.5		1.270	145.6	
8	Coxa	376.1	24.2	402		207.3		0.516	233.0	
9	Upper limb	576.9	30.9	631		17.7		0.028	20.0	
	Humerus	284.4	16.0		310		17.7	0.057		20.0
	Radius	85.6	6.0		94					
	Ulna	107.1	7.9		117					
	Hand	99.8	11.0		110					
10	Lower limb	1569.8	75.7	1706		35.4		0.021	40.0	
	Femur	745.1	38.2		812		35.4	0.044		40.0
	Patella	29.4	2.3		32					
	Tibia	436.8	34.9		476					
	Fibula	102.8	7.0		112					
	Foot	250.5	20.0		274					
Water Percent		9.7%		17%						
Remark	Age	20-30yrs		20-30yrs		35yrs			40yrs	
	n	17							1	

Table 17. Conversion factors for estimating weights of wet bone from those of dry bone.

Bone	Male				Female				Female/Male
	Literature		Present study		Literature		Present study		
	n	Dry bone	Conv. factor	Wet bone	n	Dry bone	Conv. factor	Wet bone	Ratio
Skull (incl. mandible and teeth)	78	674	1.08	730	20	619	1.08	670	0.92
Scapula	208	109	1.28	140	128	79	1.28	101	0.72
Clavicle	213	42	1.24	53	138	32	1.25	40	0.77
Rib	**	260	1.18	307	**	195	1.18	230	0.75
Sternum	**	18	1.28	23	**	14	1.29	18	0.78
Vertebral column	**	325	1.25	406	**	244	1.25	305	0.75
Sacrum	**	70	1.46	102	**	53	1.45	77	0.75
Innominates	204	300	1.34	402	150	237	1.34	318	0.79
Humerus (2)	259	234	1.32	310	186	157	1.32	208	0.67
Radius (2)	239	74	1.27	94	138	49	1.27	62	0.66
Ulna (2)	233	92	1.27	117	138	61	1.28	78	0.67
Hands (2)	85	88	1.25	110	36	60	1.25	75	0.68
Femur (2)	308	628	1.29	812	204	461	1.29	596	0.73
Patella (2)	85	22	1.45	32	36	15	1.47	22	0.68
Tibia (2)	274	356	1.34	476	203	260	1.34	348	0.73
Fibula (2)	275	83	1.35	112	201	65	1.35	88	0.78
Feet (2)	83	184	1.49	274	36	130	1.49	194	0.71
Total		3559	1.26	4500		2731	1.26	3430	0.76

**) More than 10.

Table 18. Physical measurements and major body constituents of Asian Reference Man (male): adult, and 0 (3 months), 1, 5, 10 and 15 years.

Age		Adult	15 Y	10 Y	5 Y	1 Y	3 month
Body Weight	(kg)	60	54	32	18	11	6.5
Body Height	(cm)	170.0	167	137	111	81	61
Sitting Height	(cm)	90.0	89	73	62	50	37
Chest Girth	(cm)	86.0	83	67	56	48	42
Body Surface	(cm^2)	16,300	15,400	10,500	7,400	5,100	3,700
Lipid	(%)	10	8.9	5.5	2.6	1.3	0.62
Mineral	(%)	3.2	3.1	2.2	1.3	0.6	0.2
Protein	(%)	9.2	9.1	6.2	3.8	1.7	0.6
Water	(%)	37.2	32	16.5	10.7	7	4.4

Table 19. Content of lipid, lean body mass (LBM), protein and body water of Asian Reference males and females: newborn to over 70 years.

Age	Male								Female							
	1	2		3	4	5	6		1	2		3	4	5	6	
	B.W.	Lipid		LBM	Mineral	Protein	Body Water		B.W.	Lipid		LBM	Mineral	Protein	Body Water	
	(kg)	Ratio	(kg)	(kg)	(kg)	(kg)	(%)	(kg)	(kg)	Ratio	(kg)	(kg)	(kg)	(kg)	(%)	(kg)
Newborn	3.22	0.116	0.37	2.85	0.07	0.20	80.00	2.58	3.19	0.115	0.37	2.82	0.07	0.20	80.00	2.55
0-1month	4.42	0.120	0.53	3.89	0.10	0.28	79.41	3.51	4.22	0.120	0.51	3.71	0.01	0.34	79.71	3.36
2-3	5.78	0.120	0.69	5.09	0.12	0.45	78.20	4.52	5.74	0.121	0.69	5.05	0.15	0.61	74.66	4.29
4-5	7.02	0.121	0.85	6.17	0.18	0.62	76.50	5.37	6.98	0.121	0.84	6.14	0.20	0.88	72.43	5.06
6-11	8.76	0.122	1.07	7.69	0.29	0.96	73.52	6.44	8.64	0.122	1.05	7.59	0.31	1.42	67.78	5.86
1year	10.66	0.123	1.31	9.35	0.60	1.72	65.94	7.03	10.36	0.123	1.27	9.09	0.54	1.56	67.43	6.99
2	12.80	0.126	1.61	11.18	0.80	2.31	63.09	8.07	12.43	0.126	1.57	10.86	0.76	2.21	63.50	7.89
3	14.72	0.130	1.91	12.80	0.98	2.82	61.18	9.00	14.34	0.131	1.88	12.46	0.93	2.69	61.66	8.84
4	16.58	0.136	2.26	14.33	1.13	3.25	59.98	9.95	16.22	0.139	2.26	13.97	1.10	3.16	59.84	9.71
5	18.46	0.143	2.64	15.82	1.32	3.78	58.07	10.72	18.00	0.146	2.63	15.38	1.29	3.71	57.63	10.38
6	20.41	0.148	3.02	17.39	1.49	4.29	56.89	11.61	19.80	0.155	3.07	16.73	1.42	4.09	56.67	11.22
7	22.51	0.157	3.53	18.98	1.64	4.72	56.05	12.62	21.83	0.165	3.60	18.23	1.57	4.52	55.60	12.14
8	24.82	0.166	4.12	20.70	1.81	5.21	55.12	13.68	24.20	0.175	4.23	19.96	1.74	5.01	54.60	13.21
9	27.40	0.175	4.80	22.61	1.98	5.68	54.55	14.95	27.04	0.189	5.11	21.93	1.90	5.46	53.88	14.57
10	30.33	0.181	5.49	24.84	2.16	6.21	54.30	16.47	30.54	0.202	6.17	24.37	2.10	6.03	53.17	16.24
11	33.81	0.184	6.22	27.59	2.39	6.88	54.18	18.32	34.79	0.214	7.45	27.35	2.34	6.73	52.53	18.28
12	38.23	0.181	6.92	31.31	2.64	7.84	54.49	20.83	39.48	0.226	8.92	30.56	2.58	7.41	52.10	20.57
13	43.58	0.175	7.63	35.95	2.97	8.58	56.00	24.40	44.00	0.235	10.34	33.66	2.74	7.87	52.39	23.05
14	49.04	0.170	8.34	40.70	3.09	8.86	58.63	28.75	47.26	0.244	11.53	35.72	2.82	8.11	52.47	24.79
15	53.70	0.166	8.91	44.79	3.13	9.09	60.64	32.57	49.46	0.250	12.37	37.10	2.88	8.18	52.64	26.04
16	56.75	0.164	9.31	47.44	3.15	9.13	61.96	35.16	50.73	0.252	12.78	37.94	2.86	8.19	53.02	26.89
17	58.29	0.162	9.44	48.85	3.17	9.17	62.63	36.51	51.26	0.251	12.87	38.39	2.85	8.19	53.36	27.35
18	58.94	0.161	9.49	49.45	3.19	9.19	62.89	37.07	51.35	0.247	12.68	38.66	2.83	8.20	53.82	27.63
19	59.25	0.160	9.48	49.77	3.20	9.20	63.07	37.37	51.10	0.242	12.37	38.74	2.81	8.20	54.26	27.73
20	59.40	0.159	9.44	49.95	3.21	9.21	63.19	37.53	50.92	0.236	12.02	38.90	2.82	8.20	54.76	27.88
21	59.46	0.159	9.45	50.01	3.22	9.22	63.18	37.57	50.71	0.234	11.87	38.85	2.78	8.21	54.93	27.86
22	59.49	0.159	9.46	50.03	3.25	9.24	63.11	37.54	50.46	0.232	11.71	38.75	2.79	8.21	55.00	27.75
23	59.53	0.159	9.46	50.06	3.27	9.25	63.07	37.54	50.51	0.232	11.72	38.79	2.80	8.21	55.00	27.78
24	59.56	0.160	9.53	50.03	3.28	9.27	62.93	37.48	50.60	0.234	11.84	38.76	2.82	8.21	54.80	27.73
25-29	59.59	0.165	9.83	49.76	3.24	9.27	62.51	37.25	50.67	0.245	12.41	38.25	2.89	8.22	53.57	27.14
30-39	59.73	0.169	10.09	49.64	3.23	9.25	62.21	37.16	50.81	0.257	13.06	37.75	2.93	8.25	52.30	26.57
40-49	59.72	0.173	10.33	49.39	3.19	9.10	62.12	37.10	51.42	0.275	14.14	37.28	2.90	8.24	50.84	26.14
50-59	58.98	0.176	10.38	48.60	3.10	8.94	61.99	36.56	50.93	0.286	14.57	36.36	2.66	8.23	50.02	25.47
60-69	57.11	0.178	10.17	46.94	2.97	8.93	61.36	35.04	49.68	0.289	14.36	35.32	2.35	8.22	49.82	24.75
70-79	53.69	0.176	9.45	44.24	2.42	8.91	61.30	32.91	47.72	0.291	13.89	33.83	1.97	8.22	49.55	23.64
20-30	59.54	0.162	9.65	49.89	3.24	9.25	62.80	37.39	50.65	0.239	12.12	38.53	2.85	8.21	54.23	27.47
20-50	59.67	0.168	10.03	49.64	3.22	9.20	62.38	37.22	50.96	0.257	13.11	37.85	2.89	8.23	52.46	26.73

Table 20. Composition of the body of Asian Reference Man (ARM) as compared with those of ICRP Reference Man (CRM).

Organ, tissue or component	Caucasian Reference Man (CRM)		Asian Reference Man (ARM)		ARM to CRM ratio	
	Weight (g)	Rel. wt. (%)	Weight (g)	Rel. wt. (%)	Weight 1	Weight 2
Body Weight (BW)	70,000	100.0	60,000	100.0	0.857	1.00
Fat	13,500	19.3	10,000	16.7	0.741	0.86
Essential	1,500		1,200		0.800	
Non-Essential	12,000		8,800		0.733	
Lean Body Mass (LBM)	56,500	80.7	50,000	83.3	0.855	1.03
Skeleton	10,000	14.3	8,400	14.0	0.840	0.98
Teeth(32)	46		45		0.978	1.14
Soft LBM (SLBM)	46,454	66.4	41,655	69.4	0.897	1.05
Water	42,000	60.0	37,000	61.7	0.881	1.03
Extracellular	18,000		16,000		0.889	
Intracellular	24,000		21,000		0.875	
Blood	5,500	7.9	4,800	8.0	0.873	1.02
Muscle	28,000	40.0	24,600	41.0	0.879	1.03
Body Surface	18,000	25.7	16,300	27.5	0.906	
Sp. Gr.	1.07		1.062			

Table 21. Composition of the body of Asian Reference Male and Female.

Organ, tissue or component	Reference Asian Man		Female/Male
	Male	Female	
	Weight (g)	Weight (g)	Rel. wt. (%)
Body Weight (BW)	60,000	51,000	85
Fat	10,000	13,100	131
Essential	1,200	900	75
Non-Essential	8,800	12,200	139
Lean Body Mass (LBM)	50,000	37,900	76
Bone	4,500	3,430	76
Teeth(32)	45	41	91
Water	37,000	26,700	72
Extracellular	16,000	11,500	72
Intracellular	21,000	15,200	72
Blood	4,800	3,600	75
Muscle	24,600	18,500	75
Body Surface	16,300	14,500	89

Table 22. Physical properties, blood content and contents of other constituents of organs and tissues of Asian Reference Man (adult male)(ARM) as compared with those of ICRP Reference Man for Caucasians (CRM).

	1 Organ, tissue, or component	2 Weight in situ (g)		3 Total blood (ml)		4 Residual blood (ml)	
		CRM	ARM	CRM	ARM	CRM	ARM
1	Total body	70000	60000	5200	4500	..	..
1a	Total soft tissue	60000	51600	..	..	..	..
2	Adipose tissue	15000	11000	270	150	270	150
3	Subcutaneous (hypodermis)*	7500 *	5500 *	140 *	80 *	140 *	80 *
4	Other separable*	5000 *	3500 *	90 *	60 *	90 *	60 *
5	Interstitial	1000	700	..	..	..	..
6	Yellow marrow (skeleton)	1500	1300	20	13	..	..
7	Adrenals (2)*	14 *	14 *	3.3 *	2.8 *	0.6 *	0.6 *
8	Aorta*	100 *	90 *	.. *	.. *	.. *	.. *
9	Contents*	190 *	170 *	180 *	160 *	.. *	.. *
10	Blood	5500	4800	5200	4500	..	..
11	Plasma	3100	2700	..	..	..	..
12	Erythrocytes	2400	2100	..	..	..	..
13	Blood vessels*	200 *	180 *	.. *	.. *	.. *	.. *
14	Contents (except aorta and pulmonary)*	3000 *	2100 *	2900 *	2000 *	.. *	.. *
15	Body fat	13500	10000	..	..	..	..
16	Essential	1500	1200	..	..	..	..
17	Nonessential	12000	8800	..	..	..	..
18	Body water	42000	37000	..	..	..	..
19	Extracellular	18000	16000	..	..	..	..
20	Intracellular	24000	21000	..	..	..	..
21	Cartilage (skeleton)	1100	900	..	..	..	..
22	Connective tissue	3400	2900	..	..	..	..
23	Tendons and fascia	1400	1200	..	..	..	..
24	Periarticular tissue	1500	1300	..	..	..	..
25	Other connective tissue	500	400	..	..	..	..
26	Separable connective tissue*	1600 *	1400 *	.. *	.. *	.. *	.. *
27	Central nervous system*	1430 *	1500 *	32 *	25 *	.. *	.. *
28	Brain	1400	1470	31	24	..	..
29	Cerebrum	1200	1280	..	..	..	..
30	Cerebellum	150	160	..	..	..	..
31	Brain stem	30	30	..	..	..	..
32	Spinal cord	30	30	..	..	..	..
33	Contents (cerebrospinal fluid)*	120 *	110 *	.. *	.. *	.. *	.. *
34	Eyes (2)*	15 *	15 *	.. *	.. *	.. *	.. *
35	Lenses (2)	0.4	0.4	..	..	..	..
36	Gall bladder*	10 *	8 *	.. *	.. *	.. *	.. *
37	Contents (bile)*	62 *	50 *	.. *	.. *	.. *	.. *
38	GI tract*	1200 *	1100 *	.. *	.. *	.. *	.. *
39	Contents (food plus digestive fluids)*	1005 *	950 *	.. *	.. *	.. *	.. *
40	Esophagus	40	40	..	..	..	..
41	Stomach	150	140	6.0	4.4	..	..
42	Contents	250	240	..	..	..	..
43	Intestine	1000	920	..	..	..	..
44	Contents	750	710	..	..	..	..
45	Small intestine	640	590	..	..	..	..
46	Contents	400	350	..	..	..	..
47	Duodenum	60	50	..	..	..	..
48	Jejunum	280	260	..	..	..	..
49	Ileum	300	280	..	..	..	..
50	Large intestine	370	330	..	..	..	..
51	Contents	355	360	..	..	..	..
52	Upper large intestine	210	180	..	..	..	..
53	Contents	220	220	..	..	..	..
54	Ascending colon and cecum	90	80	..	..	..	..
55	Transverse colon	120	100	..	..	..	..
56	Lower large intestine	160	150	..	..	..	..
57	Contents	135	140	..	..	..	..
58	Descending colon	90	80	..	..	..	..
59	Sigmoid colon	50	50	..	..	..	..
60	Rectum	20	20	..	..	..	..
61	Hair*	20 *	25 *	.. *	.. *	.. *	.. *
62	Heart*	330 *	380 *	53 *	35 *	13 *	11 *
63	Contents (av.)*	500 *	400 *	500 *	380 *	.. *	.. *
64	Kidneys (2)*	310 *	320 *	70 *	50 *	25 *	26 *
65	Larynx*	28 *	27 *	.. *	.. *	.. *	.. *
66	Liver*	1800 *	1600 *	250 *	160 *	.. *	.. *
67	Lung*	1000 *	1200 *	530 *	750 *	100 *	90 *
68	Parenchyma (includes bronchial tree plus capillary blood)	570	500	..	90	100	90
69	Blood (arterial and venous)	430	700	400	660	..	..
70	Bronchial tree	30	26	..	..	..	..
71	Lymphocytes	1500	1300	..	..	..	..
72	Lymphatic tissue	700	600	..	..	..	..
73	Lymph nodes (dissectible)*	250 *	220 *	.. *	3.0 *	9.4 *	3.0 *
74	Miscellaneous*	2953.1 *	2540.1 *	*	*	*	*
75	Solid soft tissue (nasopharynx, etc.)	2600	2140.1	..	..	..	..
76	Fluid (synovial, pleural, etc.)	350	400	..	..	..	..
77	Muscle (skeletal)*	28000 *	25000 *	700 *	430 *	250 *	220 *
78	Nails (20)*	3 *	3 *	.. *	.. *	.. *	.. *
79	Pancreas*	100 *	130 *	.. *	2.4 *	3.0 *	2.4 *
80	Parathyroid (4)*	0.12 *	0.12 *	.. *	.. *	.. *	.. *

5 Water (g)		6 Mineral (g)		7 Lipid (g)		8 Protein (g)		9 Specific gravity
CRM	ARM	CRM	ARM	CRM	ARM	CRM	ARM	ARM
42000	37000	3700	3200	13500	10000	10600	9200	1.06
38700	33000	400	340	11400	9700	8700	7500	..
2300	1700	30	22	12000	8800	750	550	0.92
1100 *	810 *	15 *	11 *	6000 *	4400 *	380 *	280 *	0.97
750 *	490 *	10 *	6.6 *	4000 *	2800 *	250 *	170 *	0.92
150	110	2.0	1.4	800	560	50	35	0.92
230	200	3	2.6	1200	1000	60	52	0.98
8 *	9 *	0.06 *	0.06 *	3.6 *	2.8 *	2.2 *	2.4 *	1.02
70 *	63 *	1.4 *	1.3 *	1.5 *	1.1 *	27 *	24 *	..
150 *	140 *	1.9 *	1.7 *	1.2 *	0.9 *	34 *	31 *	1.06
4400	3800	55	48	36	31	990	860	1.06
2900	2500	29	25	23	20	210	180	1.03
1500	1300	26	23	13	11	780	680	1.09
150 *	140 *	1.2 *	1.1 *	.. *	.. *	48 *	42 *	..
2400 *	1700 *	30 *	21 *	20 *	14 *	540 *	380 *	1.06
..	..	..	..	13500	10000	..	..	0.92
..	..	..	..	1500	1200	..	..	0.92
..	..	..	..	12000	8800	..	..	0.92
42000	37000	..	..	..	..	..	..	1
18000	16000	..	..	..	..	..	..	1
24000	21000	..	..	..	..	..	..	1
860	700	45	37	14	11	180	140	1.1
2100	1800	140	120	44	38	1200	1000	1.2
880	750	57	49	14	12	520	450	1.2
950	820	62	54	15	13	560	490	1.2
320	260	21	17	5	4	180	140	1.2
1000 *	850 *	66 *	58 *	21 *	16 *	580 *	480 *	1.2
1100 *	1176 *	21 *	23 *	160 *	170 *	110 *	120 *	..
1100	1176	21	23	150	160	110	120	1.03
930	980	18	19	130	140	96	98	..
120	130	2.3	2.4	13	14	12	13	..
23	23	0.45	0.45	3.3	3.3	2.4	2.4	1.04
..	24	..	0.4	..	3.0	..	2.6	1.03
120 *	110 *	0.8 *	0.7 *	.. *	.. *	0.03 *	0.03 *	1.01
.. *	.. *	.. *	.. *	.. *	.. *	.. *	.. *	1.03
0.27	0.27	0.0016	0.0016	0.008	0.008	0.14	0.14	1.1
7.3 *	7.9 *	0.07 *	0.06 *	.. *	.. *	.. *	.. *	..
53 *	48 *	0.6 *	0.5 *	1.2 *	0.9 *	0.26 *	0.24 *	1.03
950 *	880 *	10 *	9.2 *	74 *	55 *	160 *	150 *	1.04
900 *	850 *	.. *	.. *	.. *	.. *	.. *	.. *	..
30	30	0.36	0.36	..	..	..	..	1.04
110	100	1.2	1.1	9.3	8.7	20	19	1.05
..	..	..	..	..	..	..	..	..
790	730	8.0	7.4	62	57	130	120	1.04
..	..	..	..	..	..	..	..	..
510	470	5.1	4.7	40	40	83	77	1.04
..	..	..	..	..	..	..	..	..
47	39	0.48	0.40	3.7	3.1	7.8	6.5	1.05
220	200	2.2	2.0	17	16	36	33	1.04
240	220	2.4	2.2	19	18	39	36	1.04
290	260	2.3	2.1	23	21	48	43	1.04
..	..	..	..	..	..	..	..	..
170	150	1.4	1.2	13	11	27	23	1.04
..	..	..	..	..	..	..	..	..
71	63	0.72	0.64	5.6	5.0	12	11	1.04
95	79	0.96	0.80	7.4	6.2	16	13	1.04
130	120	1.3	1.2	9.9	9.3	21	20	1.04
..	..	..	..	..	..	..	..	..
71	63	0.72	0.64	5.6	5.4	3.8	3.4	1.04
40	40	0.4	0.4	3.1	3.1	6.5	6.5	1.04
16	16	0.16	0.16	1.2	1.2	2.6	2.6	1.04
1.7 *	2.1 *	0.1 *	0.13 *	0.5 *	0.6 *	18 *	22 *	1.3
240 *	290 *	3.6 *	4.1 *	33 *	26 *	55 *	65 *	1.03
400 *	320 *	5 *	4 *	3.3 *	2.5 *	90 *	72 *	1.06
240 *	250 *	3.4 *	3.5 *	16 *	12 *	53 *	55 *	1.05
19 *	18 *	0.84 *	0.81 *	.. *	.. *	.. *	.. *	1.08
1300 *	1200 *	23 *	20 *	120 *	90 *	320 *	280 *	..
780 *	960 *	11 *	11 *	9.9 *	8.9 *	177 *	184 *	1.05 deflated
430	380	6.3	5.5	7.1	6.2	100	88	0.26 inflated
350	550	4.3	7	2.8	4.2	77	130	1 1.06
..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..
.. *	.. *	.. *	.. *	.. *	.. *	.. *	.. *	..
1770 *	1829 *	.. *	.. *	.. *	.. *	.. *	.. *	..
..	..	..	..	..	..	..	..	..
350	400	..	..	..	..	..	..	..
22000 *	20000 *	340 *	300 *	620 *	460 *	4800 *	4300 *	1.04
0.2 *	0.2 *	.. *	.. *	.. *	.. *	.. *	.. *	1.3
71 *	108 *	1.2 *	1.7 *	8 *	11 *	13 *	20 *	1.05
.. *	.. *	.. *	.. *	.. *	.. *	.. *	.. *	1.05

Table 22. Physical properties, blood content and contents of other constituents of organs and tissues of Asian Reference Man (adult male)(ARM) as compared with those of ICRP Reference Man for Caucasians (CRM) (continued).

1 Organ, tissue, or component		2 Weight in situ (g)		3 Total blood (ml)		4 Residual blood (ml)	
		CRM	ARM	CRM	ARM	CRM	ARM
81	Pineal*	0.18 *	0.18 *	.. *	.. *	.. *	.. *
82	Pituitary*	0.6 *	0.6 *	0.056 *	0.1 *	.. *	.. *
83	Prostate*	16 *	13 *	.. *	.. *	.. *	.. *
83a	Contents*	*	8 *	*	*	*	*
84	Salivary glands (6)*	85 *	82 *	8.2 *	6.1 *	.. *	.. *
85	Parotid (2)	50	48	4.8	4.1	..	..
86	Submaxillary (2)	25	24	2.4	2.1	..	..
87	Sublingual (2)	10	10	0.96	0.65	..	..
88	Skeleton*	10000 *	8400 *	350 *	220 *	.. *	.. *
89	Bone	5000	4500	250	160	..	..
90	Cortical	4000	3600	..	..	..	..
91	Trabecular	1000	900	..	..	..	..
92	Red marrow	1500	1000	80	45	..	..
93	Yellow marrow	1500	1300	20	15	..	..
94	Cartilage	1100	900	..	..	..	..
95	Periarticular tissue (skeletal)	900	700	..	..	..	..
96	Skin*	2600 *	2400 *	65 *	47 *	.. *	.. *
97	Epidermis	100	100	..	..	..	..
98	Dermis	2500	2300	..	..	..	..
99	Hypodermis (see adipose tissue)	7500	5500	..	..	..	..
100	Spleen*	180 *	130 *	90 *	51 *	40 *	30 *
101	Teeth (32)*	46 *	45 *	.. *	.. *	.. *	.. *
102	Enamel	10	10	..	..	..	..
103	Dentin	35	34	..	..	..	..
104	Pulp	1	1	..	..	..	..
105	Testes (2)*	35 *	36 *	1.3 *	1.0 *	.. *	.. *
106	Thymus*	20 *	32 *	6.0 *	3.6 *	.. *	.. *
107	Tyhroid*	20 *	19 *	3.6 *	3 *	.. *	.. *
108	Tongue*	70 *	67 *	.. *	.. *	.. *	.. *
109	Tonsils (2 palatine)*	4 *	4 *	.. *	.. *	.. *	.. *
110	Trachea*	10 *	9 *	.. *	.. *	.. *	.. *
111	Ureters (2)*	16 *	14 *	.. *	.. *	.. *	.. *
112	Urethra*	10 *	9 *	.. *	.. *	.. *	.. *
113	Urinary bladder*	45 *	40 *	.. *	.. *	.. *	.. *
114	Contents (urine)*	102 *	102 *	.. *	.. *	.. *	.. *
115a	Rudimentary Organ (Breast etc)*		10 *		*		
116a	Penis*		47 *		30 *		3 *
Total body		70000	60000	5200	4500	..	..
Total of asterisked quantities		70000	60000	5972.46	4500.00	..	..

(Asterisked quantities make up the totality of Reference Man)

5 Water (g)		6 Mineral (g)		7 Lipid (g)		8 Protein (g)		9 Specific gravity
CRM	ARM	CRM	ARM	CRM	ARM	CRM	ARM	ARM
..	..	..	..	..	..	..	..	1.07
0.5	0.5	..	..	..	..	..	..	..
13	9.4	0.2	0.2	0.2	0.15	2.4	1.7	1.05
	2.7						0.15	
64	62	..	..	..	..	..	..	1.05
..	..	..	..	..	..	..	..	1.05
..	..	..	..	..	..	..	..	1.05
..	..	..	..	..	..	..	..	1.05
3300	2700	2800	2500	1900	1400	1900	1700	1.4
850	770	2700	2400	50	45	1300	1200	2.2
600	540	2200	2000	40	30	1000	900	1.85
230	210	500	450	10	9	240	220	1.08
600	400	9	5.9	600	400	300	200	1.03
230	200	3	2.6	1200	1000	60	52	0.98
860	700	45	37	14	11	180	140	1.1
570	450	37	29	12	9	140	110	1.1
1600	1500	18	17	260	190	750	690	1.1
..	..	..	..	..	..	..	..	1.15
..	..	..	..	..	..	..	..	1.12
..	..	..	..	..	..	..	..	0.97
140	110	2.5	1.8	2.9	2.0	35	25	1.06
4.2	3.7	34	33	..	..	8.3	7.3	2.1
0.28	0.28	9.6	9.6	..	..	0.12 (insol.)	0.12	..
3.9	3.7	25	24	..	..	0.16 (insol.)	0.15	..
0.7	0.7	0.1	0.1	0.01	0.01	0.6	0.6	..
28	30	0.39	0.40	1.1	0.8	4.2	4.5	1.04
16	20	0.15	0.24	..	15.3	..	4.9	1.03
15	14	0.22	0.21	2.0	1.5	2.8	2.8	1.05
46	45	0.7	0.7	14	11	12	11	..
3	3	..	..	..	..	..	..	..
6	5	0.16	0.14	..	..	..	..	1.08
11	9.6	..	..	..	..	..	..	..
7.5	6.8	..	..	..	..	..	..	..
29	26	0.36	0.32	..	..	..	..	..
95	95	1.1	1.1	..	..	6.2	6.2	1.02
	8		0.1		1.5		0.4	
	37		0.5		0.3		8	1.04
42000	37000	3700	3200	13300	10000	10600	9200	..
40958.40	36939.23	3403.95	3034.63	13273.40	9694.19	10378.39	9140.94	..

Table 23. Reference masses of all organs and tissues of Asian males: adult and 0, 1, 5, 10, 15 years.

Organ, tissue, or component	Adult			15 Y			10 Y		
	Observed wt. (g)	Organ in situ (g)	Rel. wt. (‰)	Observed wt. (g)	Organ in situ (g)	Rel. wt. (‰)	Observed wt. (g)	Organ in situ (g)	Rel. wt. (‰)
1 Total body	59670	60000	1000.000	53700	54000	1000.000	30330	30000	1000.000
1a Total soft tissue		51600	860.000		46400	859.259		25500	850.000
1b Total hard tissue		8400	140.000		7600	140.741		4500	150.000
2 Adipose tissue		11000	183.333		10000	185.185		6500	216.667
3 Subcutaneous (hypodermis)*		5500	91.667		5000	92.593		3200	106.667
4 Other separable*		3500	58.333		3200	59.259		2200	73.333
5 Interstitial		700	11.667		700	12.963		500	16.667
6 Yellow marrow (skeleton)		1300	21.667		1100	20.370		600	20.000
7 Adrenals (2)*	14.18	14	0.233	10.91	11	0.204	8.79	8.8	0.293
8 Aorta*		90	1.500		84	1.556		48	1.600
9 Contents*		170	2.833		160	2.963		90	3.000
10 Blood		4800	80.000		4300	79.630		2400	80.000
11 Plasma		2700	45.000		2400	44.444		1400	46.667
12 Erythrocytes		2100	35.000		1900	35.185		1000	33.333
13 Blood vessels*		180	3.000		170	3.148		96	3.200
14 Contents (except aorta and pulmonary)*		2100	35.000		1900	35.185		1300	43.333
15 Body fat	10030	10000	166.667	8910	9000	166.667	5490	5500	183.333
16 Essential		1200	20.000		1100	20.370		700	23.333
17 Nonessential		8800	146.667		7900	146.296		4800	160.000
18 Body water	37220	37000	616.667	32570	33000	611.111	16470	16000	533.333
19 Extracellular		16000	266.667		14000	259.259		7000	233.333
20 Intracellular		21000	350.000		19000	351.852		9000	300.000
21 Cartilage (skeleton)		900	15.000		840	15.556		480	16.000
22 Connective tissue		2900	48.333		2700	50.000		1500	50.000
23 Tendons and fascia		1200	20.000		1100	20.370		620	20.667
24 Periarticular tissue		1300	21.667		1200	22.222		680	22.667
25 Other connective tissue		400	6.667		400	7.407		200	6.667
26 Separable connective tissue*		1400	23.333		1300	24.074		750	25.000
27 Central nervous system*		1500	25.000		1500	27.778		1480	49.333
28 Brain	1451.0	1470	24.500	1475	1470	27.222	1447	1450	48.333
29 Cerebrum		1280	21.333		1280	23.704		1266	42.200
30 Cerebellum		160	2.667		160	2.963		155	5.167
31 Brain stem		30	0.500		30	0.556		29	0.967
32 Spinal cord	28	30	0.500		30	0.556		30	1.000
33 Contents (cerebrospinal fluid)*		110	1.833		100	1.852		59	1.967
34 Eyes (2)*	15	15	0.250	12.5	13	0.241	12.9	13	0.433
35 Lenses (2)		0.4	0.007		0.30	0.006		0.30	0.010
36 Gall bladder*		8	0.133		8	0.148		4	0.133
37 Contents (bile)*		50	0.833		47	0.870		27	0.900
38 GI tract*		1100	18.333		1000	18.519		600	20.000
39 Contents (food plus digestive fluids)*		950	15.833		900	16.667		510	17.000
40 Esophagus		40	0.667		30	0.556		25	0.833
41 Stomach		140	2.333		120	2.222		75	2.500
42 Contents		240	4.000		230	4.259		130	4.333
43 Intestine		920	15.333		850	15.741		500	16.667
44 Contents		710	11.833		670	12.407		380	12.667
45 Small intestine		590	9.833		540	10.000		320	10.667
46 Contents		350	5.833		330	6.111		190	6.333
47 Duodenum		50	0.833		40	0.741		30	1.000
48 Jejunum		260	4.333		240	4.444		140	4.667
49 Ileum		280	4.667		260	4.815		150	5.000
50 Large intestine		330	5.500		310	5.741		180	6.000
51 Contents		360	6.000		340	6.296		190	6.333
52 Upper large intestine		180	3.000		170	3.148		100	3.333
53 Contents		220	3.667		210	3.889		120	4.000
54 Ascending colon and cecum		80	1.333		75	1.389		45	1.500
55 Transverse colon		100	1.667		95	1.759		55	1.833
56 Lower large intestine		150	2.500		140	2.593		80	2.667

57 Contents		140	2.333		130	2.407		70	2.333
58 Descending colon		80	1.333		74	1.370		43	1.433
59 Sigmoid colon		50	0.833		47	0.870		27	0.900
60 Rectum		20	0.333		19	0.352		10	0.333
61 Hair*		25	0.417		23	0.426		13	0.433
62 Heart*	376.3	380	6.333	302.9	300	5.556	177.1	180	6.000
63 Contents (av.)*		400	6.667		380	7.037		210	7.000
64 Kidneys (2)*	320.4	320	5.333	245	250	4.630	183.6	180	6.000
65 Larynx*		27	0.450		25	0.463		14	0.467
66 Liver*	1583.5	1600	26.667	1363.8	1400	25.926	942.9	940	31.333
67 Lung*	1158.5	1200	20.000	930	930	17.222	554.3	550	18.333
68 Parenchyma (includes bronchial tree plus capillary blood)		500	8.333		430	7.963		210	7.000
69 Blood (arterial and venous)		700	11.667		500	9.259		310	10.333
70 Bronchial tree		26	0.433		24	0.444		14	0.467
71 Lymphocytes		1300	21.667		1200	22.222		690	23.000
72 Lymphatic tissue		600	10.000		540	10.000		320	10.667
73 Lymph nodes (dissectible)*		220	3.667		210	3.889		120	4.000
74 Miscellaneous*		2540.1	42.335		1728.2	32.004		890.64	29.688
75 Solid soft tissue (nasopharynx,etc.)		2140.1	35.668		1428.2	26.448		740.64	24.688
76 Fluid (synovial, pleural, etc.)		400	6.667		300	5.556		150	5.000
77 Muscle (skeletal)*		25000	416.667		23000	425.926		10300	343.333
78 Nails (20)*		3	0.050		3	0.056		2	0.067
79 Pancreas*	131.7	130	2.167	100.0	100	1.852	74.3	74	2.467
80 Parathyroid (4)*		0.12	0.002		0.10	0.002		0.06	0.002
81 Pineal*		0.18	0.003		0.17	0.003		0.10	0.003
82 Pituitary*	0.57	0.60	0.010	0.53	0.53	0.010	0.36	0.40	0.013
83 Prostate*		13	0.217		11	0.204		8	0.267
83a Contents*		8	0.133		5	0.093		2	0.067
84 Salivary glands (6)*		82	1.367		77	1.426		44	1.467
85 Parotid (2)		48	0.800		45	0.833		26	0.867
86 Submaxillary (2)		24	0.400		23	0.426		13	0.433
87 Sublingual (2)		10	0.167		9	0.167		5	0.167
88 Skeleton*		8400	140.000		7440	137.778		4560	152.000
89 Bone		4500	75.000		4000	74.074		2400	80.000
90 Cortical		3600	60.000		3200	59.259		1900	63.333
91 Trabecular		900	15.000		800	14.815		500	16.667
92 Red marrow		1000	16.667		900	16.667		700	23.333
93 Yellow marrow		1300	21.667		1100	20.370		600	20.000
94 Cartilage		900	15.000		840	15.556		480	16.000
95 Periarticular tissue (skeletal)		700	11.667		600	11.111		380	12.667
96 Skin*		2400	40.000		2200	40.741		1200	40.000
97 Epidermis		100	1.667		100	1.852		50	1.667
98 Dermis		2300	38.333		2100	38.889		1150	38.333
99 Hypodermis (see adipose tissue)		5500	91.667		5000	92.593		3200	106.667
100 Spleen*	134.0	130	2.167	120.8	120	2.222	91.1	91	3.033
101 Teeth (32)*		45	0.750		42	0.778		24.5	0.817
102 Enamel		10	0.167		9	0.167		6	0.200
103 Dentin		34	0.567		32	0.593		18	0.600
104 Pulp		1	0.017		1	0.019		0.50	0.017
105 Testes (2)*	36.32	36	0.600	33.30	33	0.611	4.09	4.1	0.137
106 Thymus*	32.7	32	0.533	35.1	35	0.648	39.7	40	1.333
107 Tyhroid*	19.02	19	0.317	15.5	16	0.296	8.7	8.7	0.290
108 Tongue*		67	1.117		63	1.167		36	1.200
109 Tonsils (2 palatine)*		4	0.067		4	0.074		1	0.033
110 Trachea*		9	0.150		8	0.148		5	0.167
111 Ureters (2)*		14	0.233		13	0.241		8	0.267
112 Urethra*		9	0.150		8	0.148		5	0.167
113 Urinary bladder*		40	0.667		38	0.704		21	0.700
114 Contents (urine)*		102	1.700		96	1.778		54	1.800
115a Rudimentary organ(Breast Appendix etc)*		10	0.167		8	0.148		5	0.167
116a Penis*	47	47	0.783		40	0.741		23	0.767
Total of asterisked quantities		60000			54000			30000	

Asterisked quantities make up the totality of Reference Man.

Table 23. Reference masses of all organs and tissues of Asian males: adult and 0, 1, 5, 10, 15 years (continued).

Organ, tissue, or component	5 Y			1 Y			0 Y (3 Month)		
	Observed wt. (g)	Organ in situ (g)	Rel. wt. (‰)	Observed wt. (g)	Organ in situ (g)	Rel. wt. (‰)	Observed wt. (g)	Organ in situ (g)	Rel. wt. (‰)
1 Total body	18460	18000	1000.000	10660	11000	1000.000	6500	6500	1000.000
1a Total soft tissue		15300	850.000		9400	854.545		5570	856.923
1b Total hard tissue		2700	150.000		1600	145.455		930	143.077
2 Adipose tissue		3000	166.667		1500	136.364		1100	169.231
3 Subcutaneous (hypodermis)*		1500	83.333		740	67.273		540	83.077
4 Other separable*		1000	55.556		500	45.455		370	56.923
5 Interstitial		200	11.111		120	10.909		80	12.308
6 Yellow marrow (skeleton)		300	16.667		140	12.727		110	16.923
7 Adrenals (2)*	5.30	5.3	0.294	4.53	4.5	0.409	4.40	4.4	0.677
8 Aorta*		29	1.611		17	1.545		13	2.000
9 Contents*		55	3.056		32	2.909		24	3.692
10 Blood		1500	83.333		900	81.818		680	104.615
11 Plasma		850	47.222		500	45.455		380	58.462
12 Erythrocytes		650	36.111		400	36.364		300	46.154
13 Blood vessels*		59	3.278		34	3.091		26	4.000
14 Contents (except aorta and pulmonary)*		820	45.556		470	42.727		360	55.385
15 Body fat	2640	2600	144.444	1310	1300	118.182	763	760	116.923
16 Essential		300	16.667		200	18.182		100	15.385
17 Nonessential		2300	127.778		1100	100.000		660	101.538
18 Body water	10720	11000	611.111	7030	7000	636.364	4940	4900	753.846
19 Extracellular		4600	255.556		3000	272.727		2100	323.077
20 Intracellular		6400	355.556		4000	363.636		2800	430.769
21 Cartilage (skeleton)		290	16.111		170	15.455		130	20.000
22 Connective tissue		950	52.778		560	50.909		410	63.077
23 Tendons and fascia		390	21.667		230	20.909		170	26.154
24 Periarticular tissue		430	23.889		250	22.727		180	27.692
25 Other connective tissue		130	7.222		80	7.273		60	9.231
26 Separable connective tissue*		460	25.556		260	23.636		200	30.769
27 Central nervous system*		1415	78.611		1120	101.818		662	101.846
28 Brain	1386.9	1388	77.111	1134	1100	100.000	681.3	650	100.000
29 Cerebrum		1210	67.222		960	87.273		570	87.692
30 Cerebellum		150	8.333		120	10.909		70	10.769
31 Brain stem		28	1.556		20	1.818		10	1.538
32 Spinal cord		27	1.500		20	1.818		12	1.846
33 Contents (cerebrospinal fluid)*		36	2.000		21	1.909		16	2.462
34 Eyes (2)*	11.4	11	0.611	6.7	7	0.636	5.6	6	0.923
35 Lenses (2)		0.30	0.017		0.10	0.009		0.10	0.015
36 Gall bladder*		3	0.167		2	0.182		1	0.154
37 Contents (bile)*		16	0.889		9	0.818		7	1.077
38 GI tract*		355	19.722		210	19.091		160	24.615
39 Contents (food plus digestive fluids)*		310	17.222		180	16.364		140	21.538
40 Esophagus		13	0.722		10	0.909		7	1.077
41 Stomach		47	2.611		30	2.727		23	3.538
42 Contents		80	4.444		50	4.545		40	6.154
43 Intestine		295	16.389		170	15.455		130	20.000
44 Contents		230	12.778		130	11.818		100	15.385
45 Small intestine		190	10.556		110	10.000		83	12.769
46 Contents		110	6.111		60	5.455		50	7.692
47 Duodenum		15	0.833		9	0.818		8	1.231
48 Jejunum		85	4.722		49	4.455		37	5.692
49 Ileum		90	5.000		52	4.727		38	5.846
50 Large intestine		105	5.833		60	5.455		47	7.231
51 Contents		120	6.667		70	6.364		50	7.692
52 Upper large intestine		60	3.333		33	3.000		26	4.000
53 Contents		70	3.889		40	3.636		30	4.615
54 Ascending colon and cecum		27	1.500		15	1.364		11	1.692
55 Transverse colon		33	1.833		18	1.636		15	2.308
56 Lower large intestine		45	2.500		27	2.455		21	3.231

57 Contents		50	2.778		30	2.727		20	3.077
58 Descending colon		27	1.500		15	1.364		11	1.692
59 Sigmoid colon		16	0.889		8	0.727		7	1.077
60 Rectum		2	0.111		4	0.364		3	0.462
61 Hair*		5	0.278		0.5	0.045		0.2	0.031
62 Heart*	97.1	100	5.556	59.0	59	5.364	36.8	37	5.692
63 Contents (av.)*		130	7.222		75	6.818		57	8.769
64 Kidneys (2)*	112.2	110	6.111	72.8	73	6.636	45.3	45	6.923
65 Larynx*		9	0.500		5	0.455		4	0.615
66 Liver*	639.2	640	35.556	427.6	430	39.091	259.0	260	40.000
67 Lung*	322.9	320	17.778	193.6	190	17.273	122.8	140	21.538
68 Parenchyma (includes bronchial tree plus capillary blood)		130	7.222		80	7.273		60	9.231
69 Blood (arterial and venous)		190	10.556		110	10.000		80	12.308
70 Bronchial tree		8.5	0.472		4.9	0.445		4	0.615
71 Lymphocytes		420	23.333		250	22.727		190	29.231
72 Lymphatic tissue		200	11.111		110	10.000		85	13.077
73 Lymph nodes (dissectible)*		72	4.000		45.5	4.136		31	4.769
74 Miscellaneous*		532.27	29.571		395.43	35.948		180.45	27.762
75 Solid soft tissue (nasopharynx,etc.)		442.27	24.571		335.43	30.494		151.65	23.331
76 Fluid (synovial, pleural, etc.)		90	5.000		60	5.455		28.8	4.431
77 Muscle (skeletal)*		6400	355.556		4000	363.636		2000	307.692
78 Nails (20)*		0.98	0.054		0.56	0.051		0.43	0.066
79 Pancreas*	39.5	40	2.222	24.1	24	2.182	9.4	9	1.385
80 Parathyroid (4)*		0.04	0.002		0.02	0.002		0.02	0.003
81 Pineal*		0.06	0.003		0.03	0.003		0.03	0.005
82 Pituitary*	0.32	0.32	0.018	0.21	0.21	0.019	0.20	0.20	0.031
83 Prostate*		5	0.278		2	0.182		1	0.154
83a Contents*			0.000			0.000			0.000
84 Salivary glands (6)*		27	1.500		15	1.364		12	1.846
85 Parotid (2)		16	0.889		9	0.818		8	1.231
86 Submaxillary (2)		8	0.444		5	0.455		3	0.462
87 Sublingual (2)		3	0.167		2	0.182		2	0.308
88 Skeleton*		2540	141.111		1480	134.545		750	115.385
89 Bone		1400	77.778		850	77.273		300	46.154
90 Cortical		1100	61.111						
91 Trabecular		300	16.667						
92 Red marrow		310	17.222		190	17.273		110	16.923
93 Yellow marrow		300	16.667		140	12.727		110	16.923
94 Cartilage		290	16.111		170	15.455		130	20.000
95 Periarticular tissue (skeletal)		240	13.333		130	11.818		100	15.385
96 Skin*		783	43.500		450	40.909		340	52.308
97 Epidermis		33	1.833		20	1.818		20	3.077
98 Dermis		750	41.667		430	39.091		320	49.231
99 Hypodermis (see adipose tissue)		1500	83.333		740	67.273		540	83.077
100 Spleen*	61.7	62	3.444	45.9	46	4.182	21.5	22	3.385
101 Teeth (32)*		14.33	0.796		8.2	0.745		6.2	0.954
102 Enamel		3	0.167		2	0.182		1	0.154
103 Dentin		11	0.611		6	0.545		5	0.769
104 Pulp		0.33	0.018		0.2	0.018		0.2	0.031
105 Testes (2)*	2.87	2.9	0.161	2.64	2.6	0.236	2.48	2.5	0.385
106 Thymus*	30.9	31	1.722	30.1	30	2.727	28.4	28	4.308
107 Tyhroid*	3.77	3.8	0.211	2.70	2.7	0.245	1.80	1.8	0.277
108 Tongue*		22	1.222		13	1.182		10	1.538
109 Tonsils (2 palatine)*		1	0.056		0.75	0.068		0.57	0.088
110 Trachea*		3	0.167		2	0.182		1	0.154
111 Ureters (2)*		5	0.278		3	0.273		2	0.308
112 Urethra*		3	0.167		2	0.182		1	0.154
113 Urinary bladder*		13	0.722		8	0.727		6	0.923
114 Contents (urine)*		33	1.833		19	1.727		15	2.308
115a Rudimentary organ(Breast Appendix etc)*		3	0.167		2	0.182		1	0.154
116a Penis*		14	0.778		9	0.818		6	0.923
Total of asterisked quantities		18000			11000			6500	

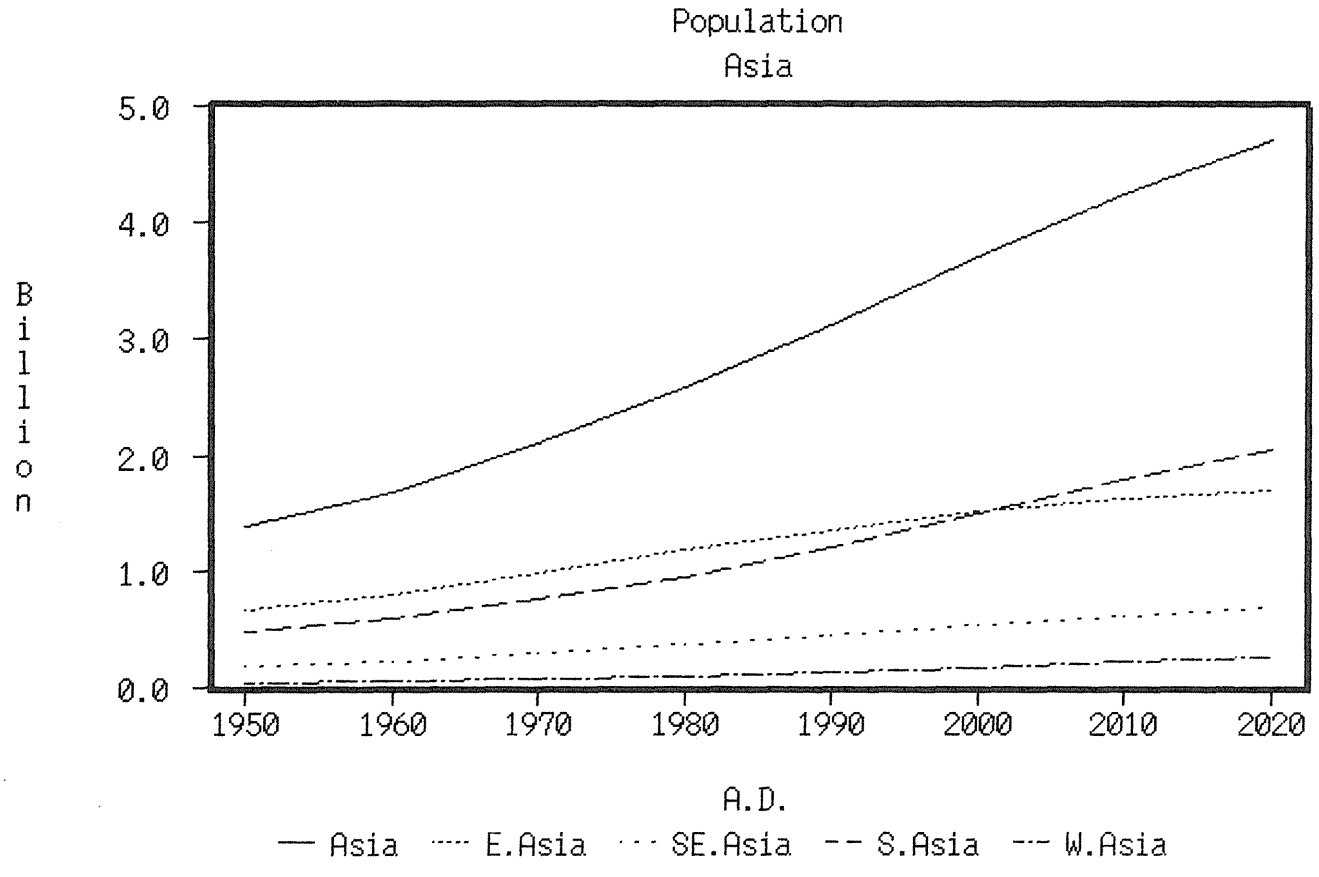


Fig. 1. Variation of population in five Asian regions during 1950-2020.

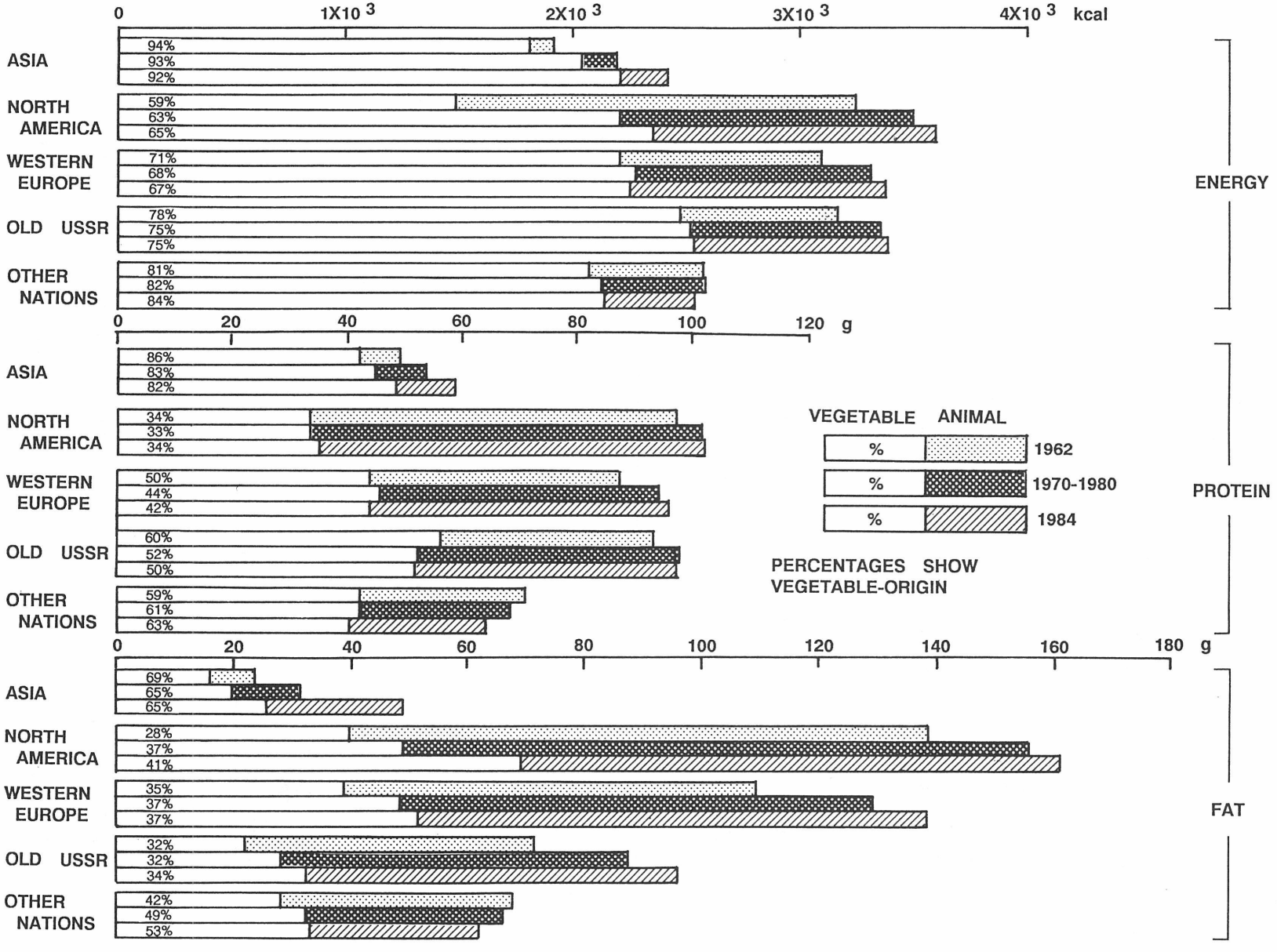
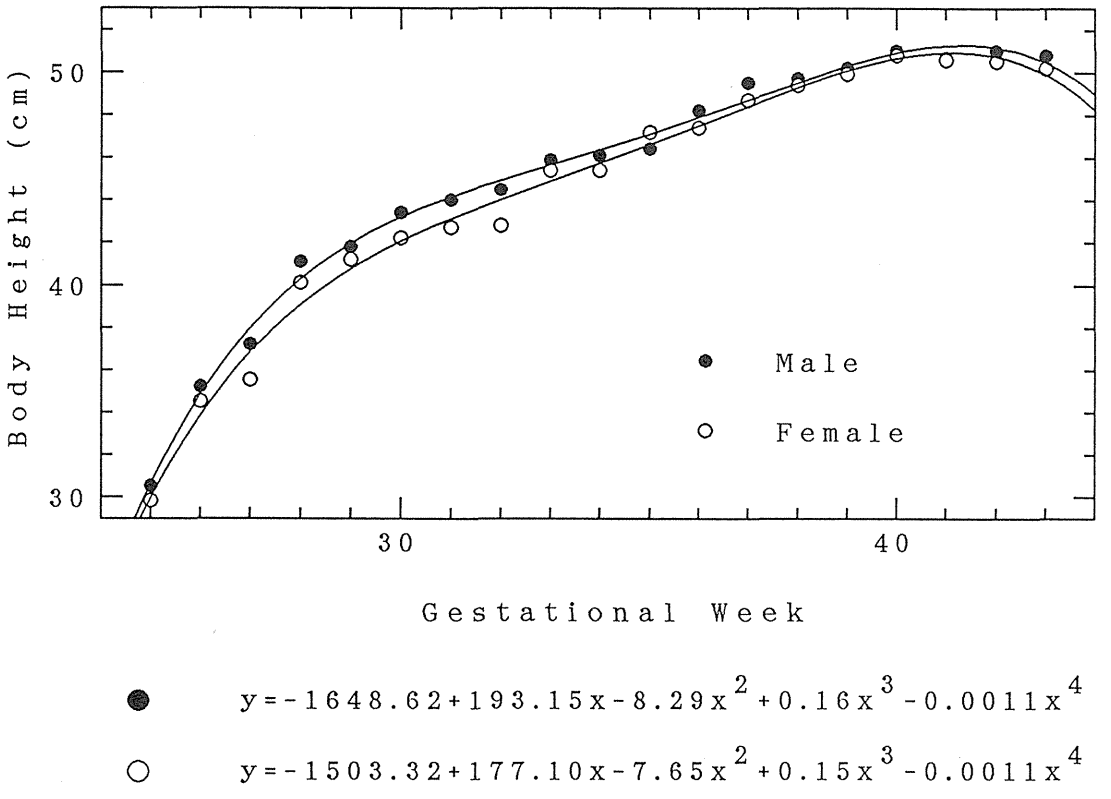
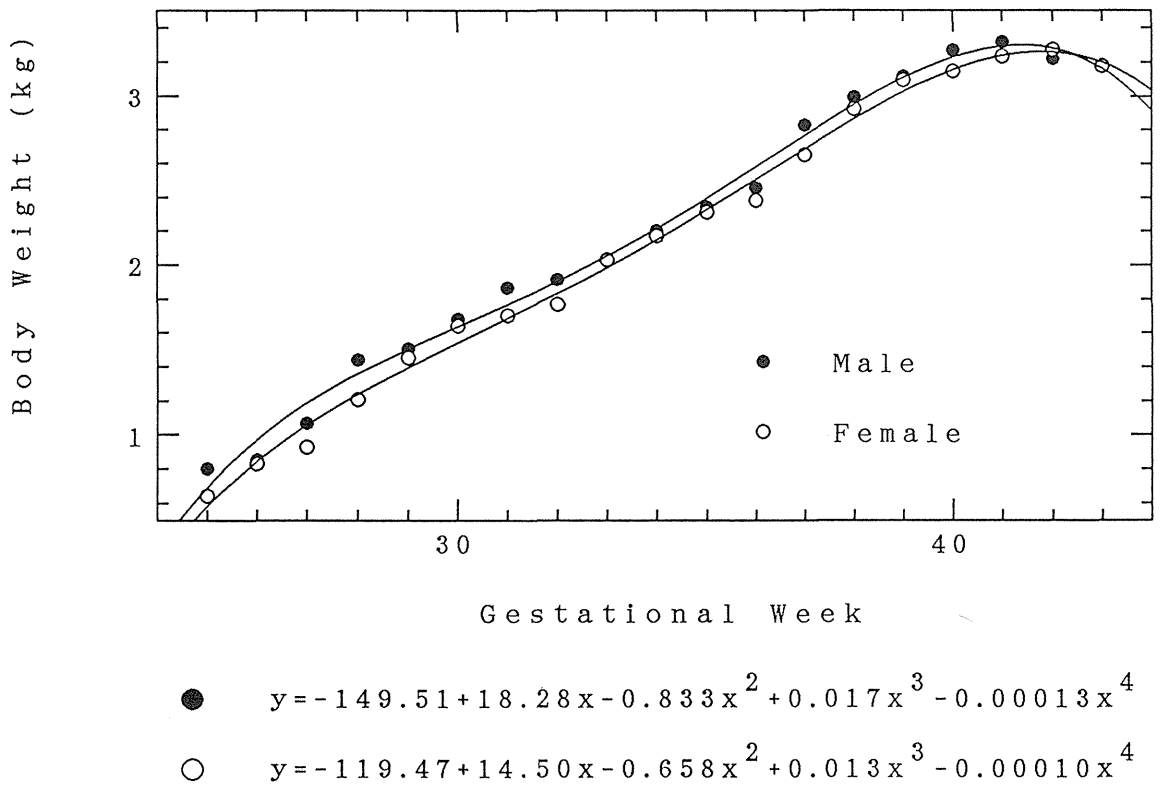


Fig. 2. Per caput net supply of energy, protein and fat in Asian, European and other regions of the world.



● $y = -1648.62 + 193.15x - 8.29x^2 + 0.16x^3 - 0.0011x^4$

○ $y = -1503.32 + 177.10x - 7.65x^2 + 0.15x^3 - 0.0011x^4$



● $y = -149.51 + 18.28x - 0.833x^2 + 0.017x^3 - 0.00013x^4$

○ $y = -119.47 + 14.50x - 0.658x^2 + 0.013x^3 - 0.00010x^4$

Fig. 3. Height and weight of the fetal body, y in relation to gestational age, x and fitted polynomial curves.

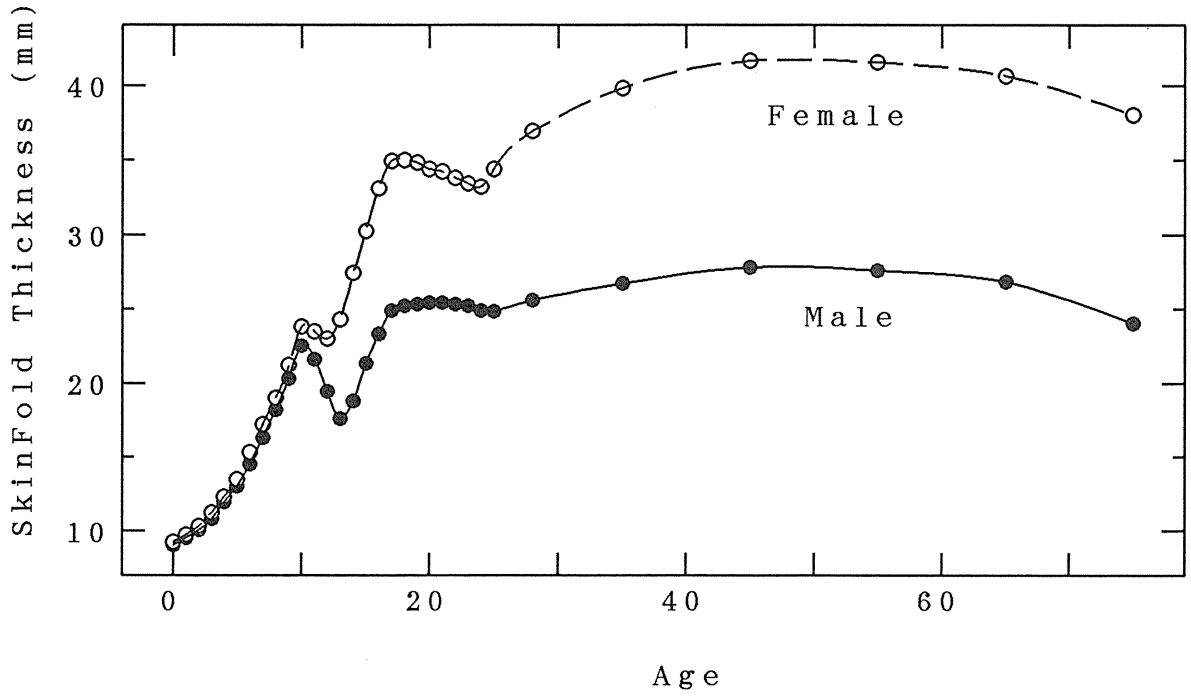


Fig. 4. Skinfold thickness of males and females and fitted polynomial functions of age.

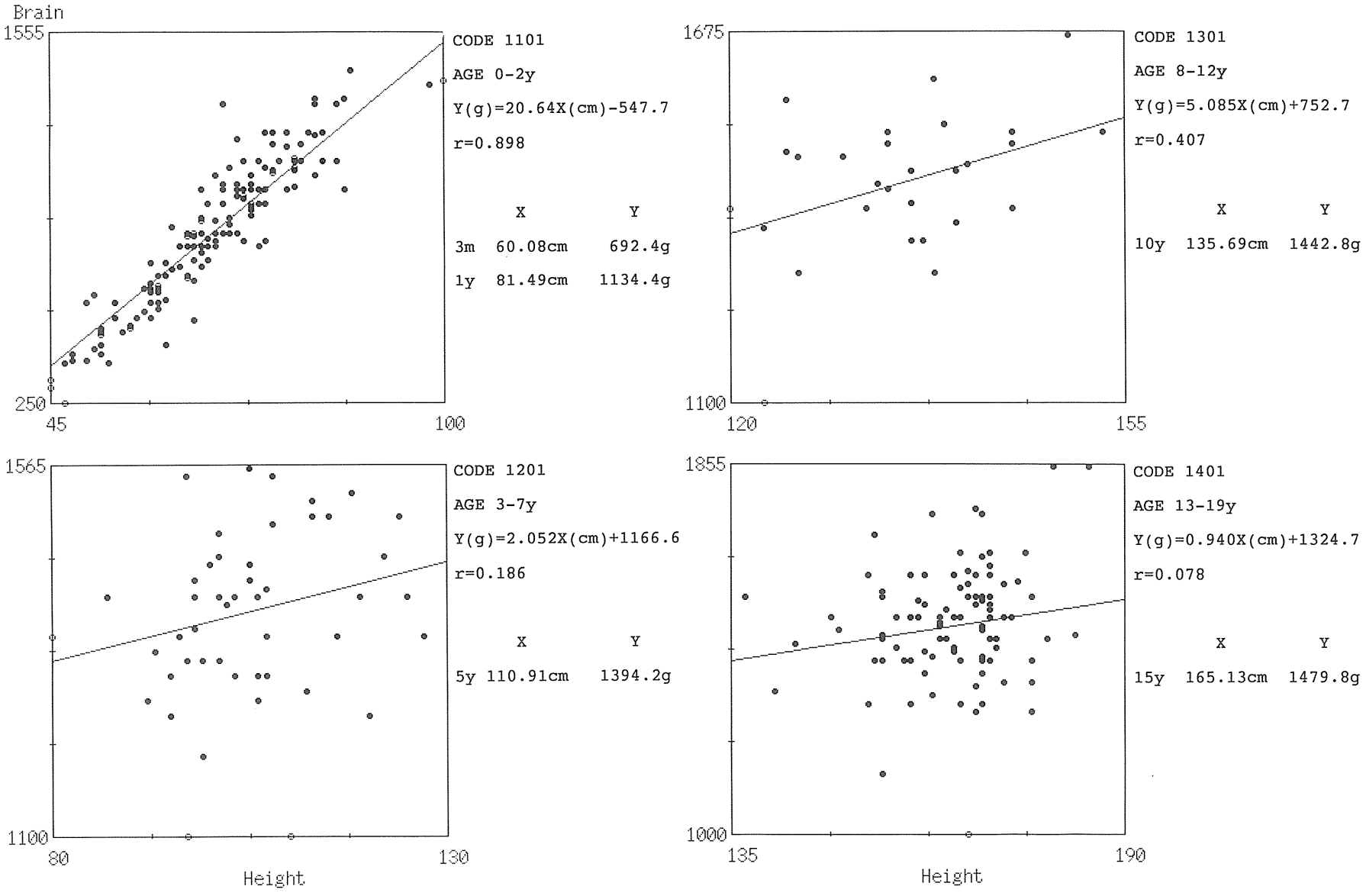


Fig. 5a. Mass of the brain, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

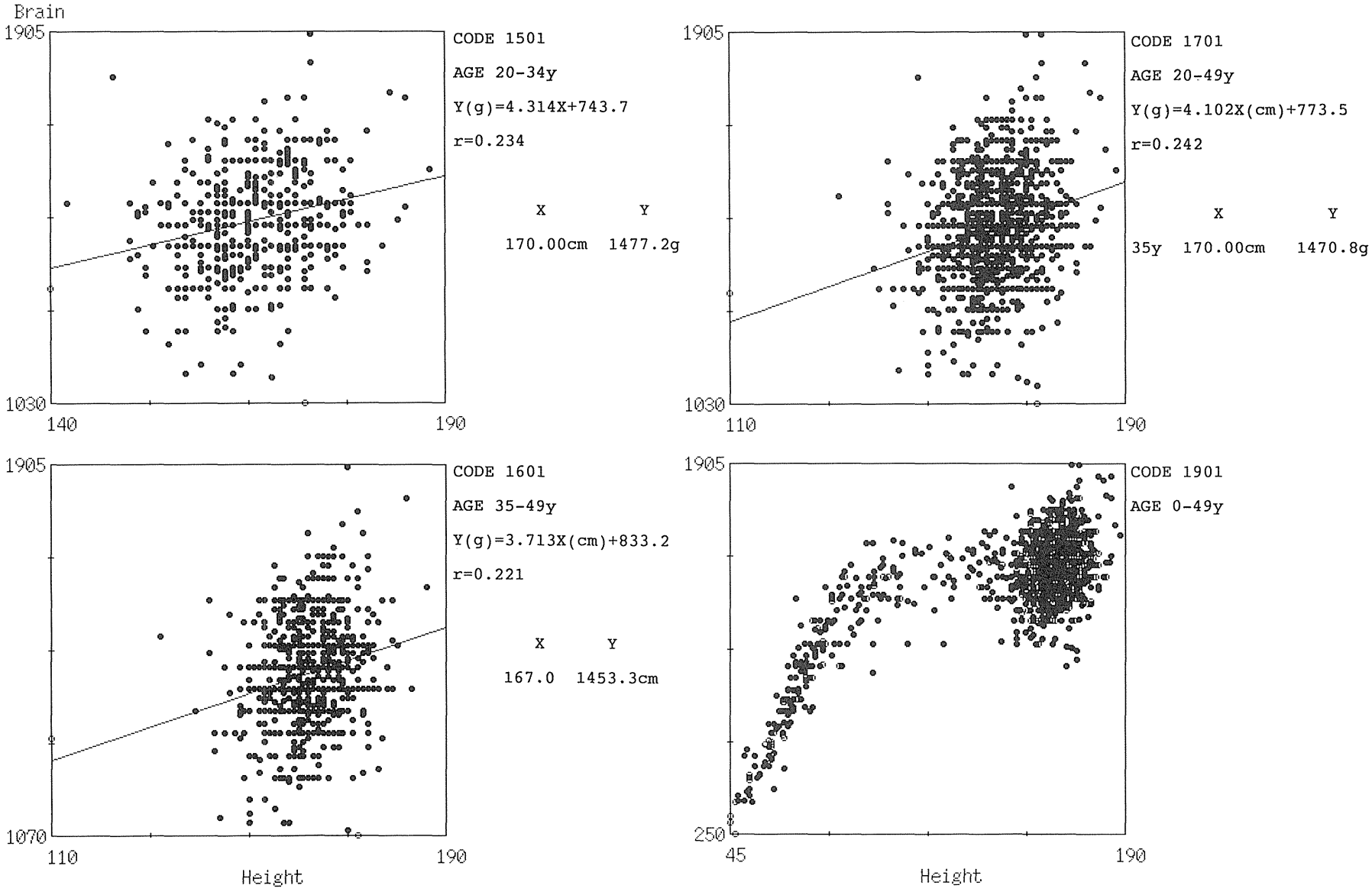


Fig. 5b. Mass of the brain, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

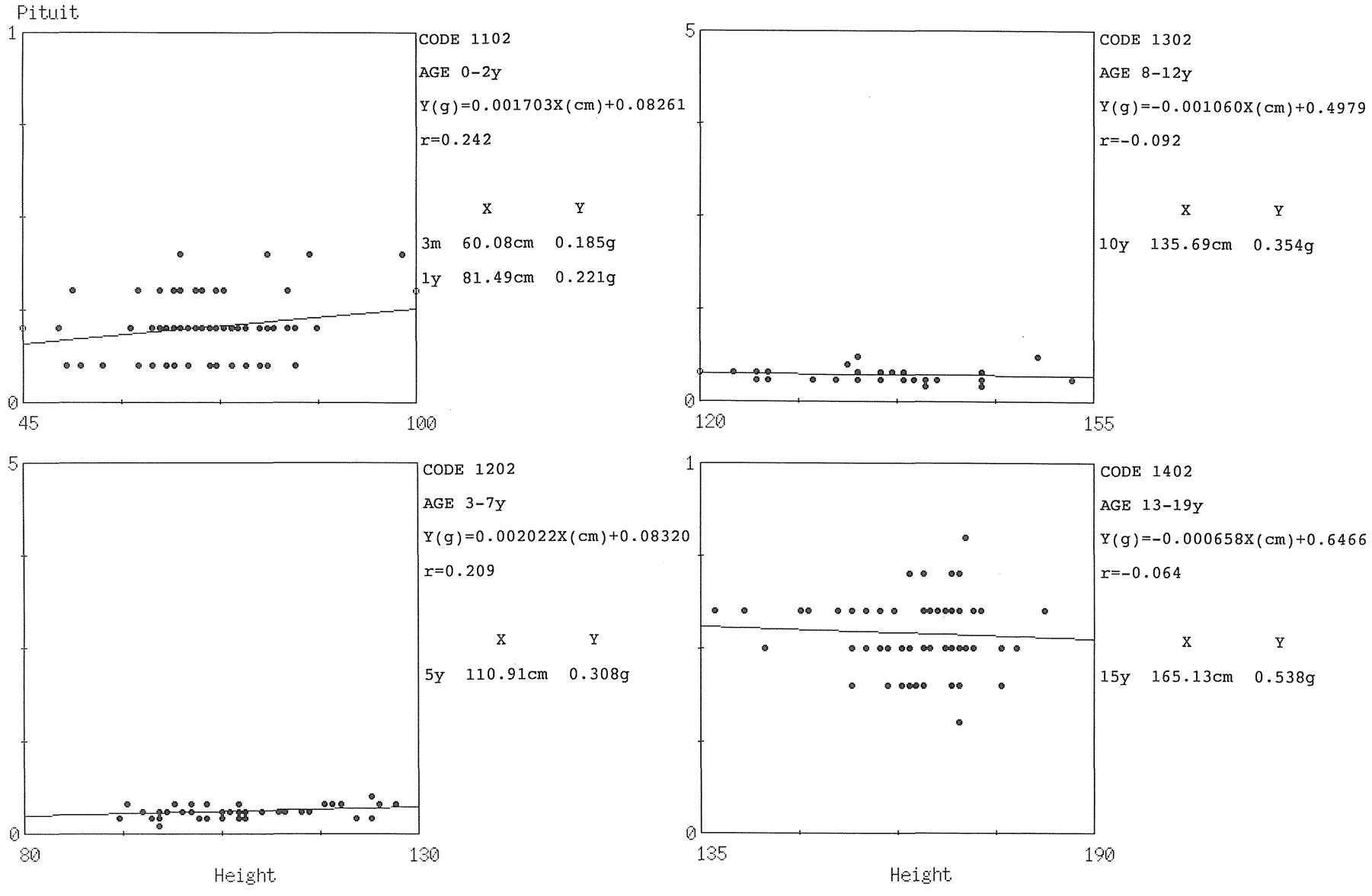


Fig. 6a. Mass of the pituitary gland, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

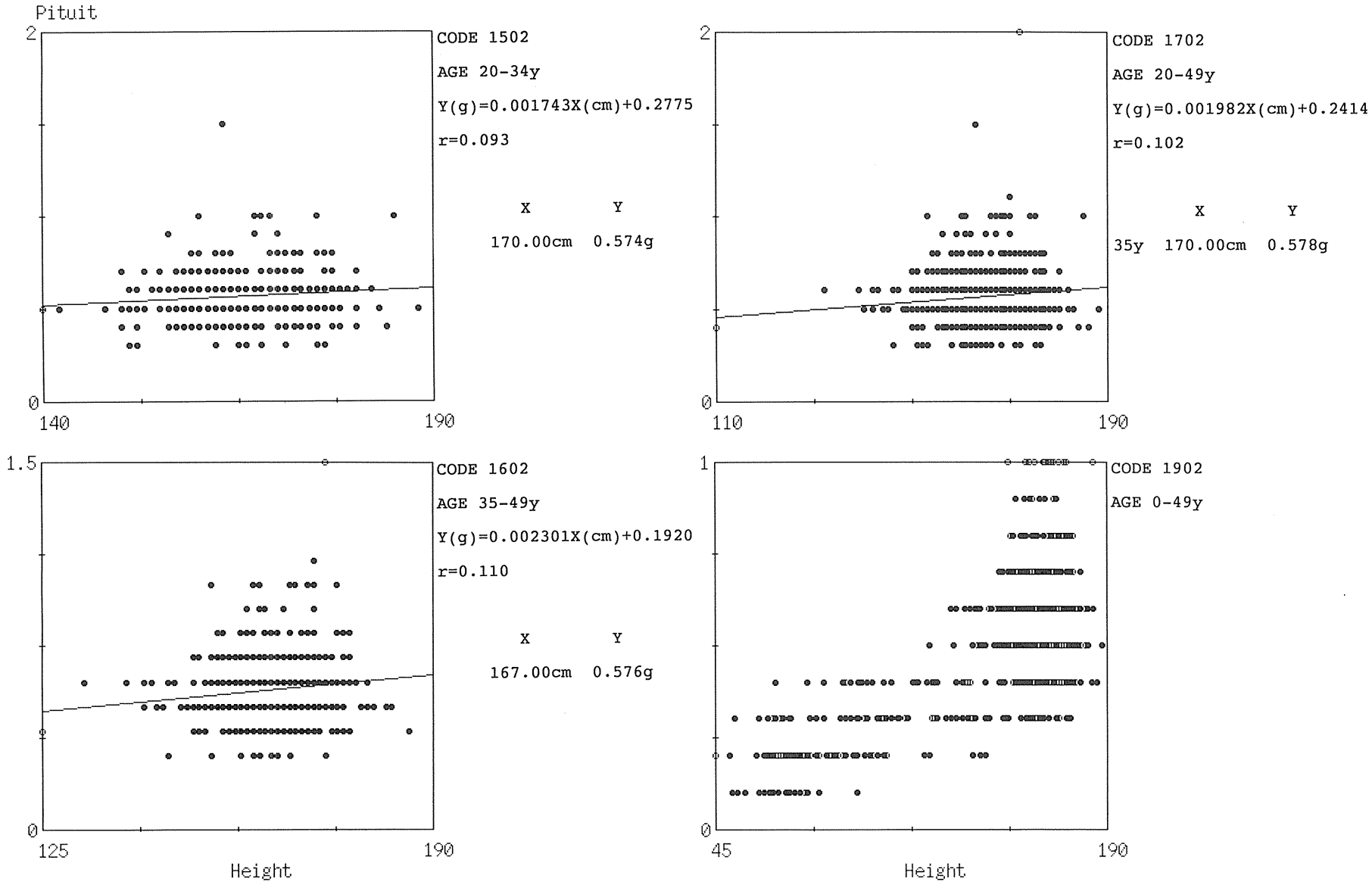


Fig. 6b. Mass of the pituitary gland, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

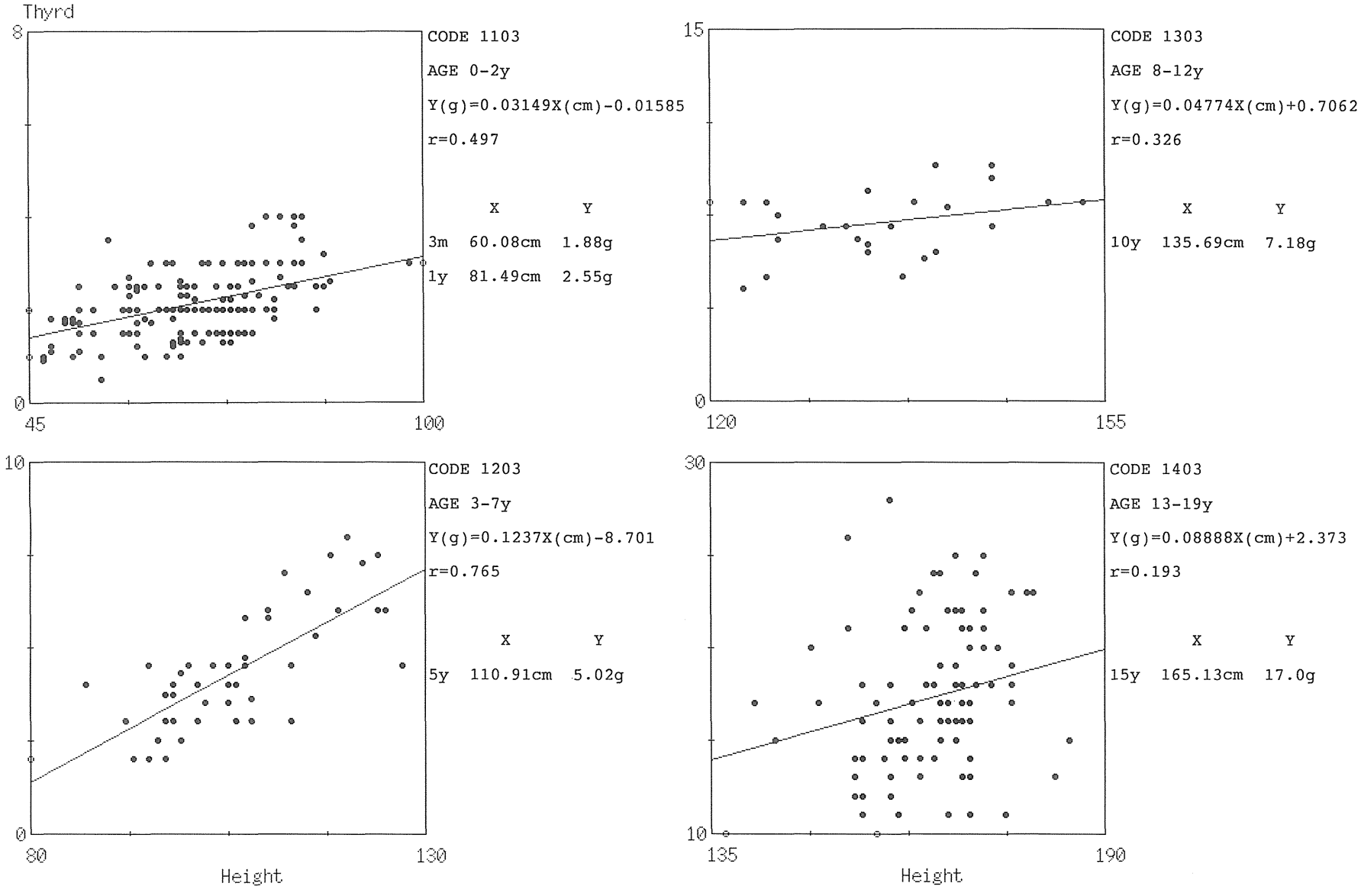


Fig. 7a. Mass of the thyroid gland, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

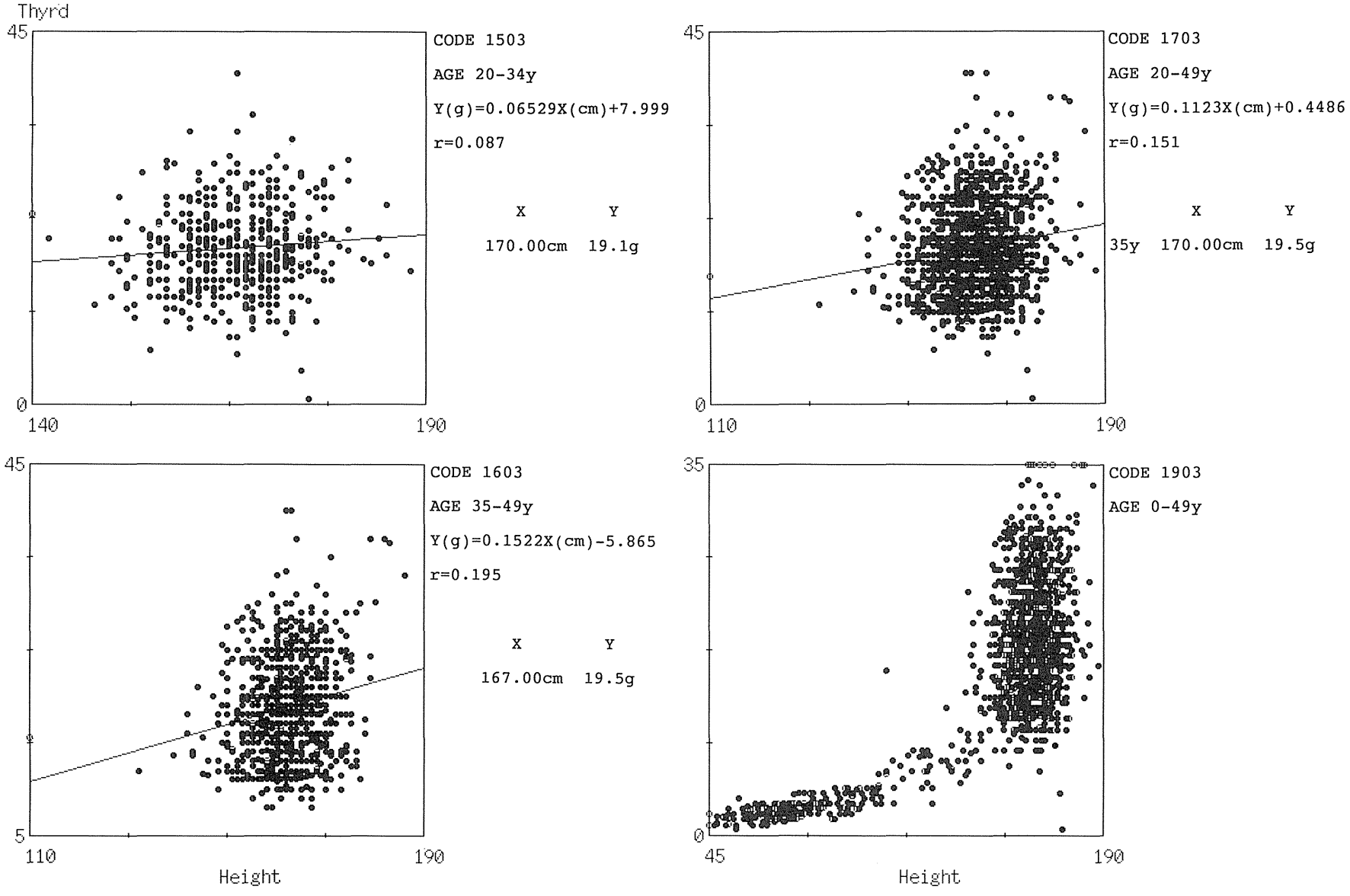


Fig. 7b. Mass of the thyroid gland, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

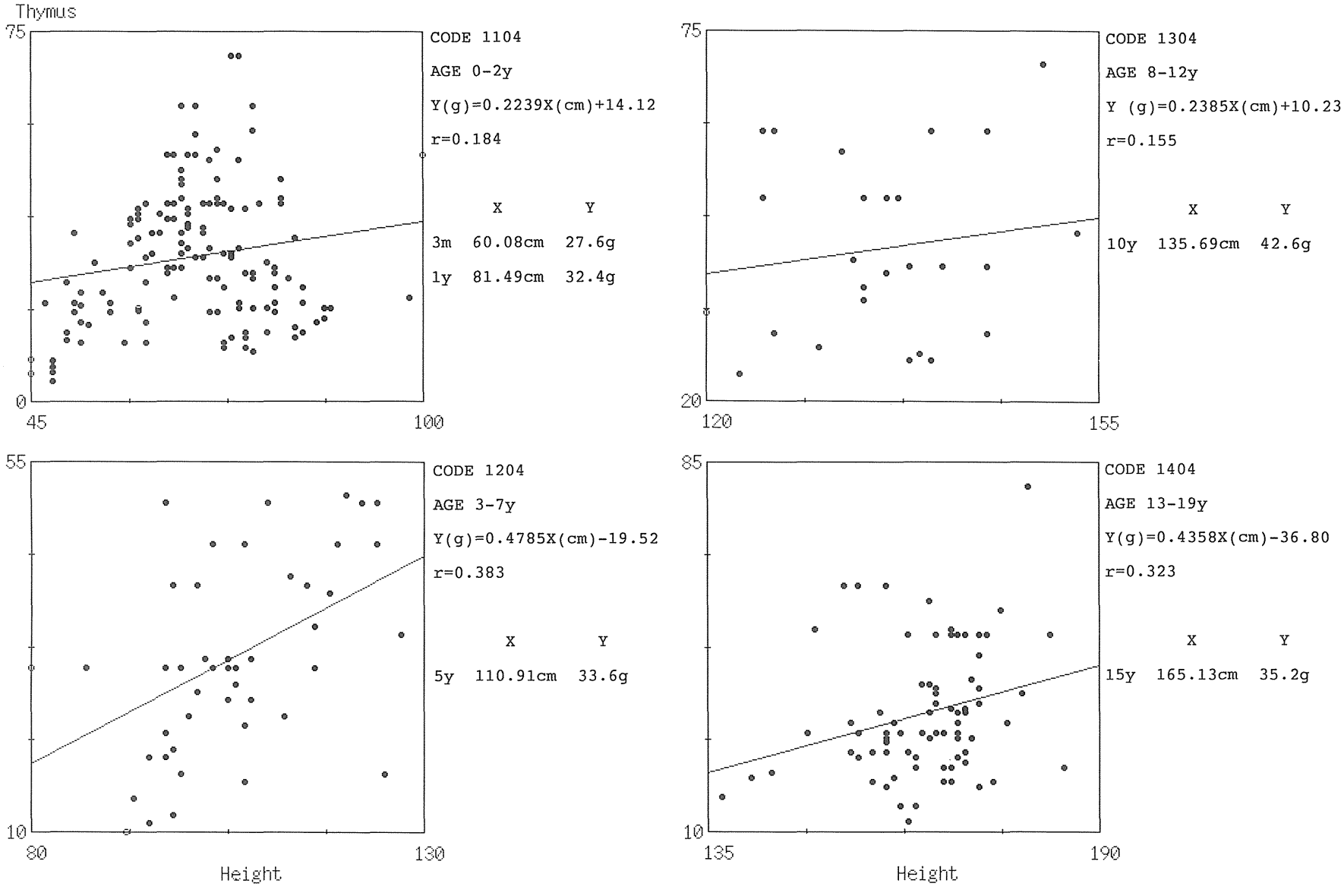


Fig. 8a. Mass of the thymus, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

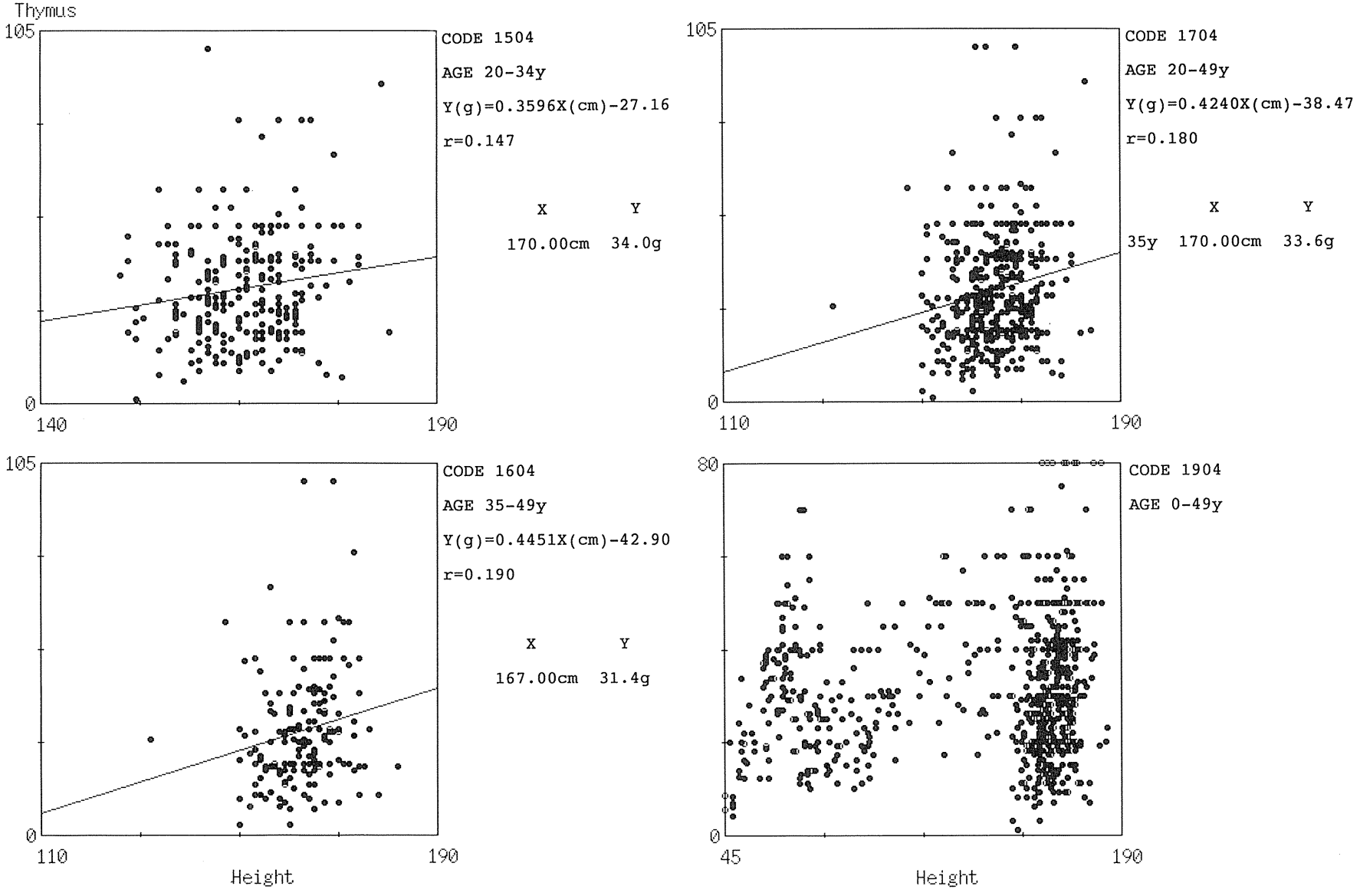


Fig. 8b. Mass of the thymus, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

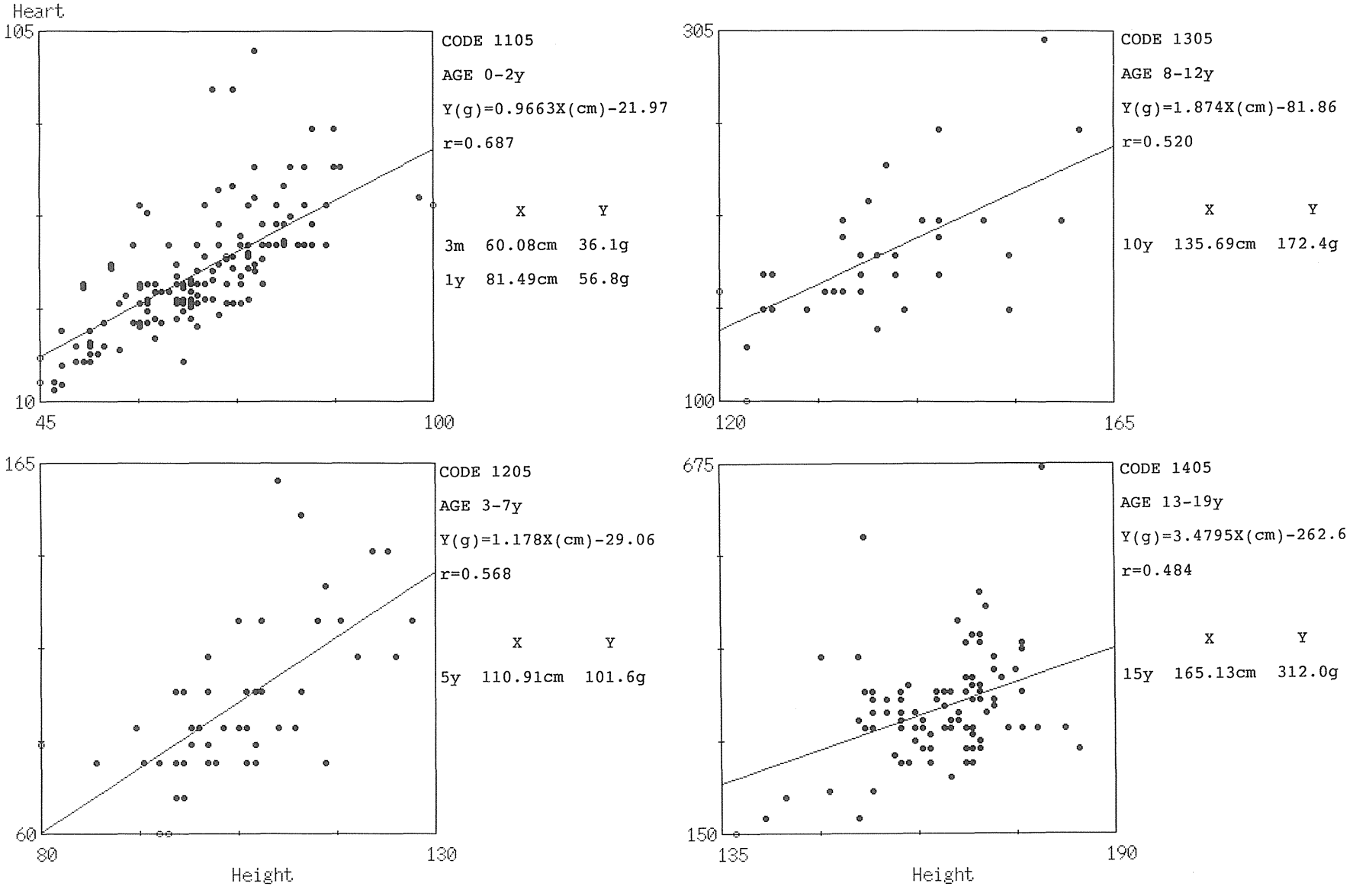


Fig. 9a. Mass of the heart, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

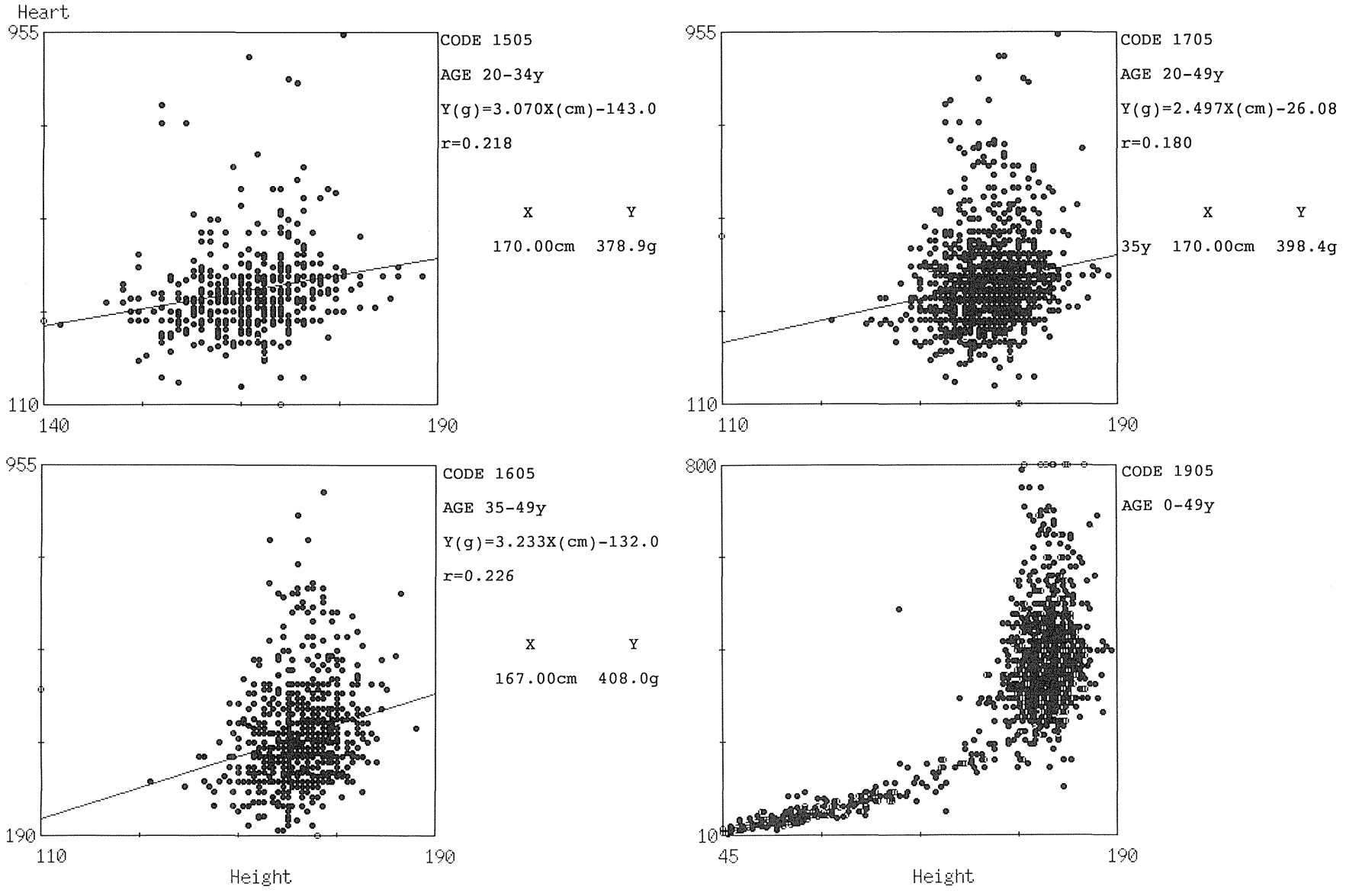


Fig. 9b. Mass of the heart, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

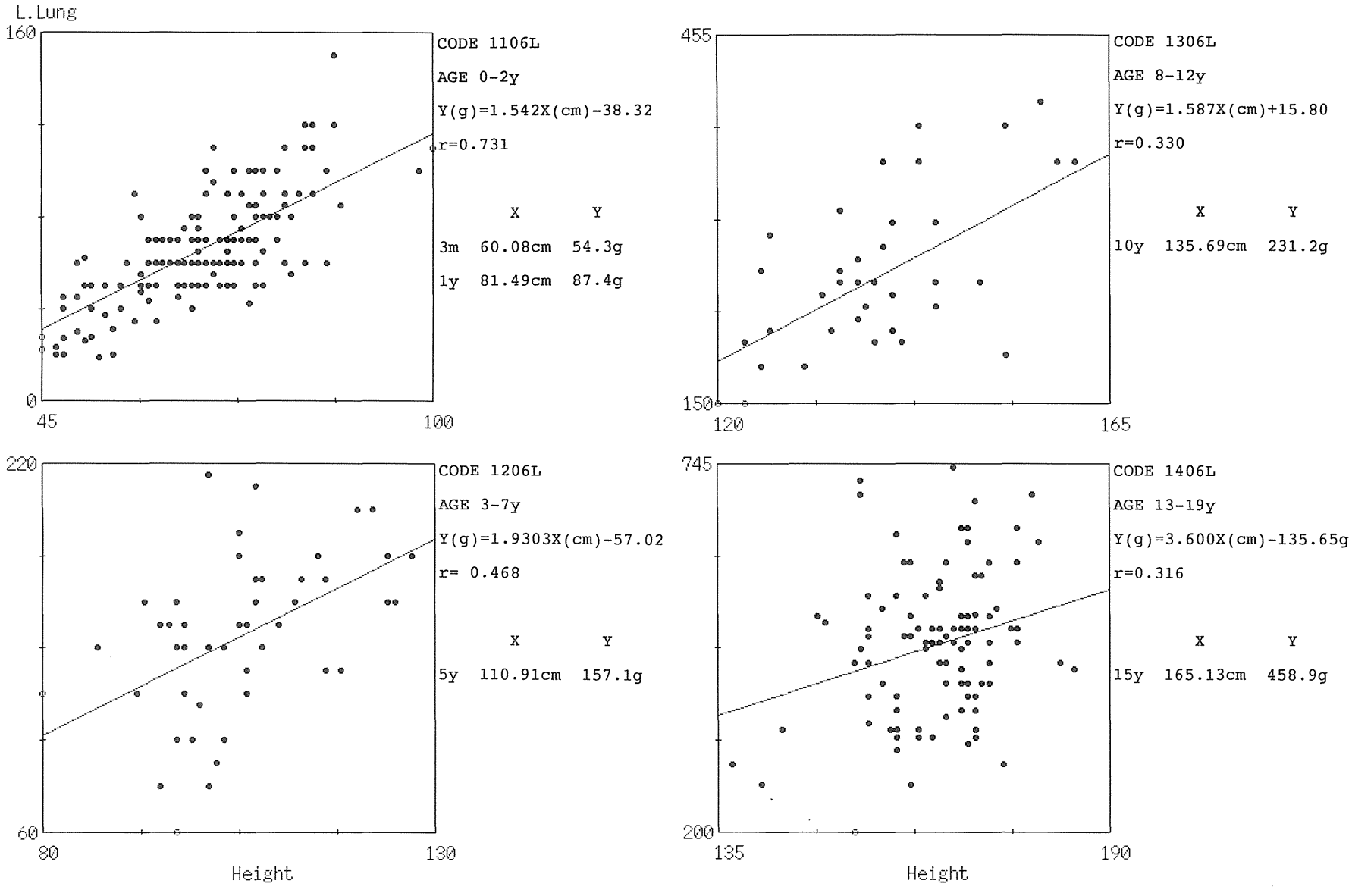


Fig. 10a. Mass of the left lung, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

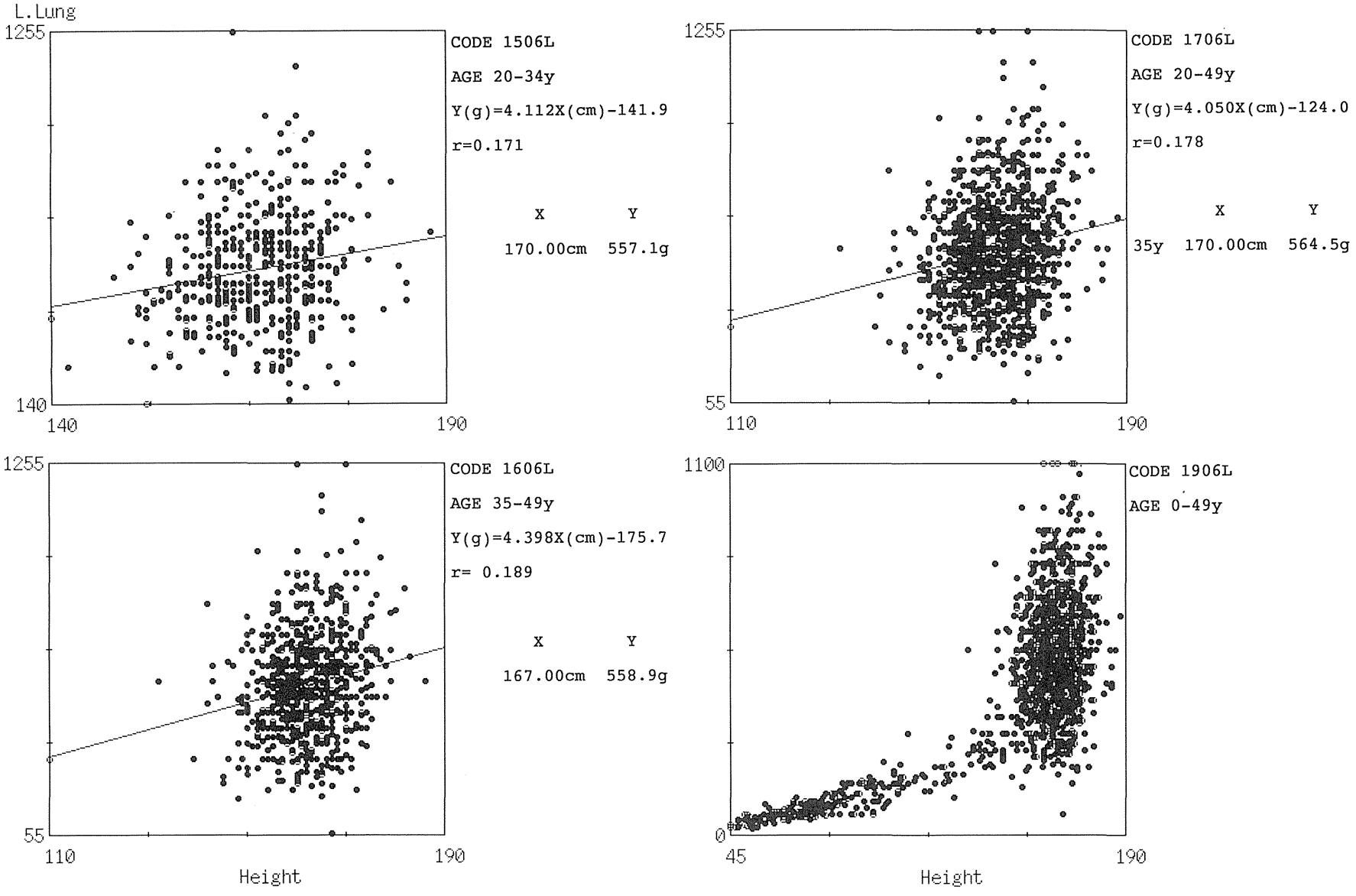


Fig. 10b. Mass of the left lung, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

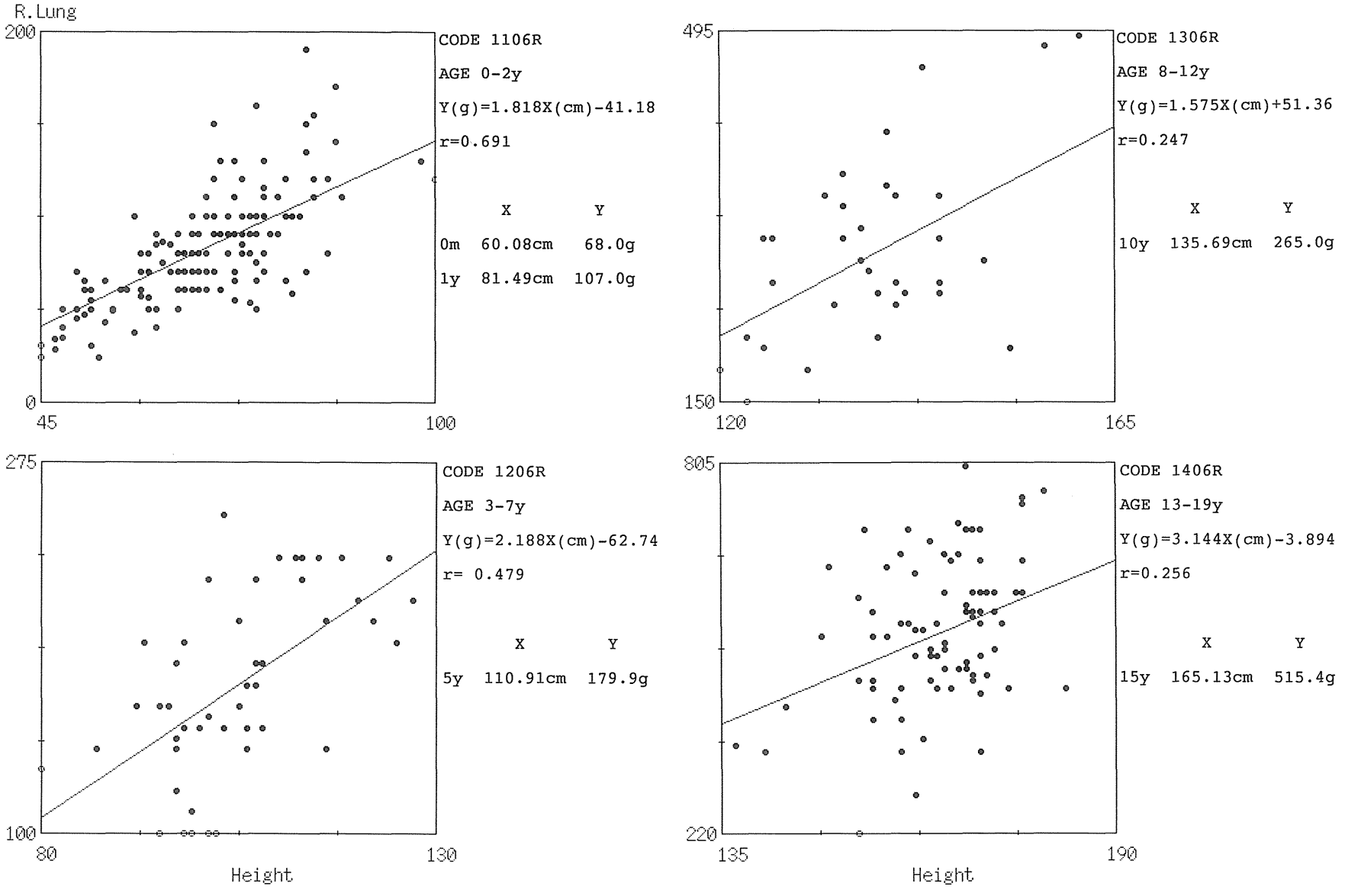


Fig. 11a. Mass of the right lung, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

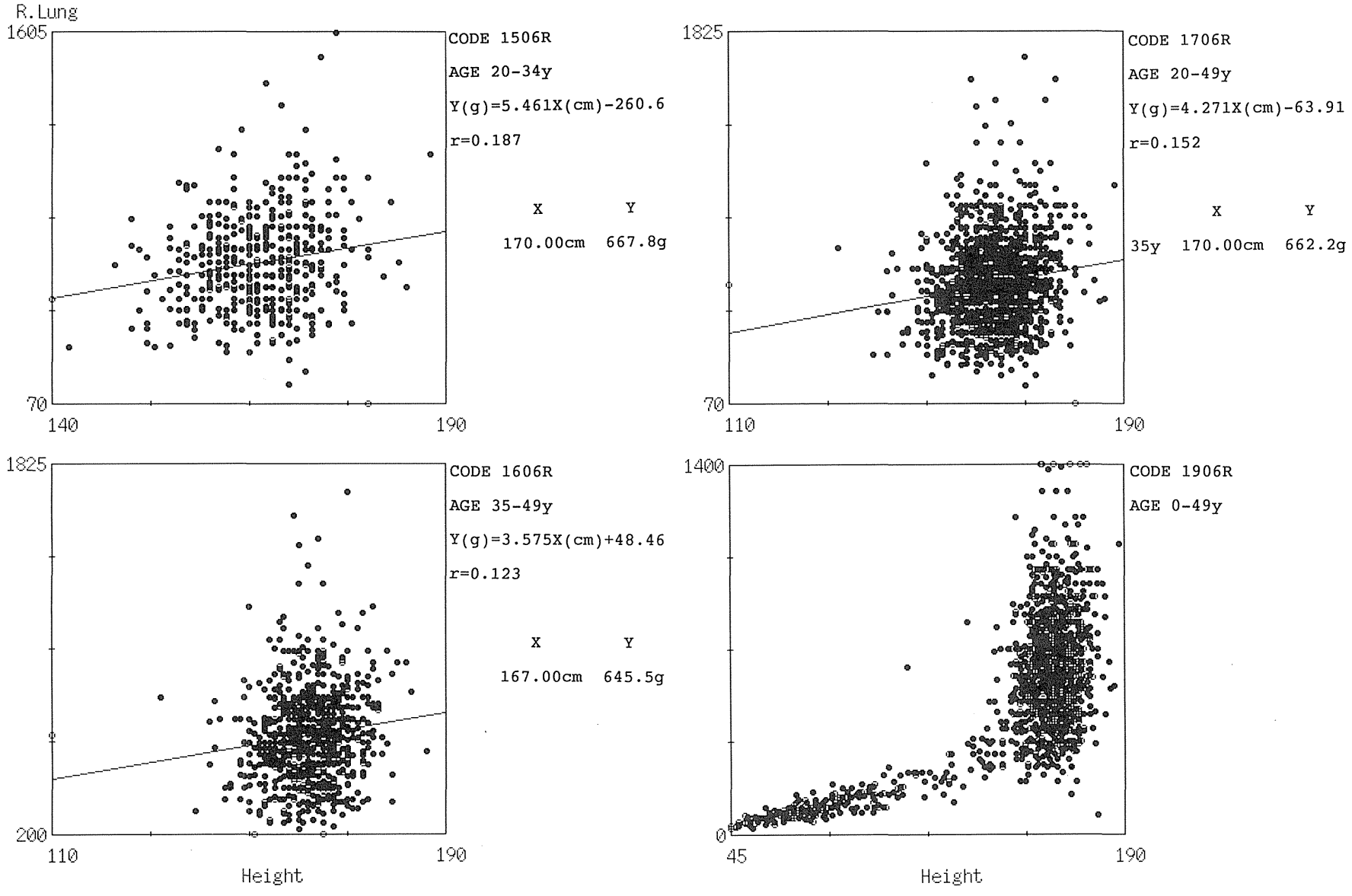


Fig. 11b. Mass of the right lung, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

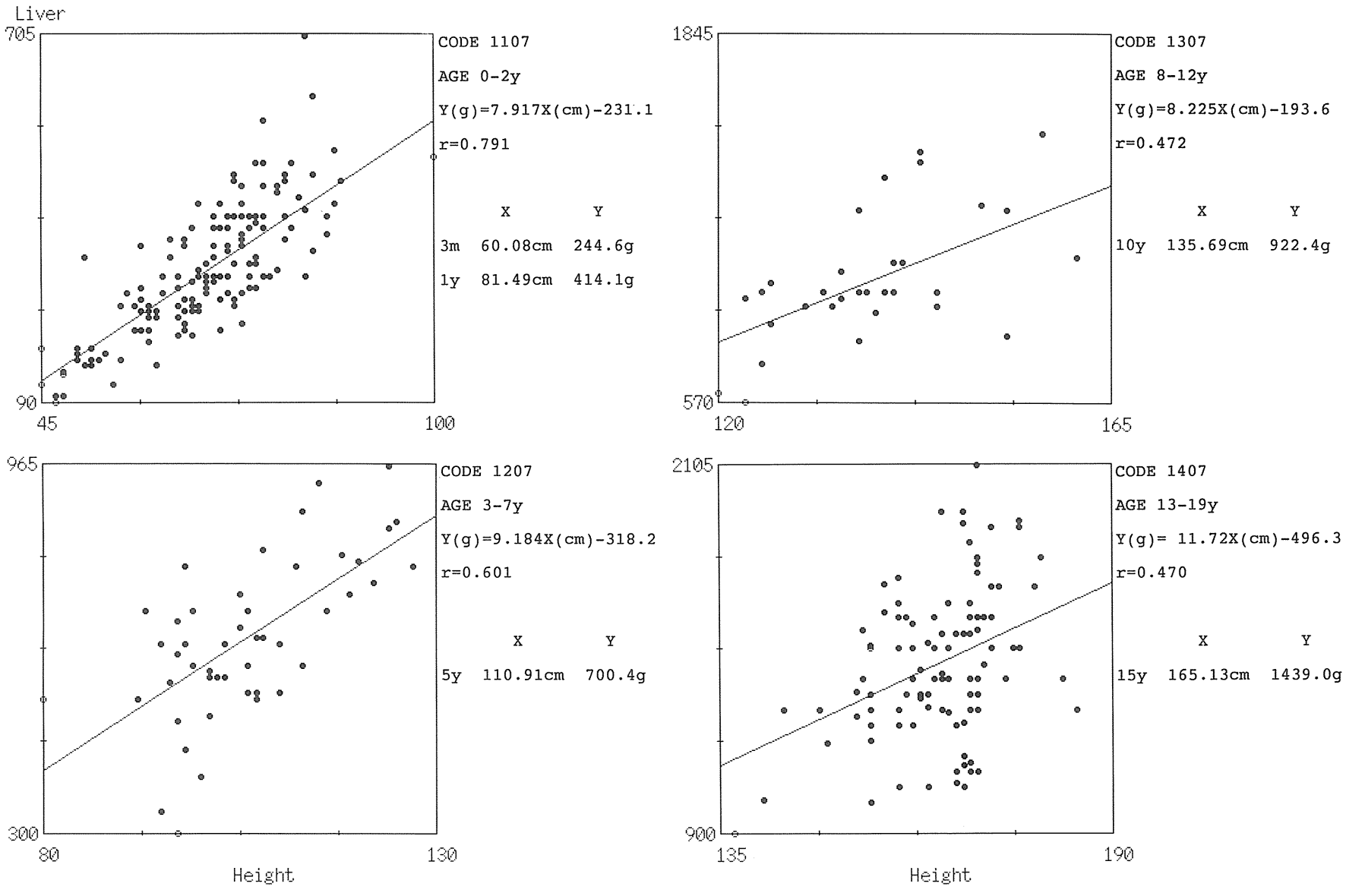


Fig. 12a. Mass of the liver, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

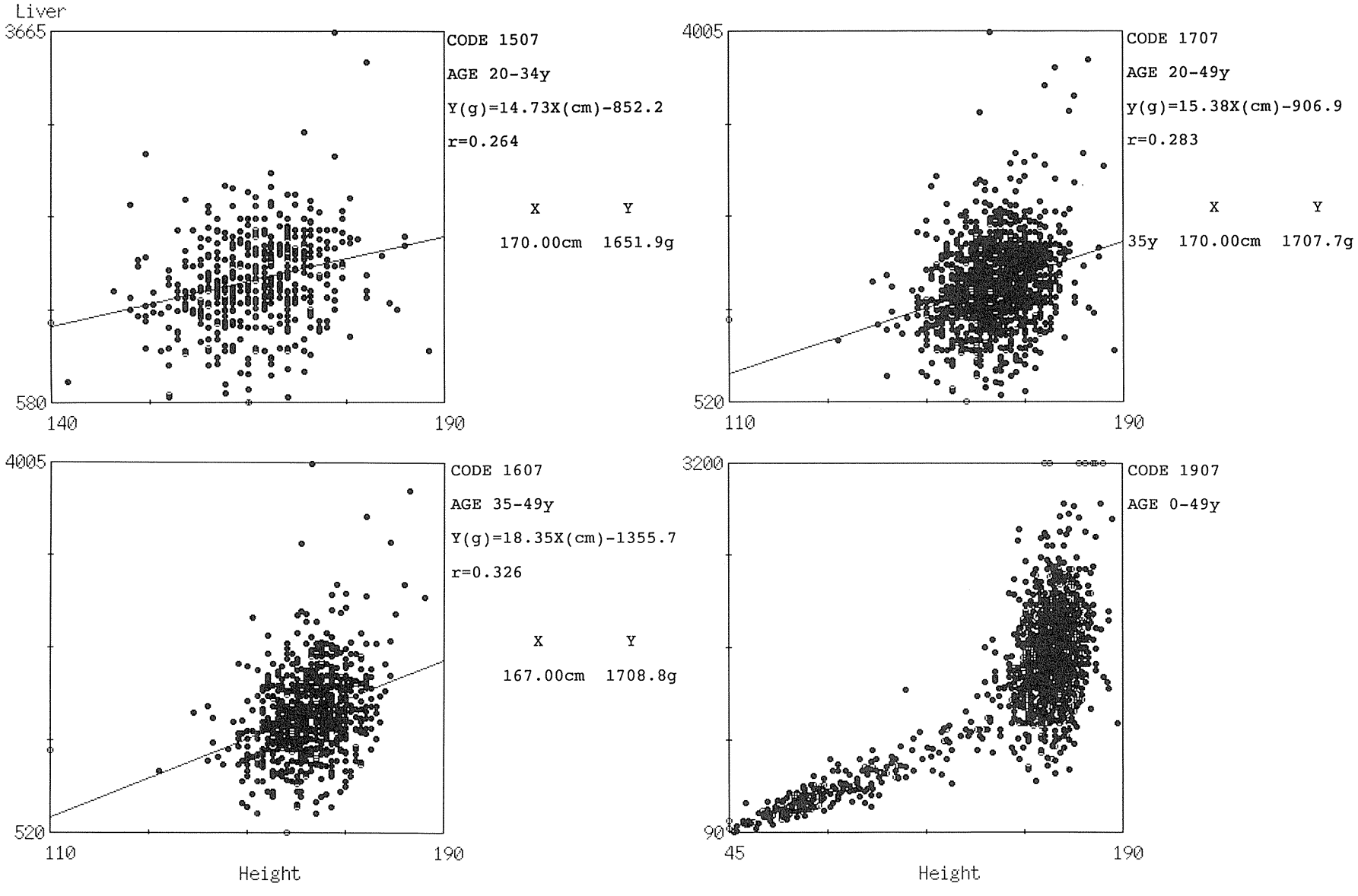


Fig. 12b. Mass of the liver, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

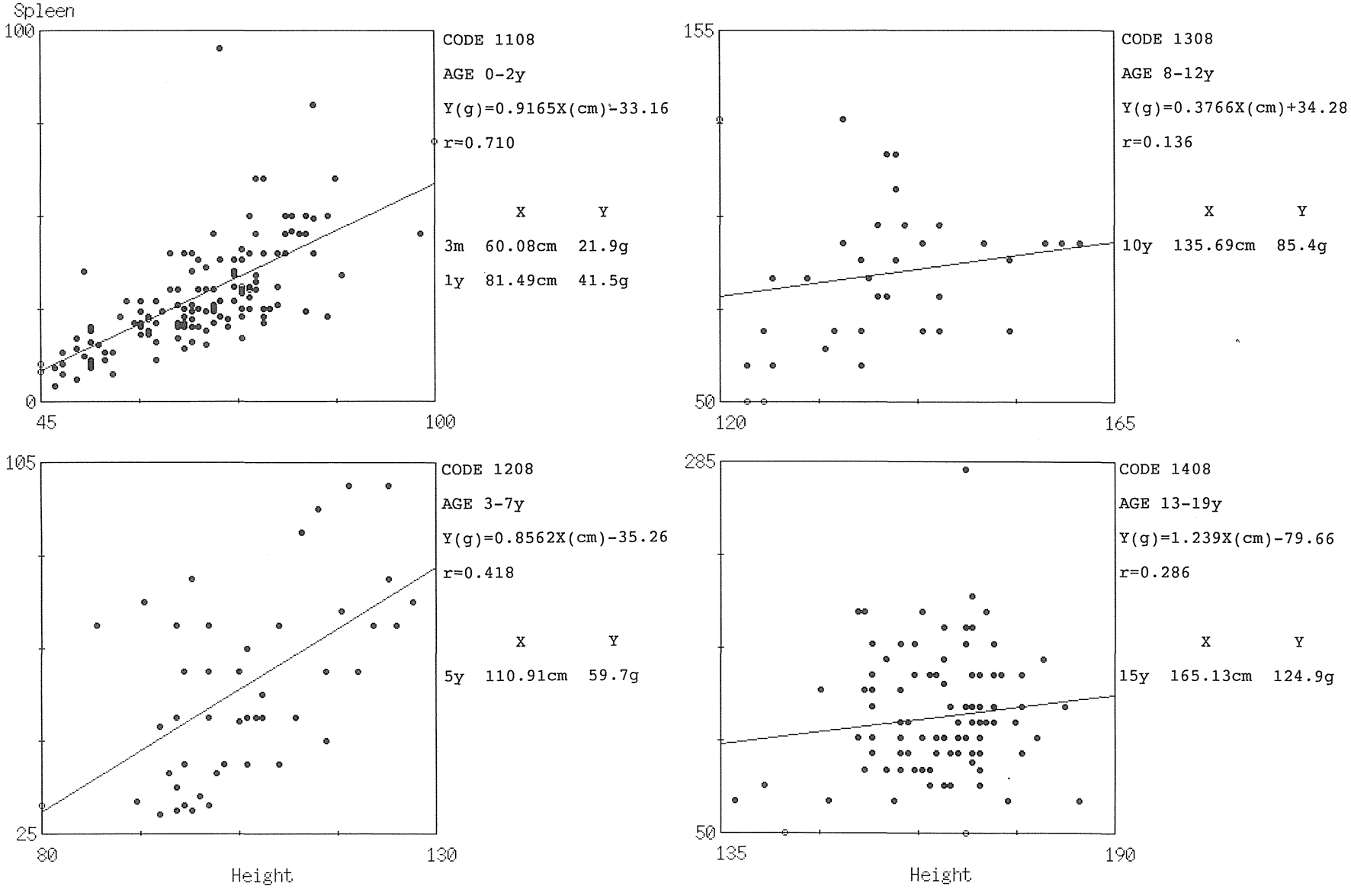


Fig. 13a. Mass of the spleen, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

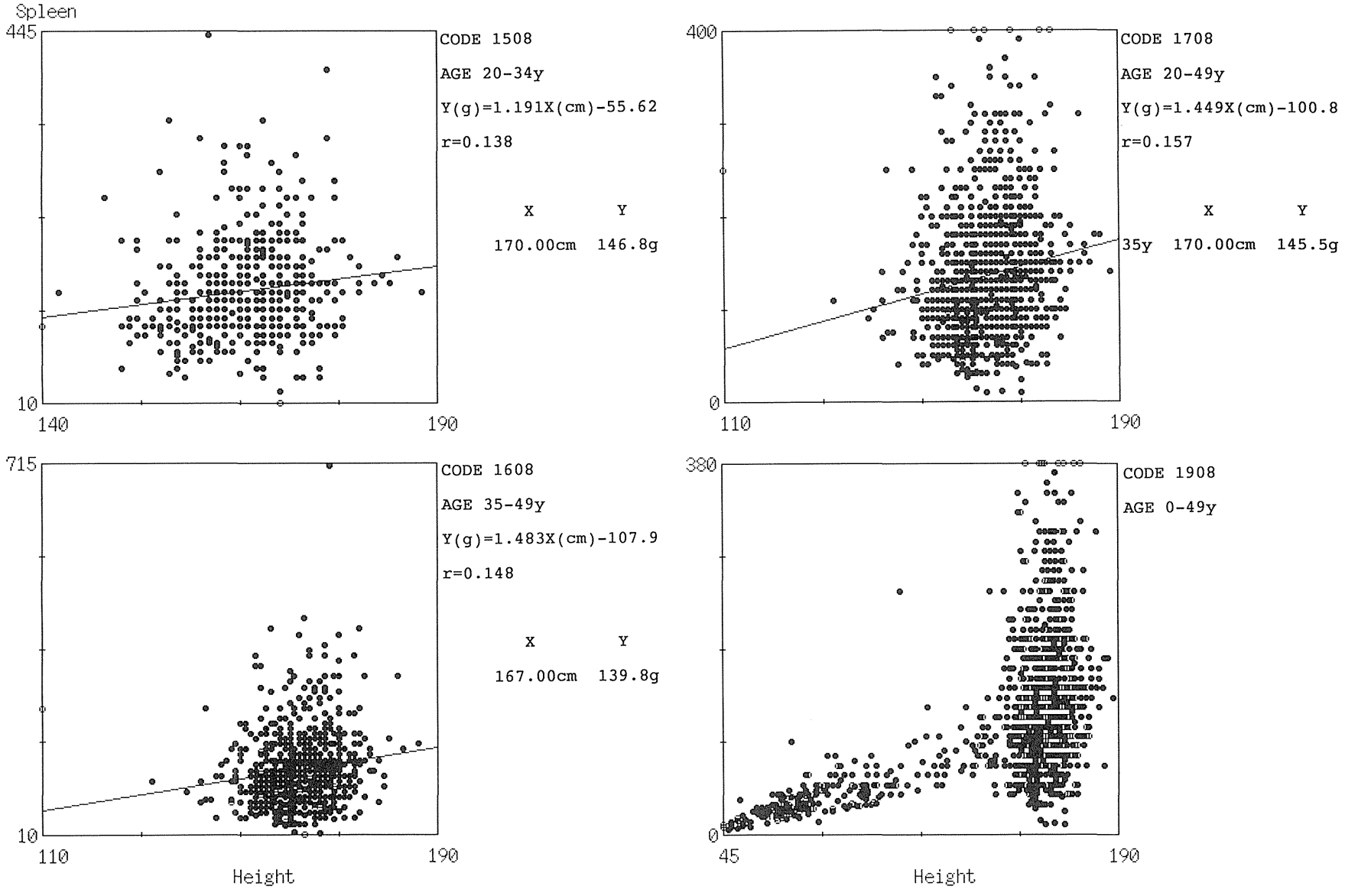


Fig. 13b. Mass of the spleen, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

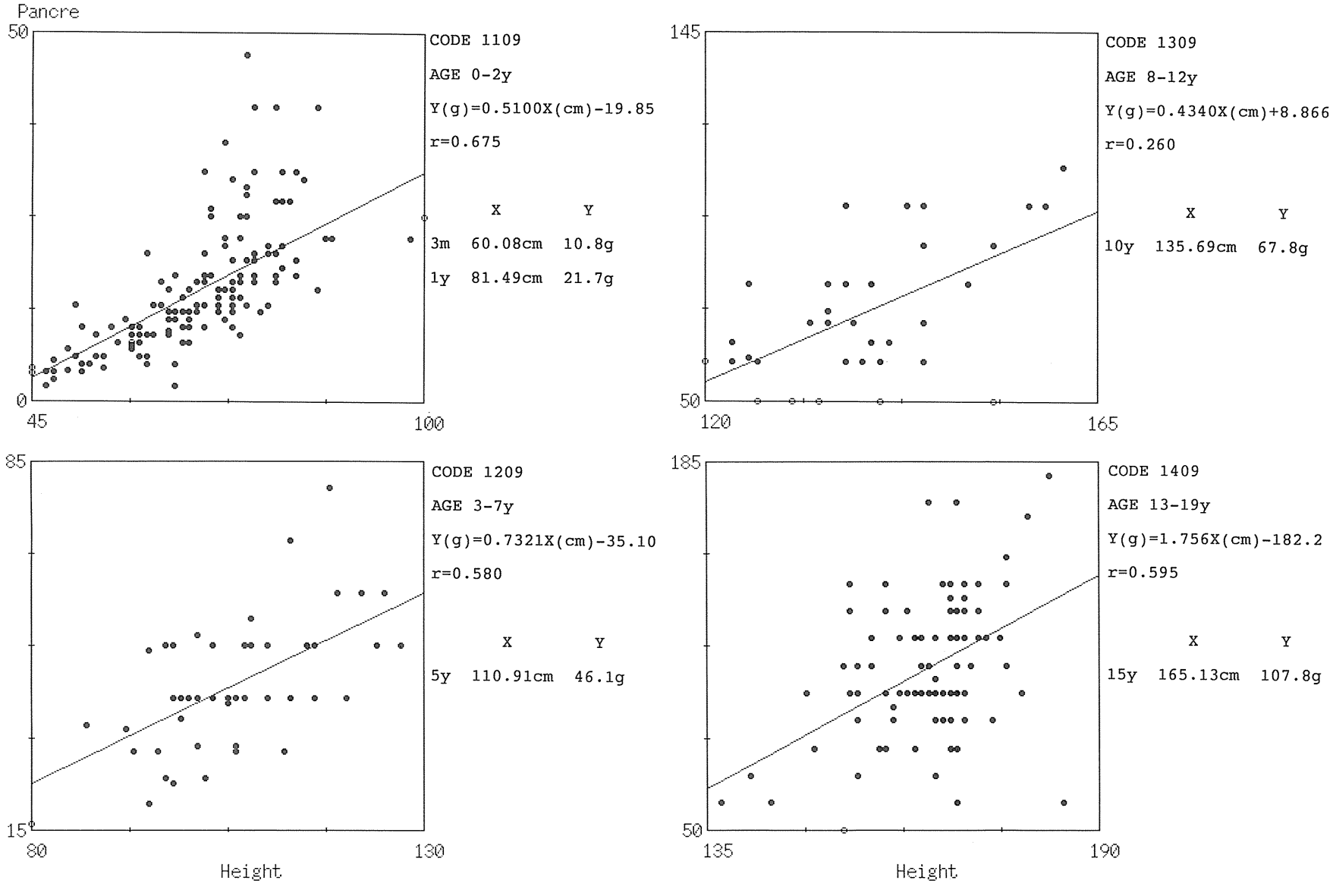


Fig. 14a. Mass of the pancreas, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

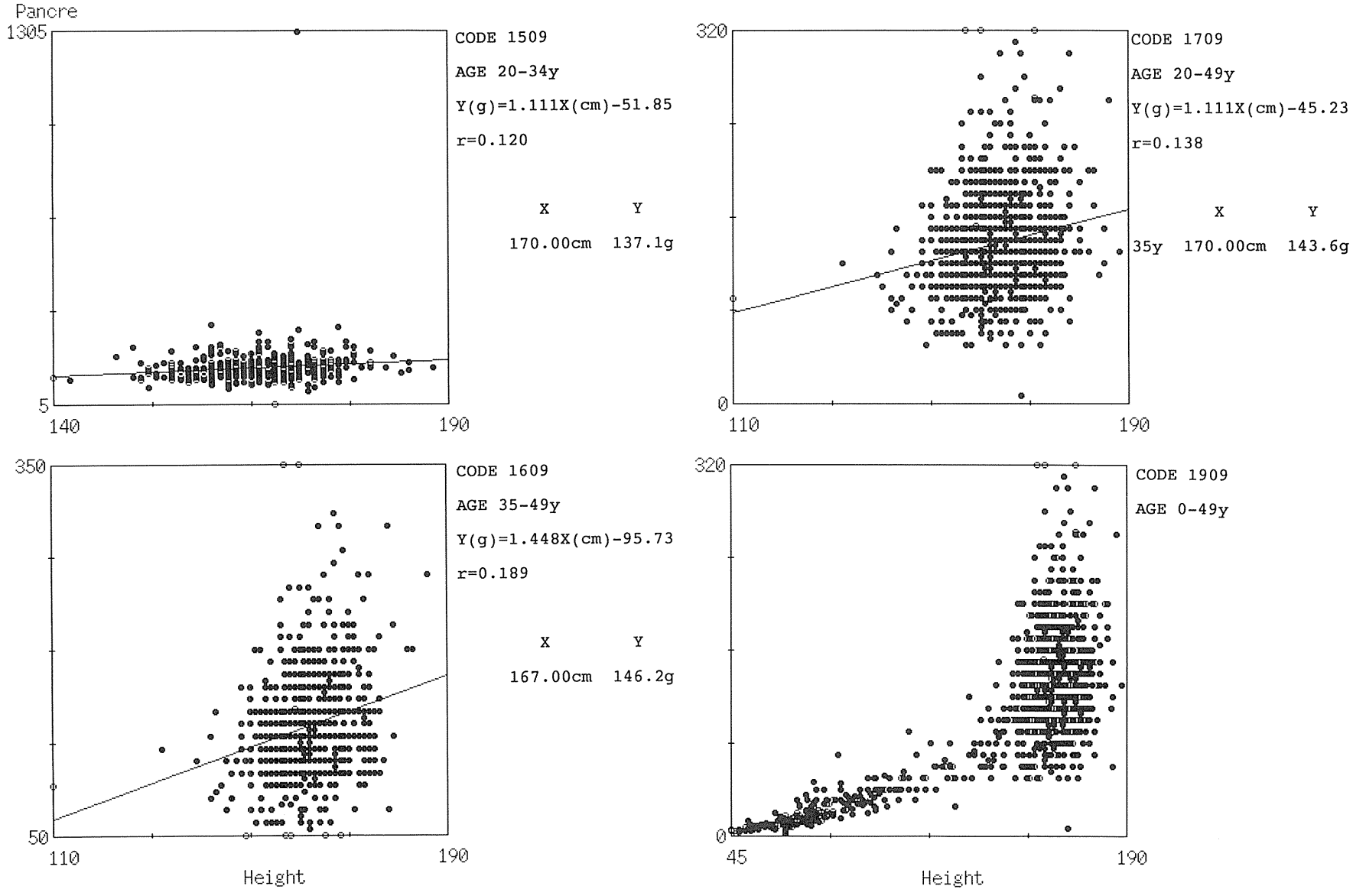


Fig. 14b. Mass of the pancreas, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

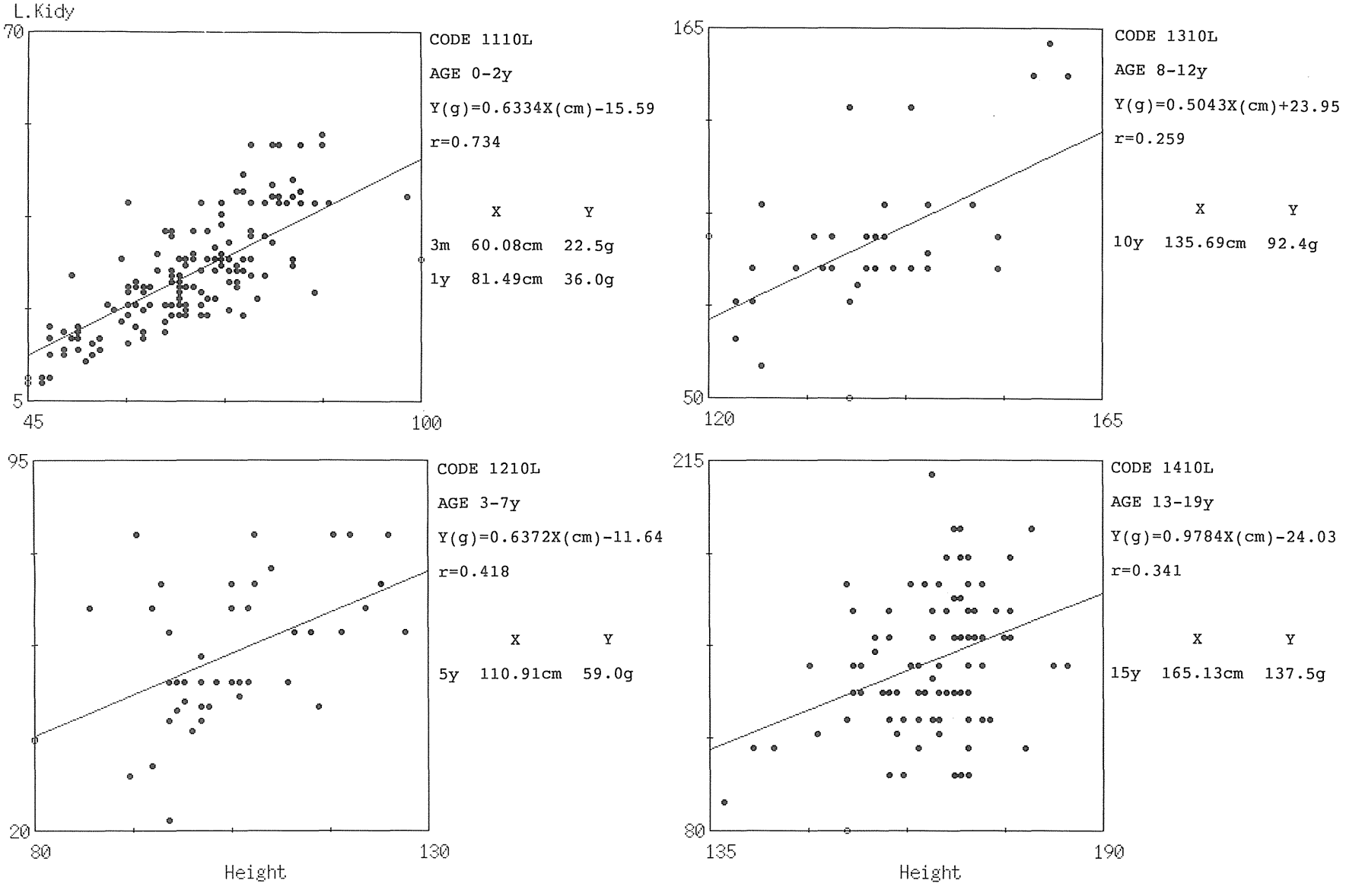


Fig. 15a. Mass of the left kidney, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

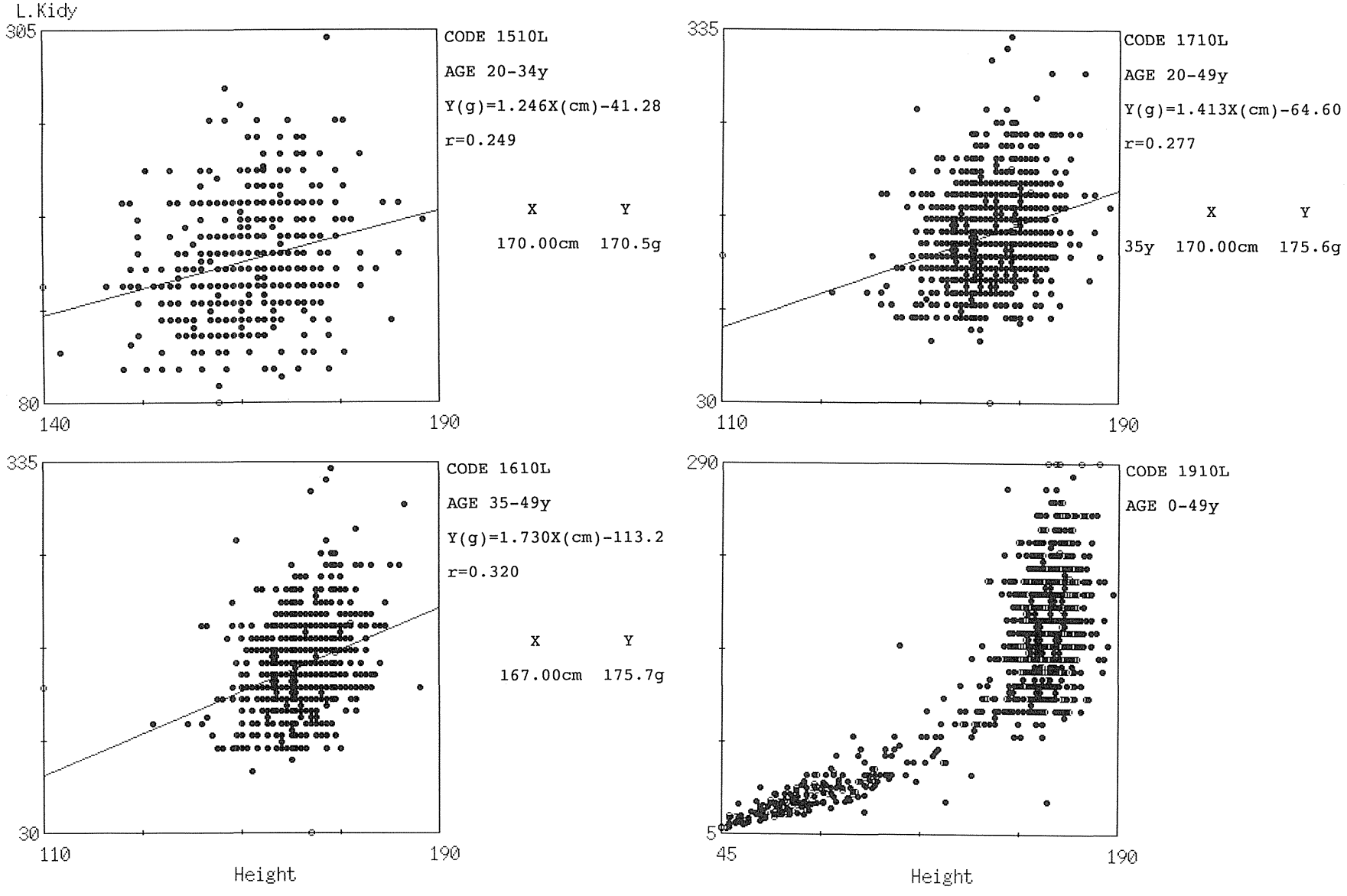


Fig. 15b. Mass of the left kidney, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

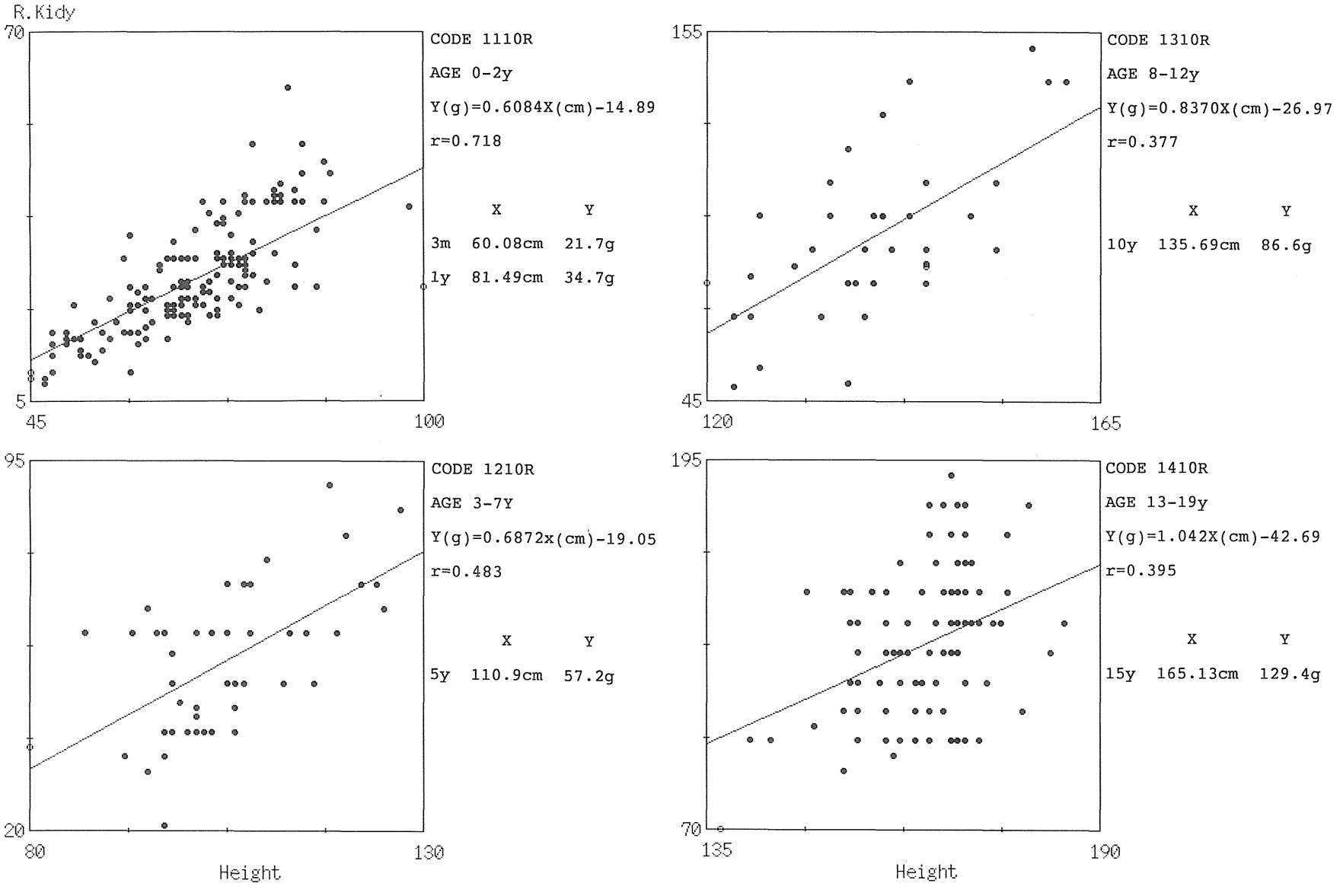


Fig. 16a. Mass of the right kidney, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

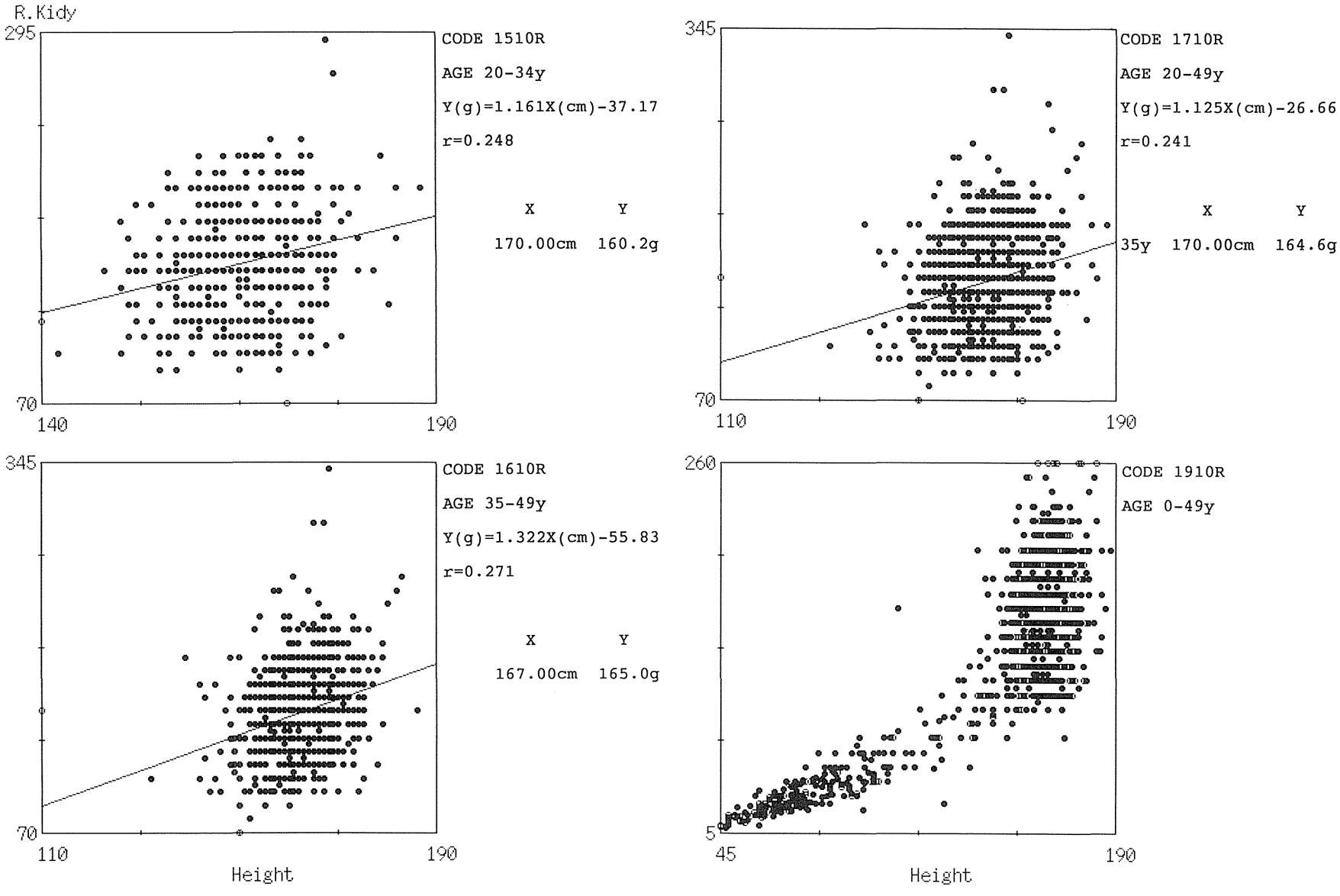


Fig. 16b. Mass of the right kidney, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

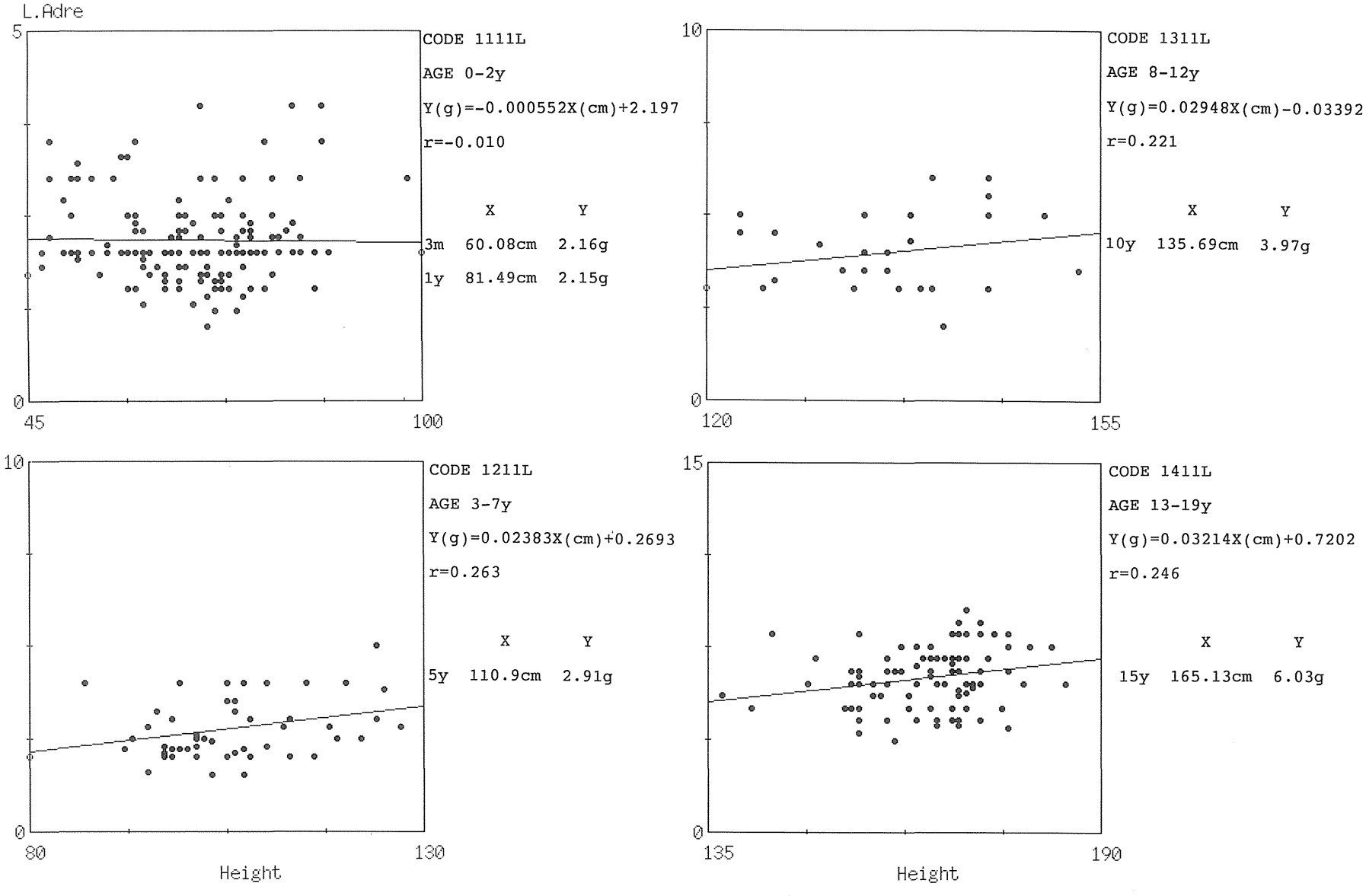


Fig. 17a. Mass of the left adrenal gland, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

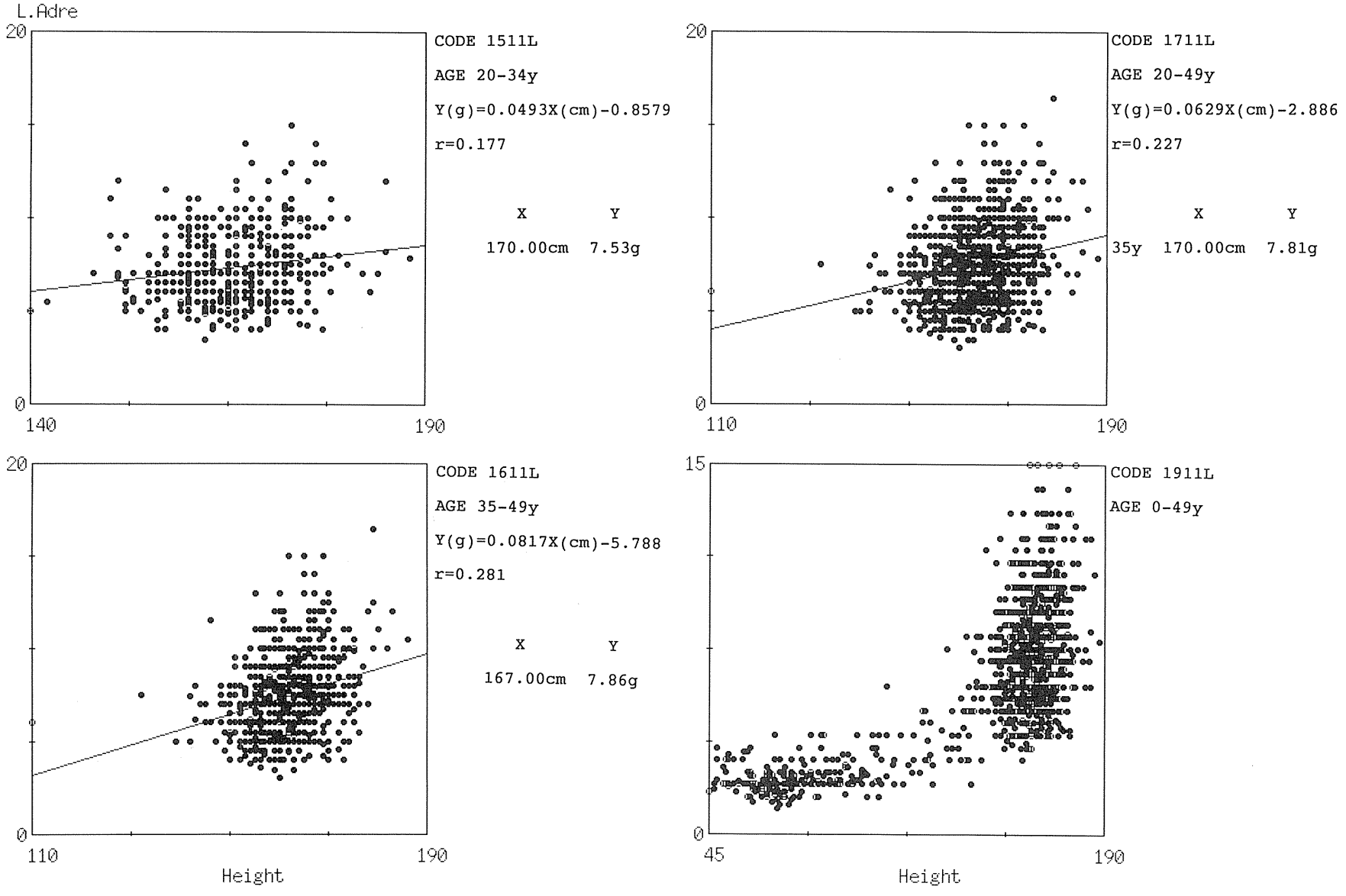


Fig. 17b. Mass of the left adrenal gland, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

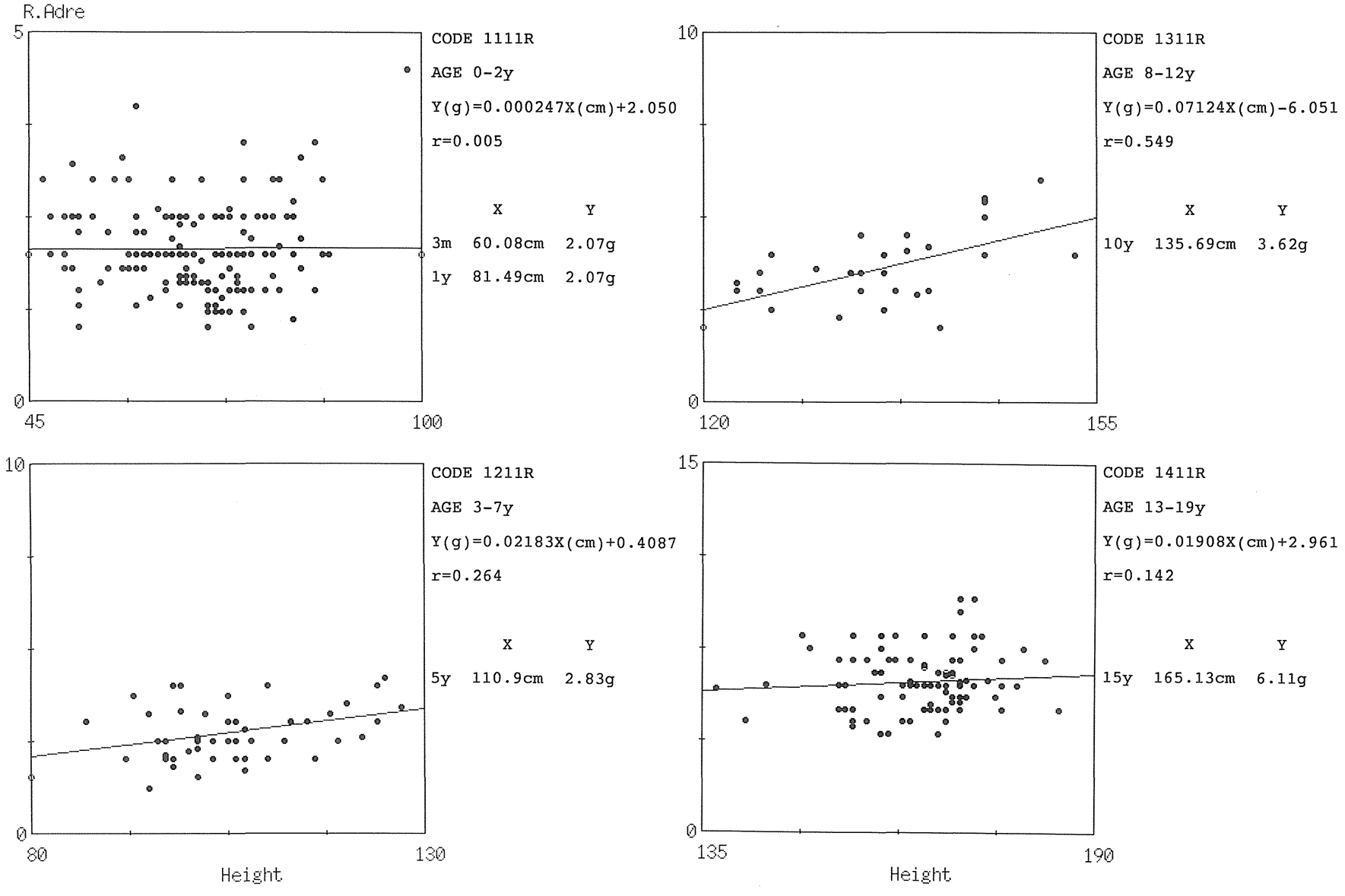


Fig. 18a. Mass of the right adrenal gland, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

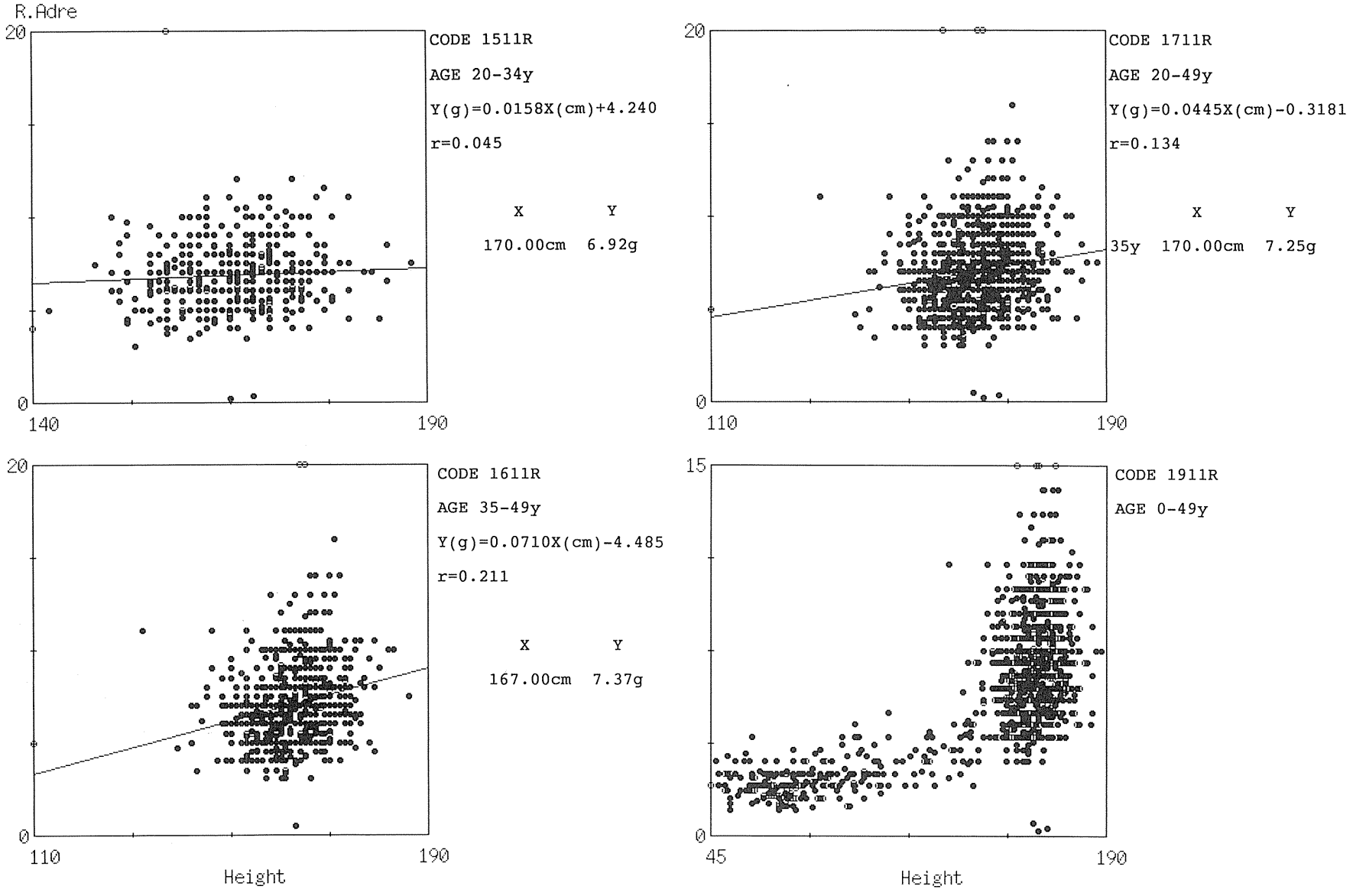


Fig. 18b. Mass of the right adrenal gland, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

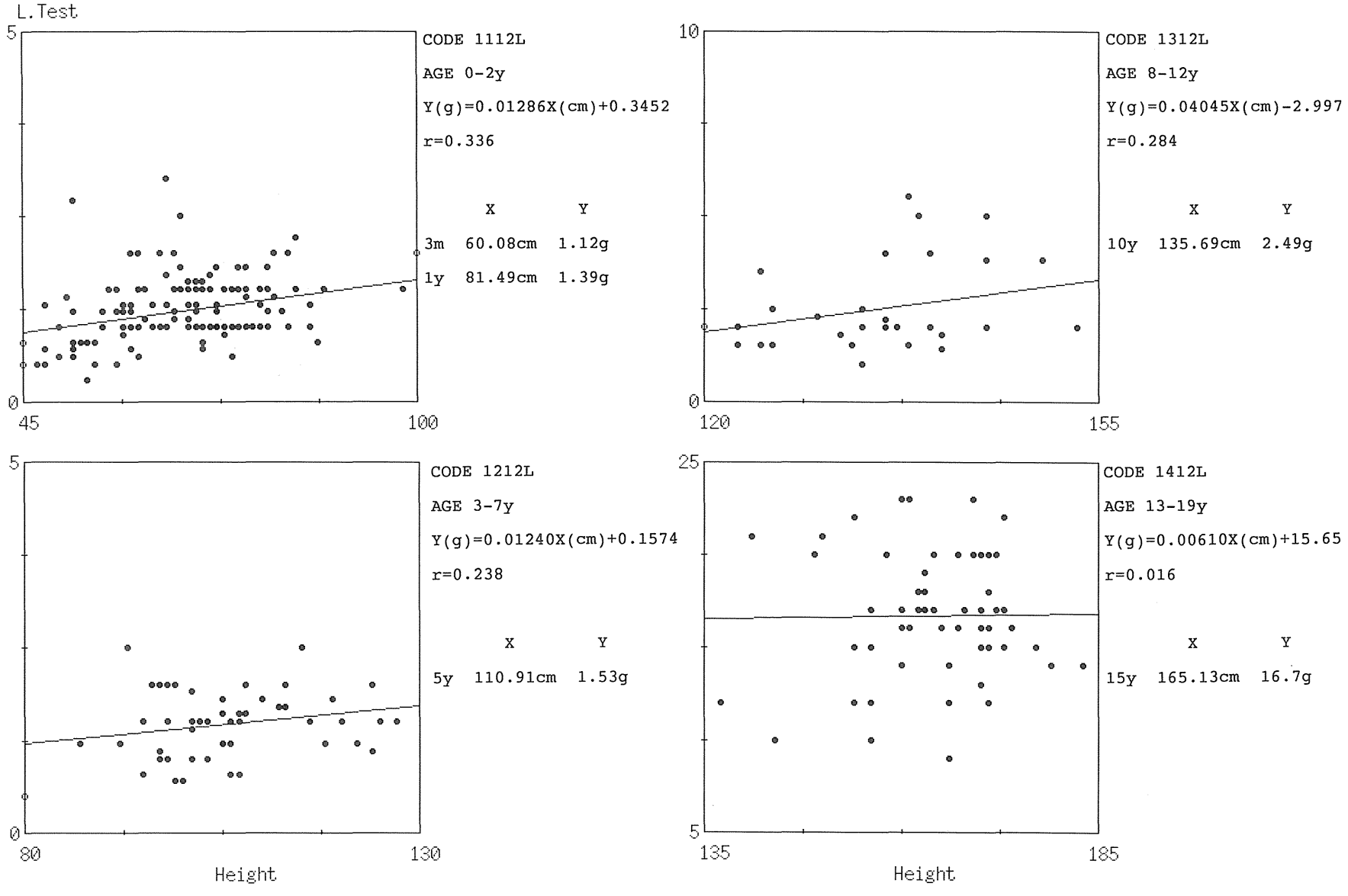


Fig. 19a. Mass of the left testis, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

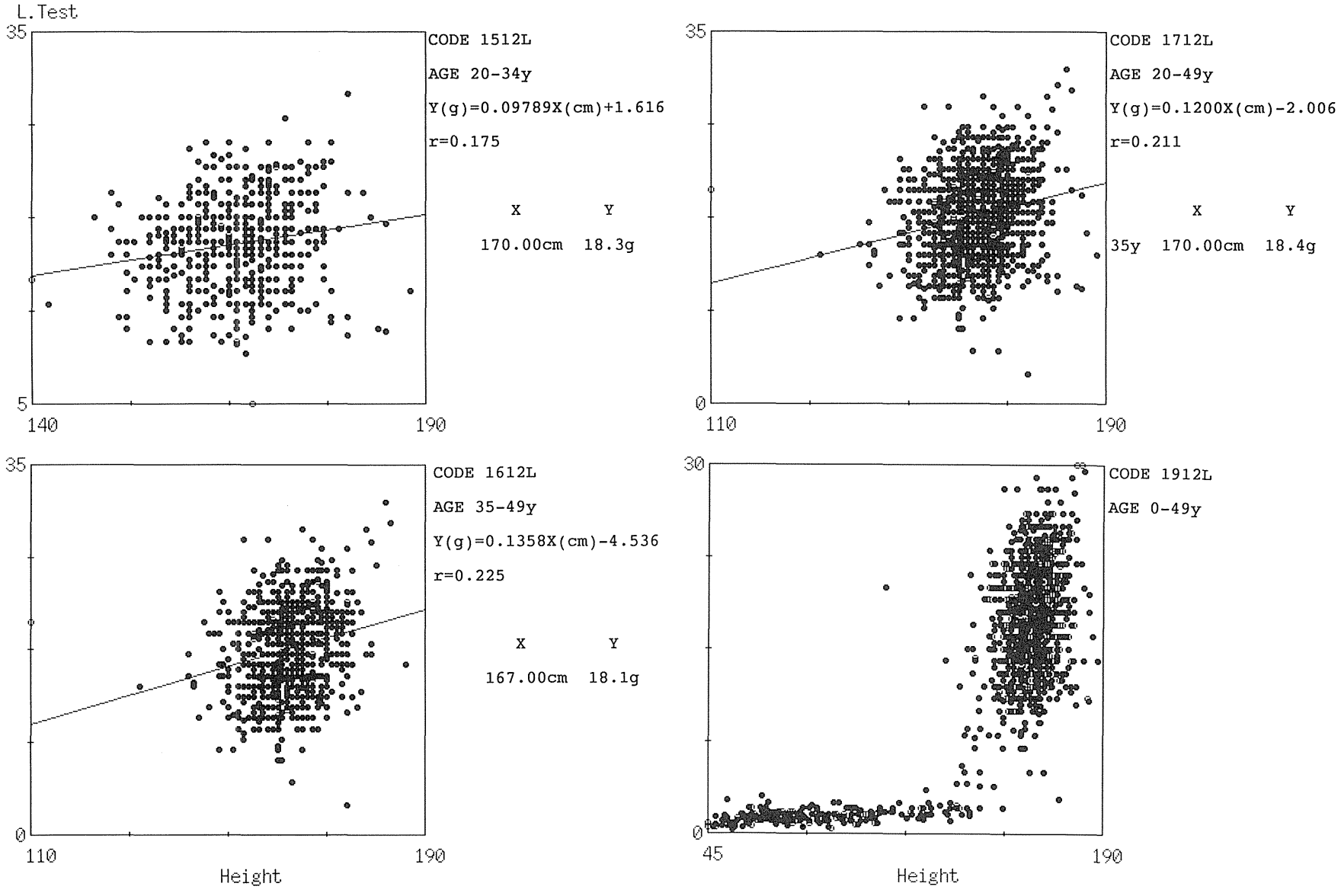


Fig. 19b. Mass of the left testis, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

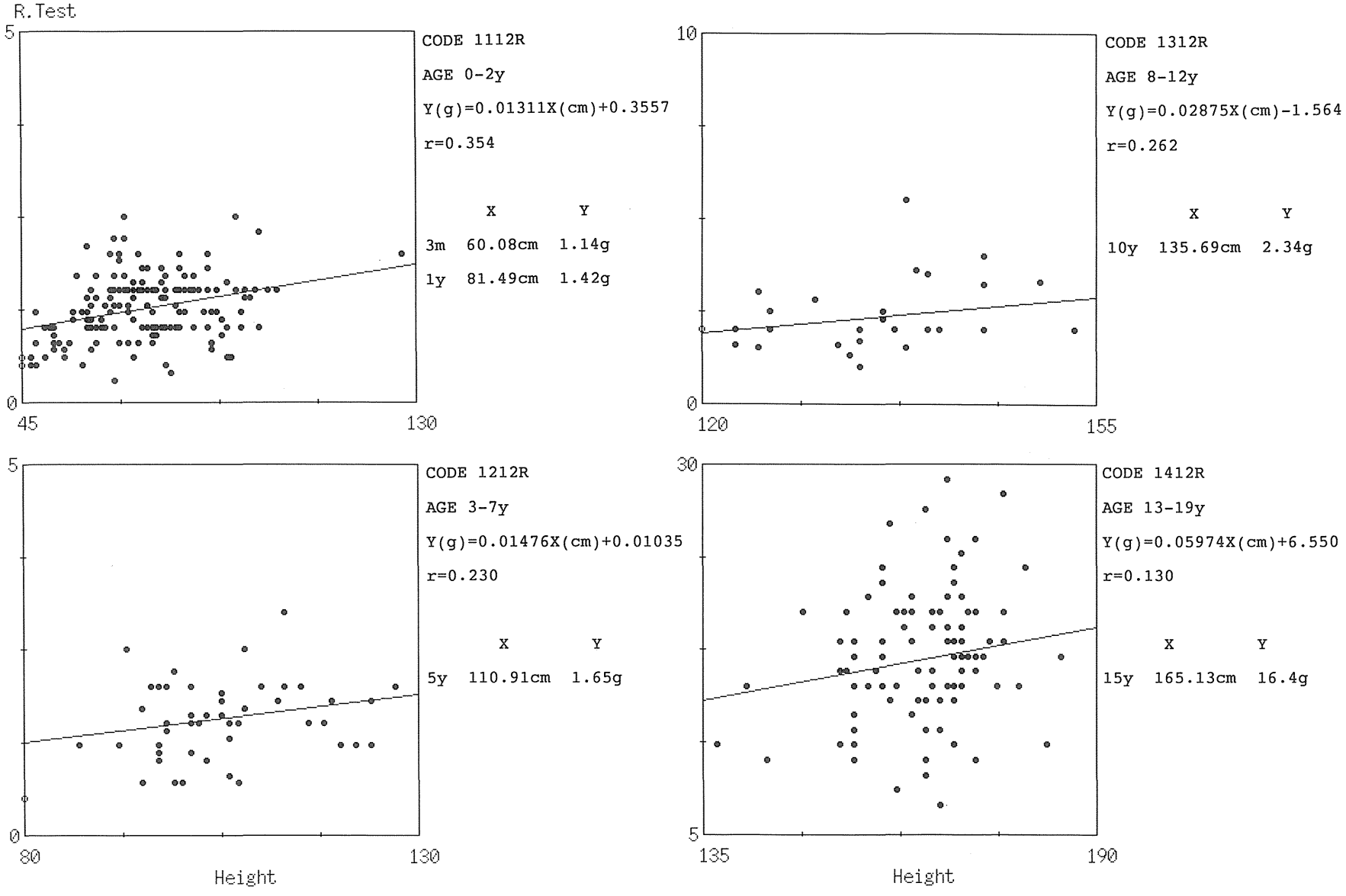


Fig. 20a. Mass of the right testis, Y in relation to body height, X in males: 0-2, 3-7, 8-12 and 13-19 year-old groups.

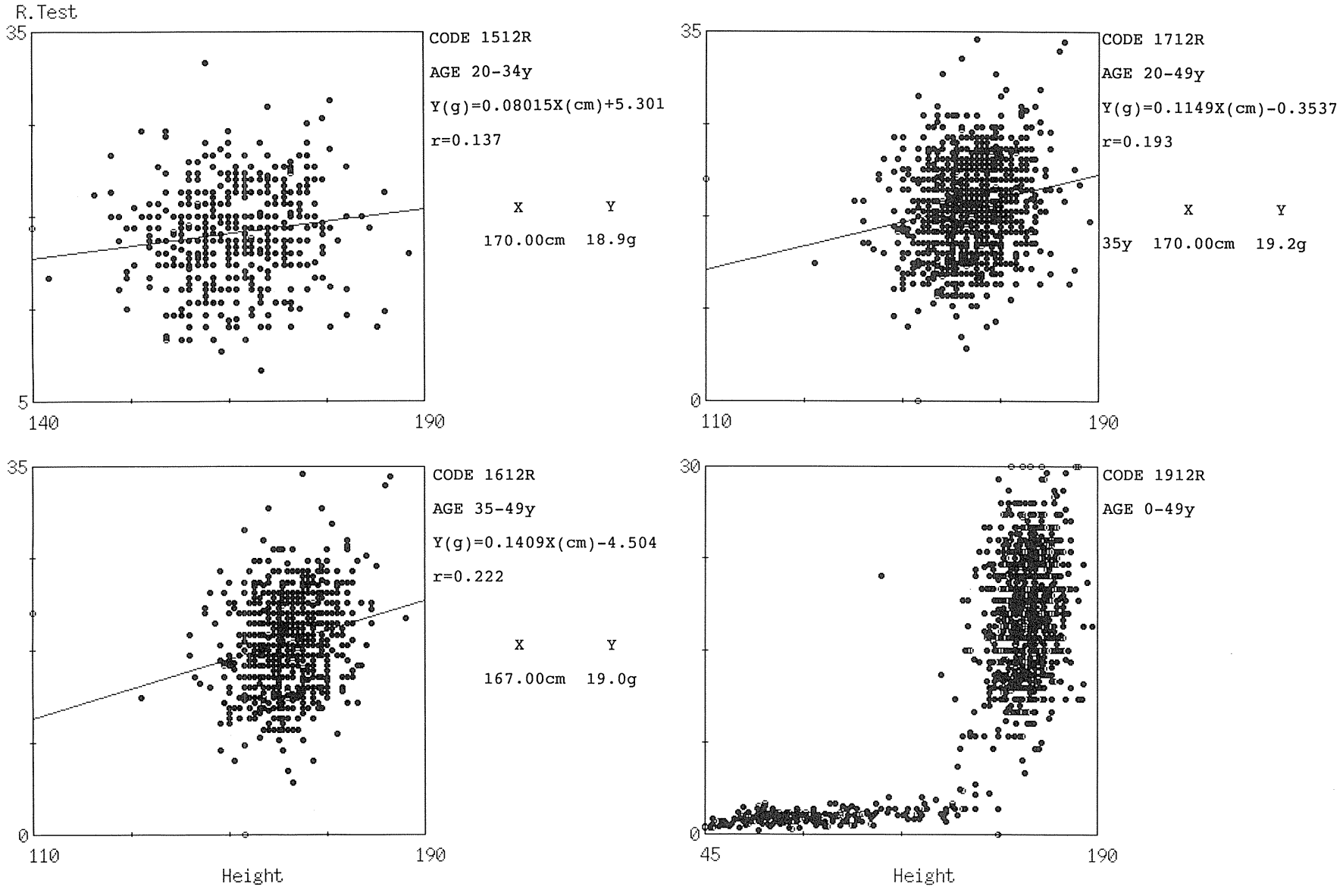


Fig. 20b. Mass of the right testis, Y in relation to body height, X in males: 20-34, 35-49, 20-49 and 0-49 year-old groups.

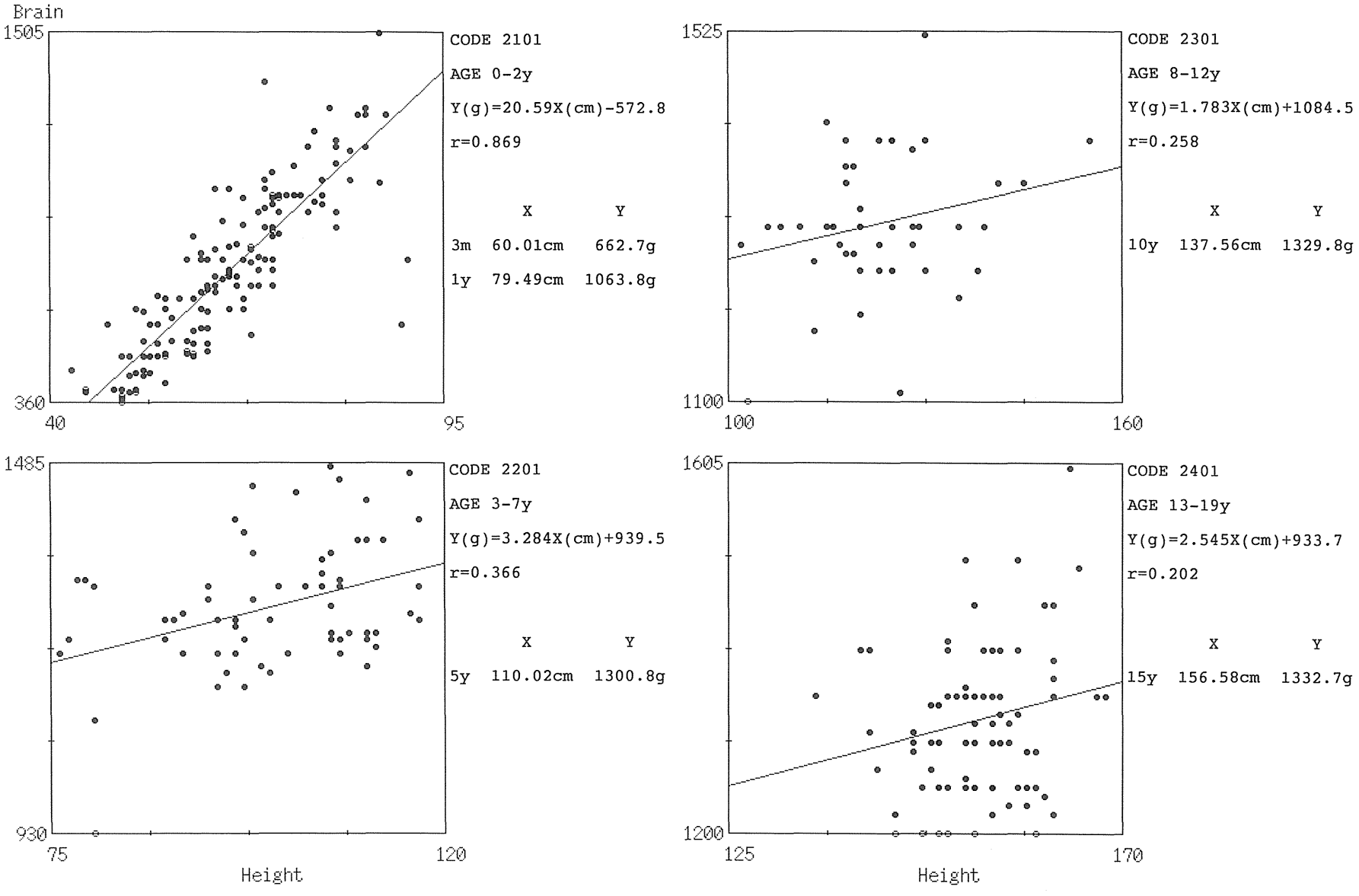


Fig. 21a. Mass of the brain, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

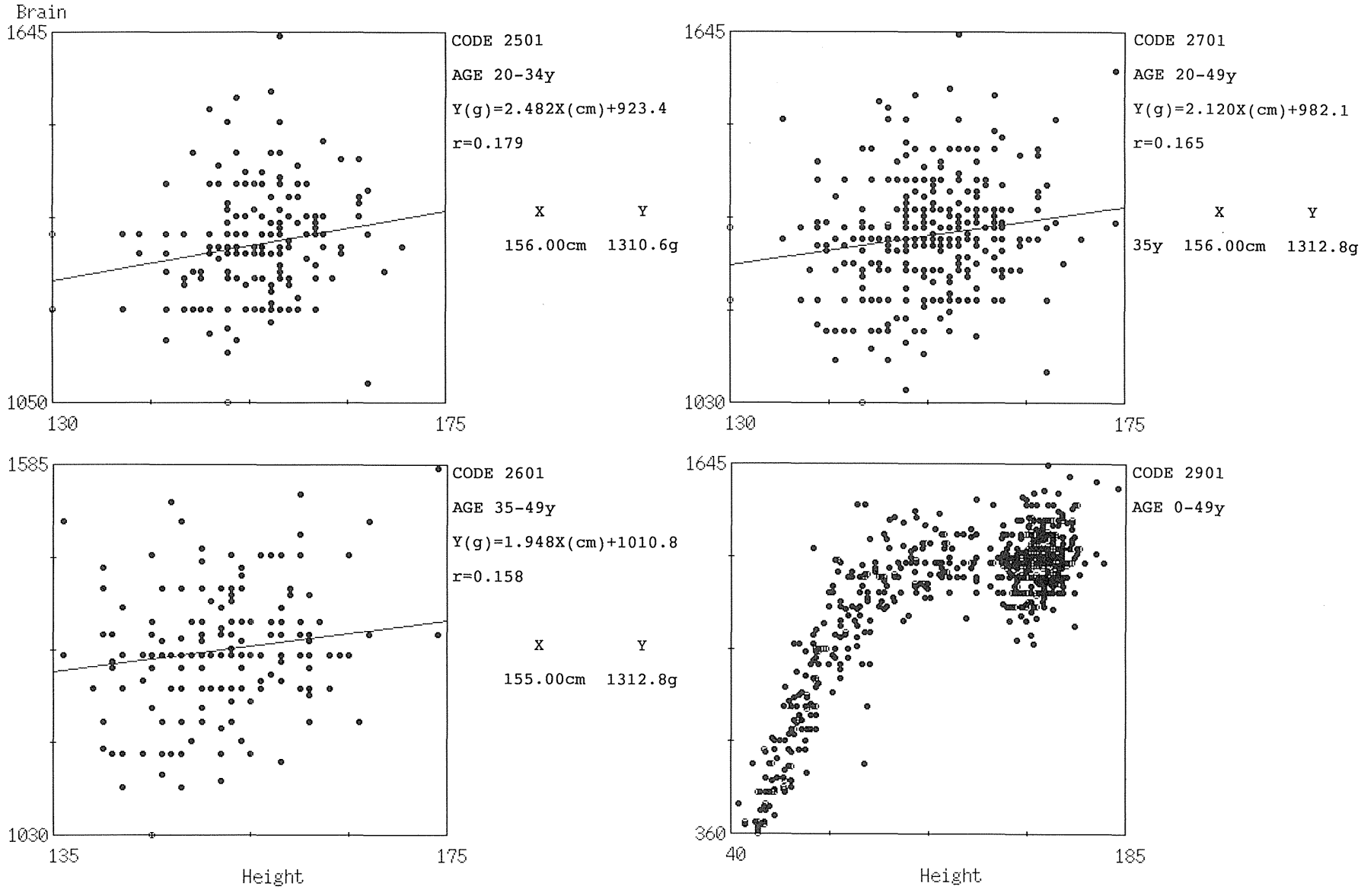


Fig. 21b. Mass of the brain, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

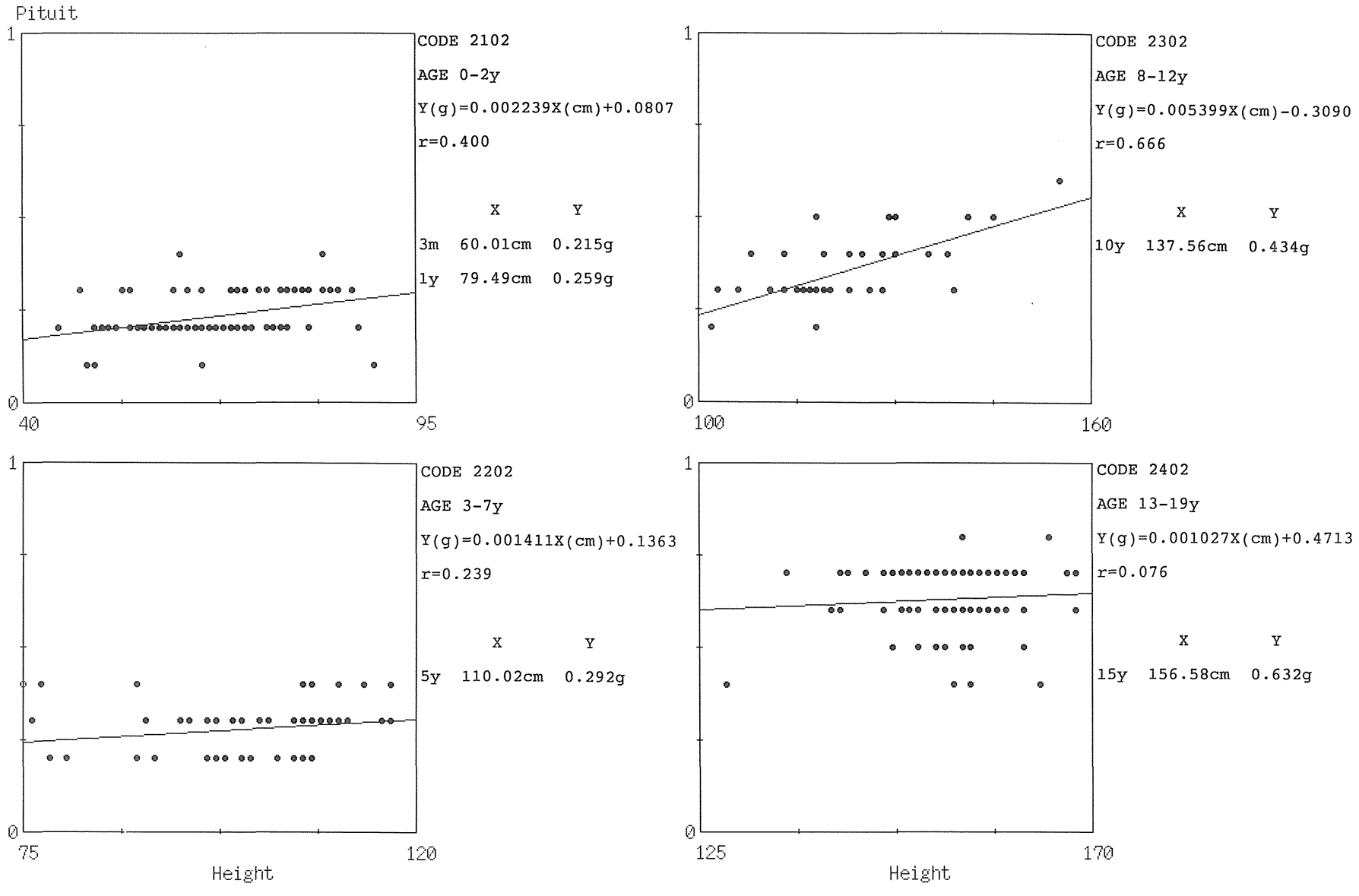


Fig. 22a. Mass of the pituitary gland, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

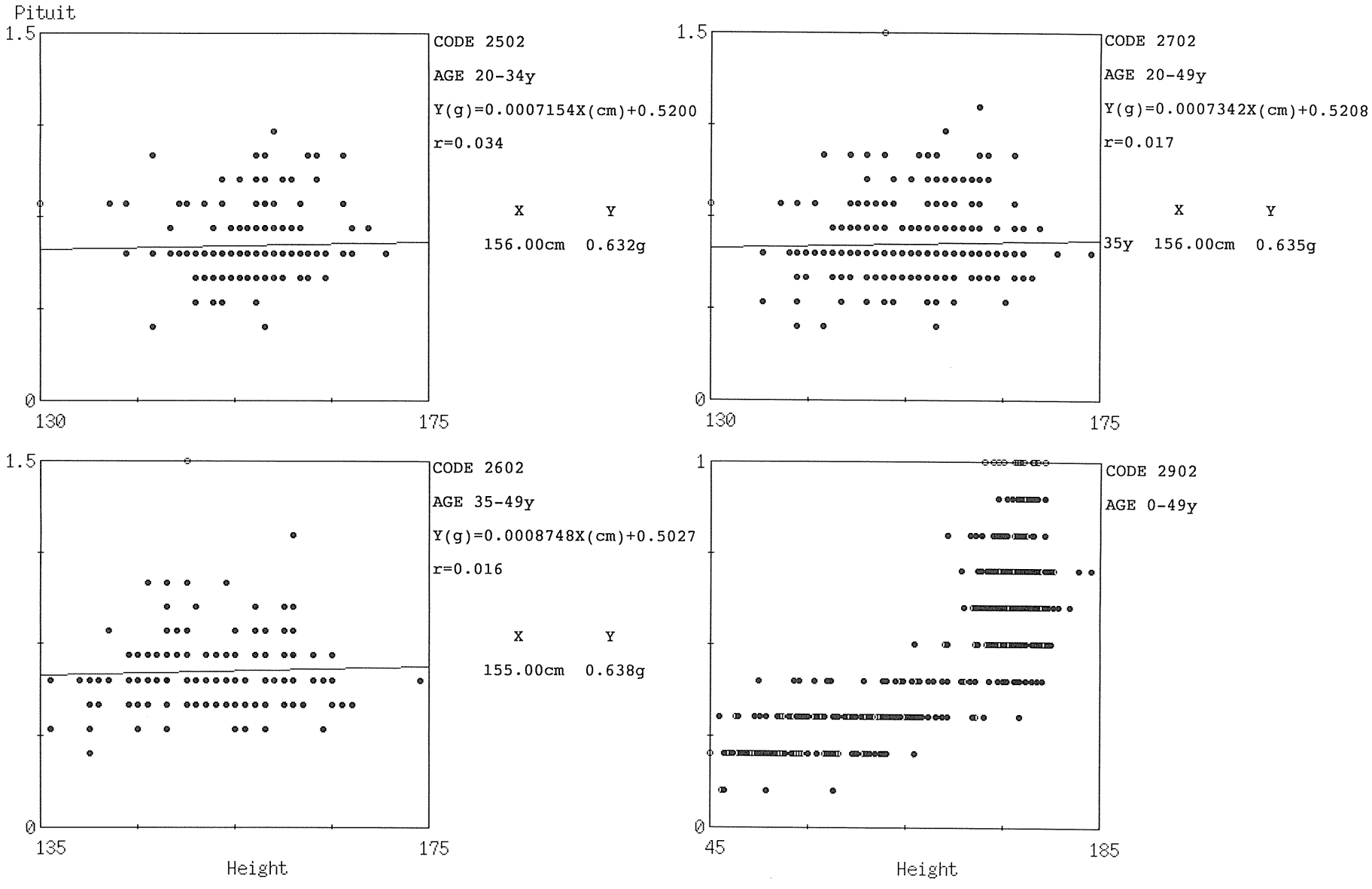


Fig. 22b. Mass of the pituitary gland, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

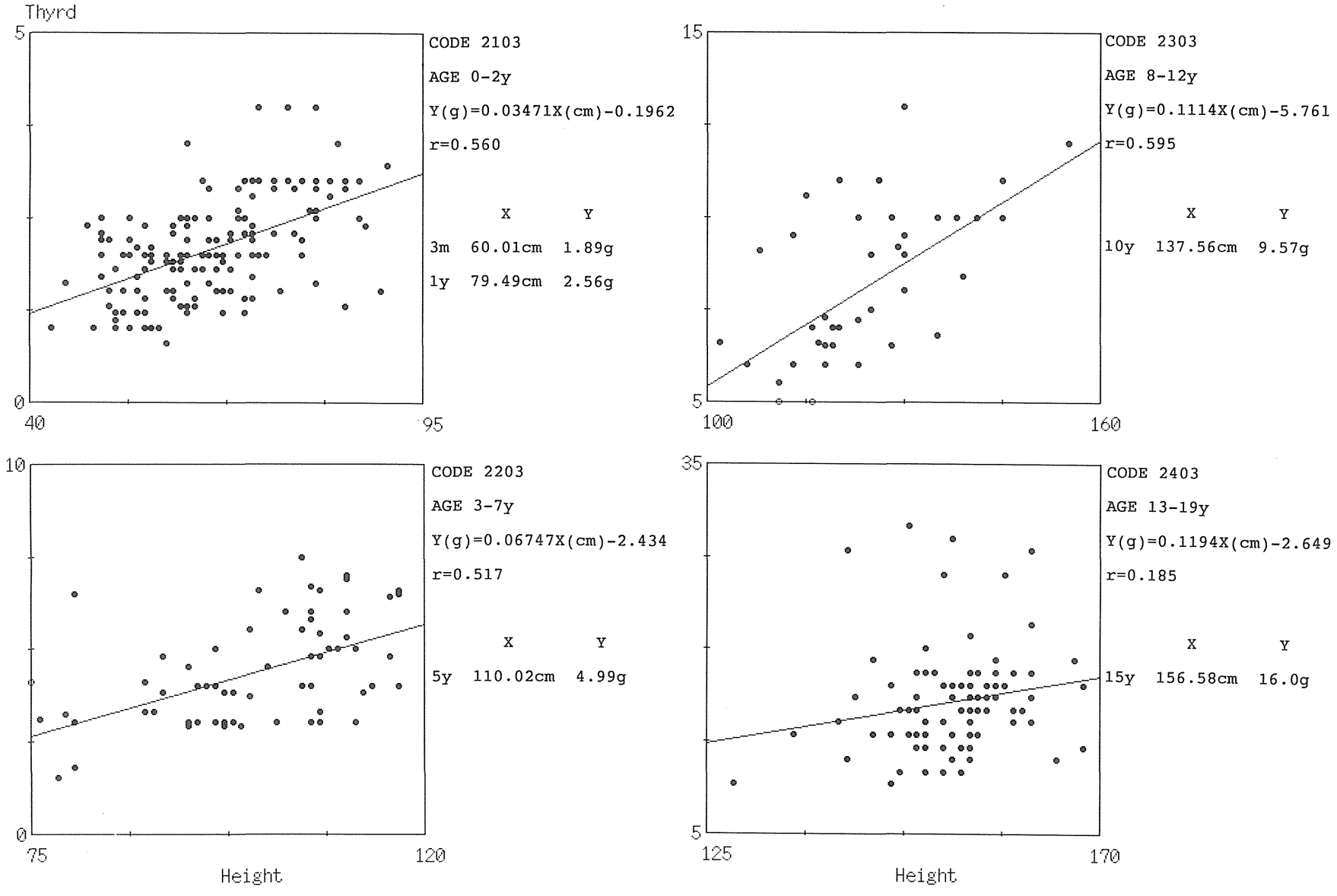


Fig. 23a. Mass of the thyroid gland, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

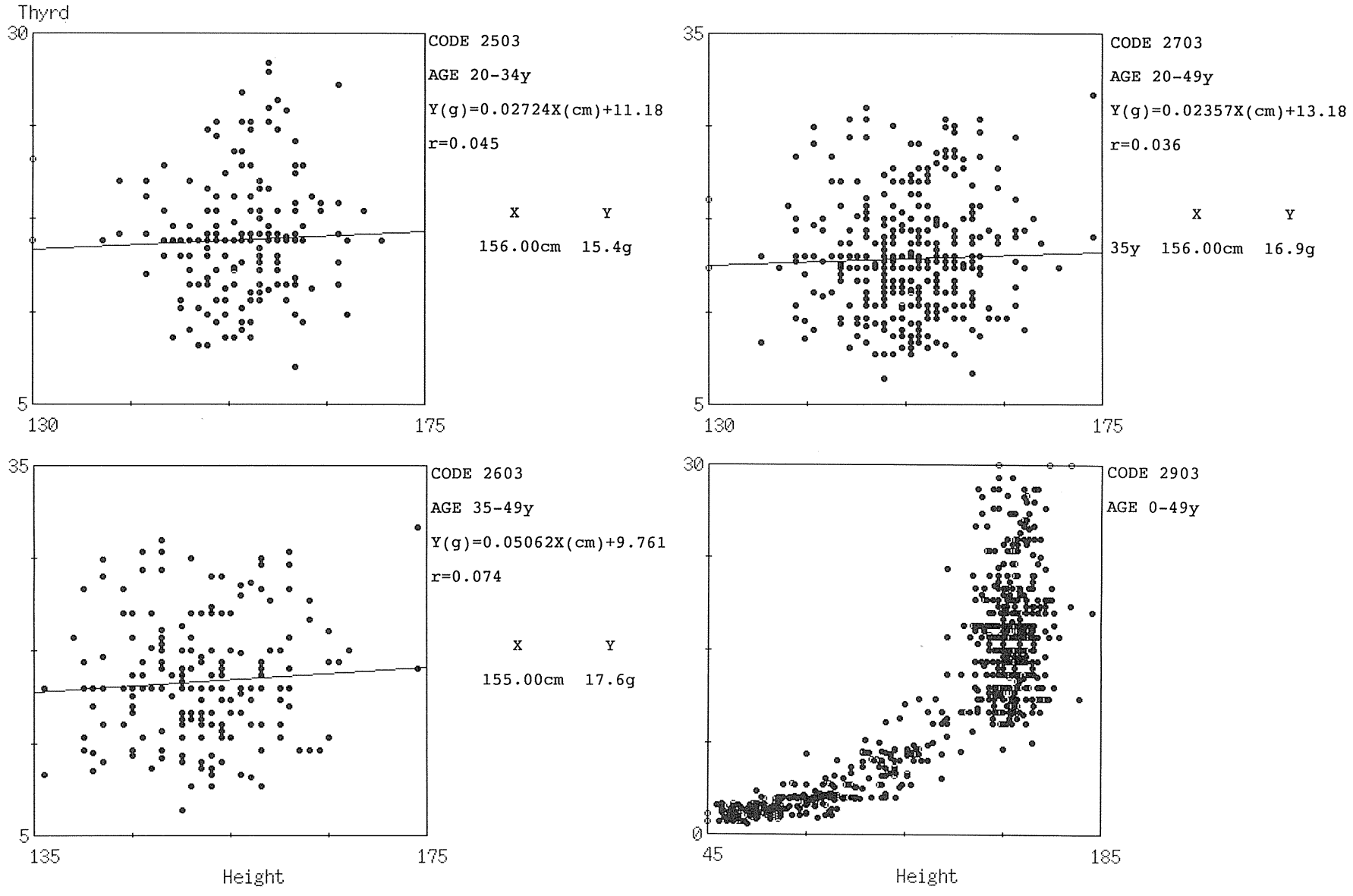


Fig. 23b. Mass of the thyroid gland, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

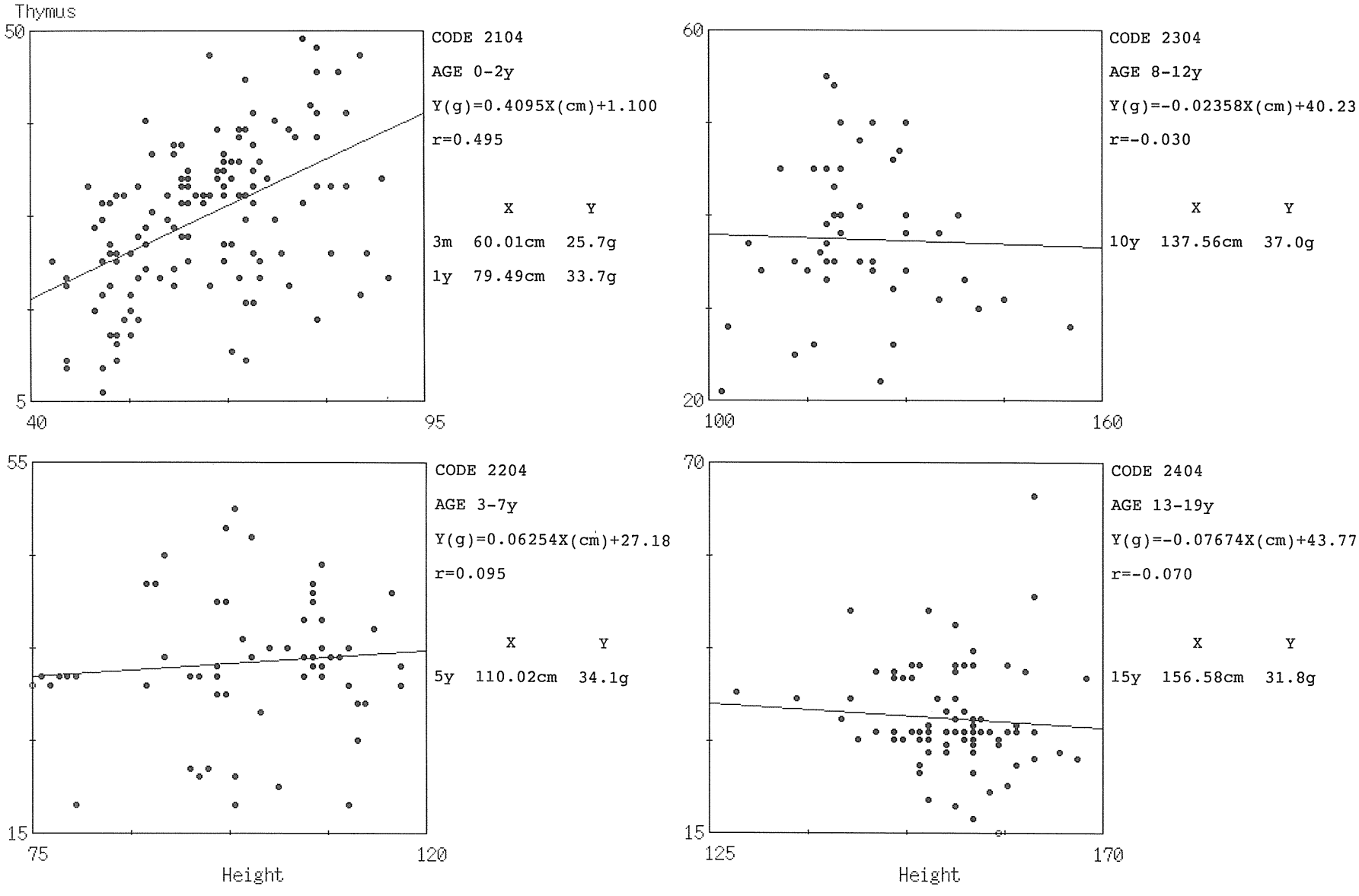


Fig. 24a. Mass of the thymus, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

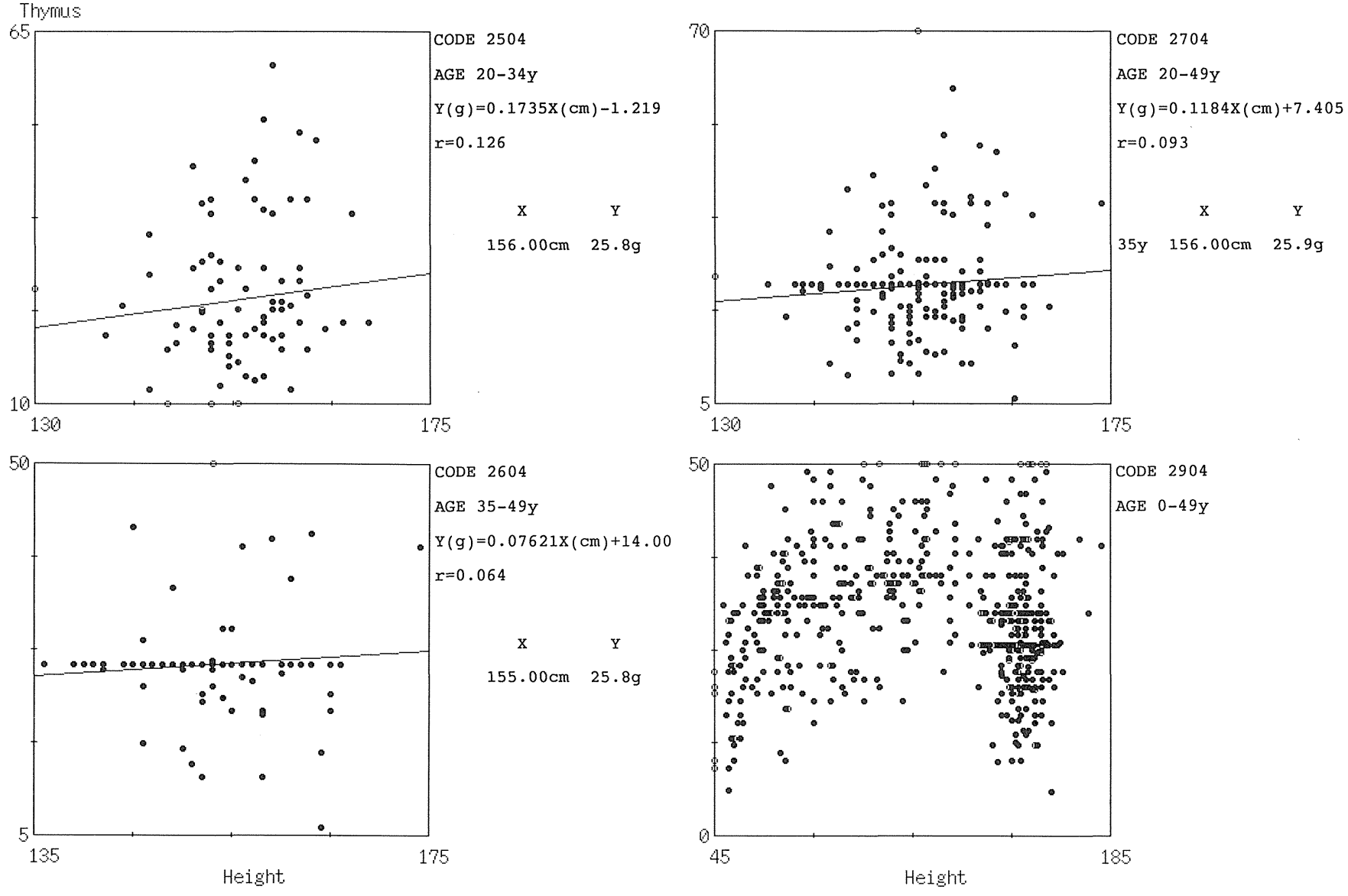


Fig. 24b. Mass of the thymus, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

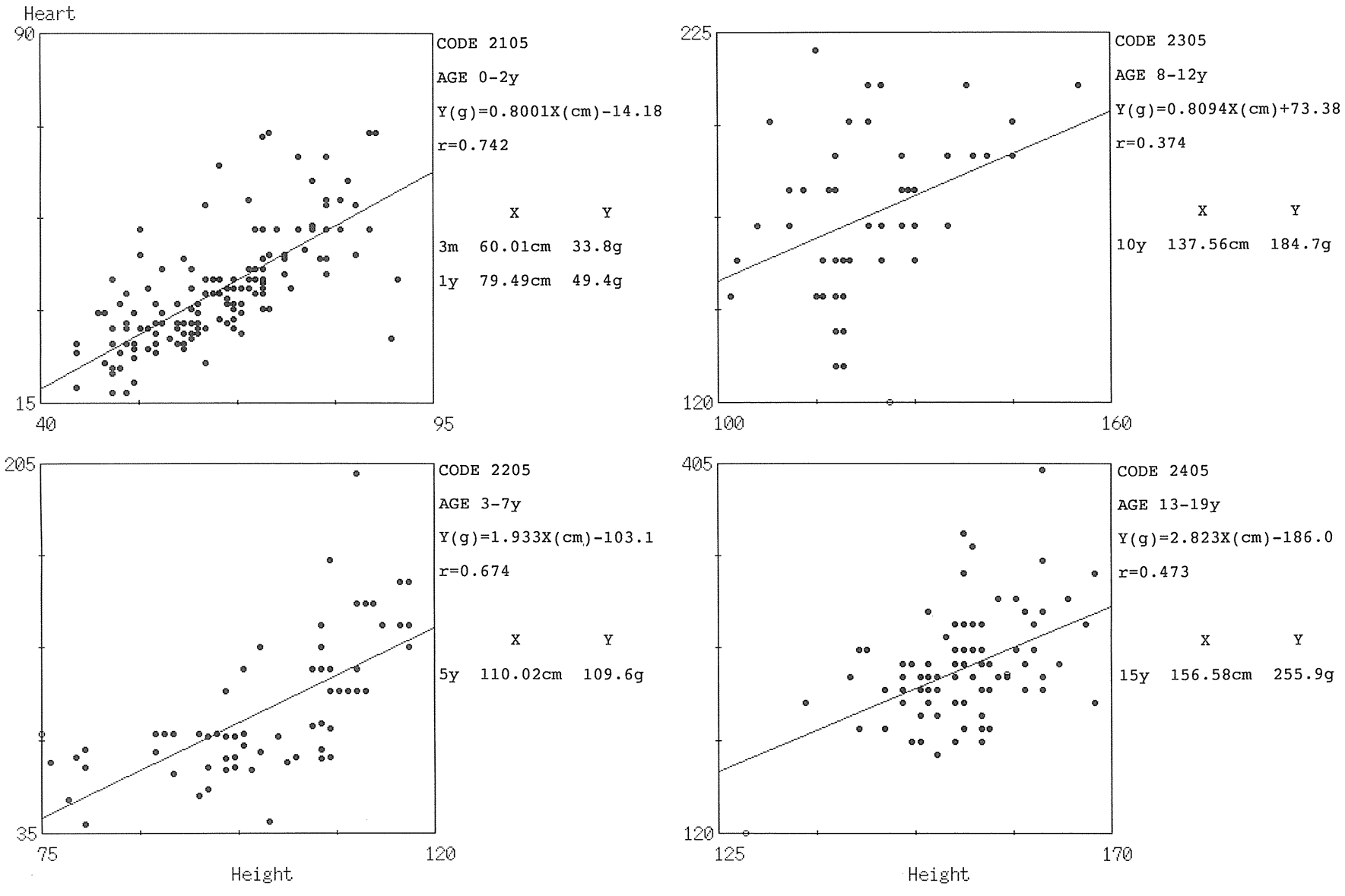


Fig. 25a. Mass of the heart, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

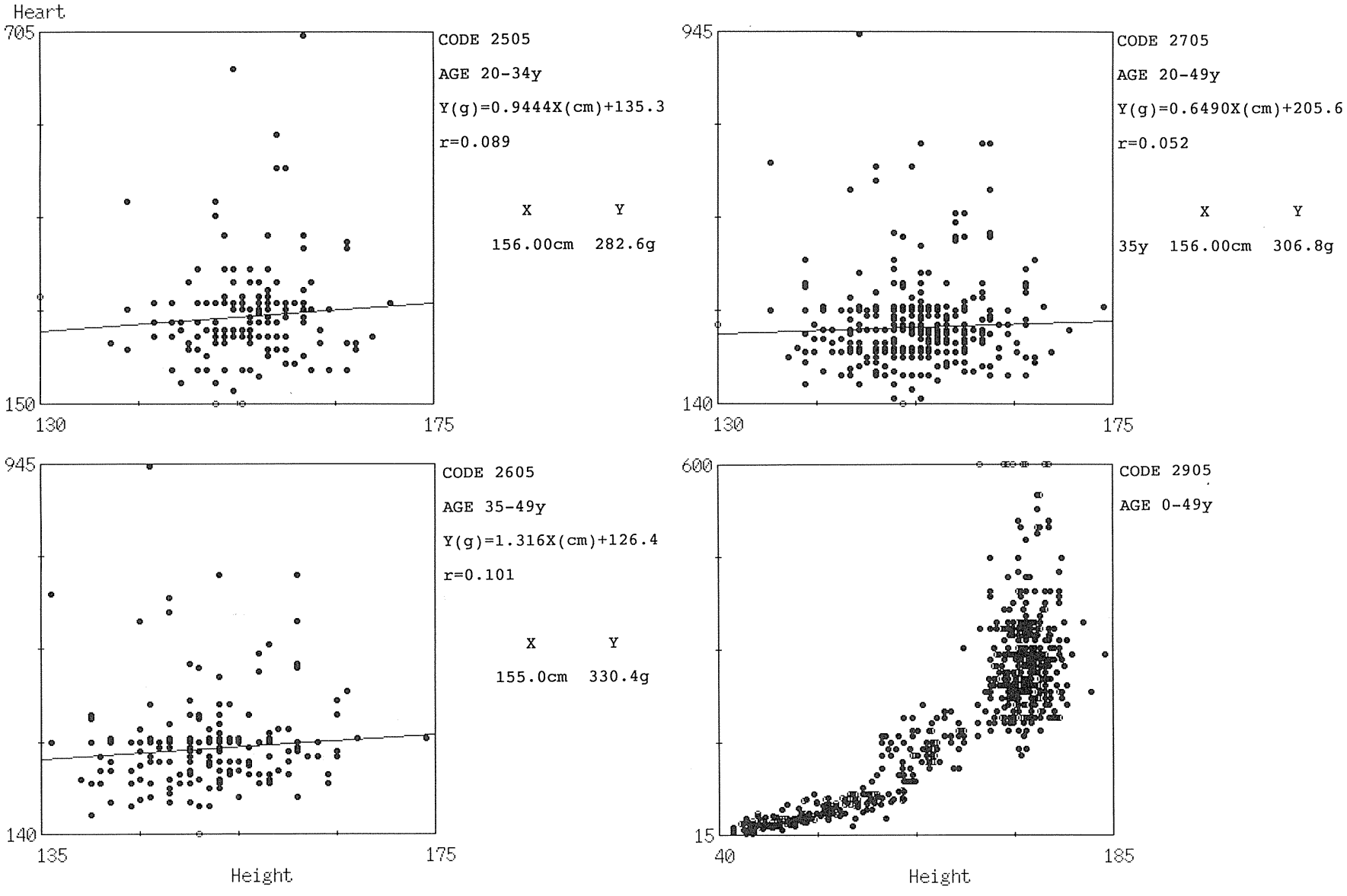


Fig. 25b. Mass of the heart, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

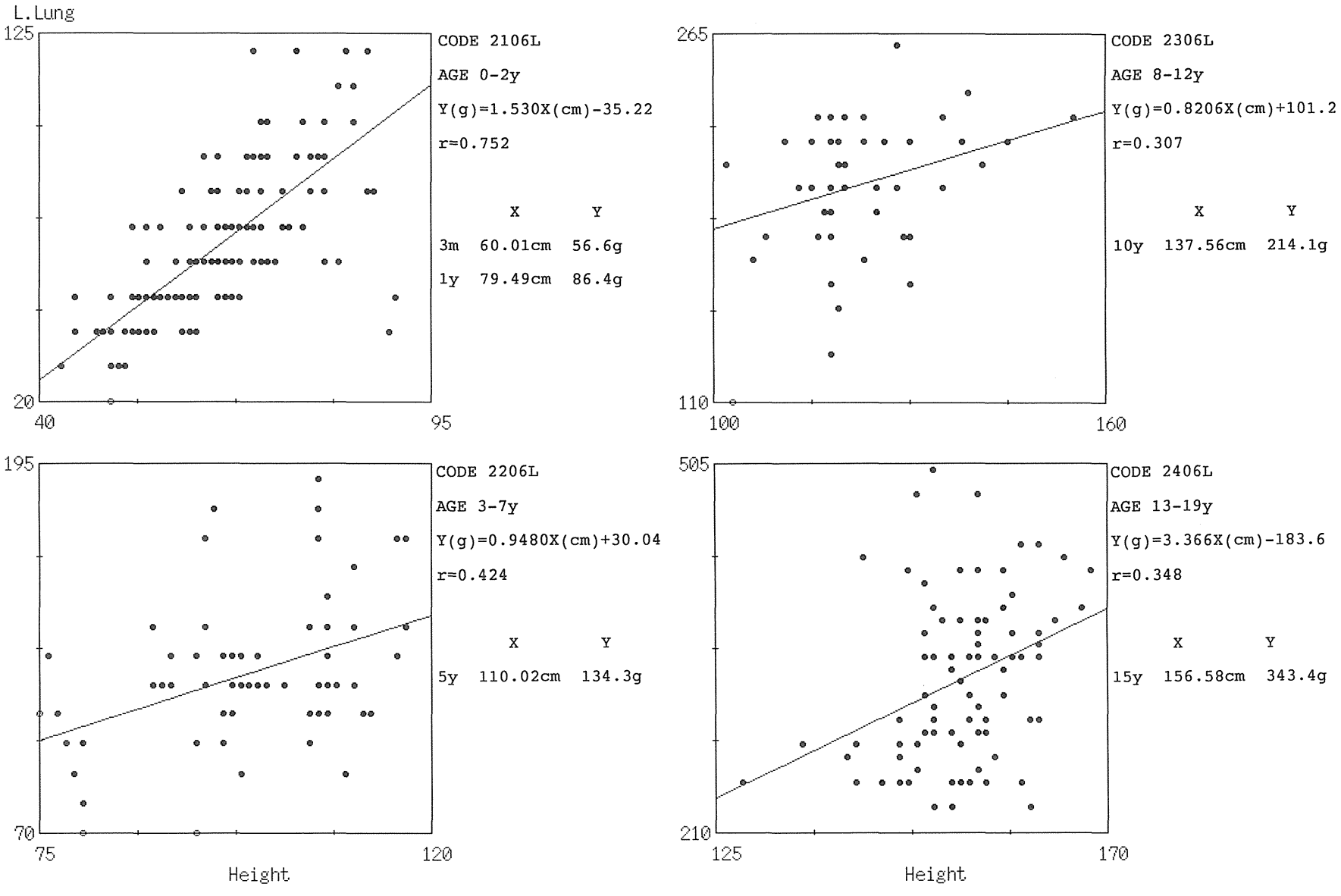


Fig. 26a. Mass of the left lung, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

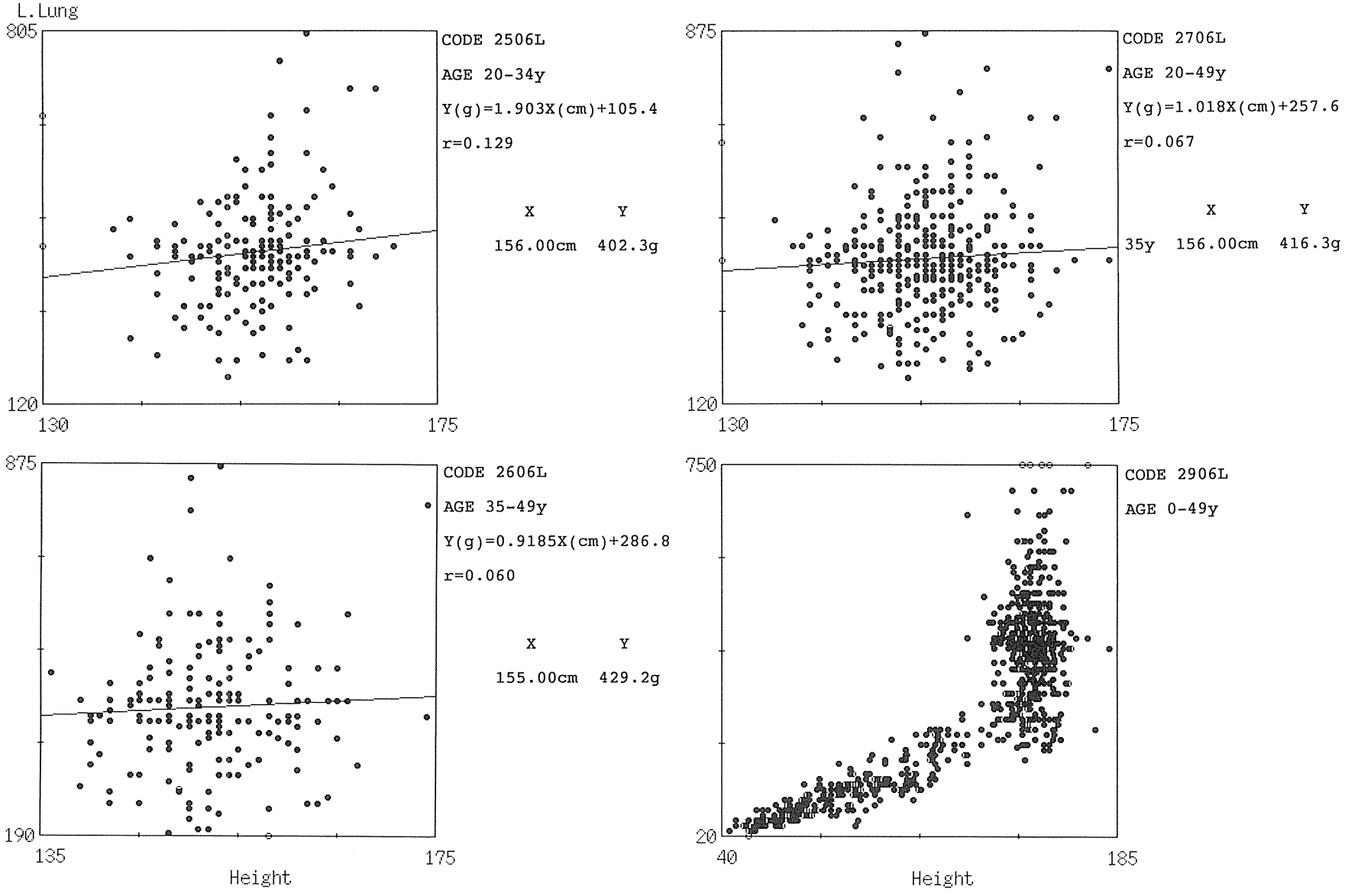


Fig. 26b. Mass of the left lung, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

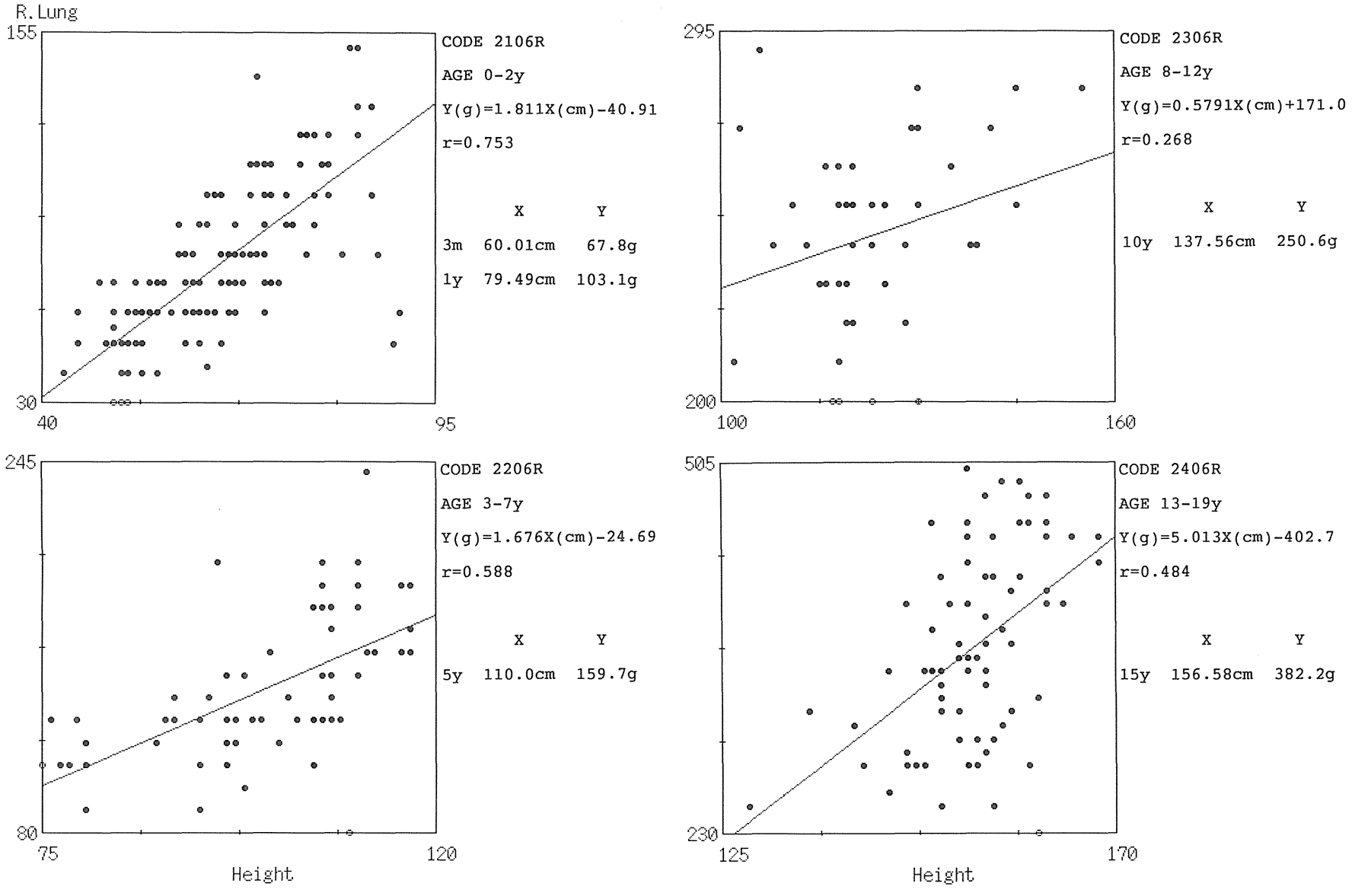


Fig. 27a. Mass of the right lung, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

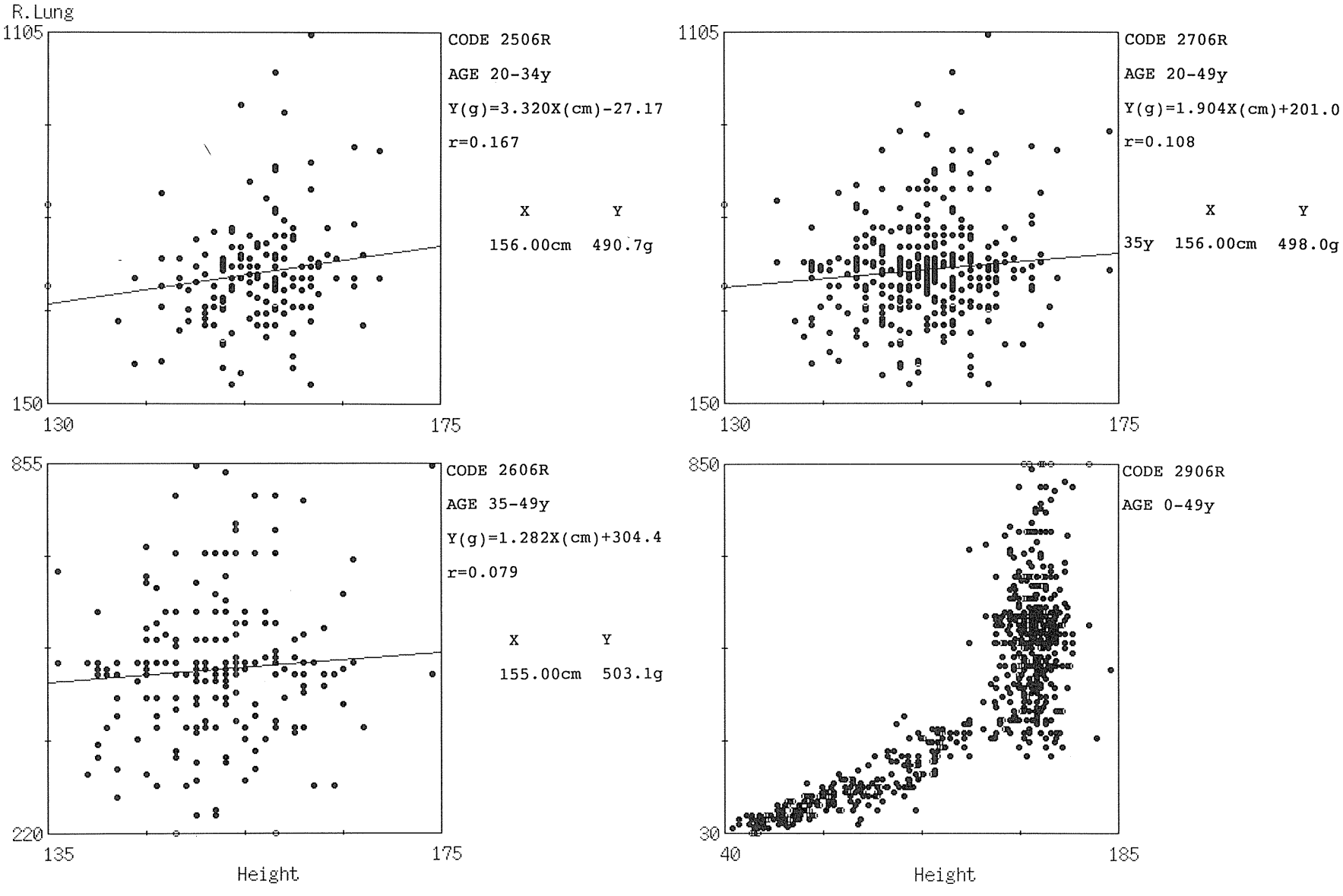


Fig. 27b. Mass of the right lung, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

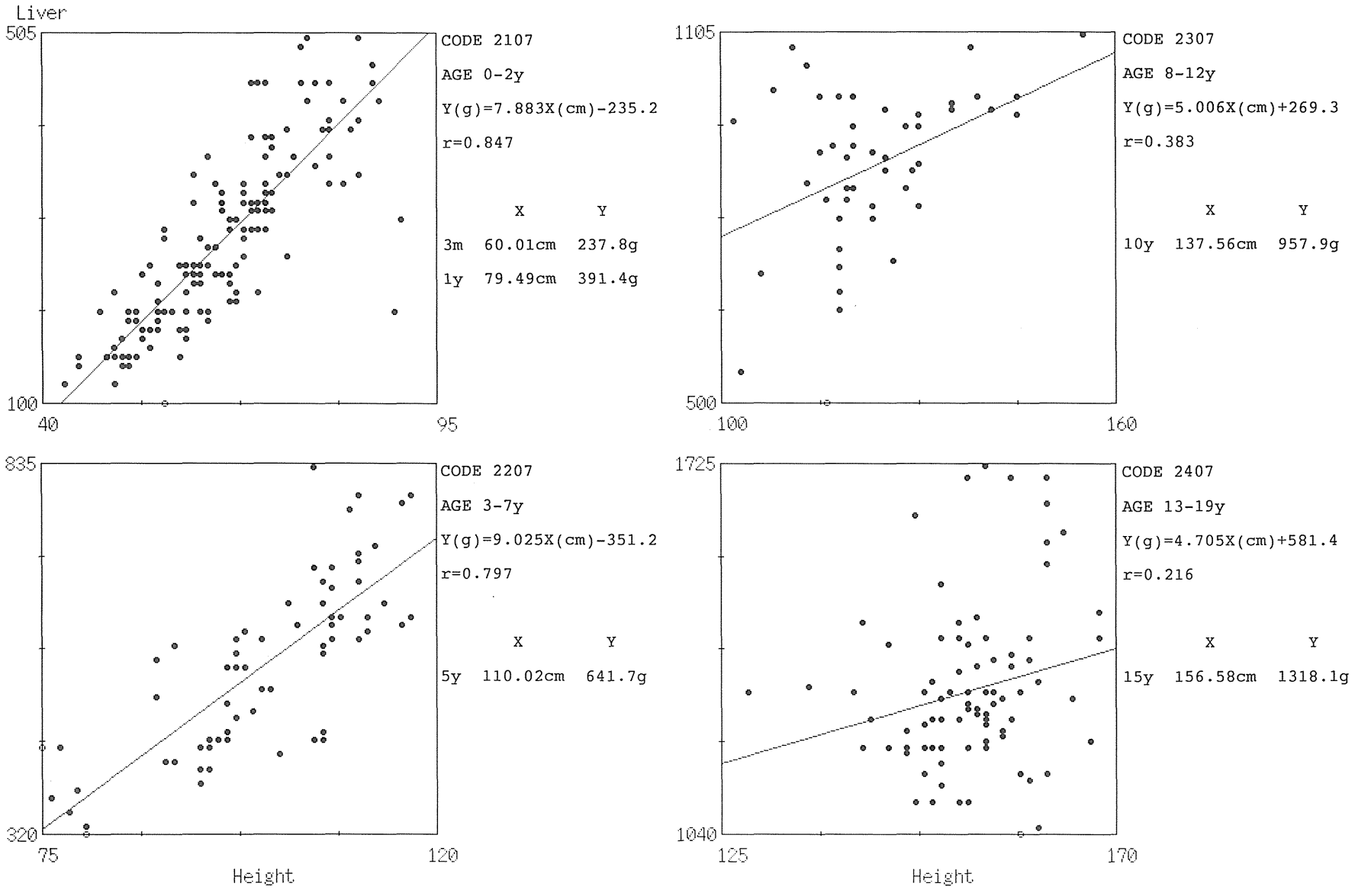


Fig. 28a. Mass of the liver, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

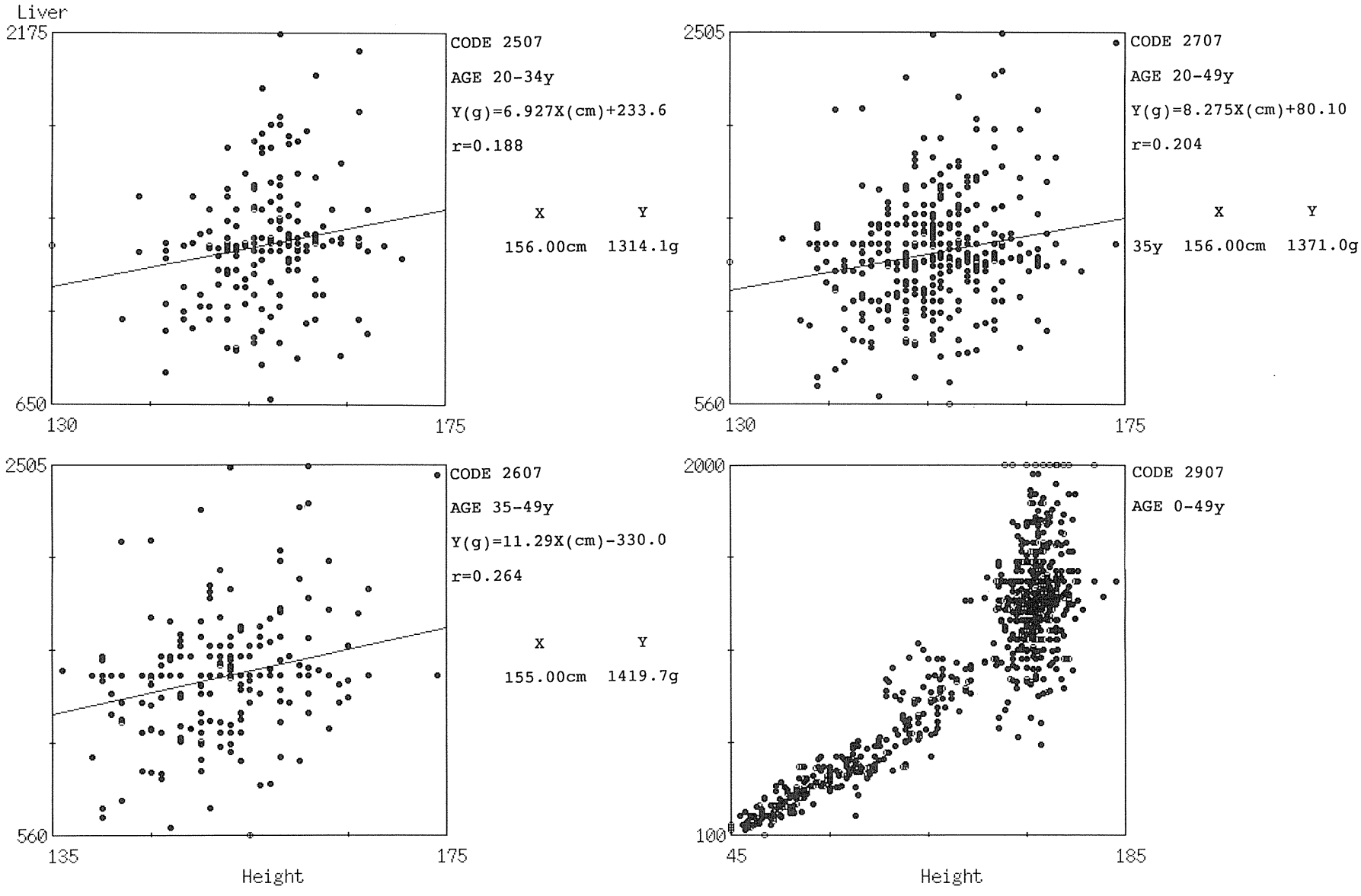


Fig. 28b. Mass of the liver, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

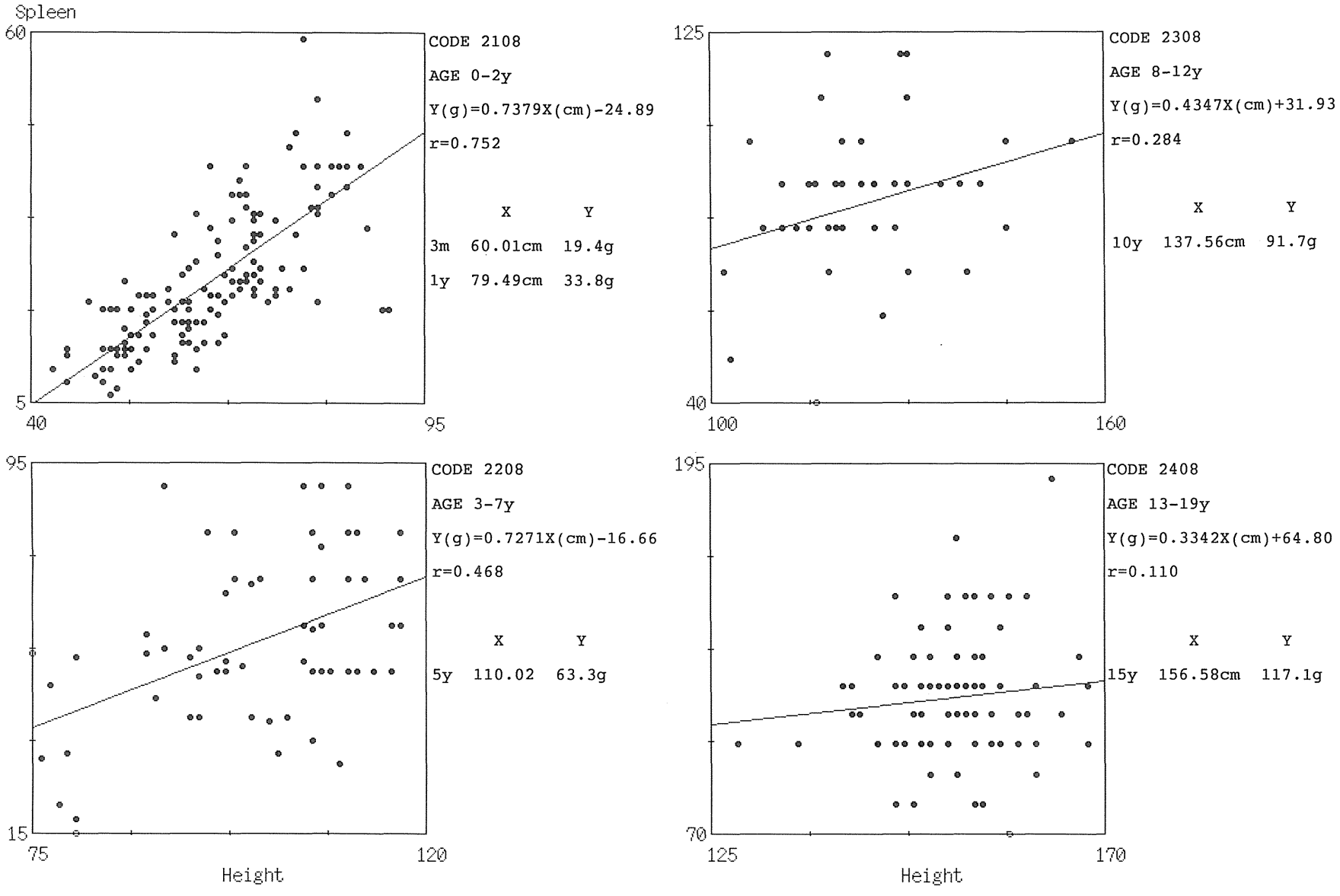


Fig. 29a. Mass of the spleen, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

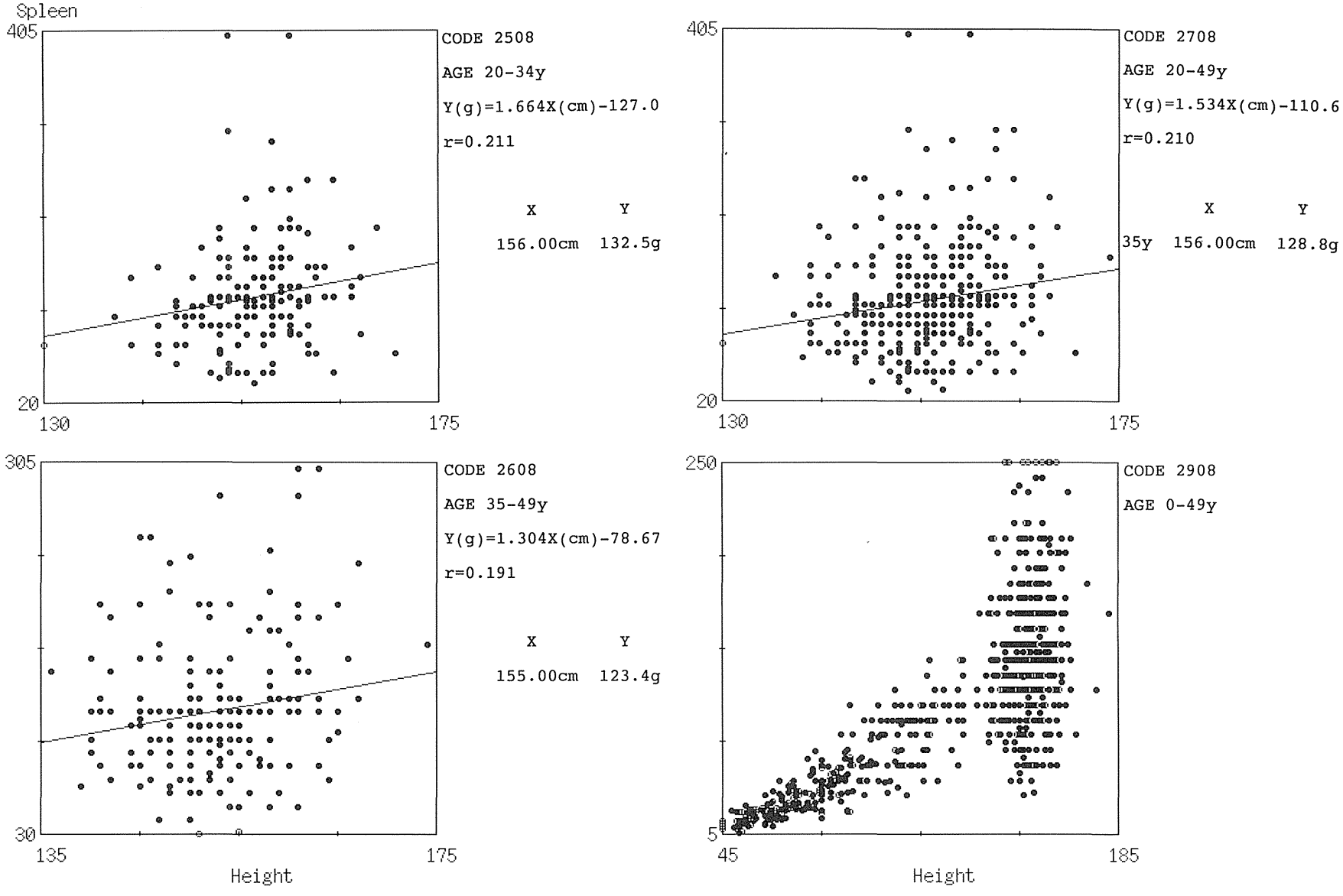


Fig. 29b. Mass of the spleen, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

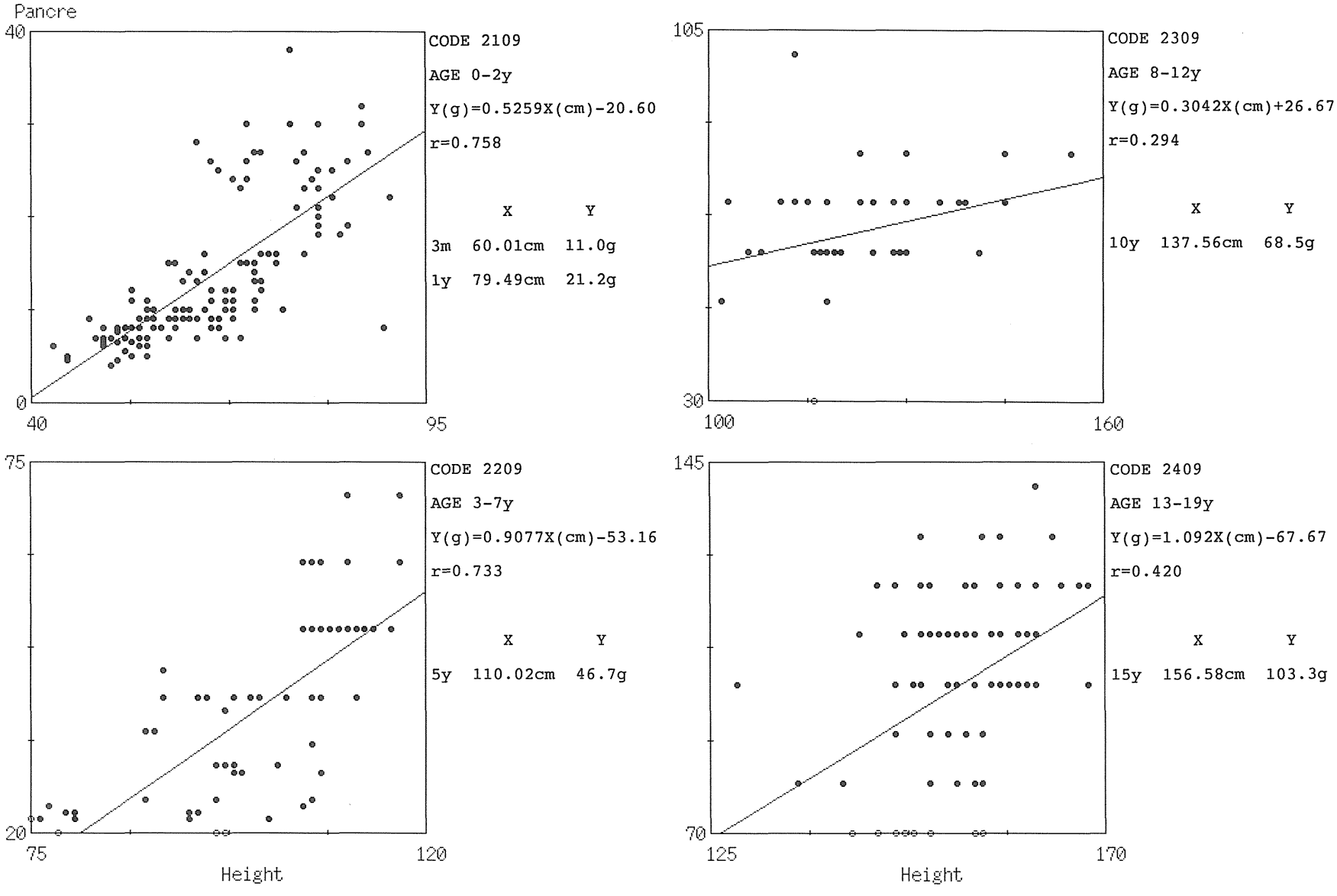


Fig. 30a. Mass of the pancreas, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

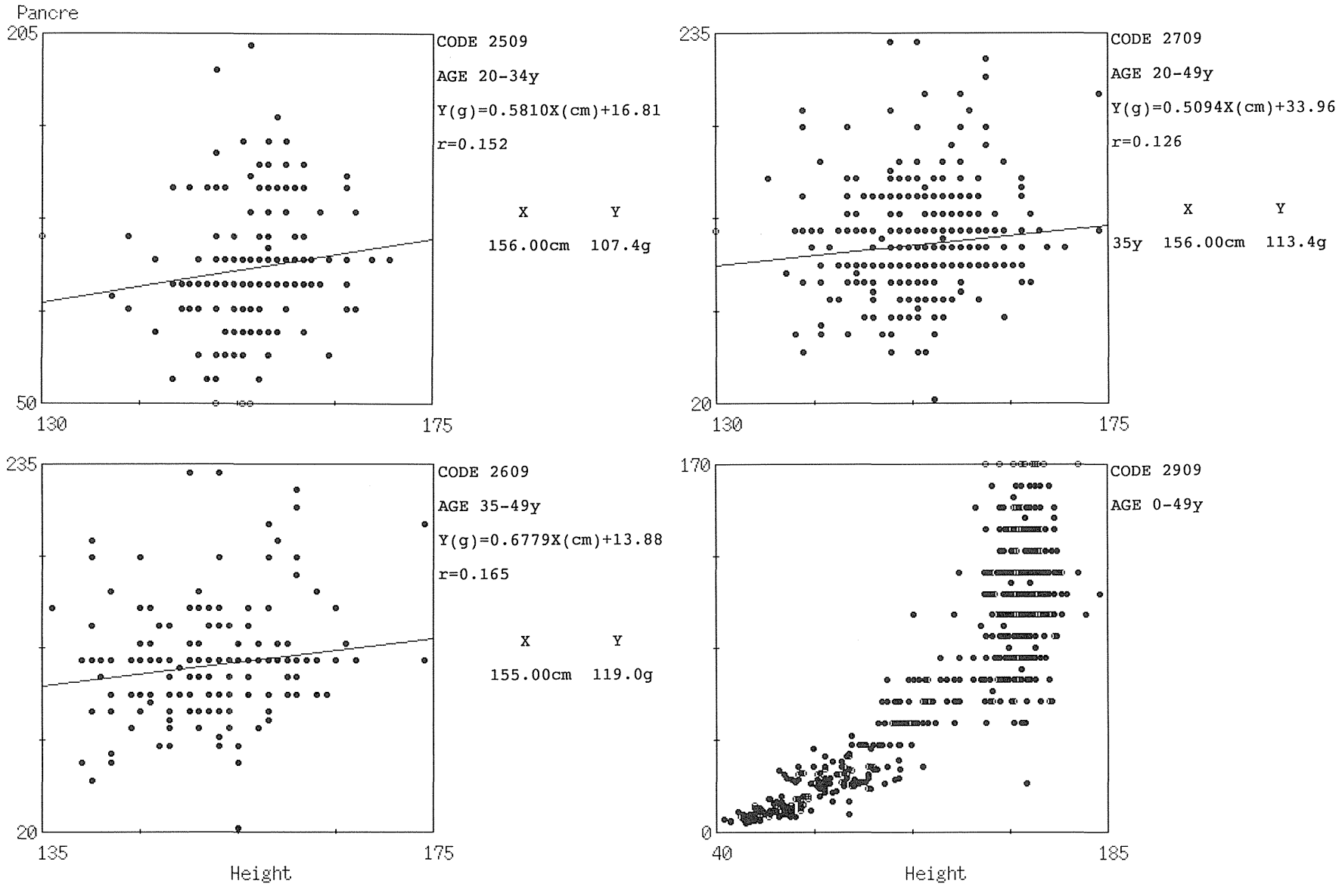


Fig. 30b. Mass of the pancreas, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

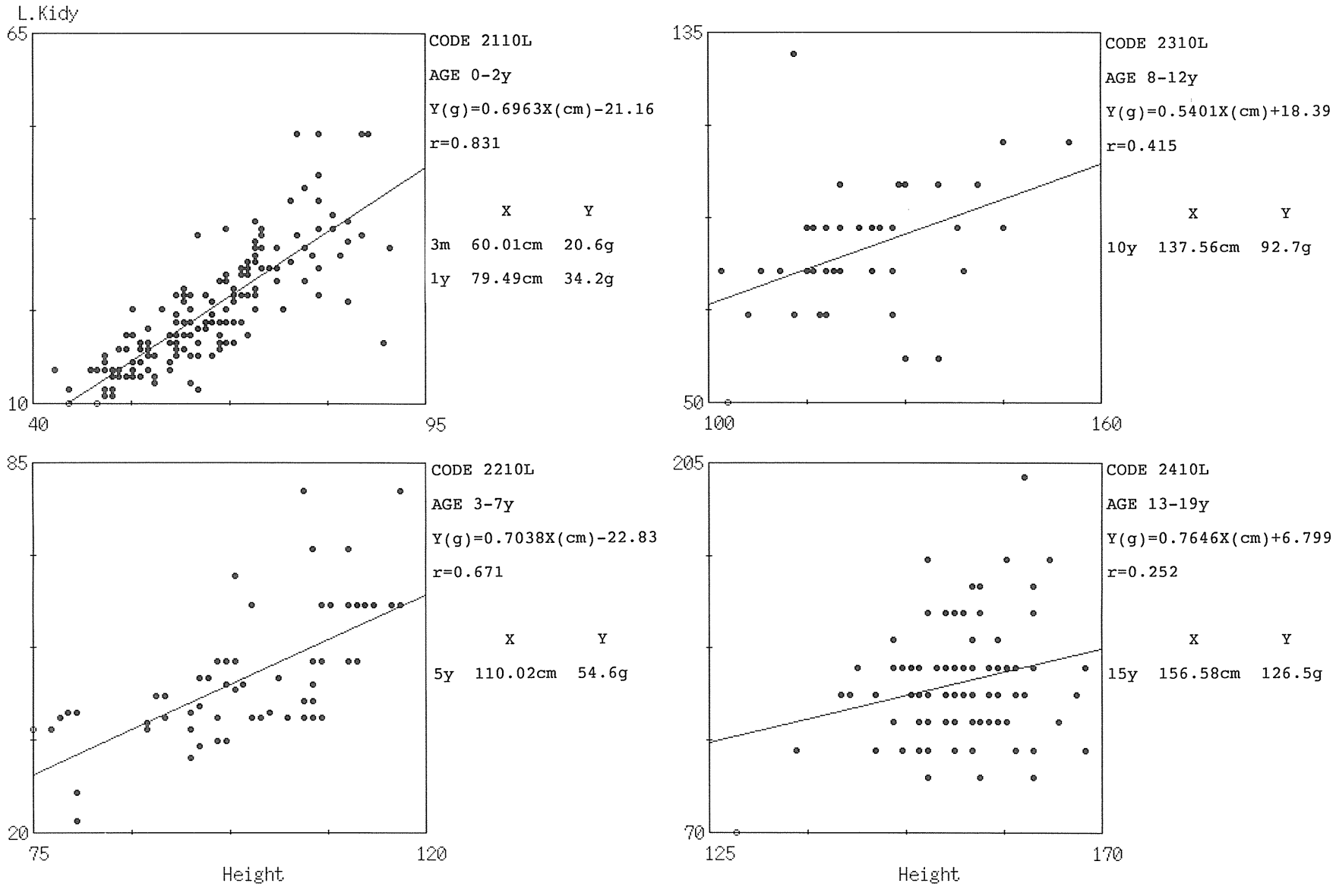


Fig. 31a. Mass of the left kidney, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

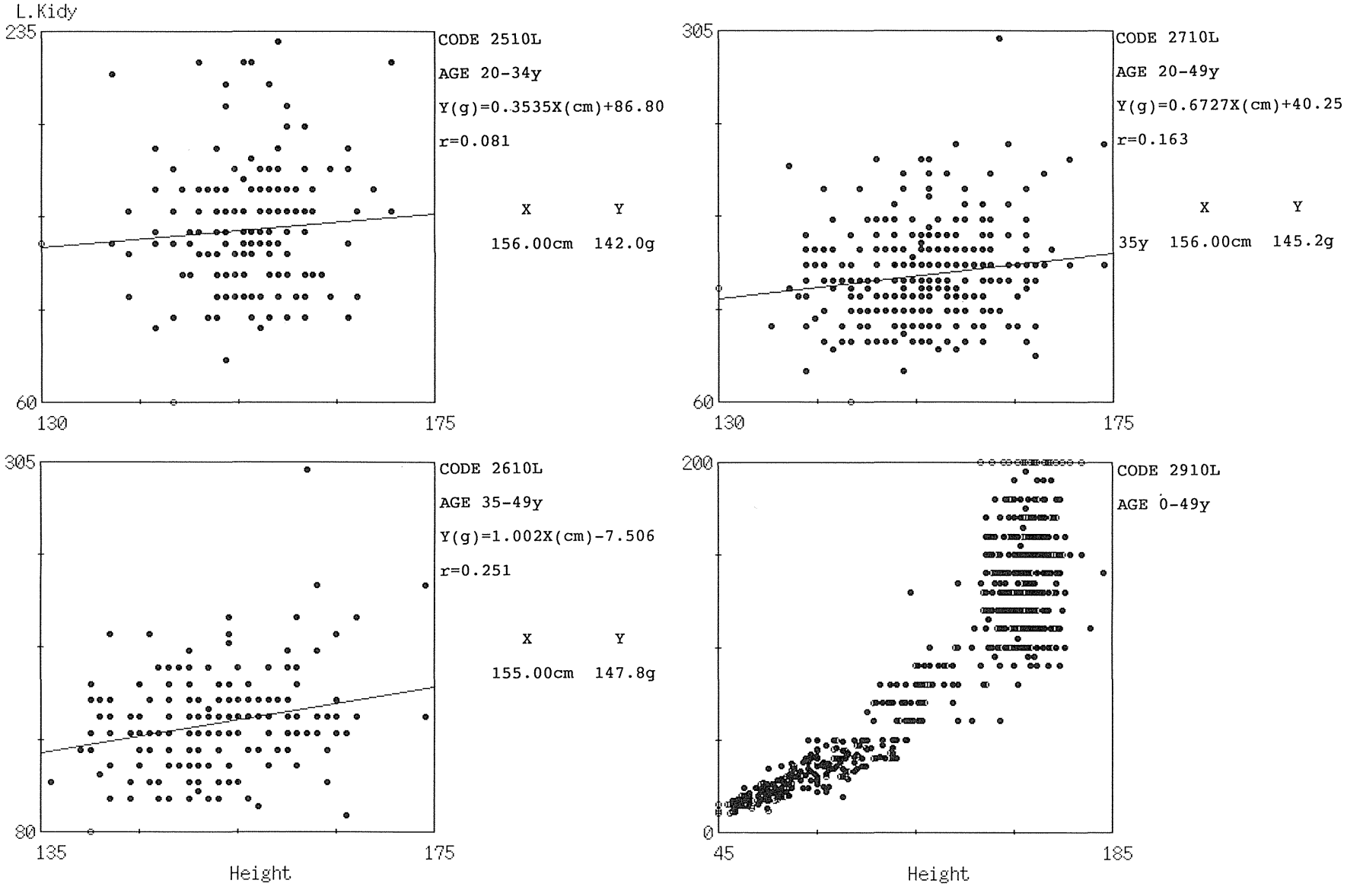


Fig. 31b. Mass of the left kidney, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

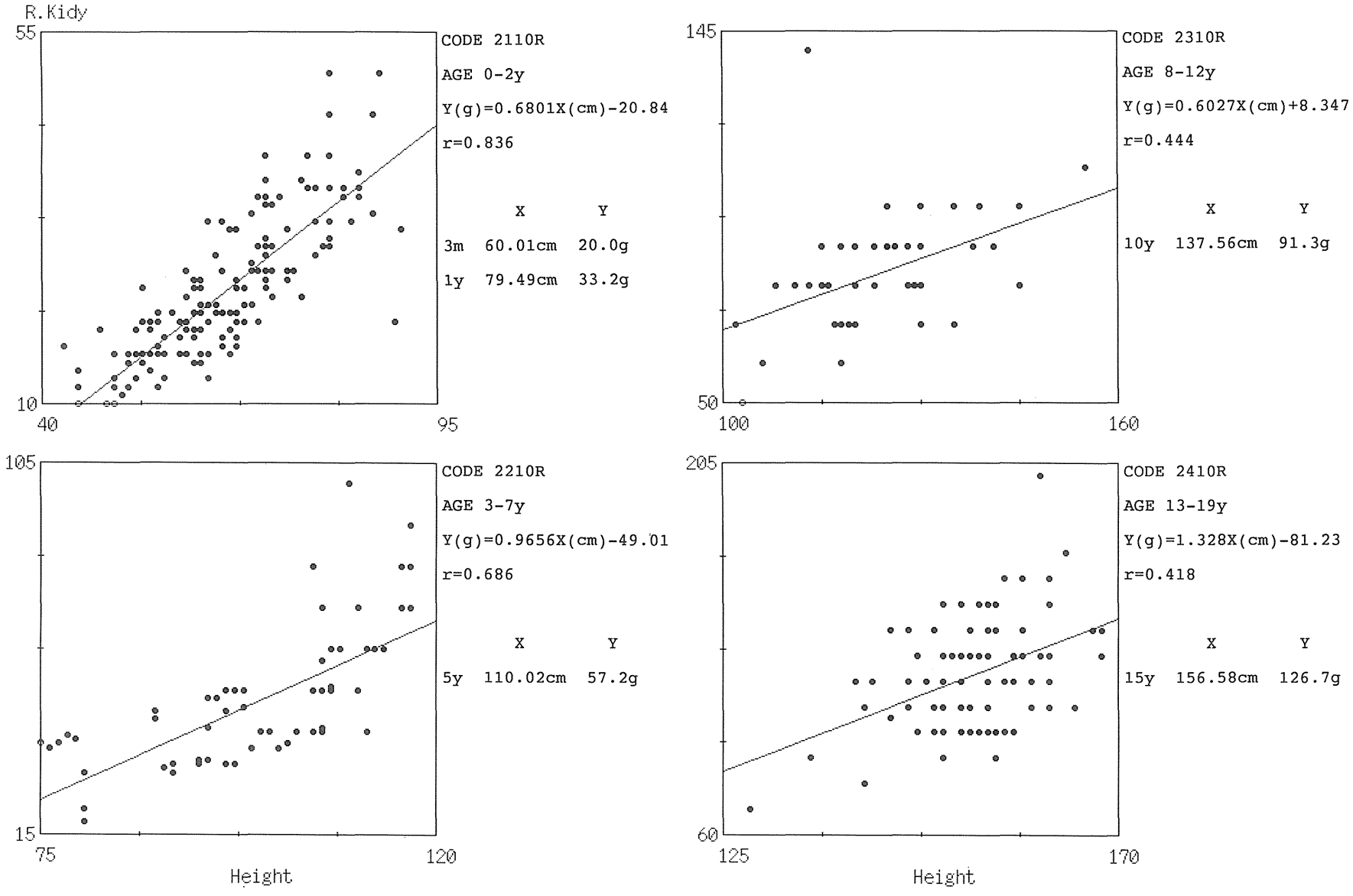


Fig. 32a. Mass of the right kidney, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

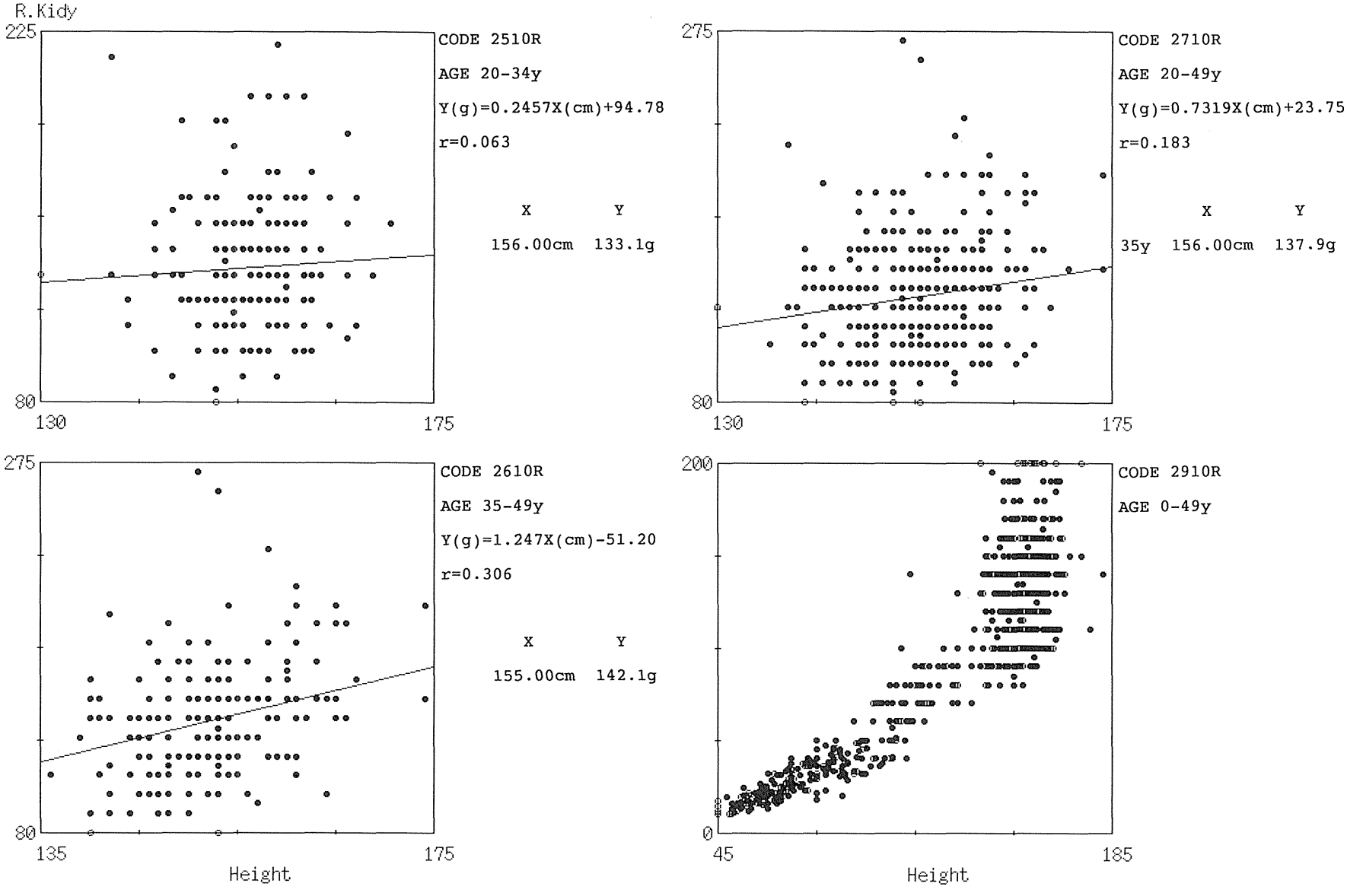


Fig. 32b. Mass of the right kidney, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

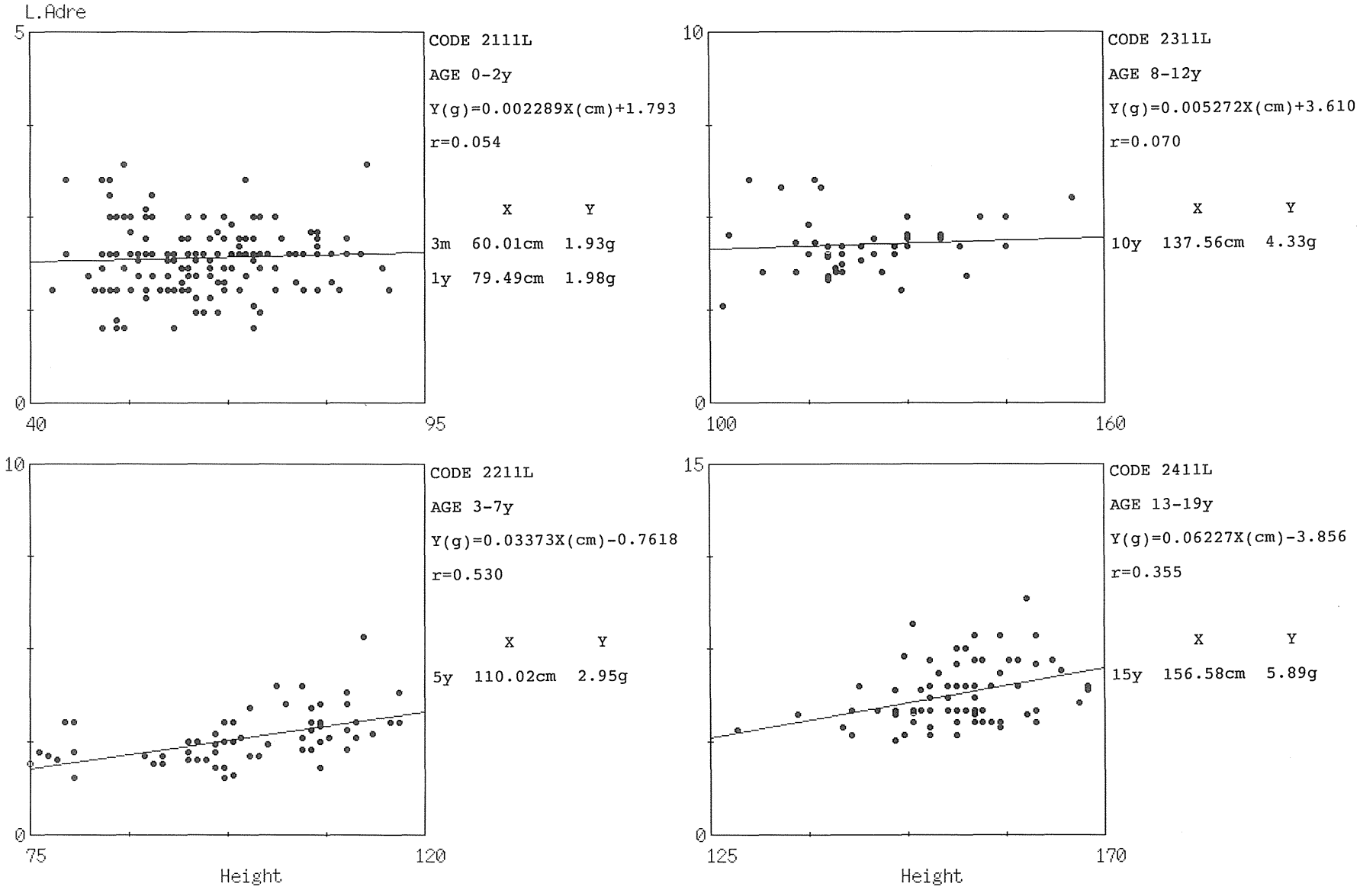


Fig. 33a. Mass of the left adrenal gland, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

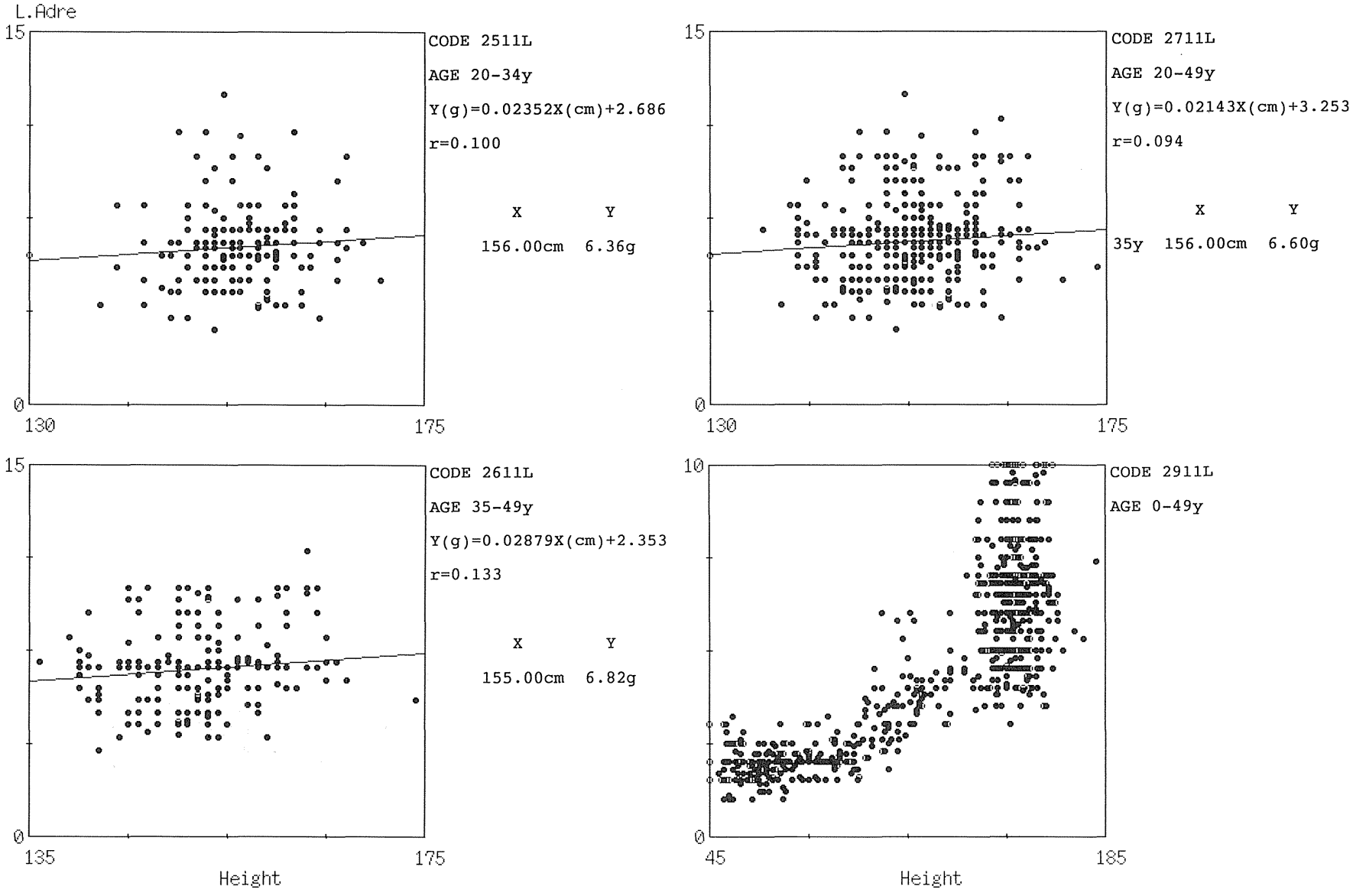


Fig. 33b. Mass of the left adrenal gland, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

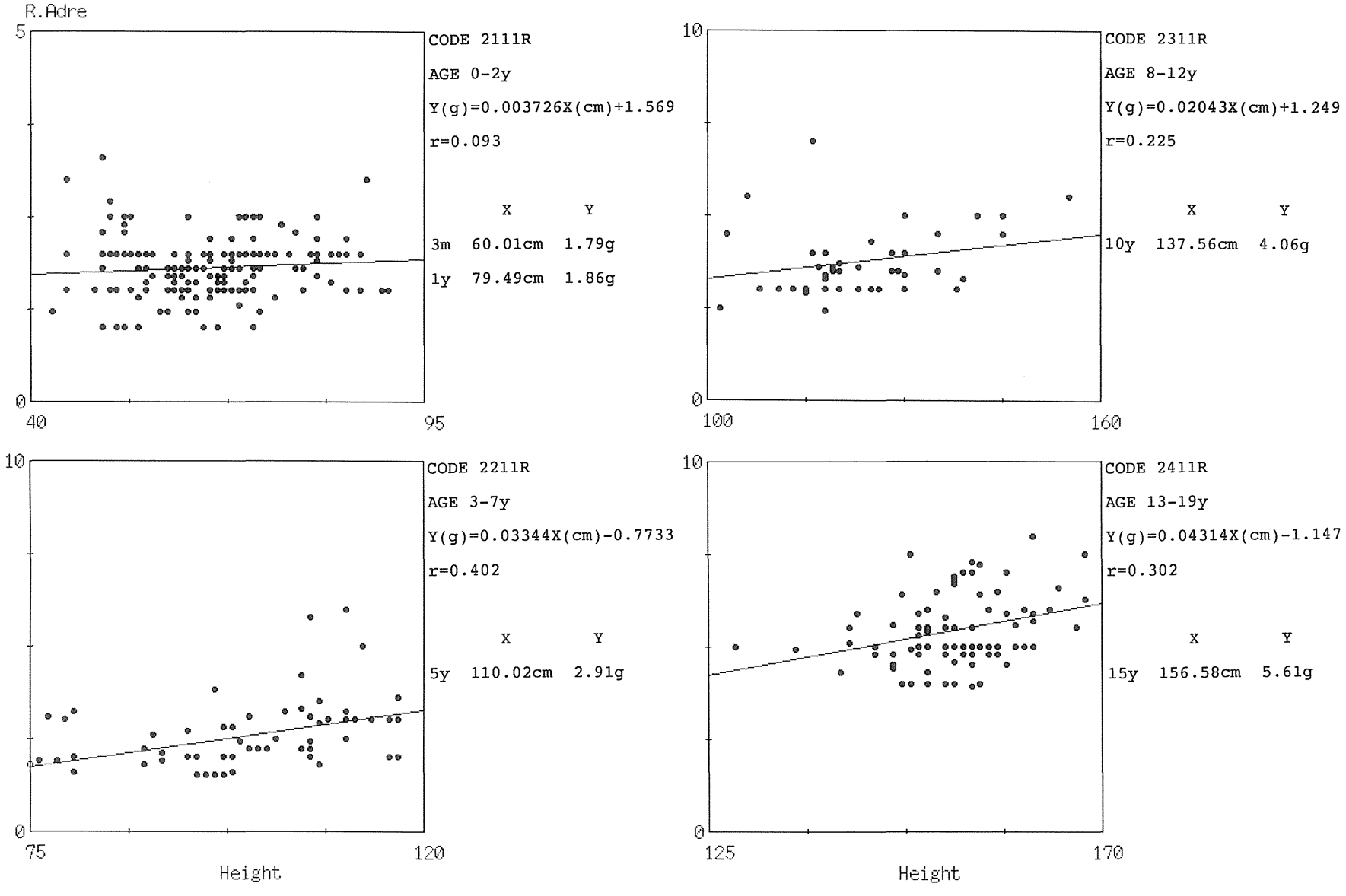


Fig. 34a. Mass of the right adrenal gland, Y in relation to body height, X in females: 0-2, 3-7, 8-12 and 13-19 year-old groups.

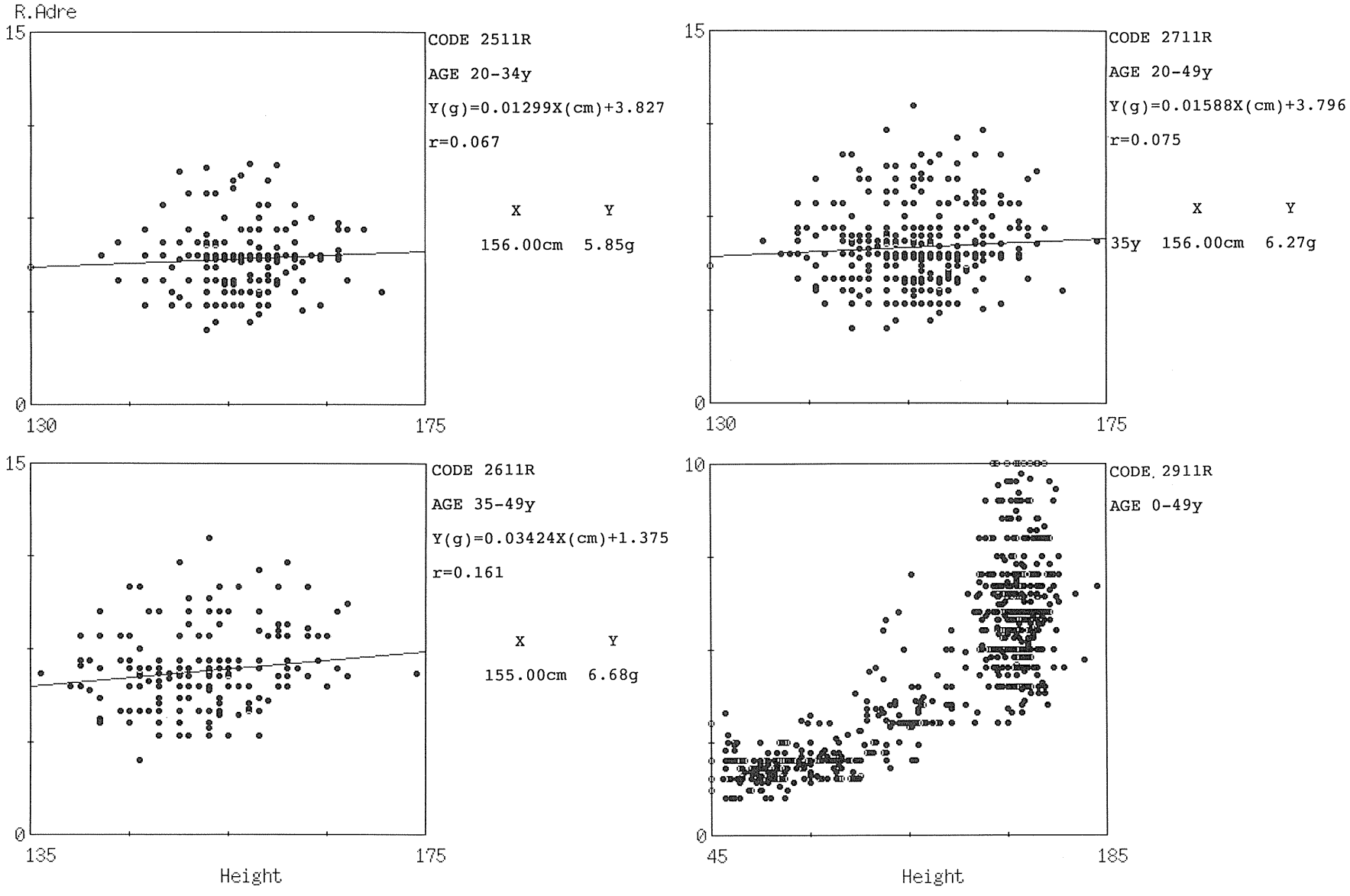


Fig. 34b. Mass of the right adrenal gland, Y in relation to body height, X in females: 20-34, 35-49, 20-49 and 0-49 year-old groups.

APPENDIX

Recent data of the world statistics were collected and several kinds of data were summarized as background information and shown in Table A: (1) for Asia, (2) for North America and (3) for West Europe. The data include the area (of farmland, pasture, forest, others), population (total, density, birth and death rates, infant death) by region and by country. The population of primary, secondary and tertiary industry and electric power generation (by thermal, hydraulic, nuclear and other systems) as well as oil-equivalent energy consumption (in 10^6 ton) were also referred to. In the end, some other kind of information was added. References used are cited in the following table.

Name of publication	Publisher or author	Year
Statistical Yearbook	United Nations	1985/86
Demographic Yearbook	United Nations	1988
International Trade Statistics Yearbook	United Nations	1987
Yearbook of Industrial Statistics	United Nations	1987
Energy Statistics Yearbook	United Nations	1987
Trade Yearbook	United Nations	1989
Yearbook of Fishery Statistics	United Nations	1988
Yearbook of Forest Products	United Nations	1988
Production Yearbook	FAO	1989
Yearbook of Labour Statistics	ILO	1989
Statistical Yearbook	UNESCO	1989
The Statesman's Year-book	McMillan	1990
The World Almanac	Newspaper Enterprise Association	1990
Information Please Almanac	Dan Golenpaul Associates	1990
Western Europe	Europa Publications	1989
The Far East and Australasia	Europa Publications	1990
The Europe Yearbook	Europa Publications	1990
The World Bank Atlas	The World Bank	1989
Japan Statistical Yearbook	Prime Minister's Office (PMO, Jpn)	1989
Population Census of Japan	Ministry of Health and Welfare, Jpn	1990
International Statistics	PMO, Jpn	1990
Japan Statistics	PMO, Jpn	1989
Sogo Enerugi Toukei (comprehensive energy statistics)	Agency of Natural Resources and Energy	1990

Table A (1). Area, population, industry, agriculture, electric power generation and other statistics in Asia.

	Area					Population		(rate)		infant	Average life span		Industrial population		
		farmland	pasture	forest	other		density	birth	death	death	male	female	primary	secondary	tertiary
	k km2	k ha	k ha	k ha	k ha	k man	Pepole/Km2	%	%	%	yrs.	yrs.	%	%	%
Korea (South)	99	2,140	90	6,490	1,160	41,975	424	1.57	0.61	2.50	63	69	21	33	43
Korea (North)	121	2,400	50	8,970	620	21,902	182	2.89	0.54	2.45	66	73	50	32	18
China	9,597	96,650	319,080	117,120	399,800	1,115,970	116	2.08	0.66	3.93	67	69	60	23	18
Japan	378	4,680	640	25,110	7,230	122,613	325	1.10	0.62	0.50	76	81	8	32	56
Hong Kong	1	7		12	79	5,681	5,437	1.25	0.48	0.74	74	80	2	42	56
Mongolian	1,567	1,370	123,870	13,910	17,500	2,092	1	3.89	0.85	4.50	62	66			
TOTAL	11,763	107,247	443,730	171,612	426,389	1,310,233	111	2.13	0.63	2.44	68	73	28	32	38
Afghanistan	652	8,050	30,000	1,900	25,260	15,513	24	4.81	2.23	18.16	36.6	37.3	60.1	13.5	24.5
Iran	1,648	14,830	44,000	18,020	86,750	52,522	32	4.25	1.15	10.80	55.75	55.04	36.9	30.4	28.5
India	3,288	169,450	12,040	66,600	49,230	797,000	242	3.20	1.00	9.50	52.5	52.1	62.6	12.3	16.1
Sri Lanka	66	1,900	440	1,750	2,380	16,587	253	2.07	0.58	2.39	67.78	71.66	42.4	15.8	24.3
Nepal	141	2,360	2,000	2,310	7,010	18,234	130	3.96	1.48	12.82	50.88	48.1	91.1	0.5	6.5
Pakistan	796	20,900	5,000	3,300	47,890	105,409	132	3.29	0.87	11.59	59.04	59.2	48.7	18.7	28.3
Bangladesh	144	9,270	600	1,960	1,190	104,532	726	4.22	1.55	11.90	54.9	54.7	56.6	12.2	26.4
Bhutan	47	130	270	2,600	1,700	1,451	31	3.83	1.68	12.82	48.6	47.1			
Maldives	0.20	3		1	25	202	679	4.29	0.78	4.99	62.2	59.48	29.5	28.3	38.5
TOTAL	6,782	226,893	94,350	98,441	221,435	1,111,450	164	3.77	1.26	10.55	54.3	53.9	53.5	16.5	24.1
Indonesia	1,905	21,220	11,800	113,430	34,700	174,951	92	2.74	1.12	8.40	54.6	57.4	53.5	13	31.2
Singapore	1	2		3	56	2,670	4,283	2.00	0.52	0.70	68.7	74	0.8	32.8	61.5
Thailand	513	20,150	760	14,170	16,010	54,536	106	2.23	0.70	3.90	63.82	68.85	68.1	9.9	19.6
Cambodia	181	3,060	580	13,370	640	7,870	43	4.14	1.66	12.97	47	49.9			
Philippines	300	7,970	1,220	10,750	9,880	58,721	196	3.32	0.77	4.50	61.9	65.5	43.4	13	34.5
Negara Brunei Darussalam	6	7		250	270	241	42	3.06	0.32	0.74	70.13	72.69	4.9	27.3	63.9
Viet-Nam	332	6,570	330	9,310	16,540	64,228	194	3.19	0.95	6.43	63.66	67.89			
Malaysia	330	4,880	30	19,340	8,610	16,921	51	2.86	0.56	2.41	67.52	71.58	32.4	23.2	38.9
Myanmar	677	10,050	360	32,380	22,960	39,966	59	3.06	0.97	7.02	58.93	63.66	63.9	10.7	19.1
Lao	237	900	800	12,900	8,480	3,875	16	4.13	1.64	11.00	47	50			
TOTAL	4,481	74,809	15,880	225,903	118,146	423,955	95	3.07	0.92	5.81	60.3	64.1	38.1	18.6	38.4
U. Arab Emirate	84	39		3	8,120	1,501	18	2.26	0.36	2.62	68.57	72.92	4.6	36	58.9
Yemen (North)	528	1,480	16,070	3,120	32,130	10,049	19	4.79	1.57	11.57	49.5	52.4	73.6	7.7	16.2
Israel	21	430	150	110	1,370	4,437	214	2.31	0.68	1.14	73.5	76.99	4.9	27.7	63.7
Iraq	438	5,450	4,000	1,890	32,400	17,657	40	4.26	0.78	6.90	62.98	64.82	30.1	20.5	45.1
Oman	212	48			20,200	1,378	6	4.60	1.27	10.02	54.08	56.75			
Qatar	11	5			1,050	341	30	3.08	0.43	3.10	66.93	71.8			
Cyprus	9	160		120	640	687	74	1.86	0.82	1.20	73.9	77.82	14.8	27.4	46.8
Kuwait	18	4		2	1,640	1,958	110	2.68	0.22	1.56	70.75	74.97	1.9	27.2	69.8
Saudi Arabia	2,150	1,190	85,000	1,200	127,580	14,016	7	4.20	0.76	7.09	61.7	65.2			
Syrian	185	5,560		20	4,070	11,338	61	4.41	0.70	4.80	63.77	64.7	24.9	31.7	40.6
Turkey	779	27,730	8,600	20,200	20,430	52,422	67	2.84	0.84	7.56	62.5	65.77	39.5	17.4	30.8
Bahrain	1	2			62	481	710	2.82	0.39	2.60	65.9	68.9	2.6	31.9	60.9
Jordan	98	370	790	71	7,660	3,943	40	4.59	0.66	4.40	64.16	67.84	10.3	22.9	57.8
Lebanon	10	300	10	80	630	2,828	272	2.89	0.78	4.01	65.1	69	17	24.9	57.6
TOTAL	4,544	42,768	114,620	26,816	257,982	123,036	27	3.40	0.73	4.90	64.5	67.8	18.7	25.0	49.8
Asia Grand Total	27,582	451,800	678,350	524,390	1024130	2,996,000	109								

Table A (1). Area, population, industry, agriculture, electric power generation and other statistics in Asia (continued).

(k=1000)

	G.N.P.		Agriculture		Farmland per farmer	Total electric generation	thermal	water	nuclear	volcanic steam	Consumption per person	Energy consumption	National defense budget	Military personnel
	Mill.$	$/person	k farmer	%	ha	Mill.kWh.	%	%	%	%	kwh	Mt	Mill$	man
Korea (South)	150,270	3,530	4,860	11.6	0.5	80,300		6.7	49.0		1,913	51,910	8,500	650,000
Korea (North)	15,640	767	3,480	15.9	0.7	520		58.0			24	40,550	4,200	1,040,000
China	356,490	330	451,180	40.4	0.2	497,300		20.1			446	560,000	6,600	3,030,000
Japan	2,576,541	21,040	4,430	3.6	1.2	699,000		12.0	27.2	0.2	5,701	320,000	30,100	250,000
Hong Kong	52,380	9,230	40	0.7	0.2	23,800	100.0				4,189	7,430		
Mongolian	1,161	608	310	14.8	401.0	320	100.0				153	2,550	270	22,000
TOTAL	3,152,482	2,406	464,300	35.4	1.19	1,301,240	100.0	24.2	38.1	0.2	993	982,440	49,670	4,992,000
Afghanistan	3,860	234	2,480	16.0	15.0	1,300		60.8			84	1,420	290	55,000
Iran	168,100	3766	4,420	8.4	13.0	37,900		16.9			722	46,140	5,800	600,000
India	271,440	330	208,860	26.2	0.9	217,500		26.6	2.5		273	150,000	9,100	1,260,000
Sri Lanka	7,020	420	3,230	19.5	0.7	2,700		80.4			163	1,450	580	49,000
Nepal	3,150	170	6,970	38.2	0.6	540		95.2			30	290	37	35,000
Pakistan	37,153	350	16,940	16.1	1.5	33,500		45.6	1.5		318	19,440	2,600	520,000
Bangladesh	18,310	170	22,170	21.2	0.4	5,900		9.0			56	4,820	220	100,000
Bhutan	202	150	590		0.7	210		38.1			145	13		
Maldives	80	410				130	100.0				644	27		
TOTAL	509,315	458	265,660	23.9	1.21	299,680	100.0	46.6	2.0		270	223,600	18,627	2,619,000
Indonesia	75,960	430	34,350	19.6	1.0	34,800		20.9		0.6	199	33,010	1,400	290,000
Singapore	24,010	9,100	14	0.5	0.1	11,800	100.0				4,419	8,750	1,500	56,000
Thailand	54,550	100	18,650	34.2	1.1	30,000		13.6			550	18,400	1,800	280,000
Cambodia	585	80	2,630	33.4	1.4	70			42.9		9	150		99,000
Philippines	37,710	630	9,920	16.9	0.9	23,900		21.9		19.0	407	10,760	1,300	110,000
Negara Brunei Darussalam	3,317	14,120		0.0		1,000	100.0				4,149	1,690	190	4,200
Viet-Nam	6,500	109	18,920	29.5	0.4	5,300		37.7			83	5,180		1,250,000
Malaysia	31,620	1,870	2,250	13.3	2.2	17,400		28.2			1,028	14,550	1,300	130,000
Myanmar	7,450	200	8,350	20.9	1.2	2,300		49.2			58	1,860	350	200,000
Lao	710	180	1,340	34.6	1.3	1,100		95.5			284	96		56,000
TOTAL	242,412	572	96,424	22.7	0.94	127,670	100.0	38.1	42.9	9.8	301	94,446	7,840	2,475,200
U. Arab Emirate	23,580	15,720	22	1.5	11.0	13,100	100.0				8,728	19,180	1,500	43,000
Yemen (North)	6,800	605	1,370	13.6	12.9	1,200	100.0				119	2,400	530	64,000
Israel	38,440	8,650	77	1.7	7.5	17,500	100.0				3,944	8,550	6,400	140,000
Iraq	46,774	2,942	1,040	5.9	13.0	22,900		2.7			1,297	8,870	12,900	1,000,000
Oman	7,110	5,070	170	12.3	6.4	3,800	100.0				2,758	7,810	1,300	26,000
Qatar	4,060	11,610		0.0		4,400	100.0				12,903	5,010	150	7,000
Cyprus	4,320	6,260	69	10.0	2.3	1,500	100.0				2,183	1,160	120	13,000
Kuwait	26,250	13,680		0.0		18,400	100.0				9,397	11,970	1,600	20,000
Saudi Arabia	86,527	6,170	1,560	11.1	55.0	37,100	100.0				2,647	55,610	14,700	66,000
Syrian	19,540	1,670	730	6.4	19.0	7,200		20.9			635	8,060	2,500	380,000
Turkey	68,600	1,280	11,720	22.4	3.1	44,400		42.0		0.1	847	36,680	2,900	650,000
Bahrain	3,027	6,610	4	0.8	1.5	3,000	100.0				6,237	4,780	190	3,350
Jordan	4,420	1,500	46	1.2	25.0	3,500		0.5			888	2,790	470	85,000
Lebanon	643	241	81	2.9	3.8	4,600		13.3			1,627	2,600	260	22,000
TOTAL	340,091	2,764	16,889	13.7	9.32	182,600	100.0	15.9		0.1	1,484	175,470	45,520	2,519,350
Asia Grand Total	4,244,300	1,417	843,273	28.1	1.3	1,911,190						1,475,956	121,657	12605550

Table A (2). Area, population, industry, agriculture, electric power generation and other statistics in North America.

	Area				Populaton		(rate)					Industrial population		
	k km2	farmland k ha	forest k ha	other k ha	k man	density Pepole/Km2	birth %	death %	infant death %	Average life span male yrs.	female yrs.	primary %	secondary %	tertiary %
U.S.A.	9,373	189,920	265,190	220,090	246,329	26	1.6	0.9	1.0	71.3	78.3	3	25.8	69
Canada	9,976	45,980	356,000	481,620	25,920	3	1.4	0.7	0.7	73	79.78	4.9	24.6	69.7
TOTAL	19,349	235,900	621,190	701,710	272,249	14	1.5	0.8	0.9	72.15	79.04	3.95	25.2	69.35

Table A (2). Area, population, industry, agriculture, electric power generation and other statistics in North America (continued).

(k=1000)

	G.N.P.		Agriculture		Farmland per farmer	Total electric generation	thermal	water	nuclear	volcanic steam	Consumption per person	Energy consumption	National defense budget	Military personnel
	Mill.$	$/person	k farmer	%	ha	Mill.kWh.	%	%	%	%	kwh	Mt	Mill$	man
U.S.A.	4,863,674	19,780	3,060	1.2	141	2,685,600		9.5	17	0.5	10,902	1,600,000	291,200	2,120,000
Canada	437,471	16,790	470	1.8	166	496,300		63.7	15.6		19,147	180,000	9,300	89,000
TOTAL	5,301,145	19,472	3,530	1.3	176	3,181,900		36.6	16.3	0.5	11,687	1,780,000	300,500	2,209,000

Table A (3). Area, population, industry, agriculture, electric power generation and other statistics in West Europe.

	Area				Populaton		(rate)		infant	Average life span		Industrial population		
	k km2	farmland k ha	forest k ha	other k ha	k man	density Pepole/Km2	birth %	death %	death %	male yrs.	female yrs.	primary %	secondary %	tertiary %
Iceland	103	10	120	7,620	249	2	1.69	0.69	0.34	73.96	80.2			
Ireland	70	960	340	900	3,538	50	1.99	0.88	0.74	70.14	75.62	12.7	26	50.8
Andorra	0.45	1	10	9	49	108	1.11	0.37	0.76					
Britain	244	6,990	2,360	3,250	57,065	234	1.38	1.11	0.88	71.22	77.51	2.1	25.7	60.6
Italy	301	12,150	6,740	5,620	57,441	191	0.99	0.93	0.95	71.43	78.14	9.1	28.2	50.8
Austria	84	1,510	3,200	1,580	7,595	91	1.16	1.10	0.81	71.53	78.13	8.4	36.8	53.8
Netherlands	41	930	300	1,080	14,758	361	1.26	0.84	0.75	72.95	79.55	4.5	22.9	61.9
Hellenic	132	3,930	2,620	1,280	10,013	76	1.06	0.95	1.26	72.15	76.35	26.5	26.4	42.5
San Marino	0.06	1		5	23	381	0.97	0.88	1.36			3	43.3	47.3
Swiss	41	410	1,050	900	6,510	158	1.17	0.91	0.68	73.8	80.5	6.4	36.7	56
Sweden	450	2,940	28,020	8,740	8,430	19	1.33	1.11	0.58	74.16	80.15	3.9	28.3	65.9
Spain	505	20,380	15,670	3,680	39,054	77	1.12	0.79	0.85	72.52	78.61	13.8	29.2	46.5
Denmark	43	2,570	490	960	5,130	119	1.15	1.15	0.83	71.8	77.6	5.7	27.1	65.7
W. Germany	357	8,950	10,480	37,280	77,865	218	1.14	1.15	0.83	71.81	78.37	4.8	38	54.7
Norway	324	860	8,330	21,390	4,196	13	1.37	1.07	0.84	72.75	79.55	6.5	25.3	67.3
Vatican	0.0004				1	1,741								
Finland	338	2,440	23,220	4,670	4,951	15	1.20	0.97	0.58	70.49	78.72	10.2	29.9	59
French	552	19,550	14,700	9,020	55,873	101	1.38	0.94	0.77	72.03	80.27	6.7	26.4	55.8
Belgium	31	820	700	1,080	9,925	325	1.18	1.06	0.97	70.04	76.79	2.5	24.4	61
Portuguese	92	2,750	3,640	2,270	10,408	113	1.20	0.93	1.42	68.35	75.2	20.6	31.4	41
Malta	0.32	13		10	348	1,101	1.59	0.84	0.71	72.54	77.01	2.5	33.4	59.7
Monaco	0.001			1,490	28	28,100	1.95	2.31	0.19			0.2	20.9	78.9
Liechtenstein	0.16	4	3	3	28	173	1.29	0.69	0.57	66.07	72.94			
Luxembourg	3				374	145	1.21	1.00	0.94	70	76.7	3.2	27.6	64.8
TOTAL	3,712	88,169	121,993	112,837	373,852	101	1.11	0.87	0.69	57.19	67.74	6.67	26.72	52.00

Table A (3). Area, population, industry, agriculture, electric power generation and other statistics in West Europe (continued).

(k=1000)

	G.N.P.		Agriculture		Farmland per farmer	Total electric generation	thermal	water	nuclear	volcanic steam	Consumption per person	Energy consumption	National defense budget	Military personnel
	Mill.$	$/person	k farmer	%	ha	Mill.kWh.	%	%	%	%	kwh	Mt	Mill$	man
Iceland	5,019	20,157	10	4.0	1.0	4,200		94		5.9	16,867	930		
Ireland	26,750	7,561	200	5.7	4.8	12,600		8.8			3,561	8,770	380	13,000
Andorra														
Britain	730,038	12,793	590	1.0	11.8	300,200		1.3	18.4		5,261	200,000	34,600	310,000
Italy	765,282	13,323	1,820	3.2	6.7	198,300		19.9	0.1	1.5	3,452	1,400,010	16,200	390,000
Austria	117,644	15,490	230	3.0	6.6	50,200		70.8			6,610	21,080	1,300	43,000
Netherlands	214,458	14,532	240	1.6	3.9	68,400			5.2		4,635	74,210	6,600	100,000
Hellenic	48,040	4,798	990	9.9	4.0	30,100		9.2			3,006	17,150	3,900	210,000
San Marino														
Swiss	178,442	27,410	150	2.3	2.7	57,000		60.2	38.1		8,756	17,350	3,300	40,000
Sweden	160,029	18,983	180	2.1	16.3	146,600		49.3	46.1		17,390	29,250	4,800	65,000
Spain	301,829	7,729	1,690	4.3	12.1	133,200		21	31		3,411	57,350	6,800	290,000
Denmark	94,792	18,478	150	2.9	17.1	29,400		0.1		0.6	5,731	19,160	1,900	32,000
W. Germany	1,131,265	14,529	2,540	3.3	3.5	530,000		3.9	27		6,807	330,000	40,600	670,000
Norway	84,165	20,058	120	2.9	7.2	103,800		99.5			24,738	19,840	3,000	34,000
Vatican														
Finland	92,015	18,585	220	4.4	11.1	53,500		25.8	36.7		10,806	19,680	1,800	31,000
French	898,671	16,084	1,460	2.6	13.4	356,200		19.1	70.6		6,375	140,000	28,800	470,000
Belgium	143,560	14,464	84	0.8	9.8	62,400		0.8	67.3		6,287	38,600	2,500	92,000
Portuguese	37,260	3,580	810	7.8	3.4	20,100		45.5			1,931	9,520	1,300	75,000
Malta	1,740	5,000	5	1.4	2.6	940	100				2,701	430	24	1,500
Monaco														
Liechtenstein														
Luxembourg	8,372	22,385				570		17.5			1,524	2,870	80	800
TOTAL	5,039,371	13,480	11,489	3.1	7.7	2,157,710	25.0	32.2	31.0	2.0	5,772	2,406,200	157,884	2,867,300