CHAPTER VI

PRESENTATION OF STATISTICAL ANALYSIS AND OBSERVATIONS

For the purposes of reporting the analysis and discussion, the variables are grouped together, meaningfully, that is, stature, stem length and lower limb length are grouped because stature includes stem length as well as the length of the lower limbs. The head circumference and chest circumference are grouped together and birth weight and weight are treated together. Each measurement is considered individually first and then with its group.

Figures of these anthropometric measurements follow the same order. Figures are arranged in the order of the control groups of residence and sexes. Thus, figure a in every group represents the urban lower class male infants, b the urban lower class female infants, c the rural lower class male infants and d the rural lower class female infants, except in the rates of growth where the pattern is different.

The presentation plan follows the following pattern. The central tendencies and deviations of each measurement are given first, followed by the percentile point

estimations of the measurement, mean rates of growth of the measurements and lastly the individual growth curves of selected infants-male and female-superimposed on the mean growth curves of the group. Five cases from both the sexes are selected on the following basis to illustrate these individual growth rates. All the individual cases selected to represent the growth curves in the different anthropometric measurements fulfilled one or more of the following criteria :

(1) Minimum increase in the age period 1 month to 2 months.

(2) Maximum increase in the age period 1 month to 2 months.

(3) Minimum increase in the age period 14 months to 15 months.

(4) Maximum increase in the age period 14 months to 15 months, and

(5) the infant whose monthly increment data was available for the maximum number of months during the age period under study.

I Stature, Stem height and lower Limb length :

Stature

All these measurements were taken in centimeters. Lower limb length was not measured independently, but for the purposes of the computation of the skelic index, it was derived from the values of stature and those of stem length.

Means and Standard Deviations : These values at each age from 1 to 15 months are given graphically in Figure I a,b,c, and d.

Observations : The increase in mean values of the different age groups with advance of age is noted. This is in accordance with the known trend of physical growth. Extremely wide deviations are noted in 5, 13 , and 15 month olds in the urban male infant groups. Similar wide deviations are noted in the 7 and 15 month olds in the urban female infants. The rural male infants exhibit these deviations in the 10 month olds. Unlike the urban group, the deviation in the 15 month olds is not wide. The rural female infants exhibit no wide deviations in stature; however, the deviations tend to widen after 12 months of age.

Percentile point estimations of Stature :

These values are presented graphically in Figures II a, b, c and d. The broken lines in the curves of the rural groups represent lack of data, as the small N made it impossible to compute these values for these age levels.

Observations : The percentile lines run fairly parallel except in 9 and 10 month olds in the urban male group. There is wider variability in the females of the same group in the age groups following the 11 month olds. In the rural groups wide variability is noted in the 10 month old male infants and 14 month old female infants.

FIG. I a

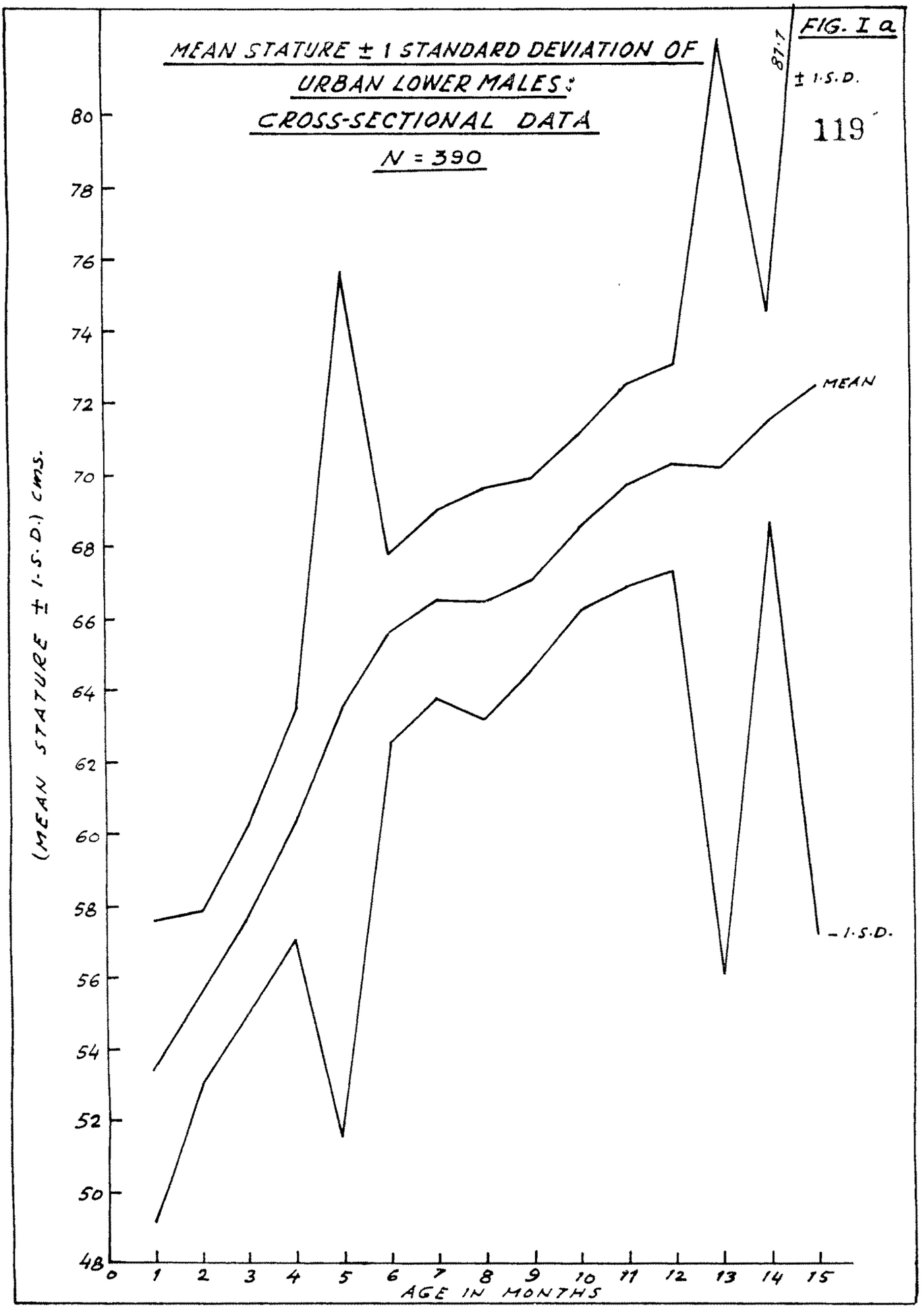

MEAN STATURE ± 1 STANDARD DEVIATION OF
URBAN LOWER MALES:
CROSS-SECTIONAL DATA
N = 390
87.1
± 1·S.D.
MEAN
- 1·S.D.
(MEAN STATURE ± 1·S.D.) CMS.
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE IN MONTHS

FIG. I b

MEAN STATURE ± 1 STANDARD DEVIATION OF URBAN LOWER FEMALES: CROSS-SECTIONAL DATA

N = 358

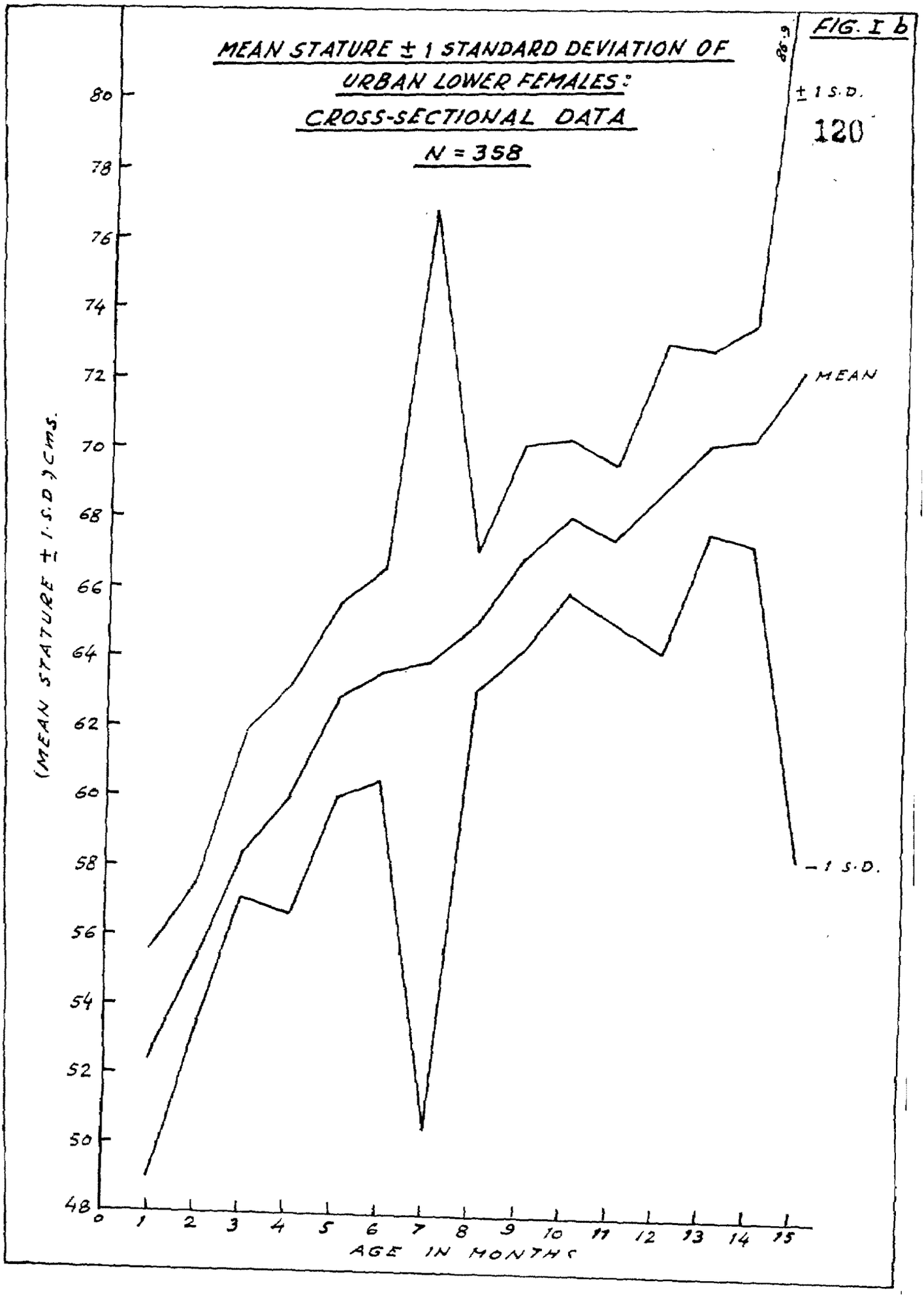


FIG. I C

MEAN STATURE ± 1 STANDARD DEVIATION OF RURAL LOWER MALES: CROSS-SECTIONAL DATA N = 215

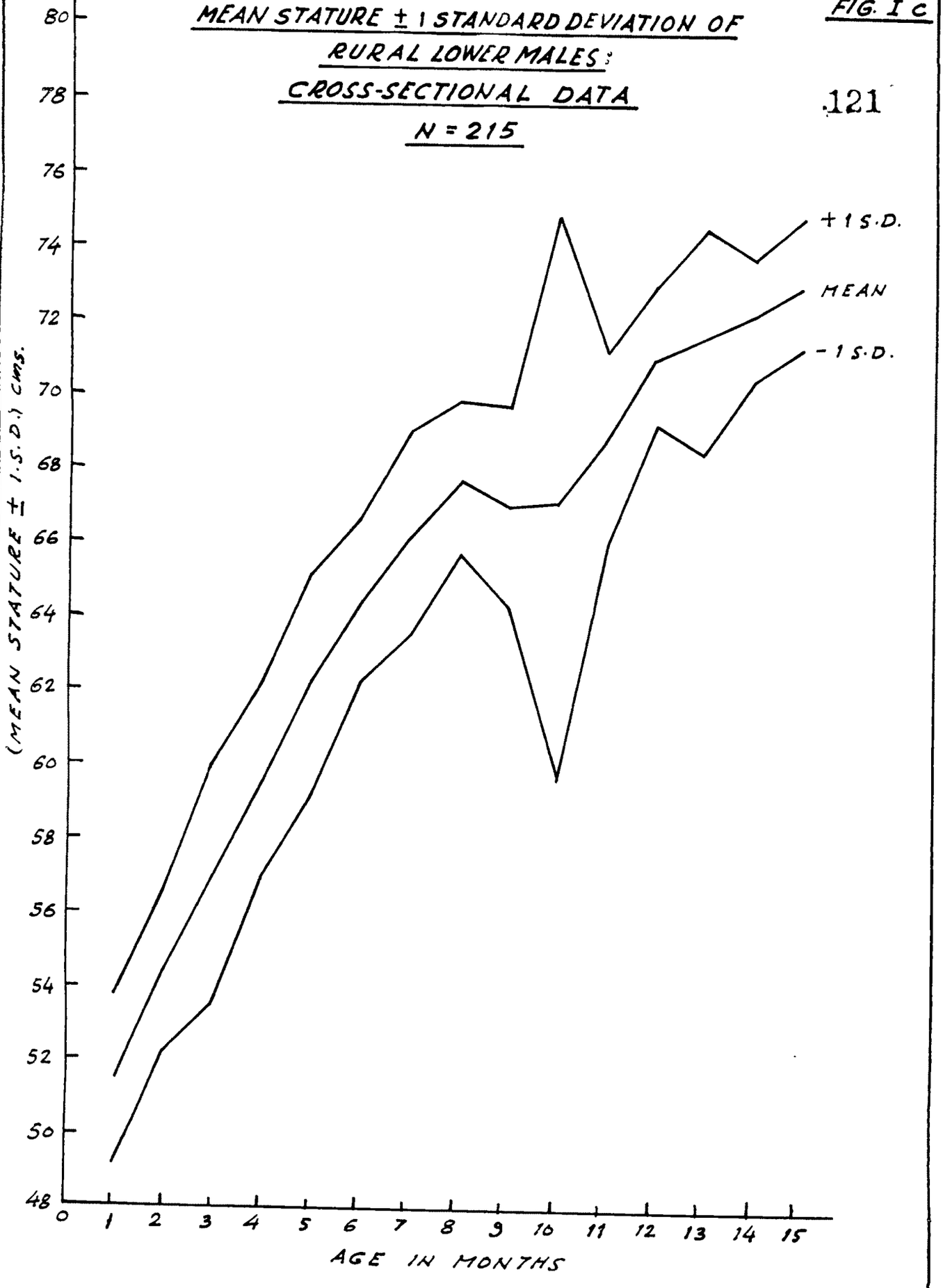


FIG. I d

MEAN STATURE ± 1 STANDARD DEVIATION OF RURAL LOWER FEMALES: CROSS-SECTIONAL DATA N = 207

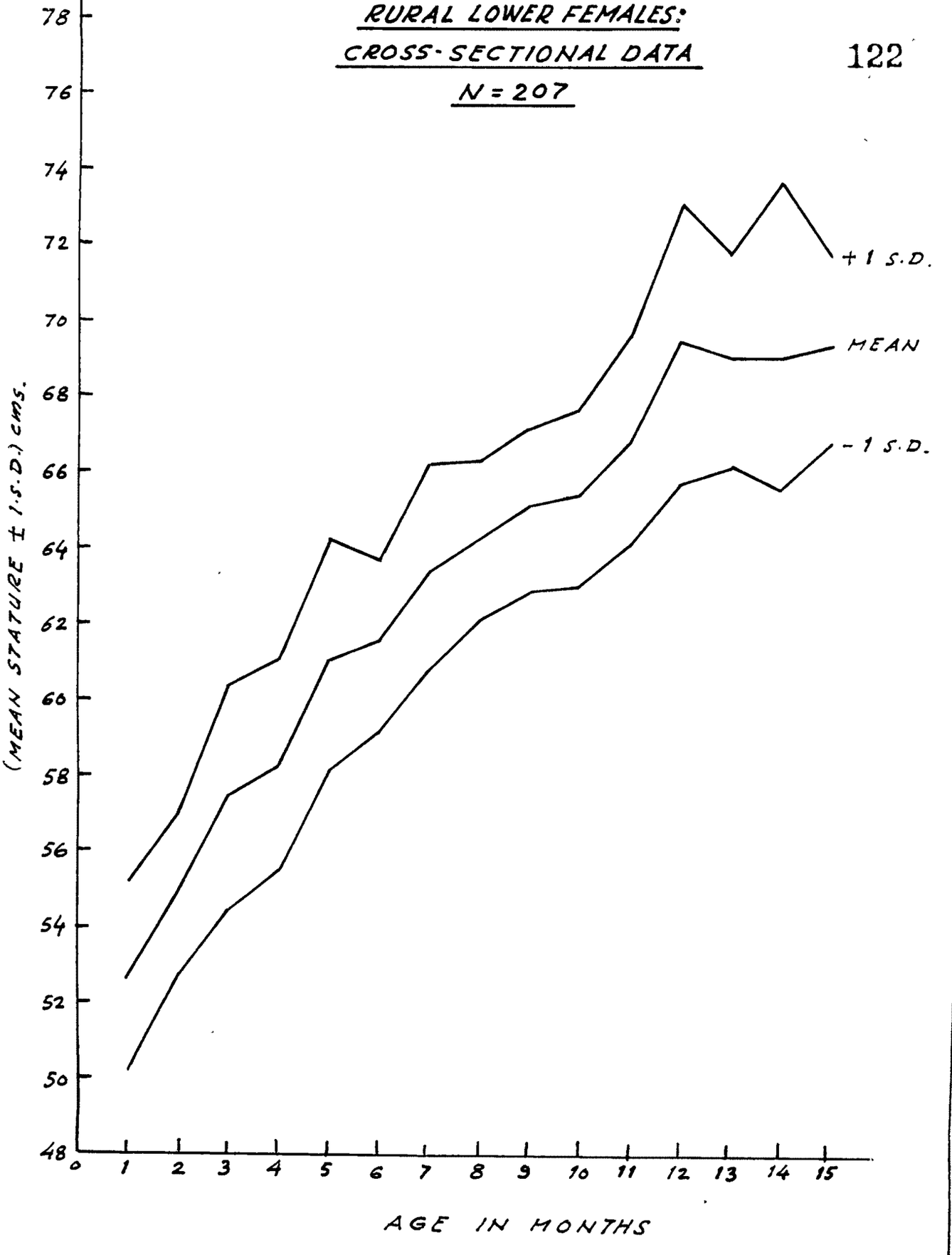


FIG. II a

PERCENTILE GRAPHS: STATURE
URBAN LOWER MALES
CROSS-SECTIONAL DATA
N = 390

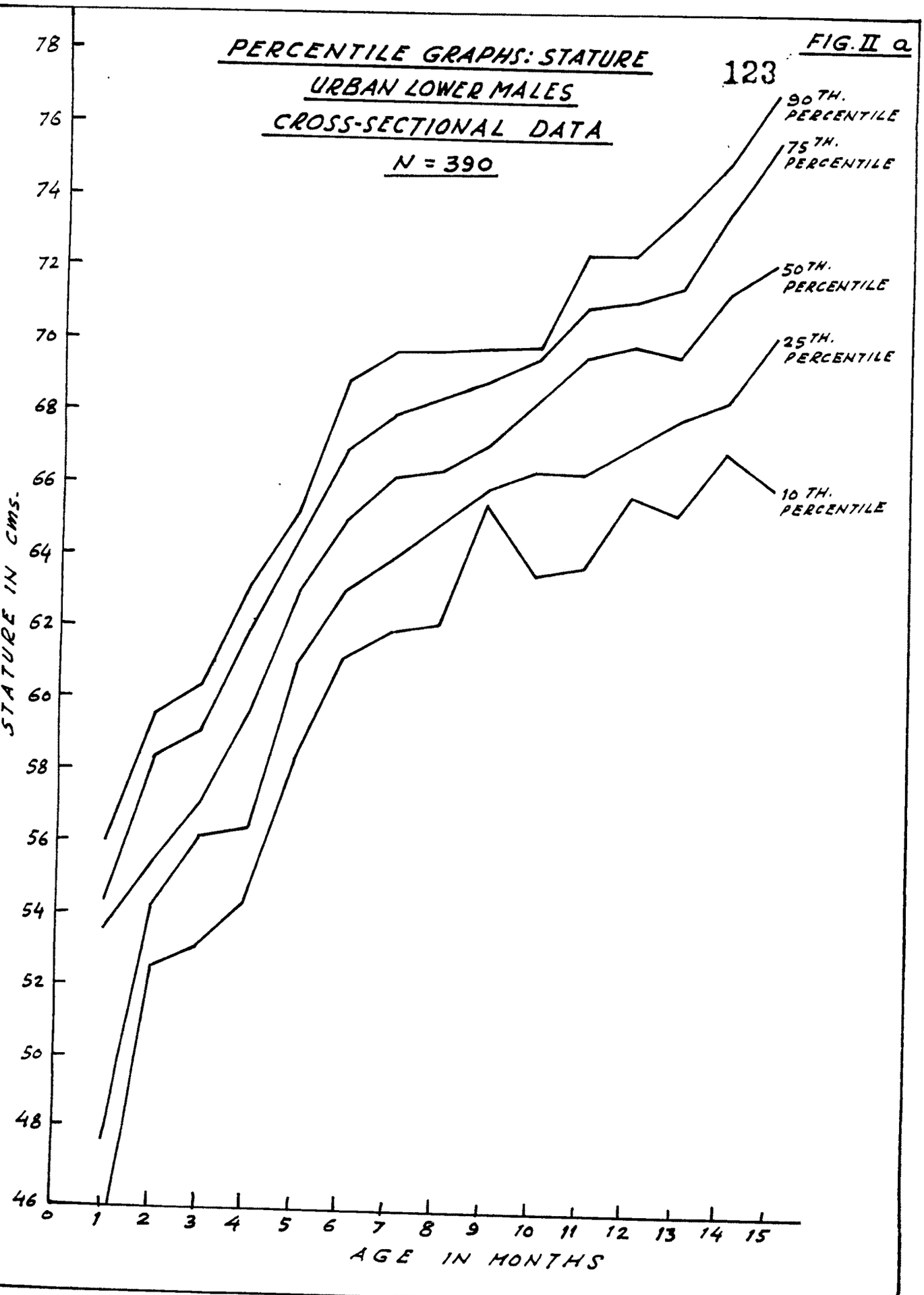


FIG. II b

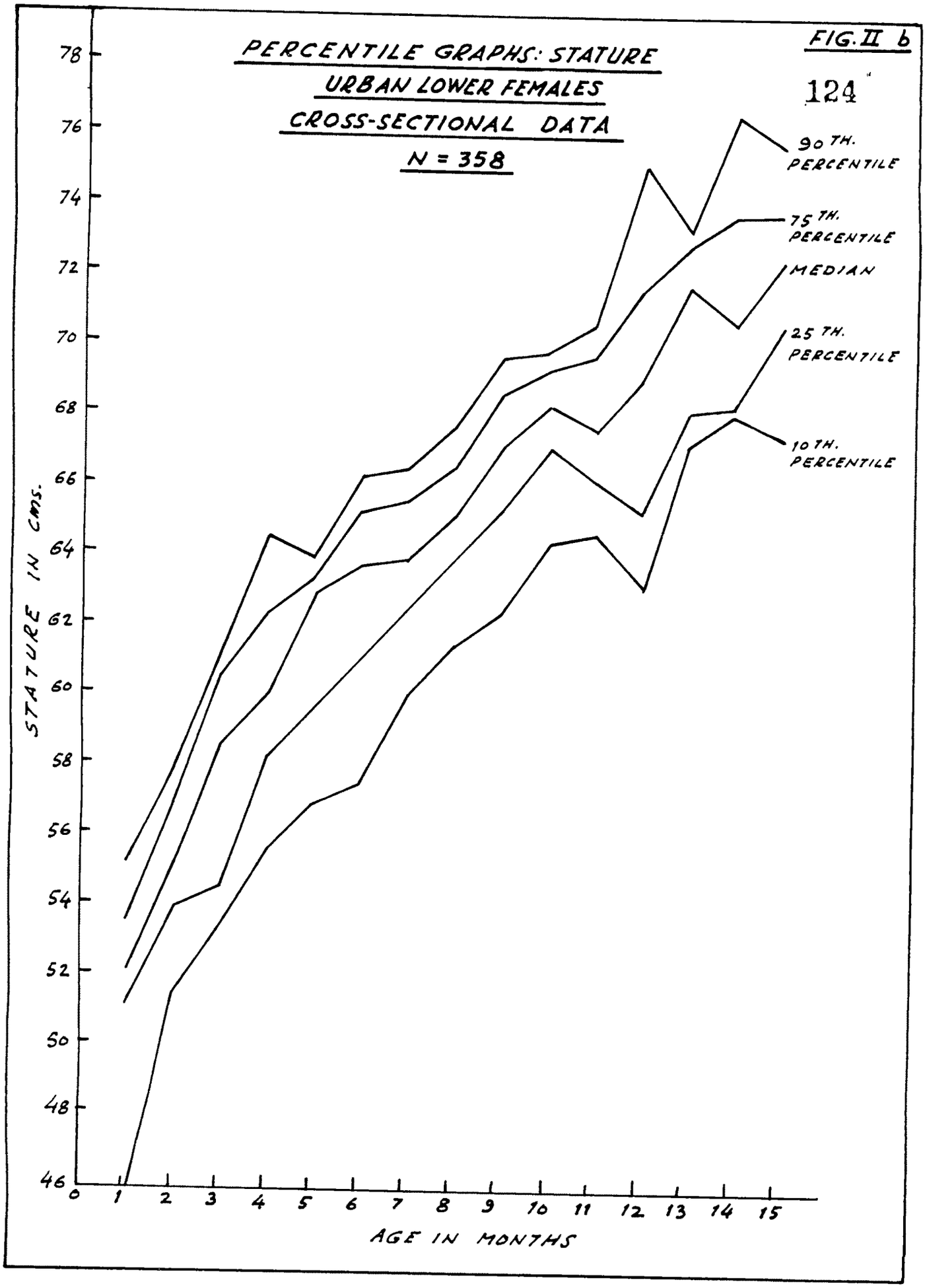

PERCENTILE GRAPHS: STATURE
URBAN LOWER FEMALES
CROSS-SECTIONAL DATA
N = 358
90 TH. PERCENTILE
75 TH. PERCENTILE
MEDIAN
25 TH. PERCENTILE
10 TH. PERCENTILE
STATURE IN CMS.
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE IN MONTHS

FIG. II c

125

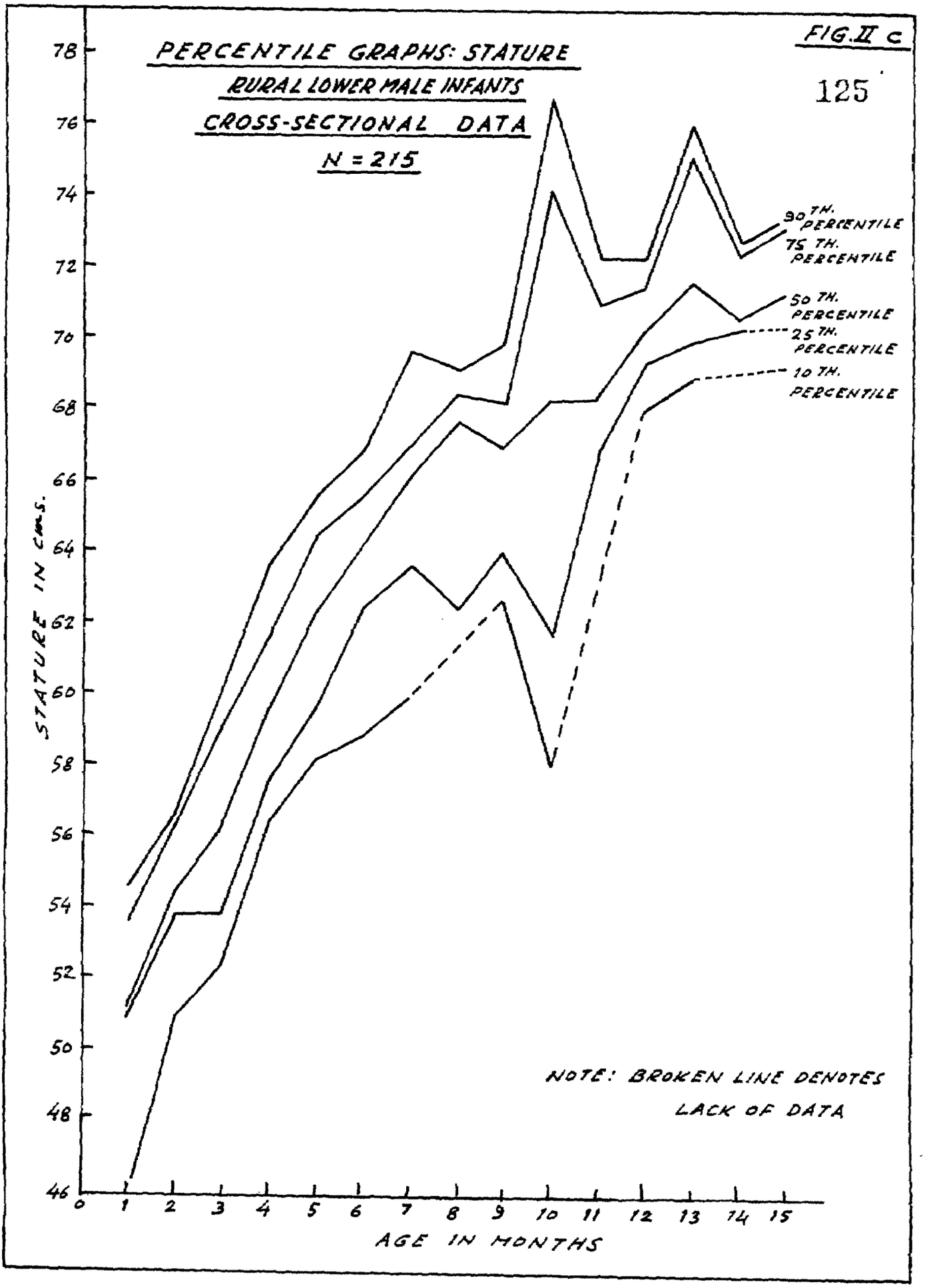
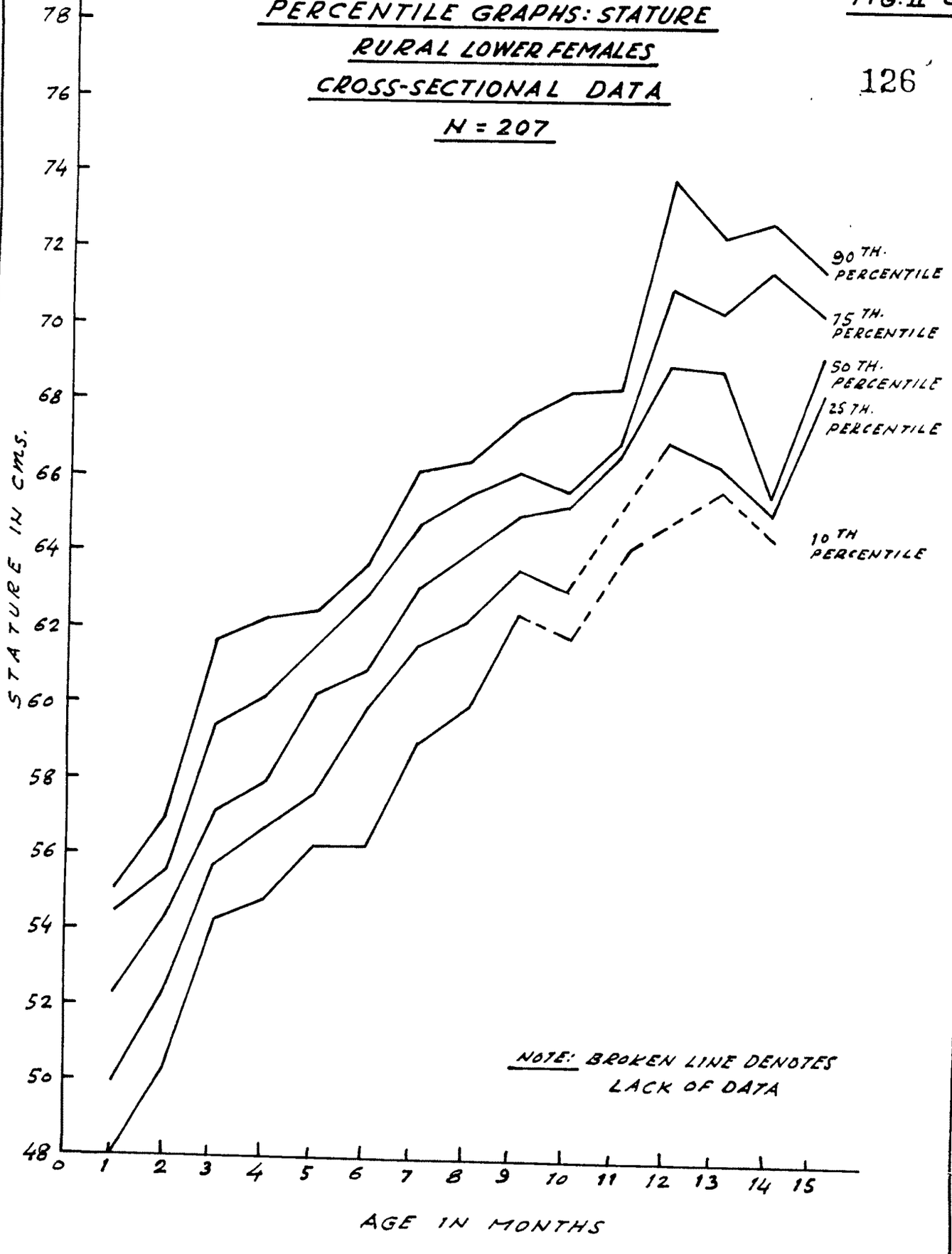

PERCENTILE GRAPHS: STATURE
RURAL LOWER MALE INFANTS
CROSS-SECTIONAL DATA
N = 215
90 TH. PERCENTILE
75 TH. PERCENTILE
50 TH. PERCENTILE
25 TH. PERCENTILE
10 TH. PERCENTILE
NOTE: BROKEN LINE DENOTES LACK OF DATA
STATURE IN CMS.
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE IN MONTHS

FIG. II d

PERCENTILE GRAPHS: STATURE
RURAL LOWER FEMALES
CROSS-SECTIONAL DATA
N = 207



Rates of growth of Stature :

There rates of growth representing mean increments and their standard deviations are calculated from the purely longitudinal urban sample. The graphs illustrating these rates of growth are given in figures III a,b,c, and d. It is known that mean growth rate curves conceal the individual pattern of minimum and maximum growth rates. Hence five selected individual growth rate curves of both the sexes are superimposed on the mean curve of the group in Figure IV a,b,c,d,e,f to visualise the tempo of individual growth.

Observations : On examination of graphs in Figure III, it is noted that the rate of growth slows down as age advances. The deceleration is more marked soon after birth and more or less levels out after the age of nine months in all the four groups. The examination of the individual patterns of stature growth show that inspite of the general trend of deceleration, ~~the~~ periods of spurts of growth, characterised by great increase, and periods of rest or no growth at all are evident. In the higher economic class, this levelling off, or ~~the~~ deceleration, is later than lower socio-economic class in both the sexes. The periods of spurts of growth and periods of rest or decreased growth are noted.

FIG. III

GRAPHS OF MEAN MONTHLY INCREMENT IN STATURE OF MALE AND FEMALE INFANTS AGED 1-15 MONTHS: FROM HIGHER AND LOWER URBAN AREA LONGITUDINAL DATA

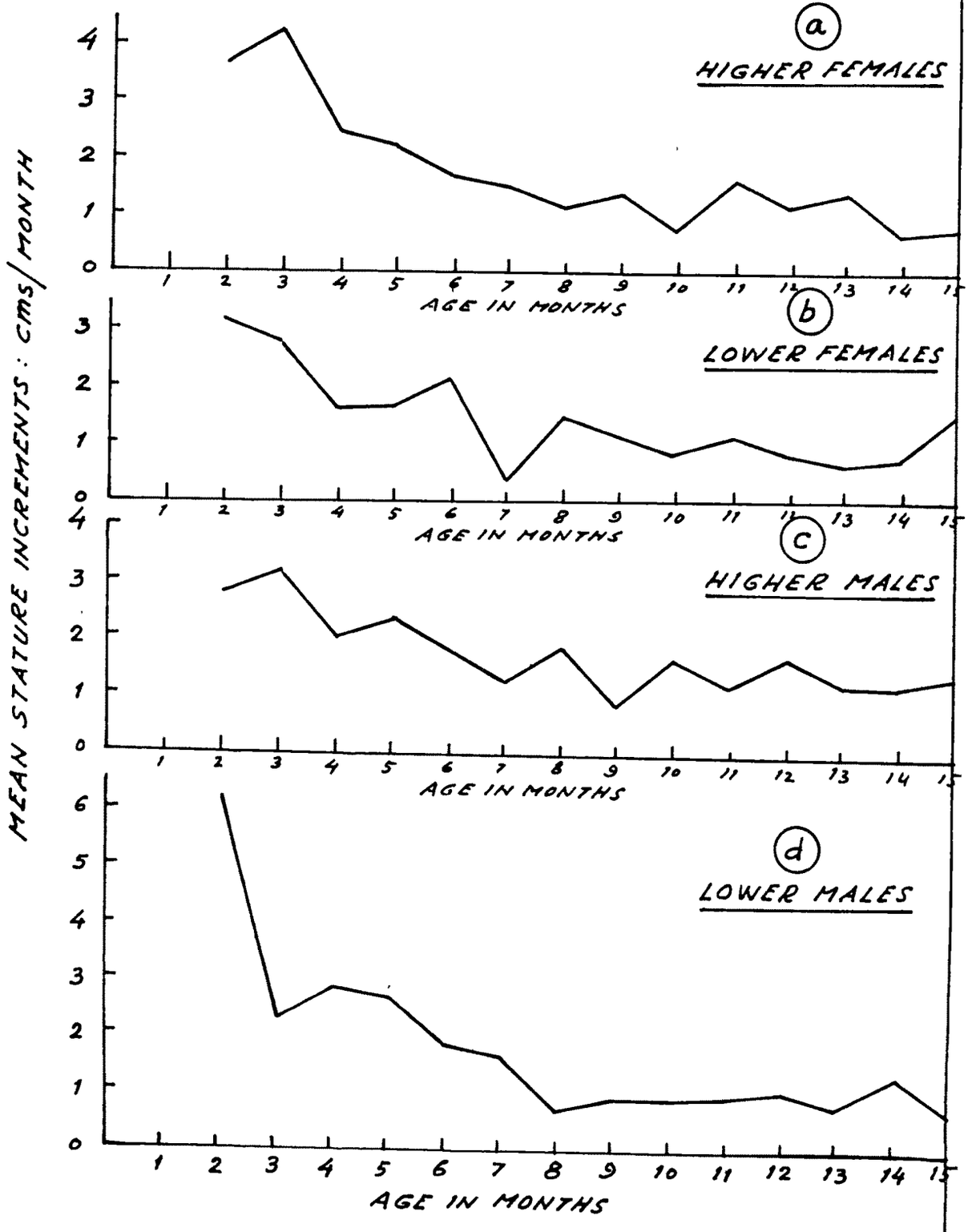


FIG. IV - 1

GRAPHS OF MEAN MONTHLY INCREMENTS IN STATURE SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN STATURE: LOWER URBAN MALES LONGITUDINAL DATA

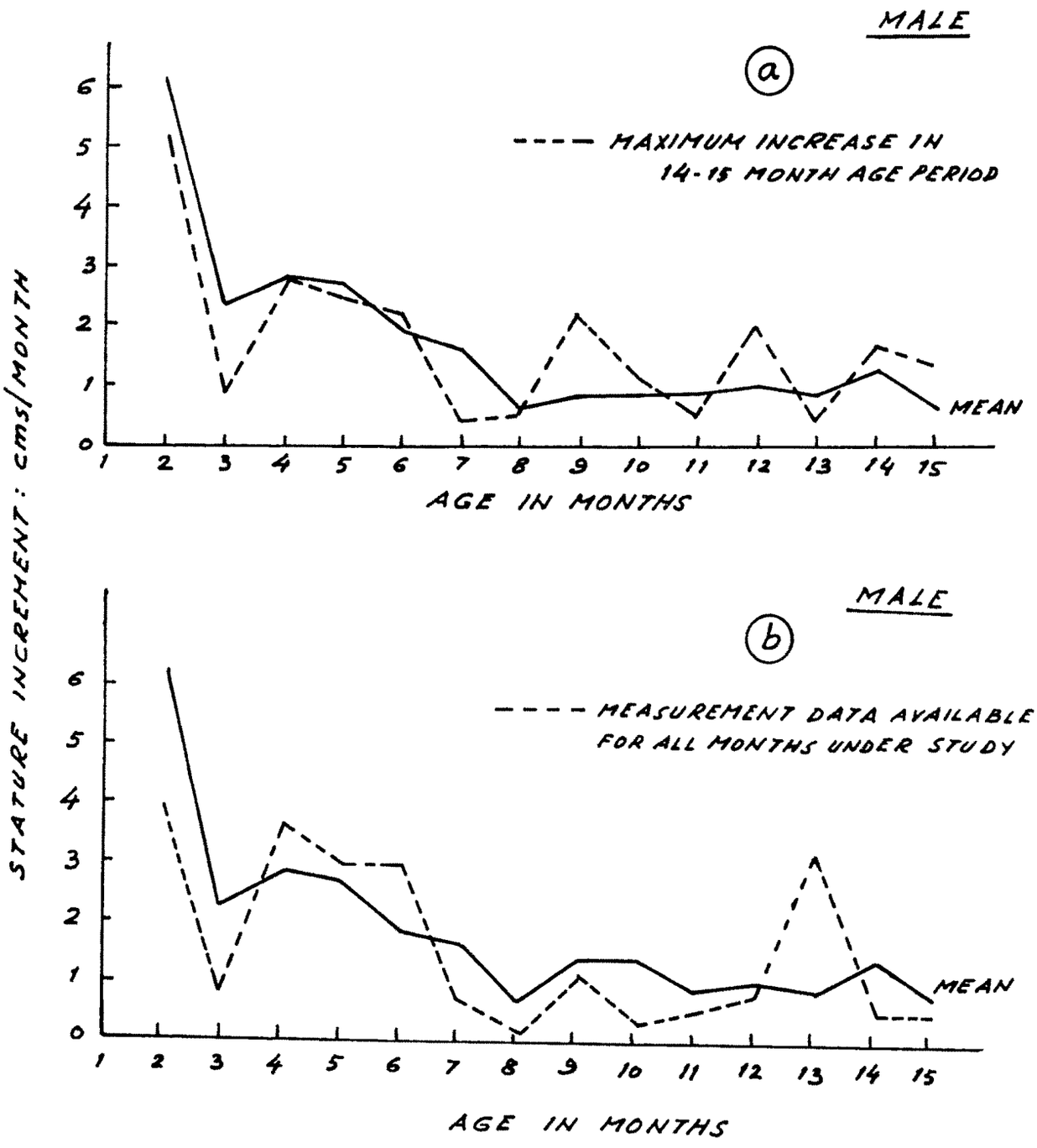
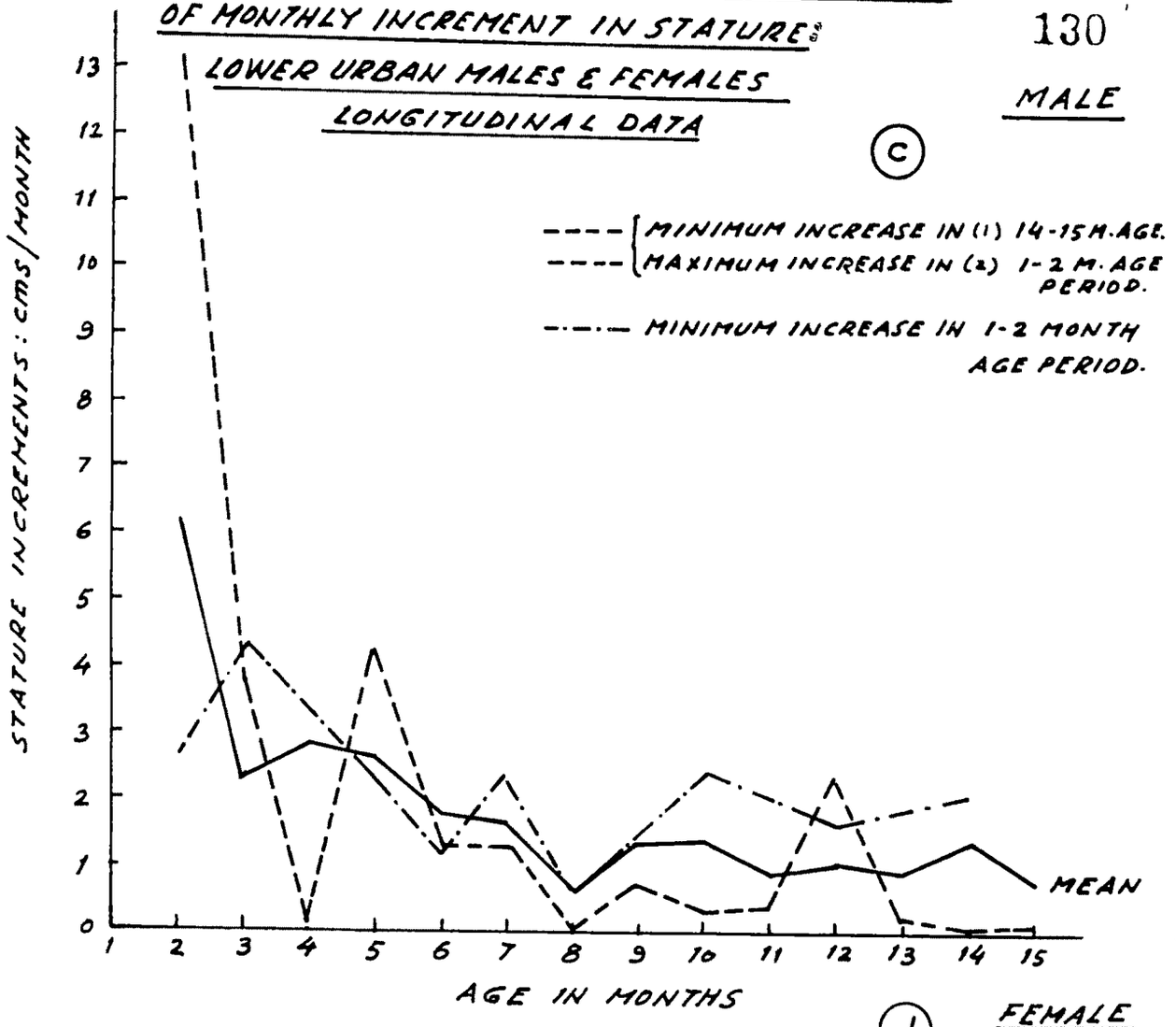


FIG. IV-2

GRAPHS OF MEAN MONTHLY INCREMENTS IN STATURE SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN STATURE: LOWER URBAN MALES & FEMALES LONGITUDINAL DATA

MALE



FEMALE

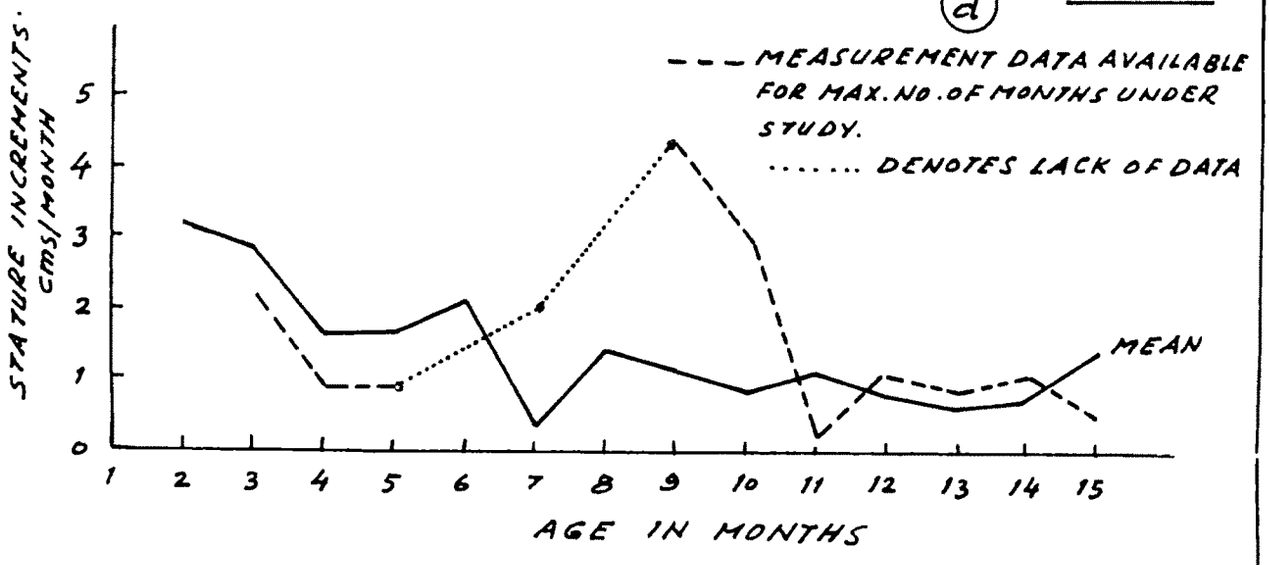


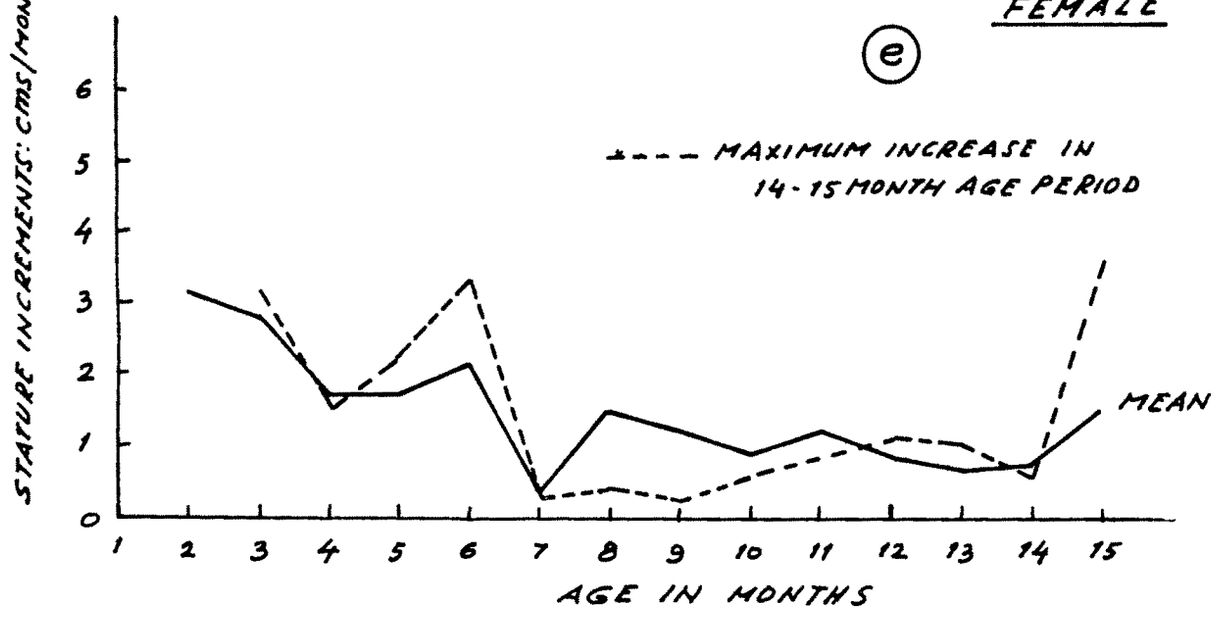
FIG. IV-3

GRAPHS OF MEAN MONTHLY INCREMENTS IN STATURE SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN STATURE:

LOWER URBAN FEMALES
LONGITUDINAL DATA

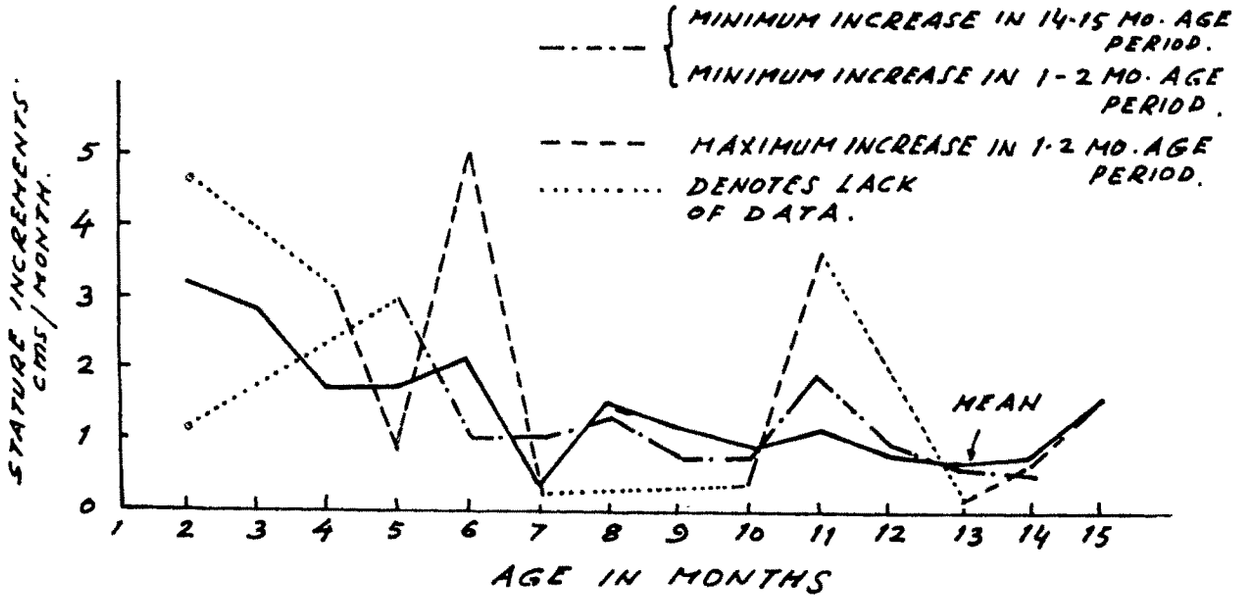
FEMALE

(e)



FEMALE

(f)



Stem Height

For the purposes of this study, the measurement of crown rump height or sitting height is referred to as stem height in contrast to stature and lower limb length.

Means and Standard Deviations :

In accordance with the known trend of physical growth, the increase in mean values of this anthropometric measurements is noted in different advancing age subgroups. These values are illustrated in Figure V a, b, c, and d for different months from 1 month to 15 months.

Observations : Extremely wide deviations are noted in the 3,5, 13 and 15 month olds of the urban lower male infants. Amongst the female counterparts of the same group, these wide deviations are noted in the 7, 10, 13 and 15 month olds. In the rural community, the lower socio-economic male infants exihibit this wide deviations in the 3 and 8 month olds only. Among the rural lower female group of infants these wide variations do not seem to occure.

Percentile values of stem Heights : These values are given graphically in Figure VI a,b,c, and d.

FIG. V a

MEAN STEM HEIGHT ± 1 STANDARD DEVIATION OF URBAN LOWER MALES: CROSS-SECTIONAL DATA

N = 390

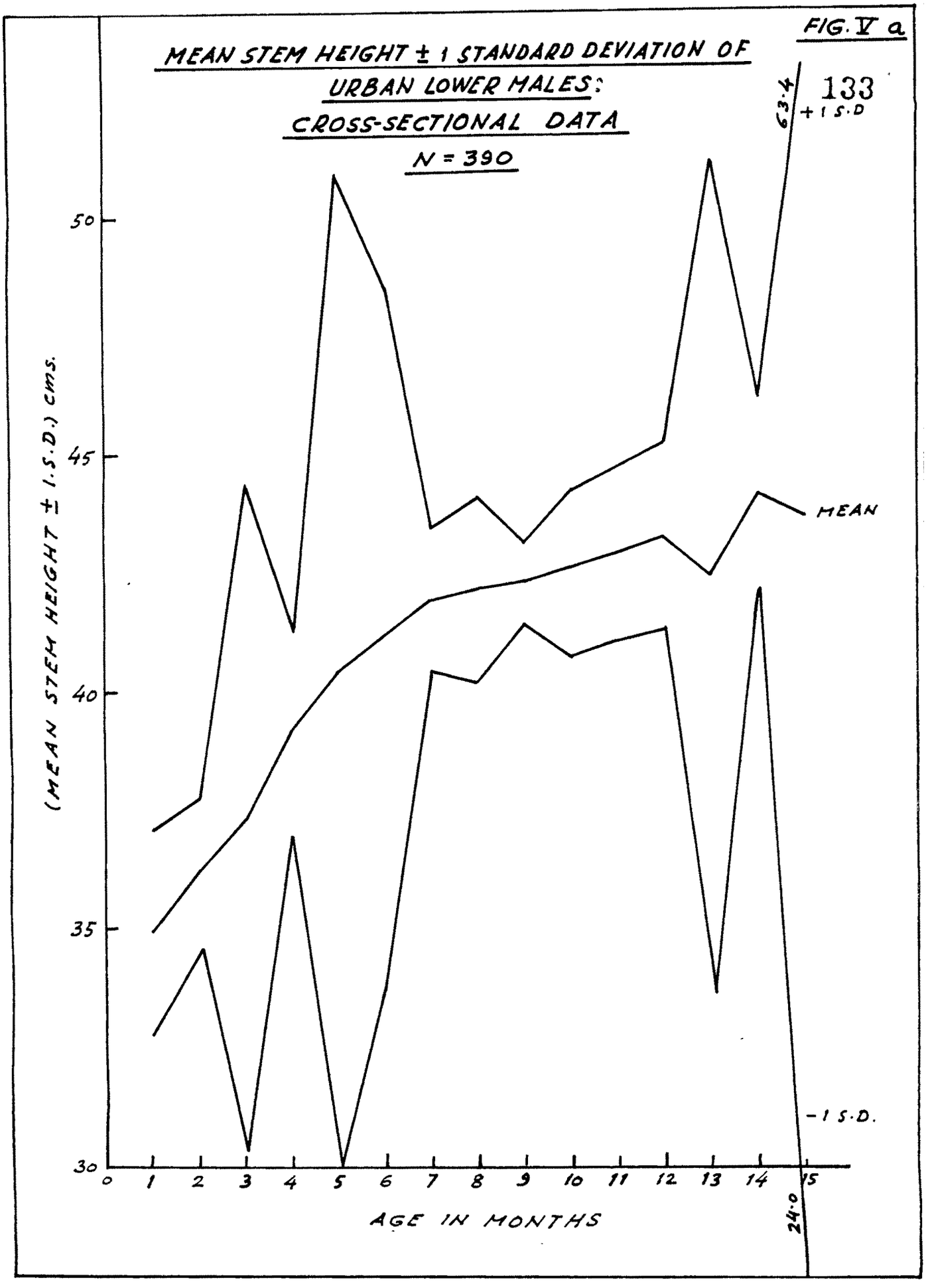


FIG. V b

134

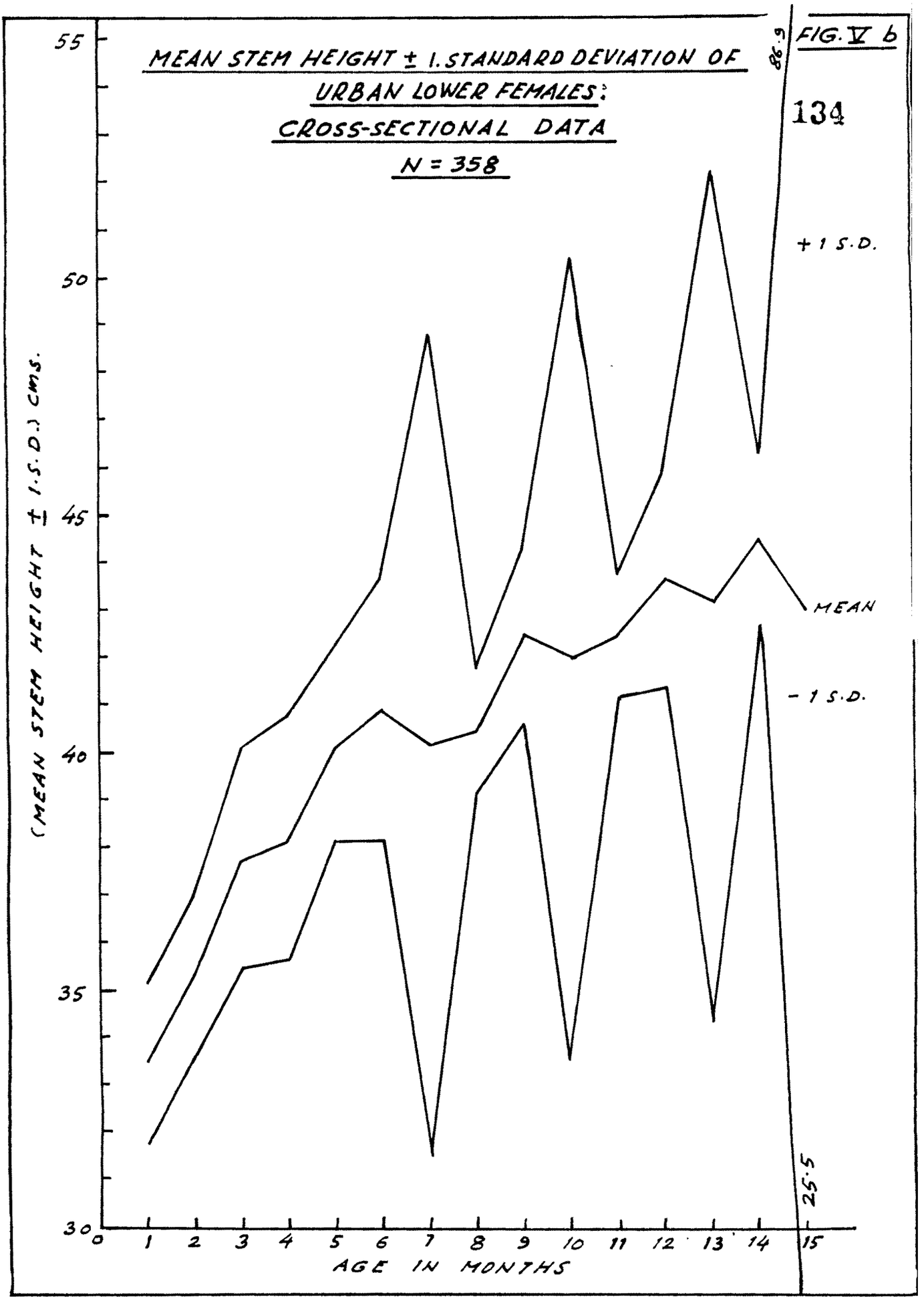

MEAN STEM HEIGHT ± 1. STANDARD DEVIATION OF URBAN LOWER FEMALES: CROSS-SECTIONAL DATA N = 358
86.9
25.5
+ 1 S.D.
MEAN
- 1 S.D.
(MEAN STEM HEIGHT ± 1.S.D.) CMS.
55
50
45
40
35
30
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE IN MONTHS

FIG. V C

MEAN STEM HEIGHT ± 1. STANDARD DEVIATION OF RURAL LOWER MALES: CROSS-SECTIONAL DATA N = 215

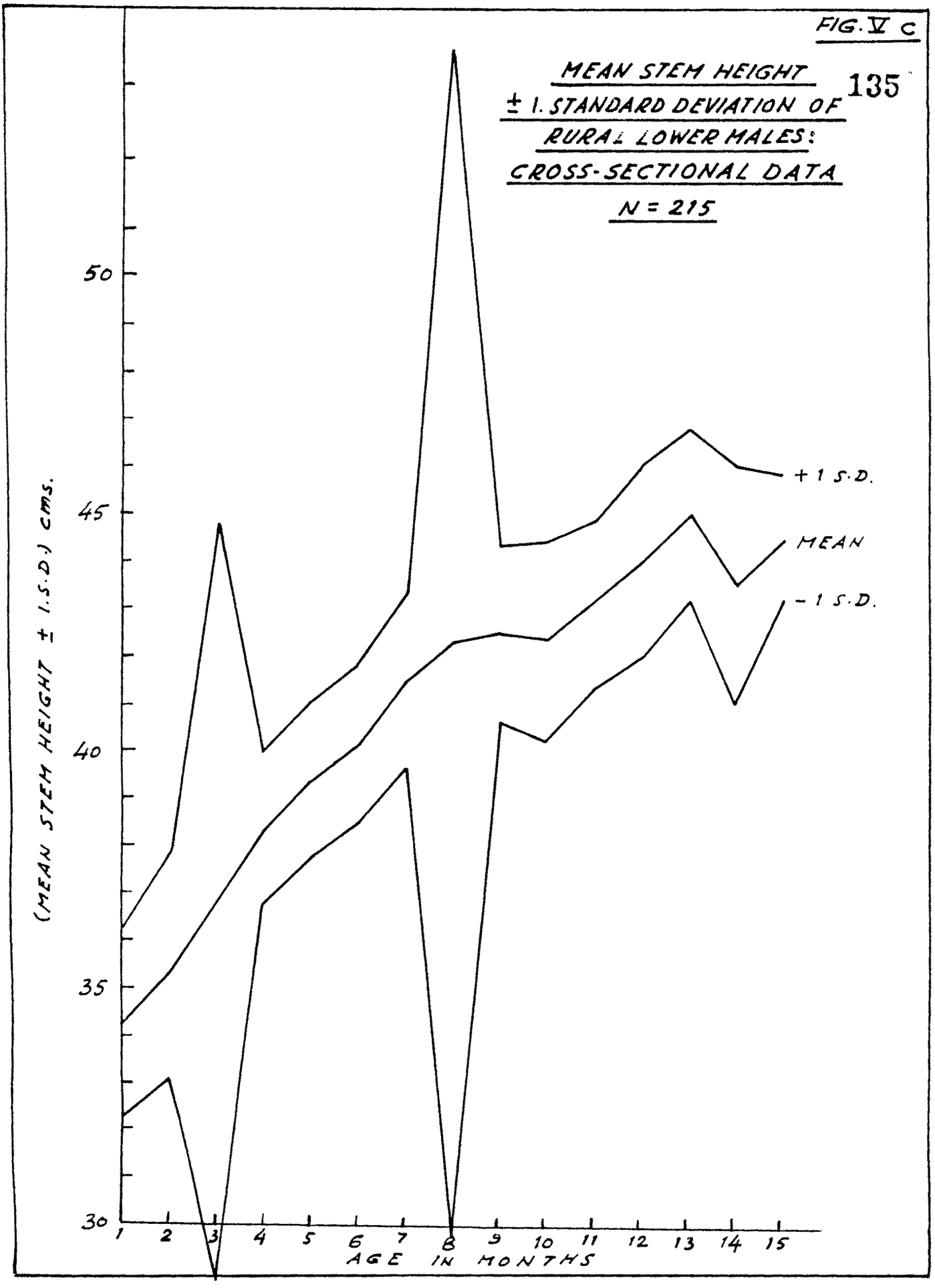


FIG. V d

136

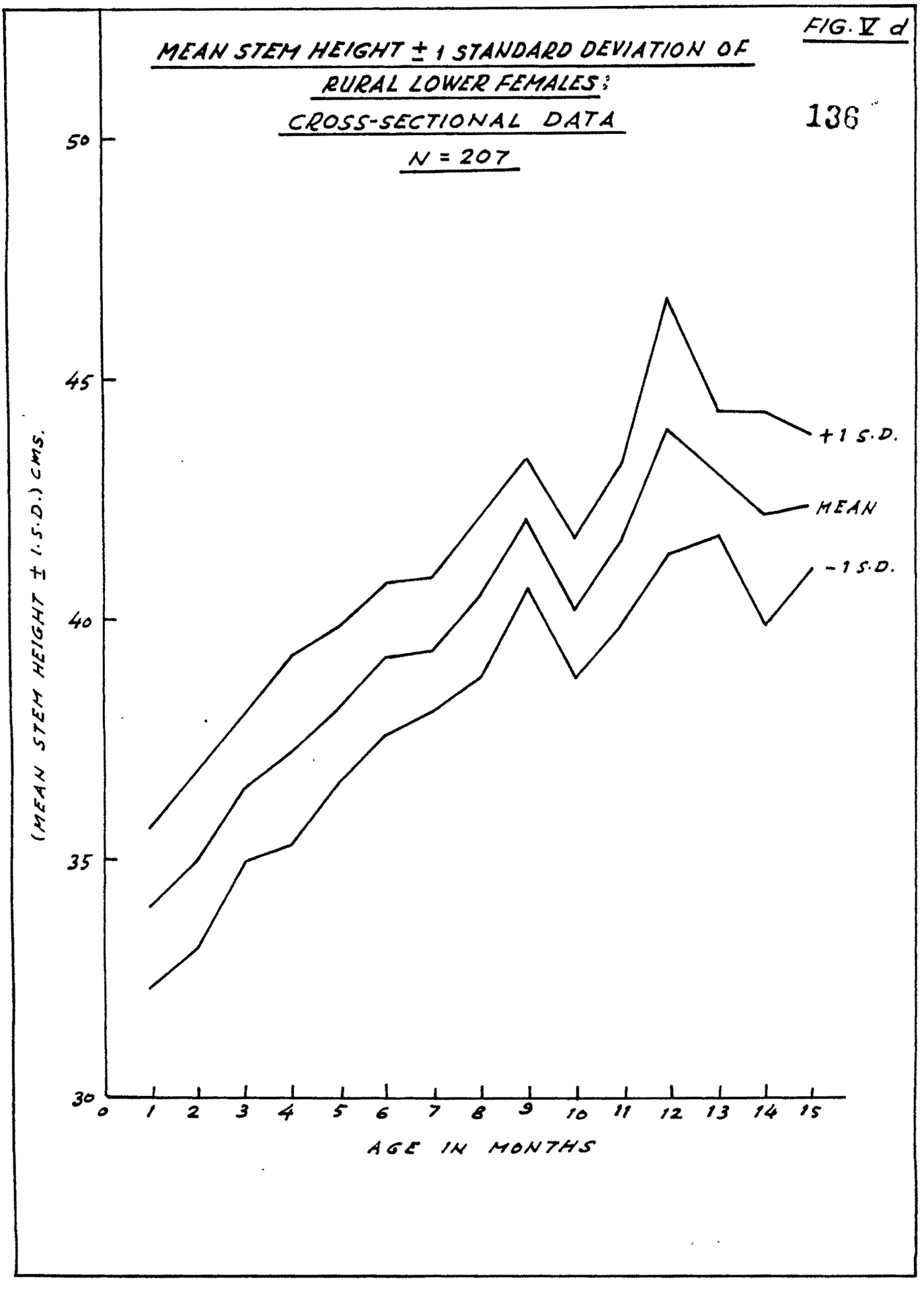

MEAN STEM HEIGHT ± 1 STANDARD DEVIATION OF RURAL LOWER FEMALES: CROSS-SECTIONAL DATA
N = 207
(MEAN STEM HEIGHT ± 1 S.D.) CMS.
50
45
40
35
30
+1 S.D.
MEAN
-1 S.D.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE IN MONTHS

FIG. VI a

PERCENTILE GRAPHS: STEM HEIGHT

URBAN LOWER MALES

CROSS-SECTIONAL DATA

N = 390

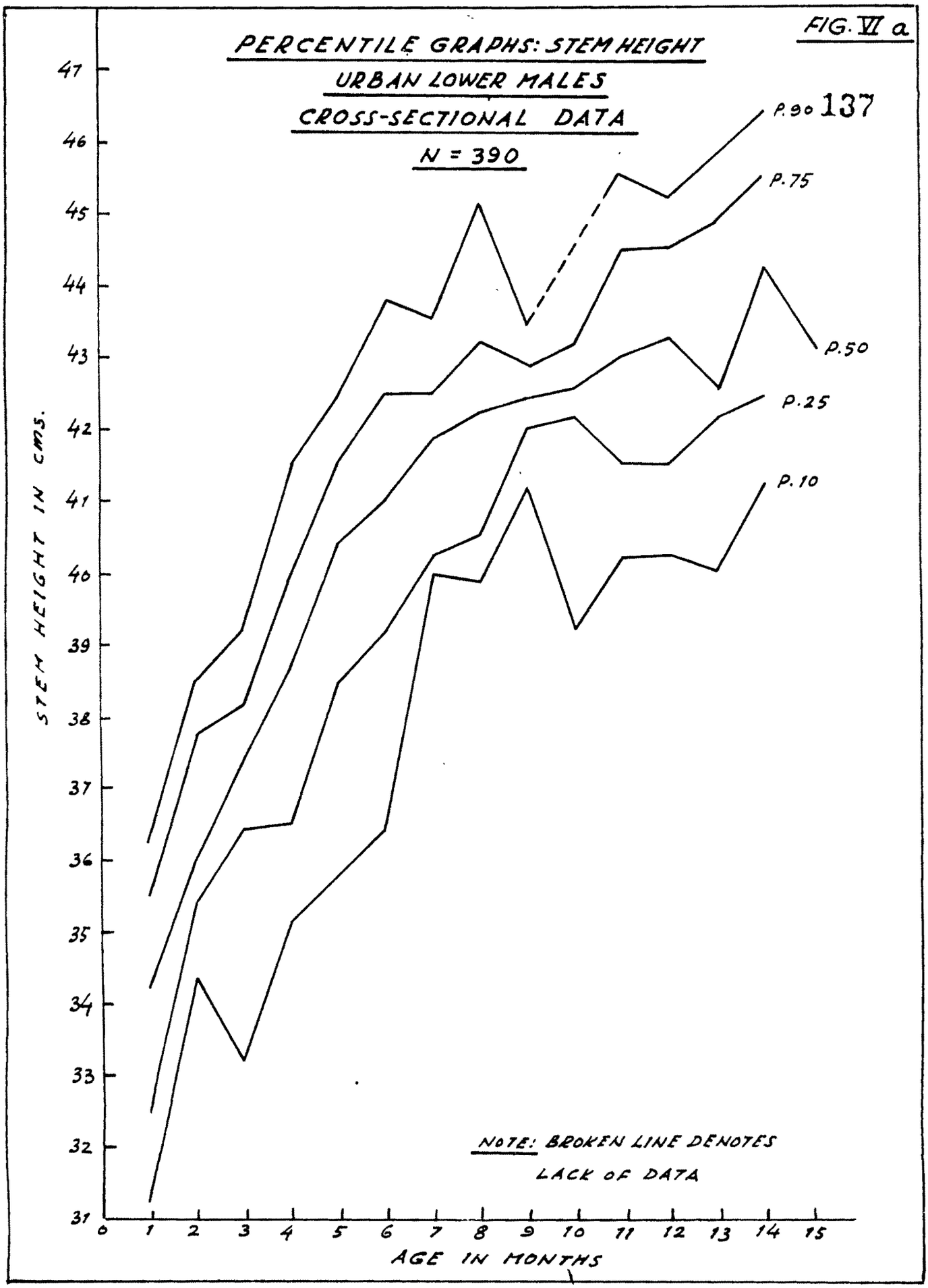


FIG. VI b

PERCENTILE GRAPHS: STEM HEIGHT
URBAN LOWER FEMALES
CROSS-SECTIONAL DATA
N = 358

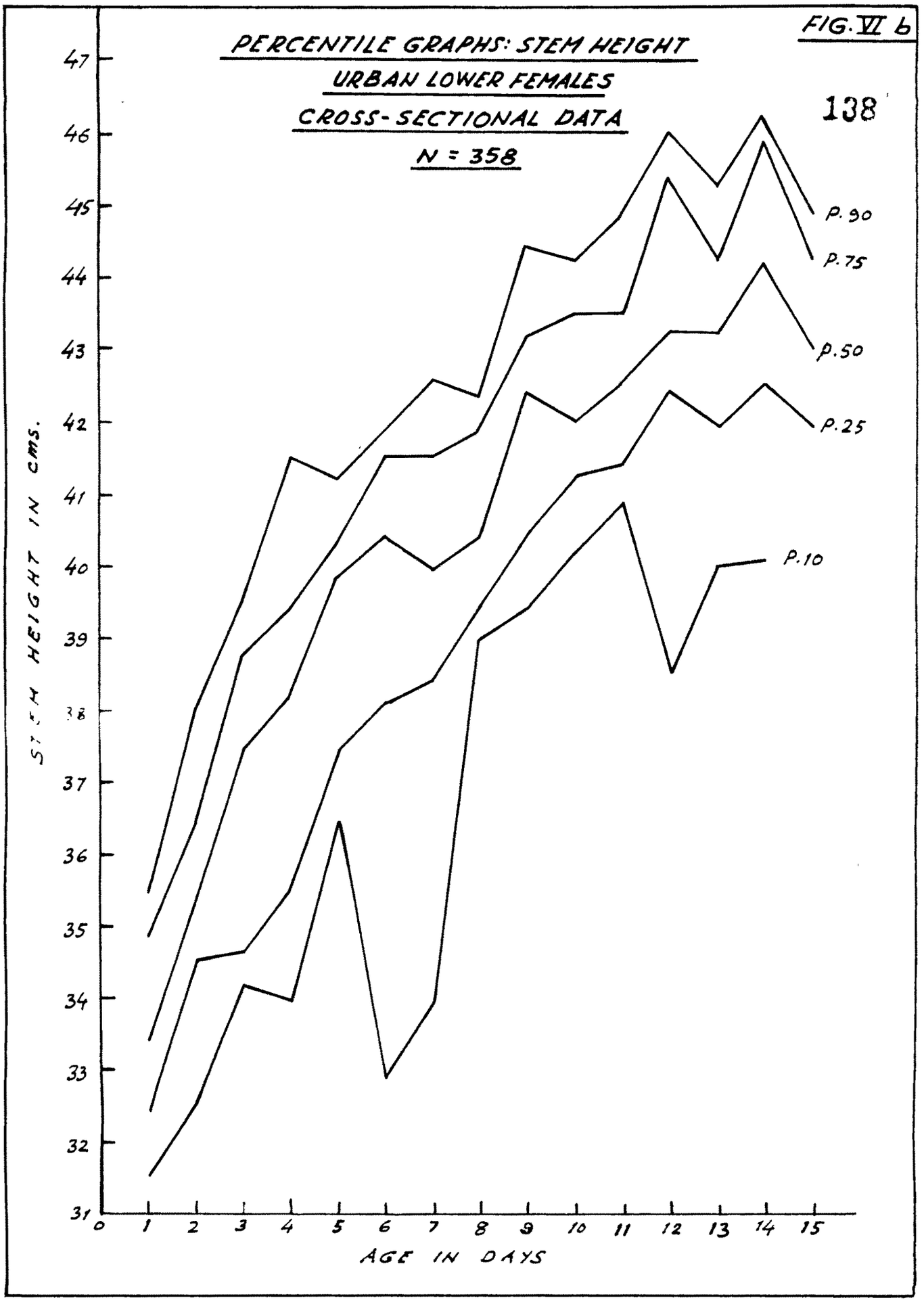


FIG. VI c

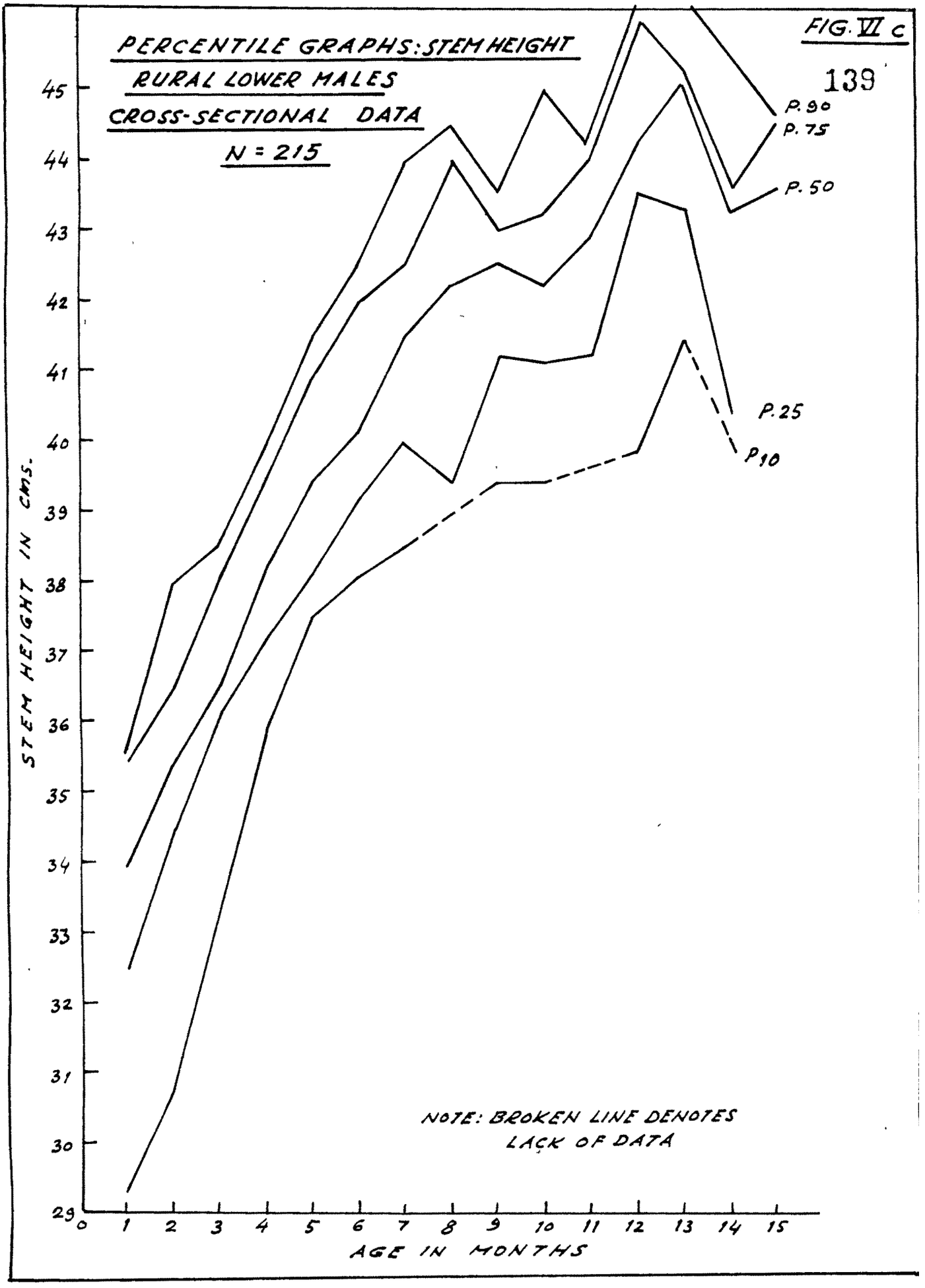
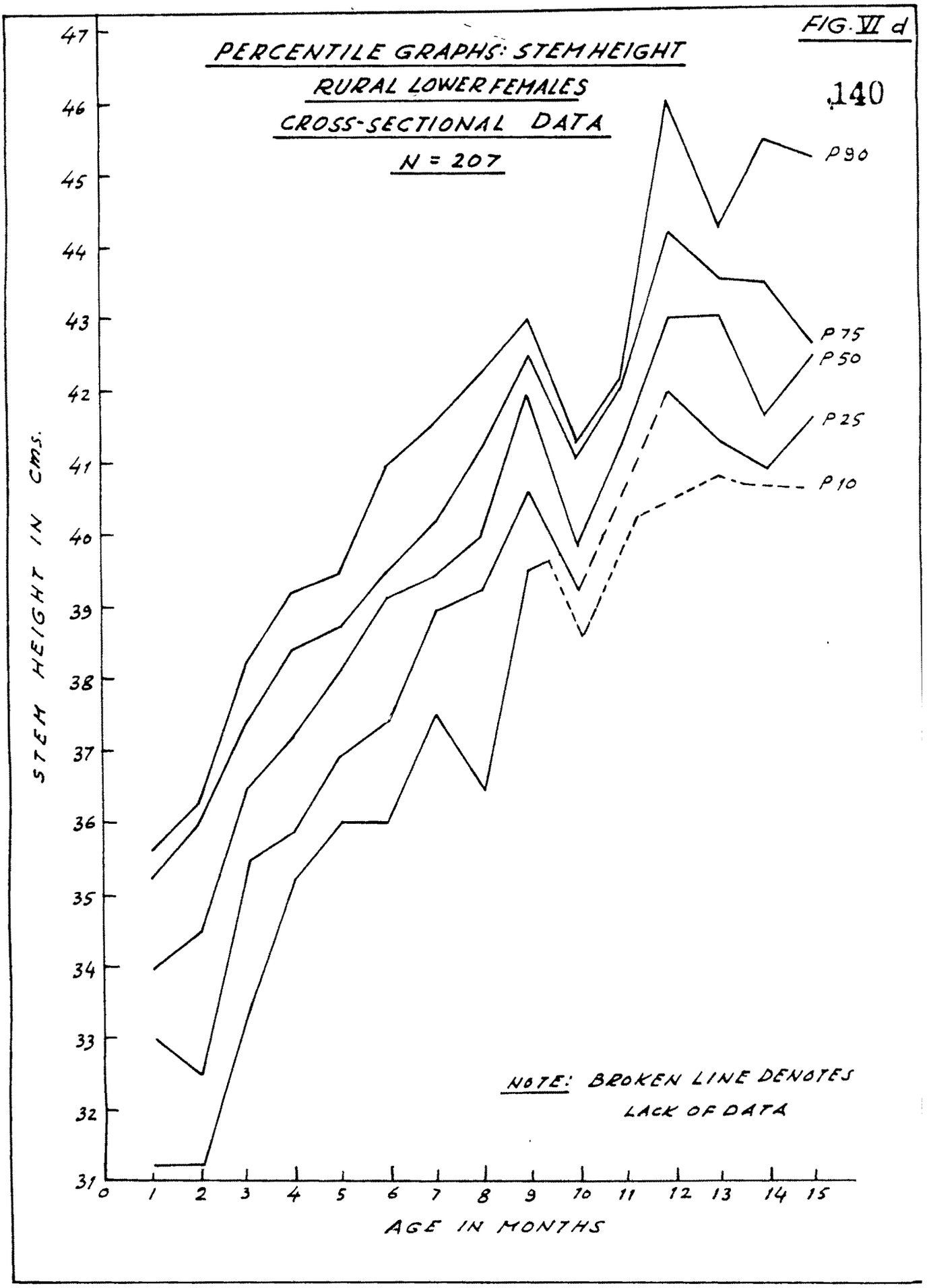

PERCENTILE GRAPHS: STEM HEIGHT
RURAL LOWER MALES
CROSS-SECTIONAL DATA
N = 215
P. 90
P. 75
P. 50
P. 25
P10
NOTE: BROKEN LINE DENOTES LACK OF DATA
STEM HEIGHT IN CMS.
45
44
43
42
41
40
39
38
37
36
35
34
33
32
31
30
29
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE IN MONTHS

FIG. VI d


PERCENTILE GRAPHS: STEM HEIGHT
RURAL LOWER FEMALES
CROSS-SECTIONAL DATA
N = 207
P90
P75
P50
P25
P10
NOTE: BROKEN LINE DENOTES LACK OF DATA
STEM HEIGHT IN CMS.
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
32
31
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE IN MONTHS

Observations : Percentile point estimations at the 10th percent level (P_{10}) are erratic in the urban group. In the rural group estimations at all levels (P_{10} to P_{90}), from 11 month onwards for the males and 10 month onwards for the females seem to be erratic.

Rates of growth of stem height :

The mean rates of growth and their standard deviations are calculated from the purely longitudinal urban sample. This data was available for the lower socio-economic group only as mentioned earlier.

Observations : The monthly rates of growth of stem height are graphically illustrated in Figure VII a and b. An examination of this graph indicates that as infancy progresses the rate of growth deccelerates. This deceleration is quite sharp in the first three months and then gradually levels off towards the end of fifteen months.

Figure VIII a, b, c, d, e show the individual tempo of growth rates of the stem height. Here the first sharp deceleration is noted after the 4th month and periods of spurts of growth and rest are also observed to occure.

FIG. VII

GRAPH OF MEAN MONTHLY INCREASE IN STEM HEIGHT OF MALE AND FEMALE INFANTS AGED 1-15 MONTHS FROM LOWER SOCIO-ECONOMIC CLASS OF THE URBAN AREA LONGITUDINAL DATA

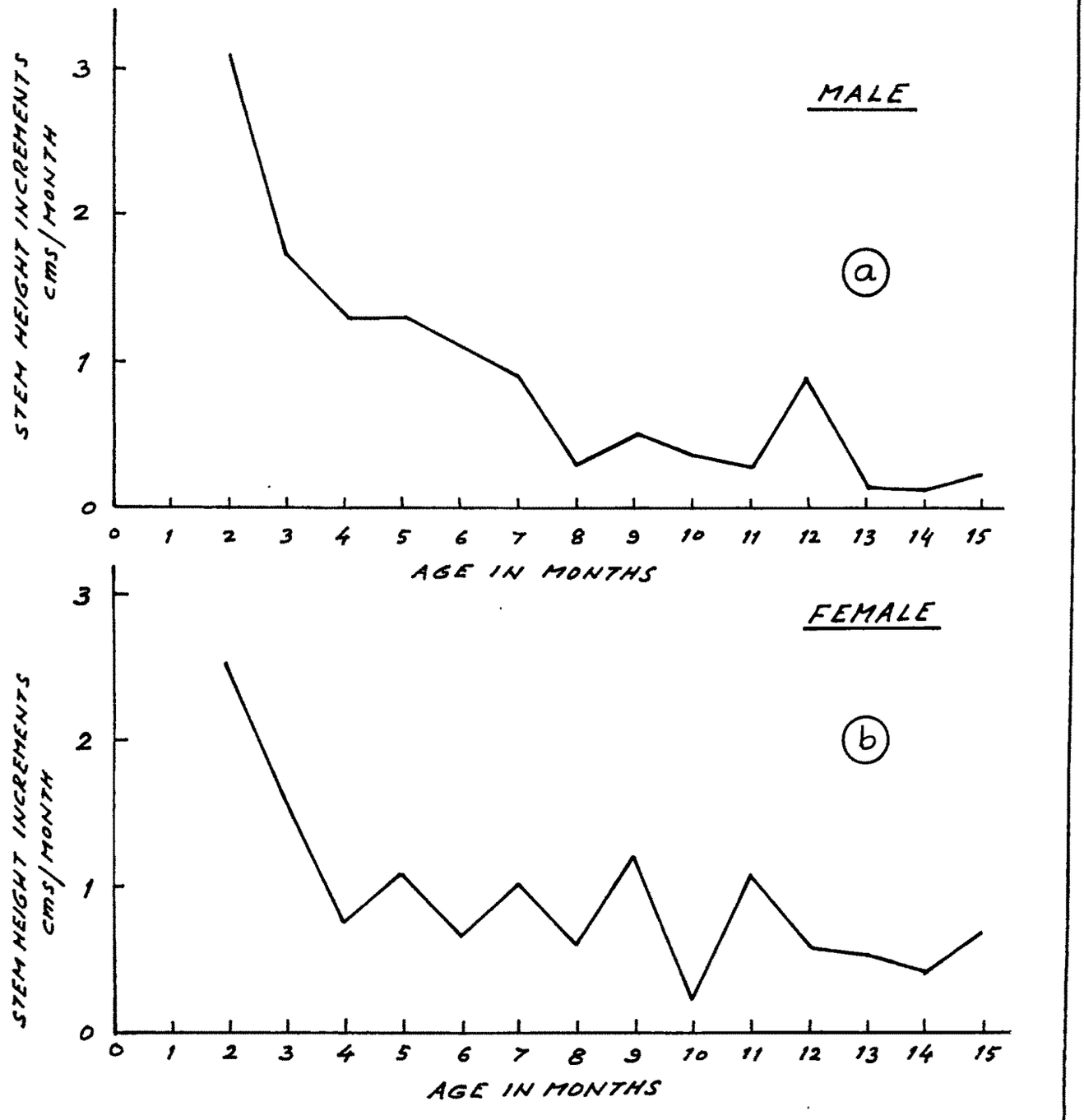
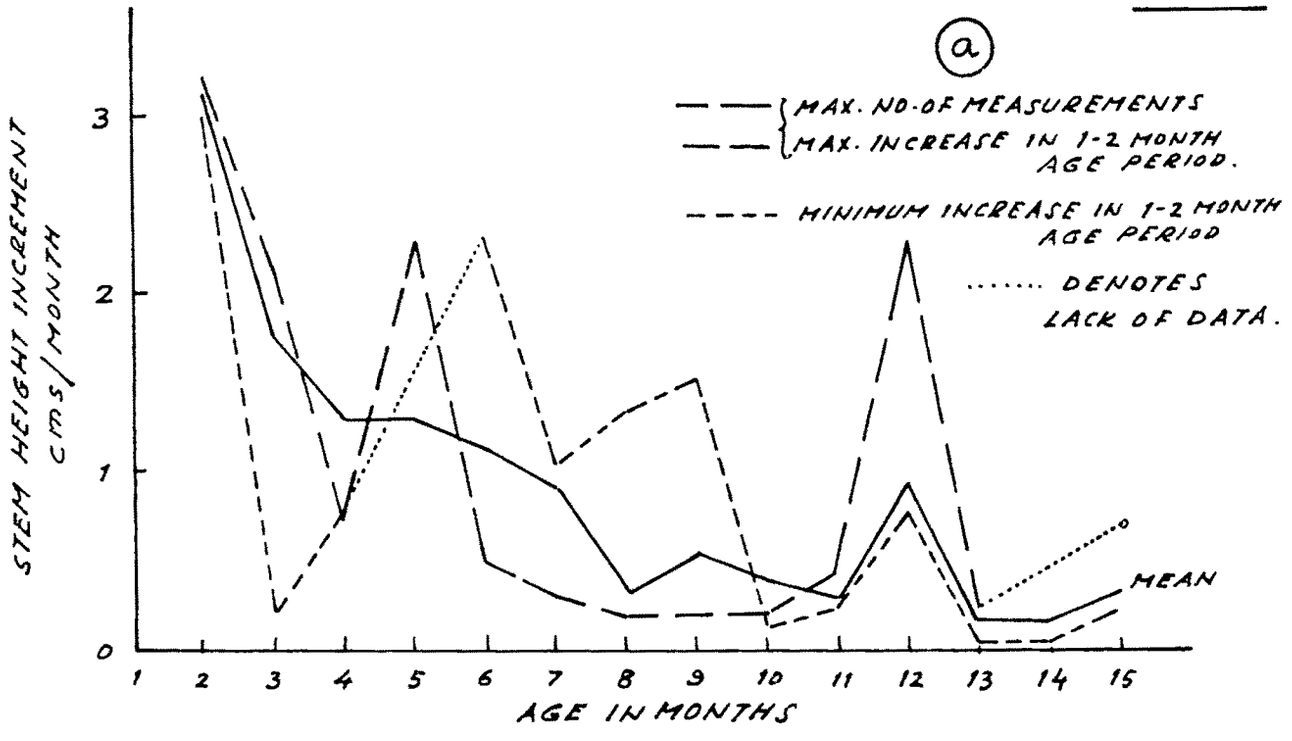


FIG. VIII 1

GRAPHS OF MEAN MONTHLY INCREMENTS IN STEM HEIGHT SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN STEM HEIGHT

LOWER URBAN MALE LONGITUDINAL DATA

MALE



MALE

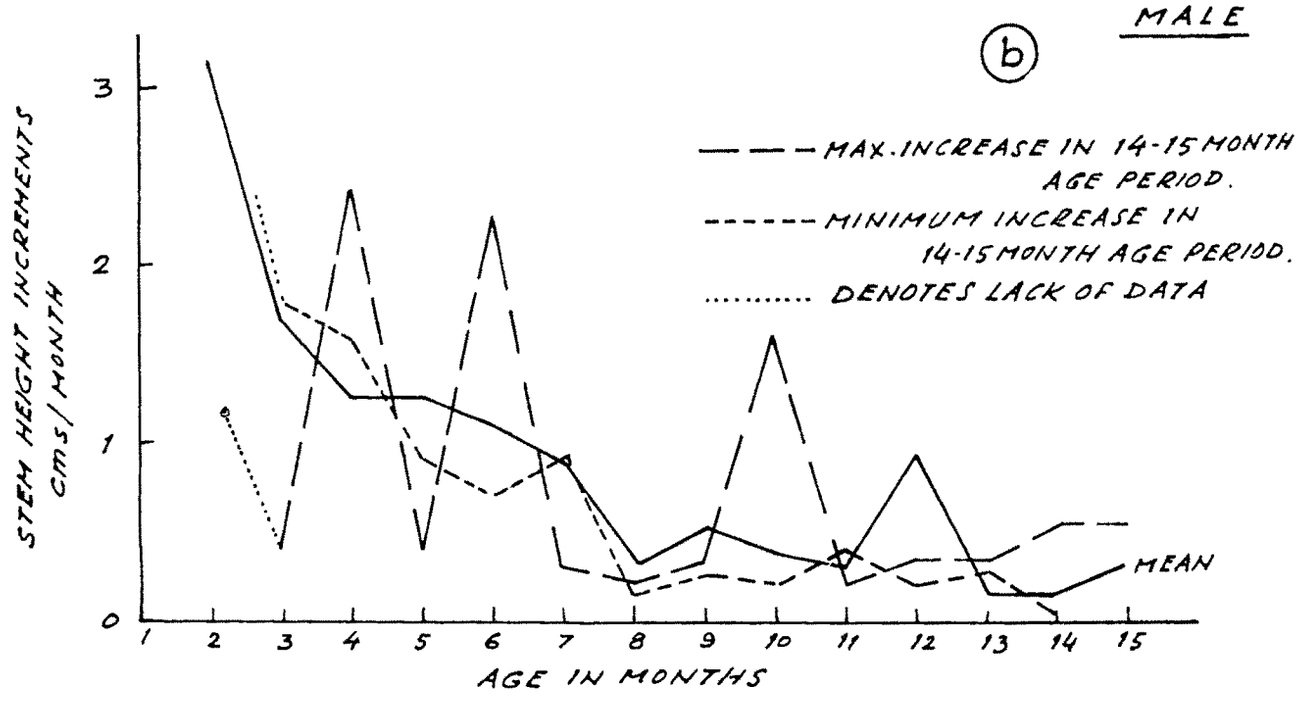


FIG. VIII 2

GRAPHS OF MEAN MONTHLY INCREMENTS IN STEM HEIGHT SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN STEM HEIGHT LOWER URBAN FEMALE LONGITUDINAL DATA

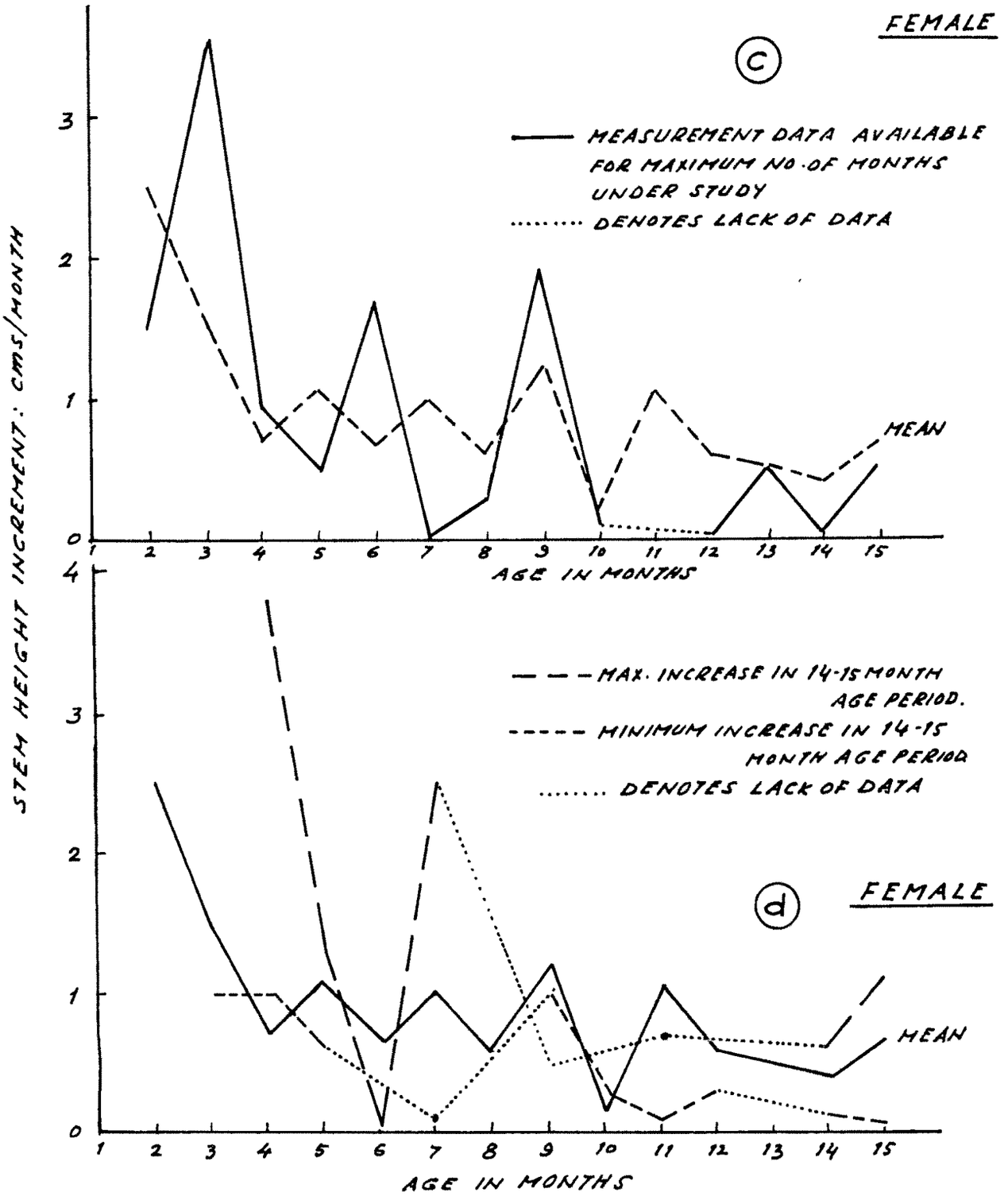
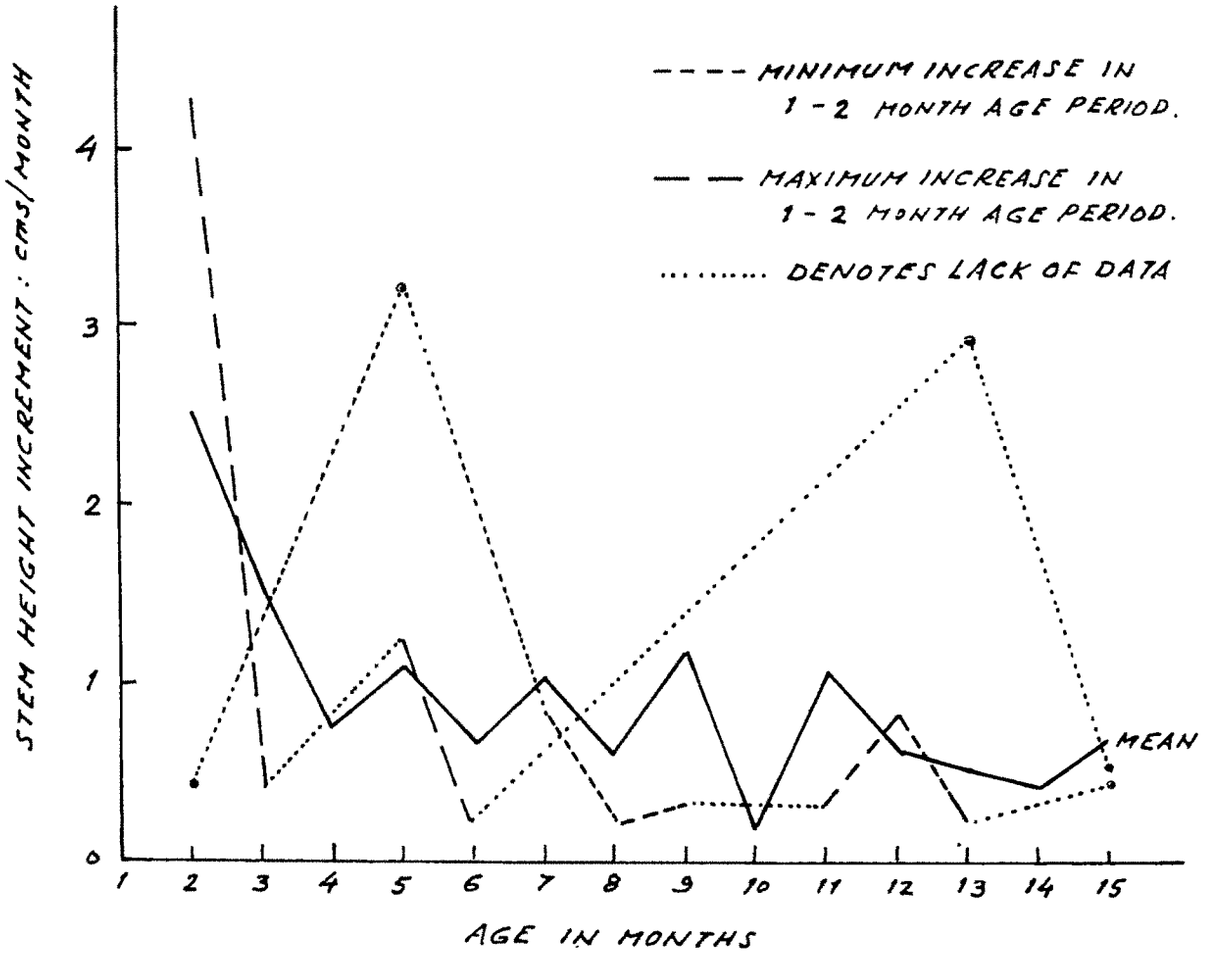


FIG. VIII 3

GRAPHS OF MEAN MONTHLY INCREMENTS IN STEM HEIGHT SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN STEM HEIGHT LOWER URBAN FEMALE LONGITUDINAL DATA

FEMALE

(e)



Ratios and Proportions :

In this group of measurement of stature, stem height and lower limb length the following ratios are calculated:

Stem-stature Index : Stem stature index is the percentage ratio of stem height to stature.

Skelic Index : The skelic index is the ratio of lower limb length to stem height.

The values of this index for the urban and rural group of male and female infants are tabulated in Table II and Table III. Table II give the cross-sectional values and Table III the longitudinal values.

Table II

Mean values of stem height expressed as a percentage of total height, and mean skelic index (lower limb length/ stem height) and standard deviations thereof, of male and female infants aged 1-15 months of lower socio-economic class of A (urban) and B (rural) areas. Cross-sectional sample.

A
URBAN

Age	MALES N	Stem Ht./Total Ht% Mean	S.D.	Skelic Index Mean	S.D.	FEMALES N	Stem Ht/Total Ht% Mean	S.D.	Skelic Index Mean	S.D.
1	2	3	4	5	6	7	8	9	10	11
1	21	65.69	4.49	.53	.1	29	65.35	3.21	.53	.07
2	24	65.00	1.69	.54	.04	26	64.42	1.92	.55	.05
3	28	64.79	1.66	.54	.04	21	64.33	2.38	.56	.06
4	19	64.71	1.79	.55	.04	31	63.17	3.01	.59	.08
5	27	63.60	2.45	.57	.07	21	63.74	2.79	.57	.08

Table II - continued

1	2	3	4	5	6	7	8	9	10	11
6	34	63.24	2.23	.58	.06	15	63.09	2.65	.59	.07
7	27	63.33	1.45	.58	.04	22	62.57	2.70	.60	.08
8	22	63.06	1.77	.59	.05	28	62.55	1.27	.60	.03
9	20	62.86	2.07	.59	.06	30	62.71	1.48	.60	.04
10	24	62.52	2.12	.60	.05	25	62.66	1.99	.60	.05
11	28	62.51	1.66	.60	.04	22	63.07	1.53	.59	.04
12	32	62.02	1.81	.61	005	18	62.88	2.48	.59	.06
13	25	61.92	1.44	.62	.04	23	61.01	2.39	.64	.06
14	31	61.87	1.92	.62	.05	19	61.91	1.92	.62	.05
15	18	61.35	2.83	.63	.07	21	59.88	1.77	.67	.05
	390					358				
					B RURAL					
1	16	65.35	2.23	.53	.05	16	63.37	2.35	.56	.06
2	20	64.54	2.18	.55	.05	17	63.47	2.08	.58	.05
3	12	65.27	2.29	.53	.05	25	63.16	1.84	.58	.05
4	23	63.60	1.81	.57	.04	18	64.00	2.38	.56	.06
5	20	63.75	1.81	.57	.04	13	63.19	2.93	.59	.08
6	15	63.21	1.79	.58	.05	15	63.41	2.20	.58	.05
7	19	63.18	2.08	.58	.05	14	62.31	2.27	.61	.06
8	11	62.80	2.56	.59	.06	17	62.77	2.45	.60	.07
9	20	63.11	1.56	.59	.04	14	64.07	1.52	.56	.04
10	12	62.75	2.57	.60	.07	9	61.82	2.42	.62	.06
11	8	61.88	1.67	.62	.04	5	62.01	1.24	.61	.03
12	13	61.99	3.08	.62	.08	9	62.61	1.37	.60	.03
13	12	61.63	1.57	.62	.04	16	61.61	1.63	.62	.04
14	5	60.99	2.81	.64	.08	9	62.33	2.72	.61	.07
15	3	61.28	1.65	.63	.04	8	61.29	1.77	.63	.05
	215					207				

Stem Stature Index :

Observations : An examination of Table II shows that in general this index decreases with age in all the four control groups.

In the urban male group of infants the standard deviation ranges from 1.45 to 4.49. In the urban female group of infants it ranges from 1.27 to 3.21. In the rural male group it ranges from 1.56 to 3.98; and in the rural female group from 1.24 to 2.98.

Skelic Index :

Observations : The ratio demonstrates an increasing trend with advance of age in all the four groups of infants. The values for the female infants are higher than the males in both the urban and rural communities. The skelic index is lowest in all the groups except the rural males in the first two months of life. In the group of rural males it is lowest at 3 months.

FIG. IX a

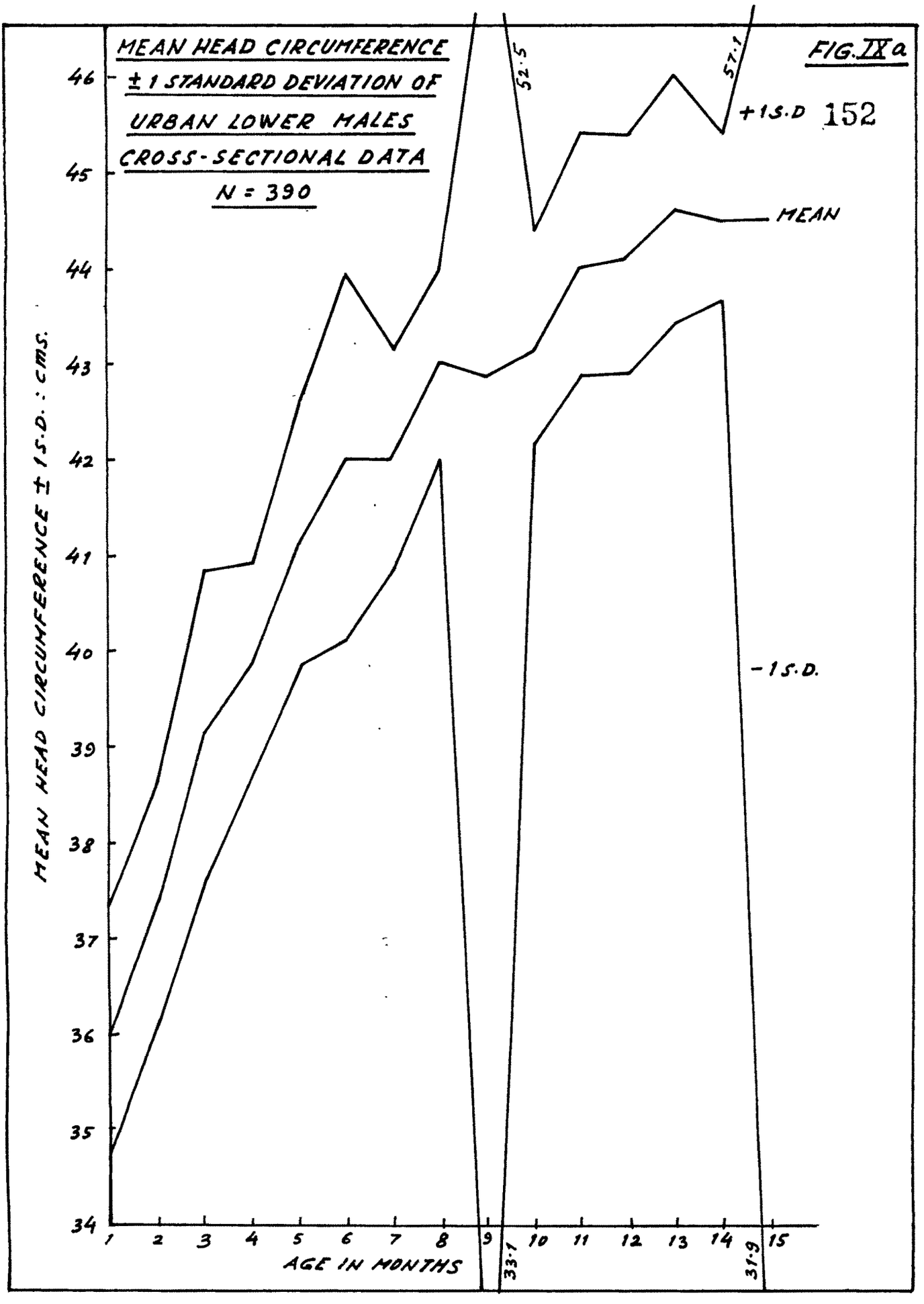

MEAN HEAD CIRCUMFERENCE
± 1 STANDARD DEVIATION OF
URBAN LOWER MALES
CROSS-SECTIONAL DATA
N = 390
+1S.D
MEAN
-1S.D.
52·5
57·1
33·1
31·9
MEAN HEAD CIRCUMFERENCE ± 1 S.D. : CMS.
AGE IN MONTHS
46
45
44
43
42
41
40
39
38
37
36
35
34
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

FIG. IX b

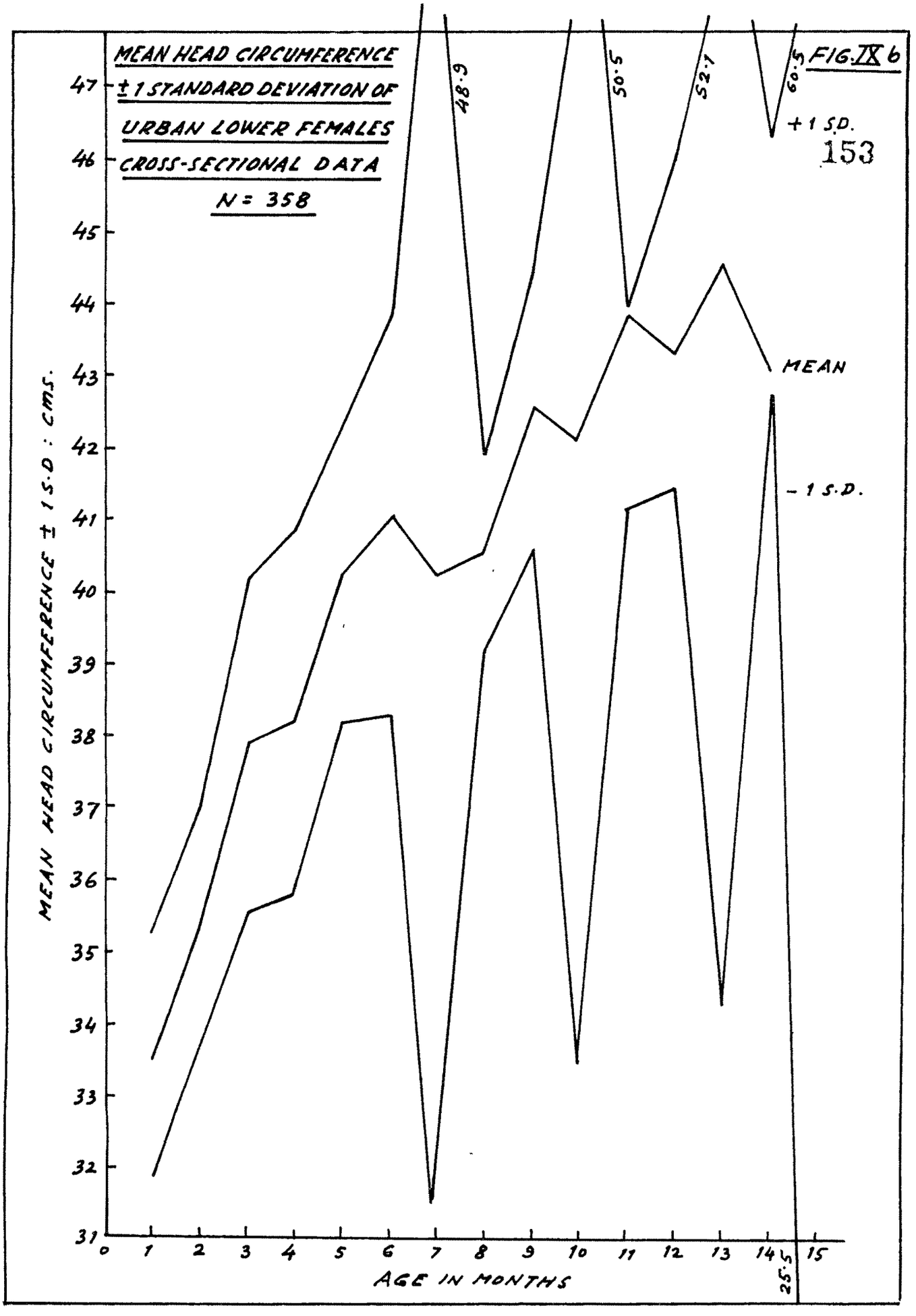

MEAN HEAD CIRCUMFERENCE
± 1 STANDARD DEVIATION OF
URBAN LOWER FEMALES
CROSS-SECTIONAL DATA
N = 358
48·9
50·5
52·1
60·5
+ 1 S.D.
MEAN
- 1 S.D.
MEAN HEAD CIRCUMFERENCE ± 1 S.D : CMS.
AGE IN MONTHS
25·5
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
32
31
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

FIG. IX C

MEAN HEAD CIRCUMFERENCE ± 1 STANDARD DEVIATION OF RURAL LOWER MALES CROSS-SECTIONAL DATA N = 215

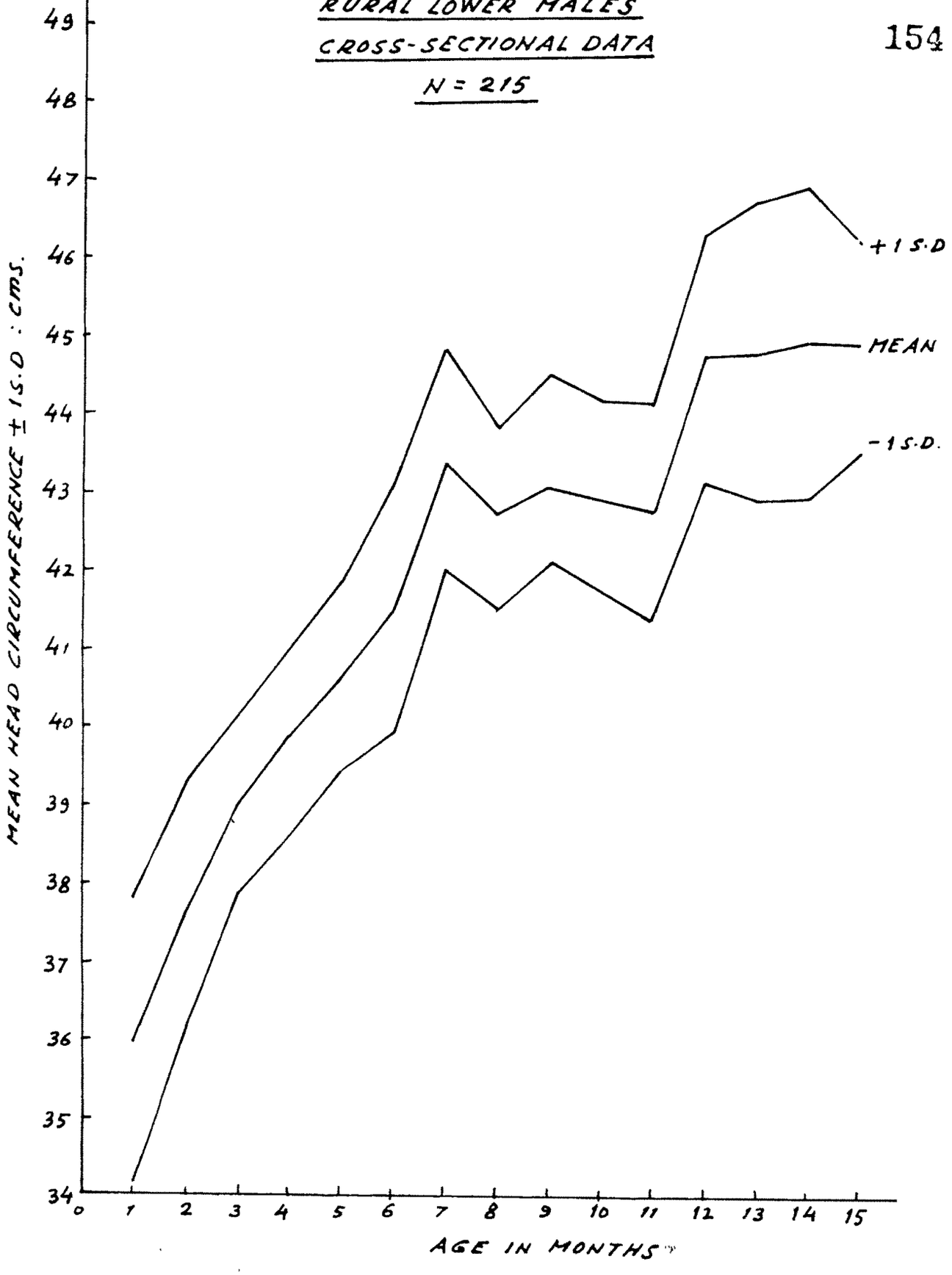
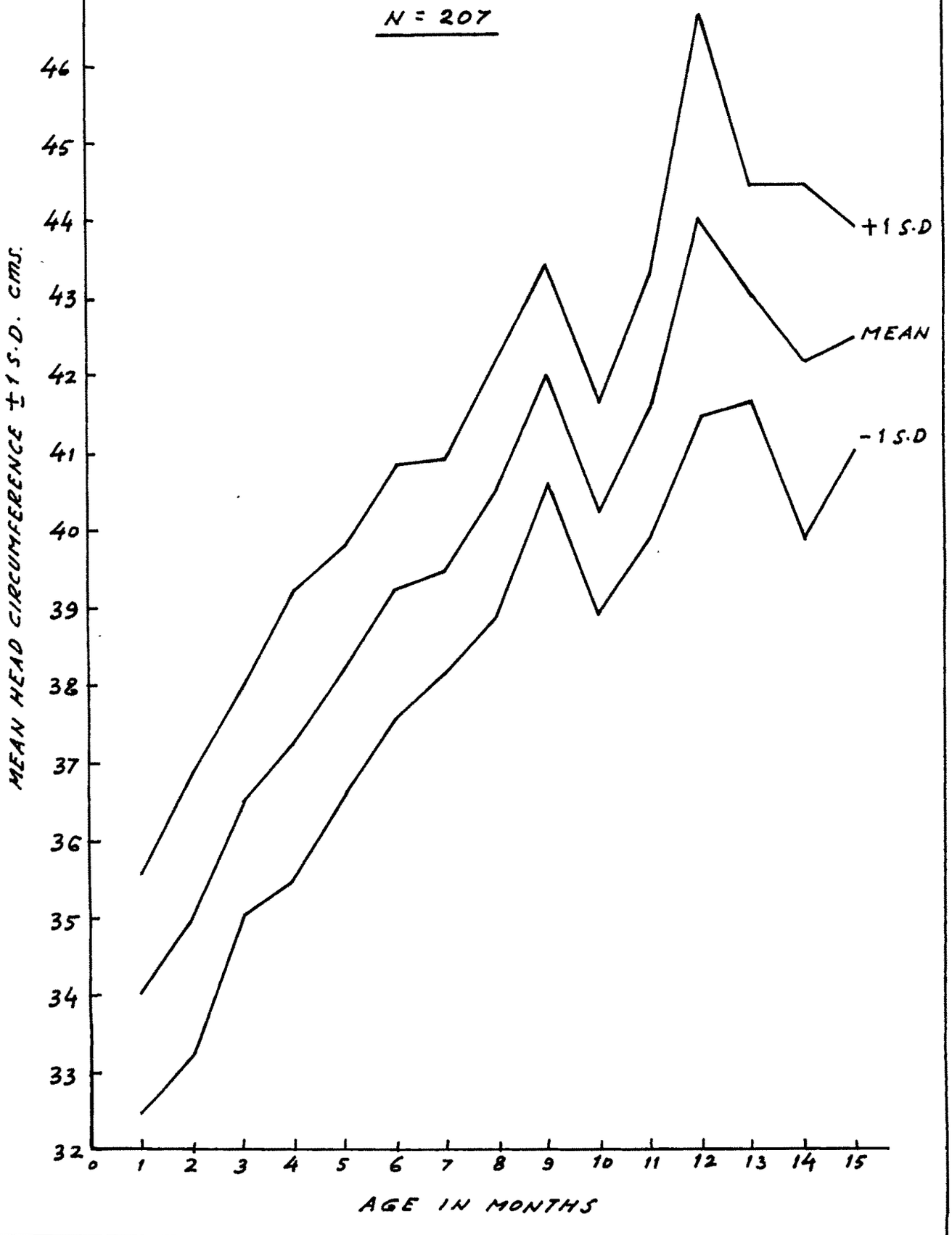


FIG. IX d

MEAN HEAD CIRCUMFERENCE ± 1 STANDARD DEVIATION OF RURAL LOWER FEMALES CROSS-SECTIONAL DATA N = 207



Observations : The broken lines in these curves represent the lack of data due to a very small N in the rural sample, the erratic nature of these parallel lines is noted.

Rates of Growth of Head Circumference :

The mean rates of growth of head circumference and the standard deviations thereof are calculated from the pure longitudinal urban sample. Mean monthly increments are plotted in a curve in Figure XI.

Observations : The rate of growth in the head circumference shows the expected trend of deceleration as age increases. The sharpest deceleration is noted at the 5th month in both the sexes.

In Figure XII a,b,c,d, and e selected individual rates of growth of head circumference are compared with the mean curves of their groups.

Observations : Periods of spurts of growth and rest are noted in cases of both the sexes.

Chest Circumference

Means and Standard Deviations :

In the present study, the means and standard deviations of the chest circumference were calculated from the cross-sectional sample. These are presented graphically in Figure XIII a,b,c and d.

FIG. X a

157

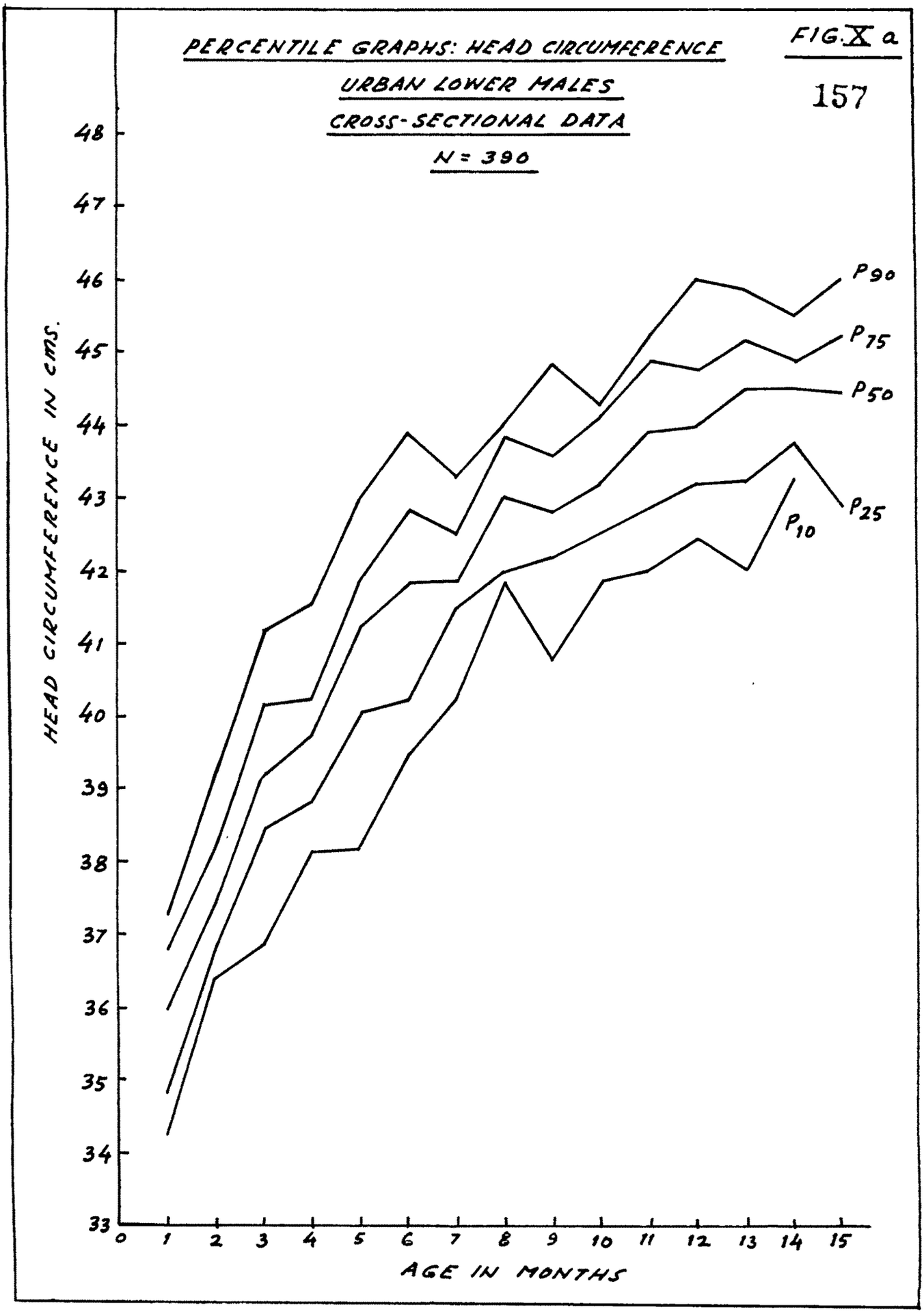

PERCENTILE GRAPHS: HEAD CIRCUMFERENCE
URBAN LOWER MALES
CROSS-SECTIONAL DATA
N = 390
HEAD CIRCUMFERENCE IN CMS.
AGE IN MONTHS
P90
P75
P50
P25
P10
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

FIG. X b

PERCENTILE GRAPHS: HEAD CIRCUMFERENCE

URBAN LOWER FEMALES

CROSS-SECTIONAL DATA

N = 358

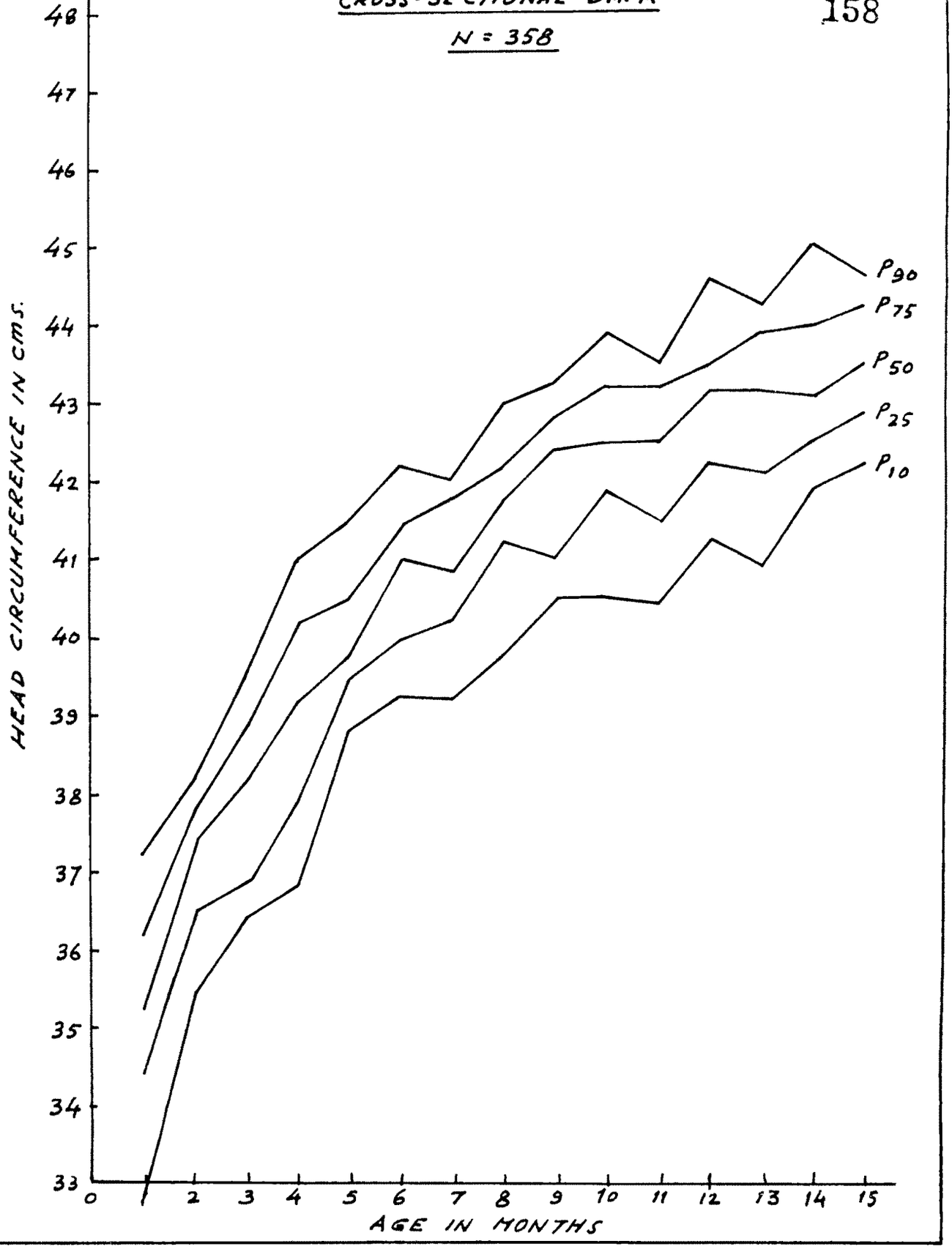


FIG. X c

PERCENTILE GRAPHS: HEAD CIRCUMFERENCE

RURAL LOWER MALES

CROSS-SECTIONAL DATA

N = 215

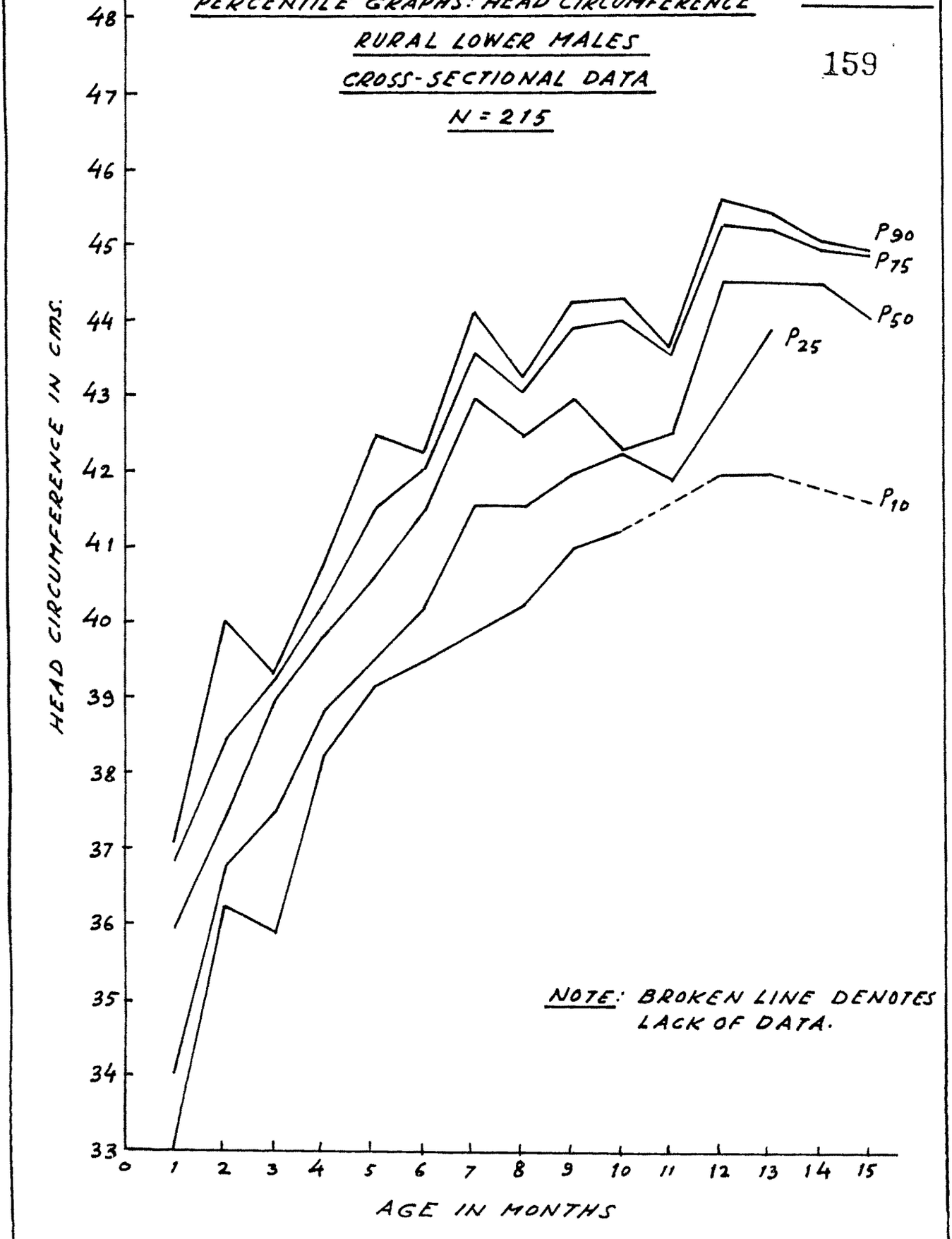


FIG. X d

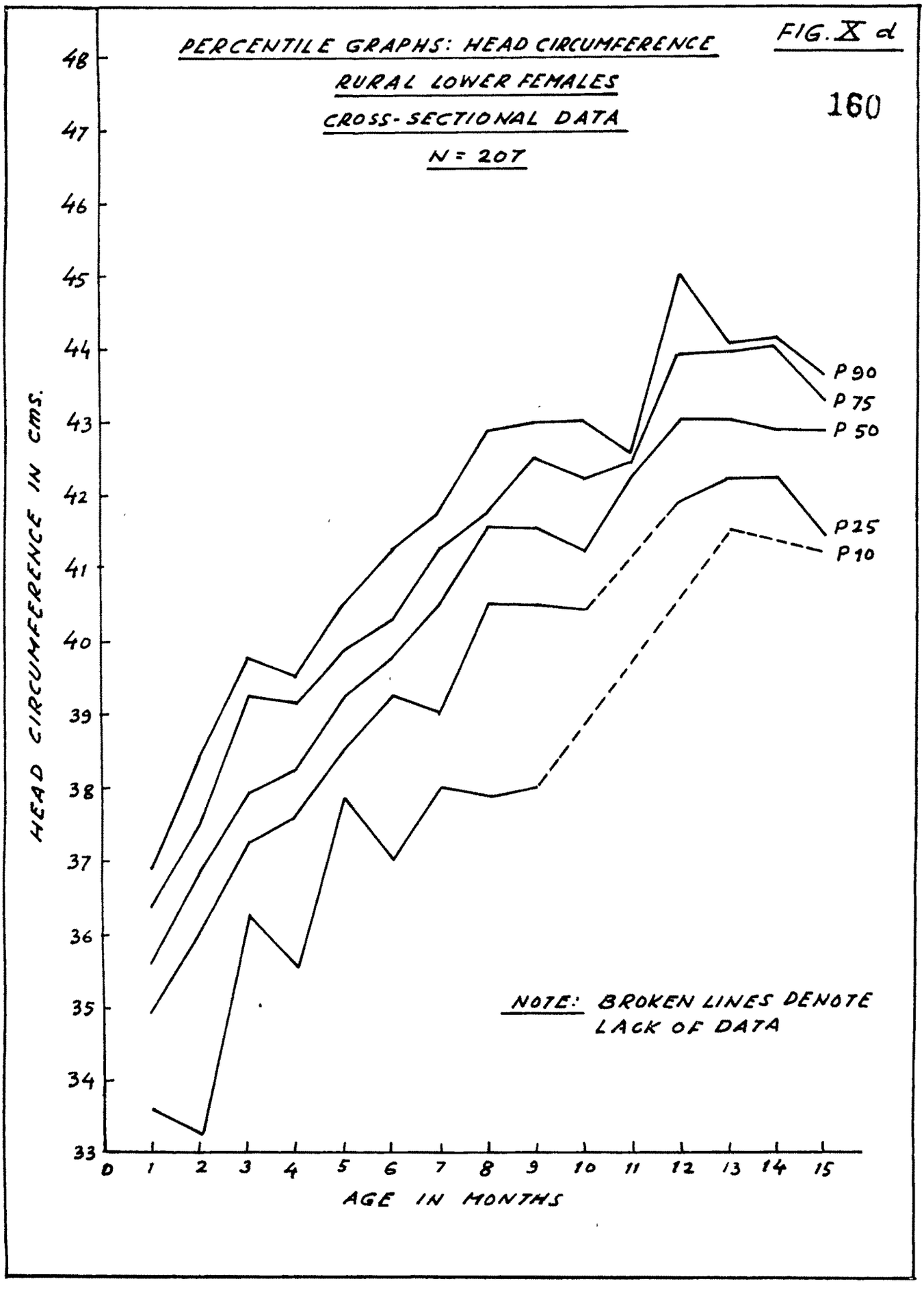
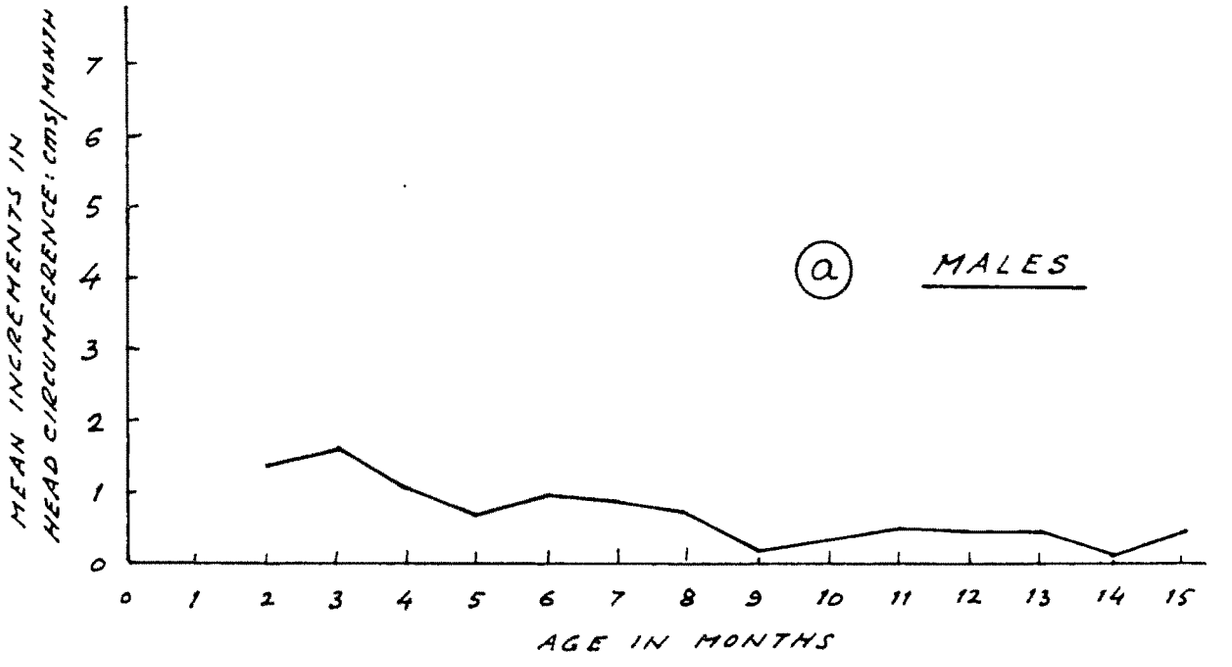

PERCENTILE GRAPHS: HEAD CIRCUMFERENCE
RURAL LOWER FEMALES
CROSS-SECTIONAL DATA
N = 207
HEAD CIRCUMFERENCE IN CMS.
AGE IN MONTHS
P 90
P 75
P 50
P 25
P 10
NOTE: BROKEN LINES DENOTE LACK OF DATA
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

FIG. XI

GRAPHS OF MEAN MONTHLY INCREMENTS IN HEAD CIRCUMFERENCE OF MALE AND FEMALE INFANTS AGED 1-15 MONTHS FROM LOWER SOCIO-ECONOMIC CLASS OF URBAN AREA LONGITUDINAL DATA



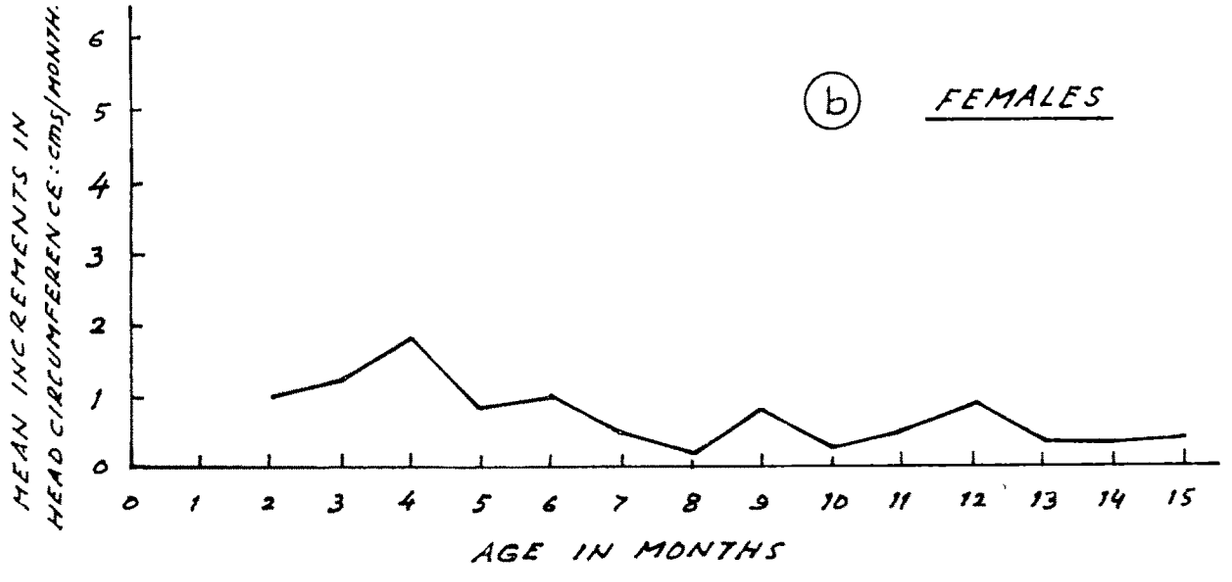
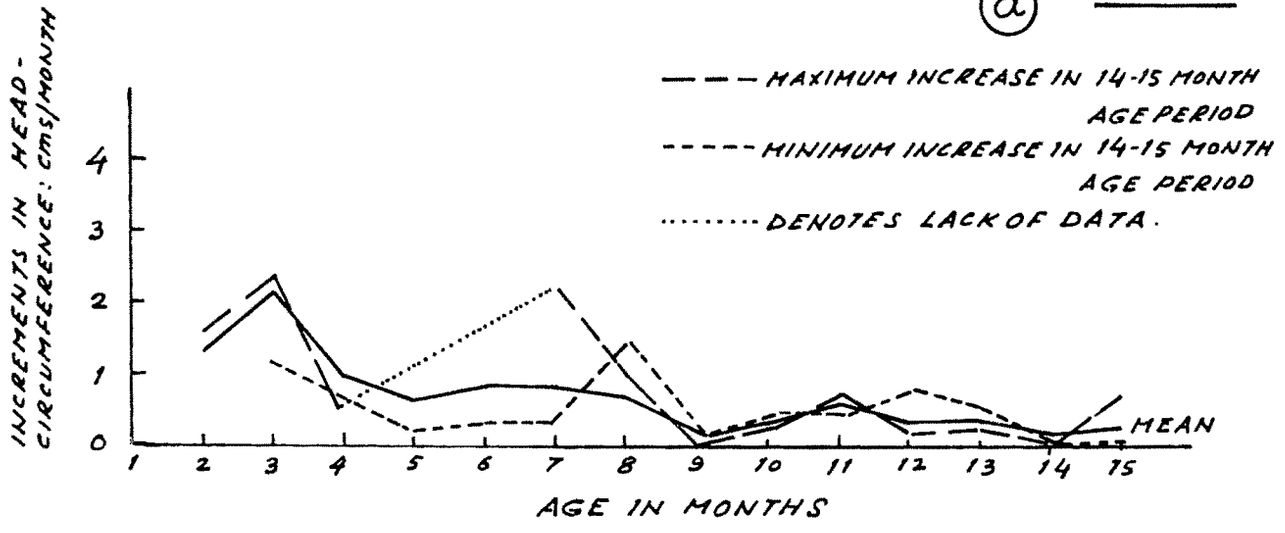


FIG. XII 1

GRAPHS OF MEAN MONTHLY INCREMENTS IN HEAD CIRCUMFERENCE SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN HEAD CIRCUMFERENCE LOWER URBAN MALE LONGITUDINAL DATA

(a) MALE



(b) MALE

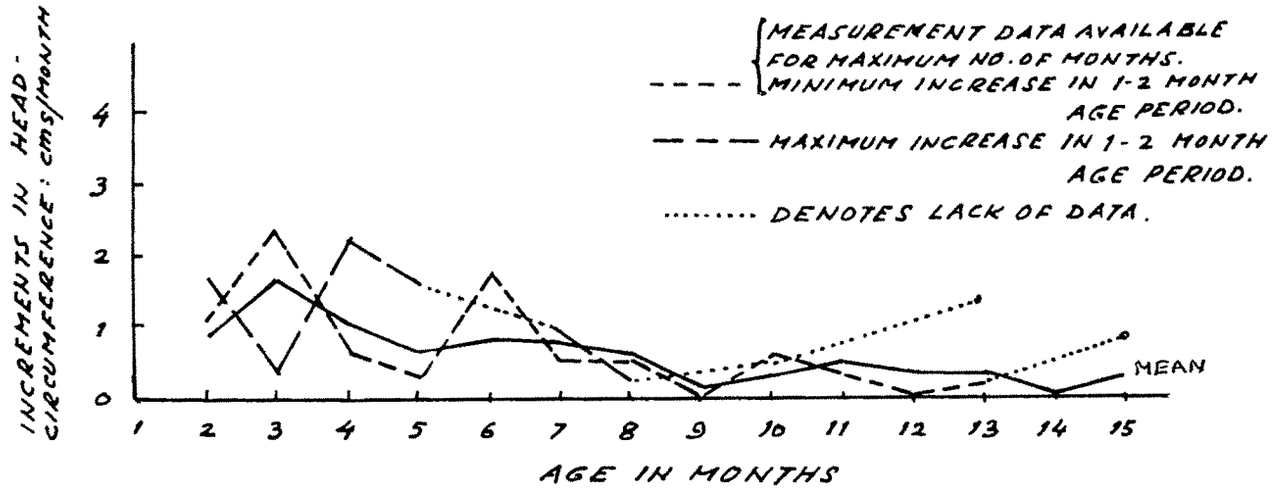


FIG XII 2

GRAPHS OF MEAN MONTHLY INCREMENTS IN HEAD CIRCUMFERENCE SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN HEAD CIRCUMFERENCE LOWER URBAN FEMALE LONGITUDINAL DATA

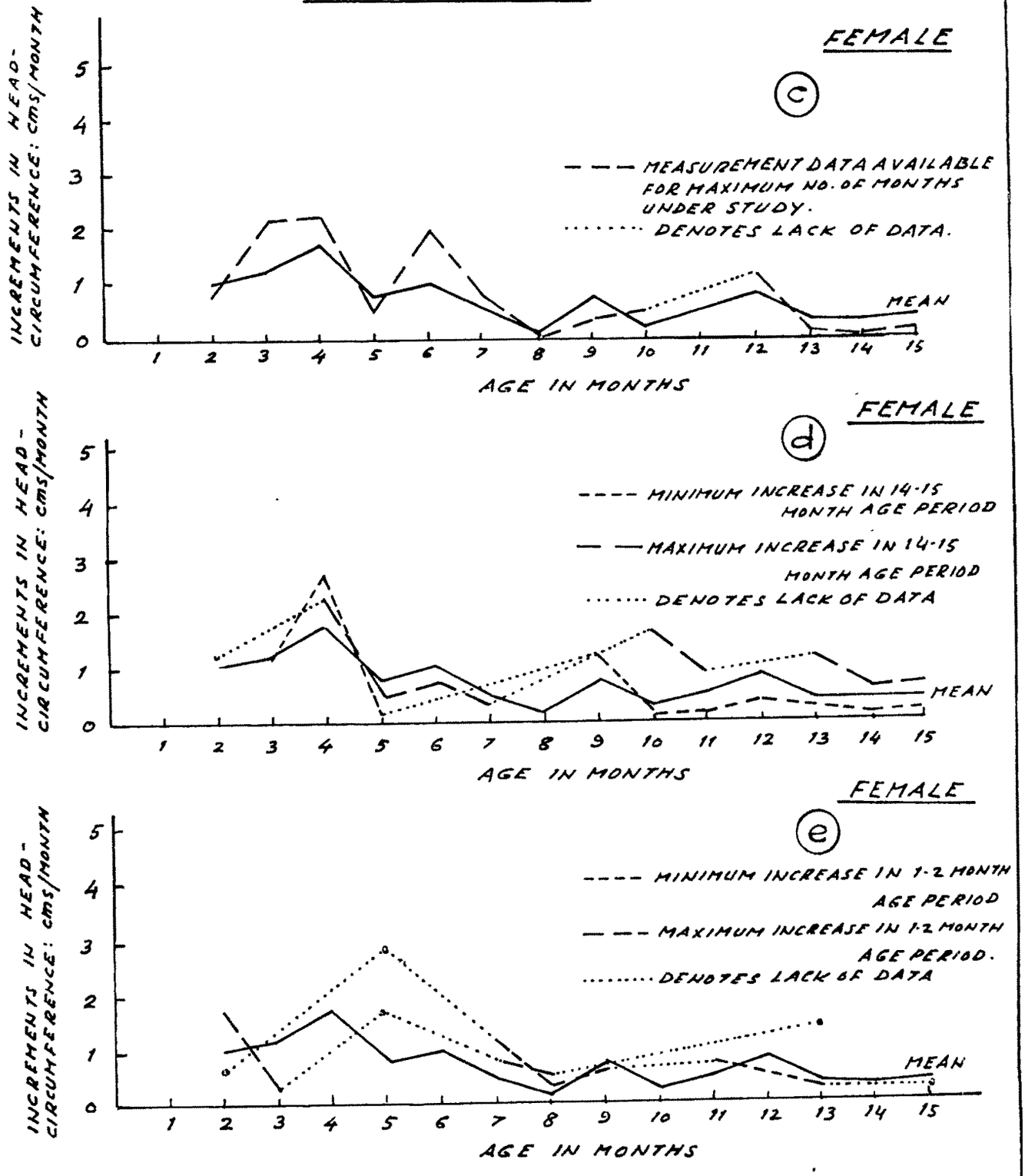


FIG. XIII a

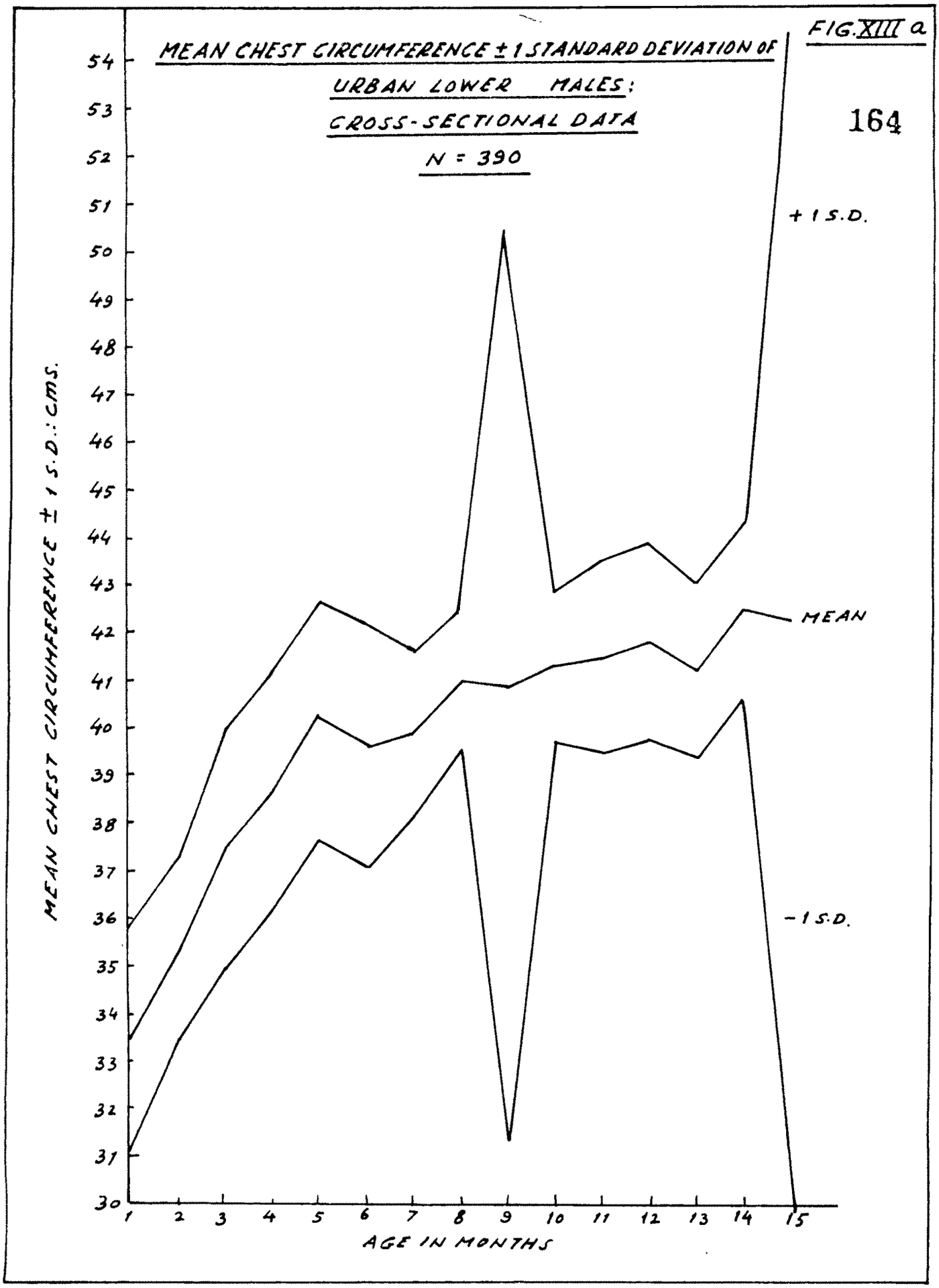

MEAN CHEST CIRCUMFERENCE ± 1 STANDARD DEVIATION OF
URBAN LOWER MALES:
CROSS-SECTIONAL DATA
N = 390
+1 S.D.
MEAN
-1 S.D.
MEAN CHEST CIRCUMFERENCE ± 1 S.D.: CMS.
AGE IN MONTHS
54
53
52
51
50
49
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
32
31
30
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

FIG. XIII 6

MEAN CHEST CIRCUMFERENCE ± 1 STANDARD DEVIATION OF URBAN LOWER FEMALES: CROSS-SECTIONAL DATA N = 360

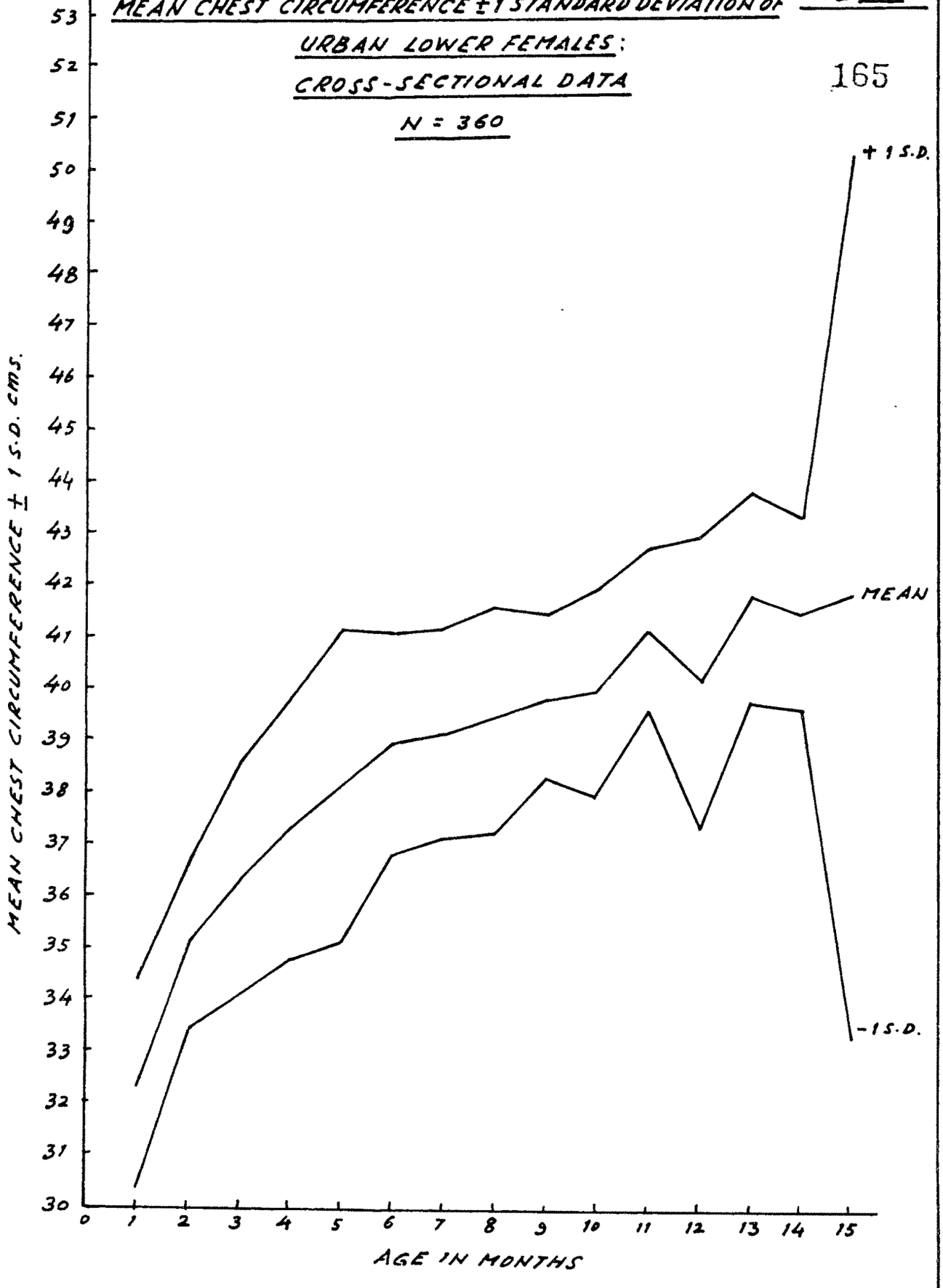


FIG. XIII C

MEAN CHEST CIRCUMFERENCE ± 1 STANDARD DEVIATION OF RURAL LOWER MALES: CROSS-SECTIONAL DATA N = 215

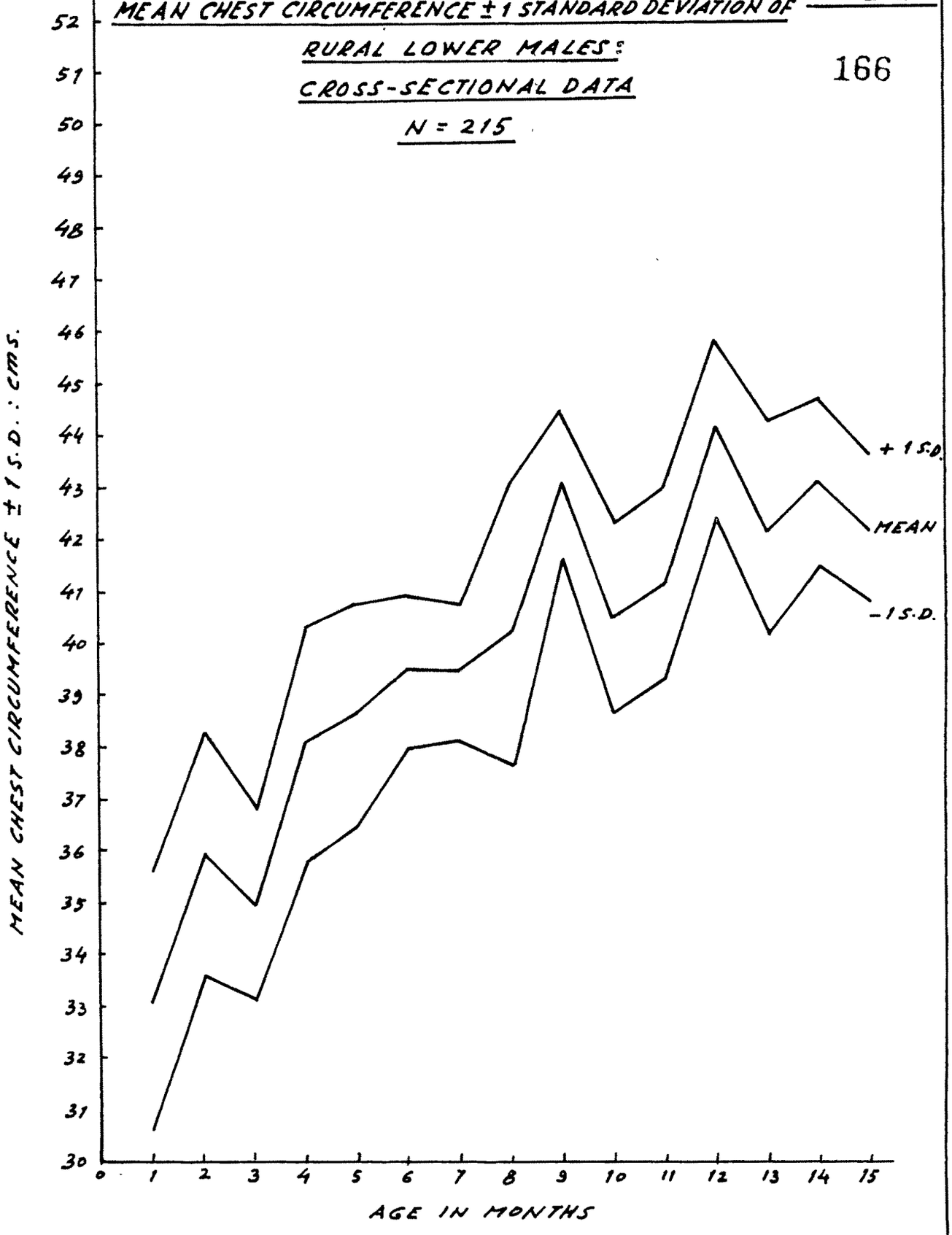
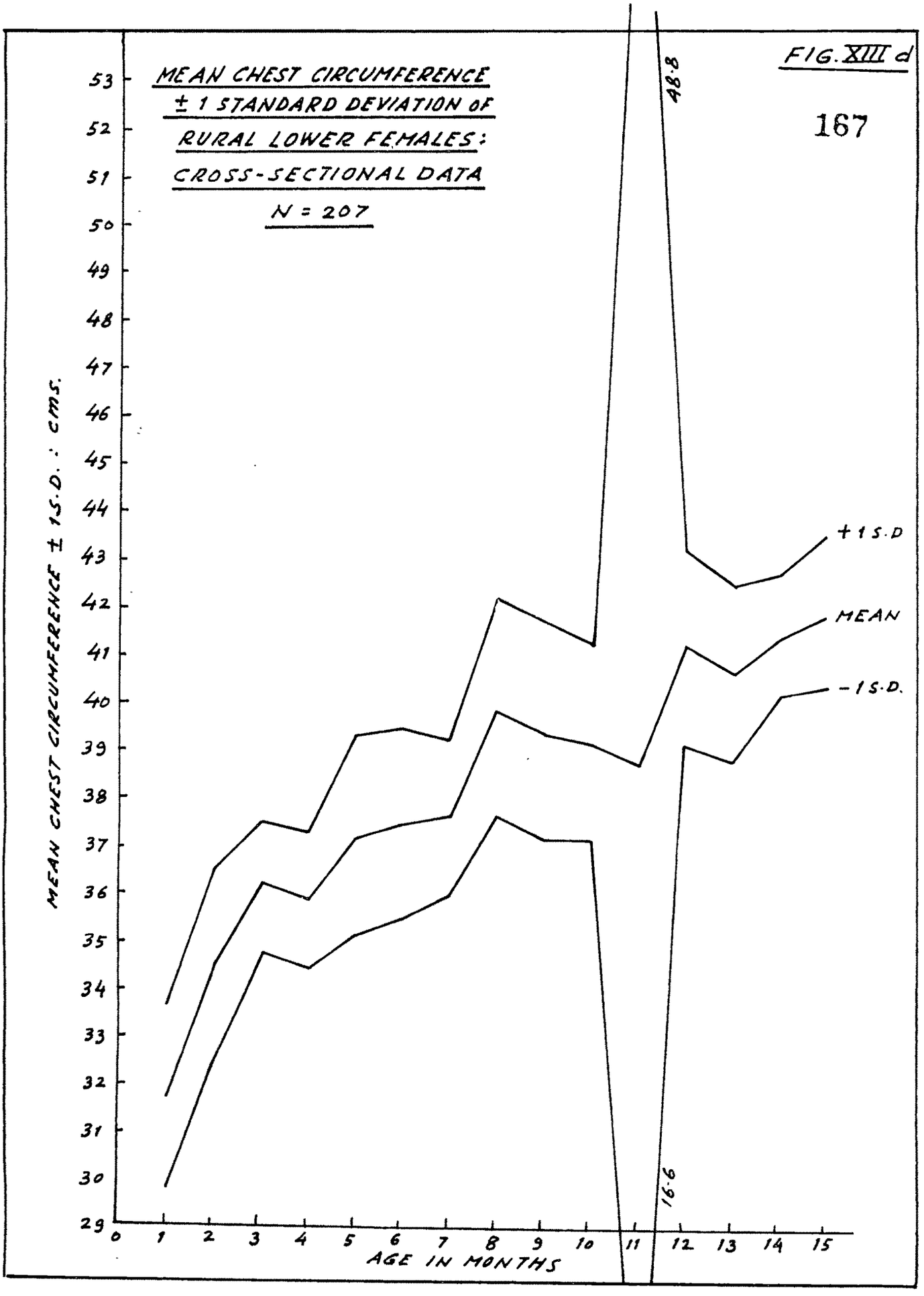


FIG. XIII d


MEAN CHEST CIRCUMFERENCE
± 1 STANDARD DEVIATION OF
RURAL LOWER FEMALES:
CROSS-SECTIONAL DATA
N = 207
MEAN CHEST CIRCUMFERENCE ± 1 S.D. : CMS.
AGE IN MONTHS
+1 S.D
MEAN
-1 S.D.
48·8
16·6

Observations : In the lower urban male infants known trend of increase in the measurement with advance of age is noted. The same groups show wide variation in the value of mean chest circumference in the 9 and 15 month olds. The female counter parts of the same group show these wide deviations only in the 15 month olds. In the rural groups the wide deviations are not evident in the male infants (Figure XIII c) but in the female counter-parts this deviation is noted in the 11 month olds only.

Percentile Point Estimations :

In Figure XIV a,b,c and d the percentile point estimations of chest circumference of the infants in the four control groups are graphically presented.

Observations : The erratic nature of the parallel lines is noted in all the control groups.

Rates of growth of Chest Circumference :

The mean monthly increment values and standard deviations of chest circumference calculated from the purely longitudinal sample are graphically presented in Figures XVa and XVb.

Observations : It is interesting to note that the rate of deceleration of increments in chest circumference is similar to the one observed for head circumference in the same groups; viz., that the sharp deceleration takes

FIG. XIV a

PERCENTILE GRAPHS: CHEST CIRCUMFERENCE

URBAN LOWER MALES

CROSS-SECTIONAL DATA

N = 390

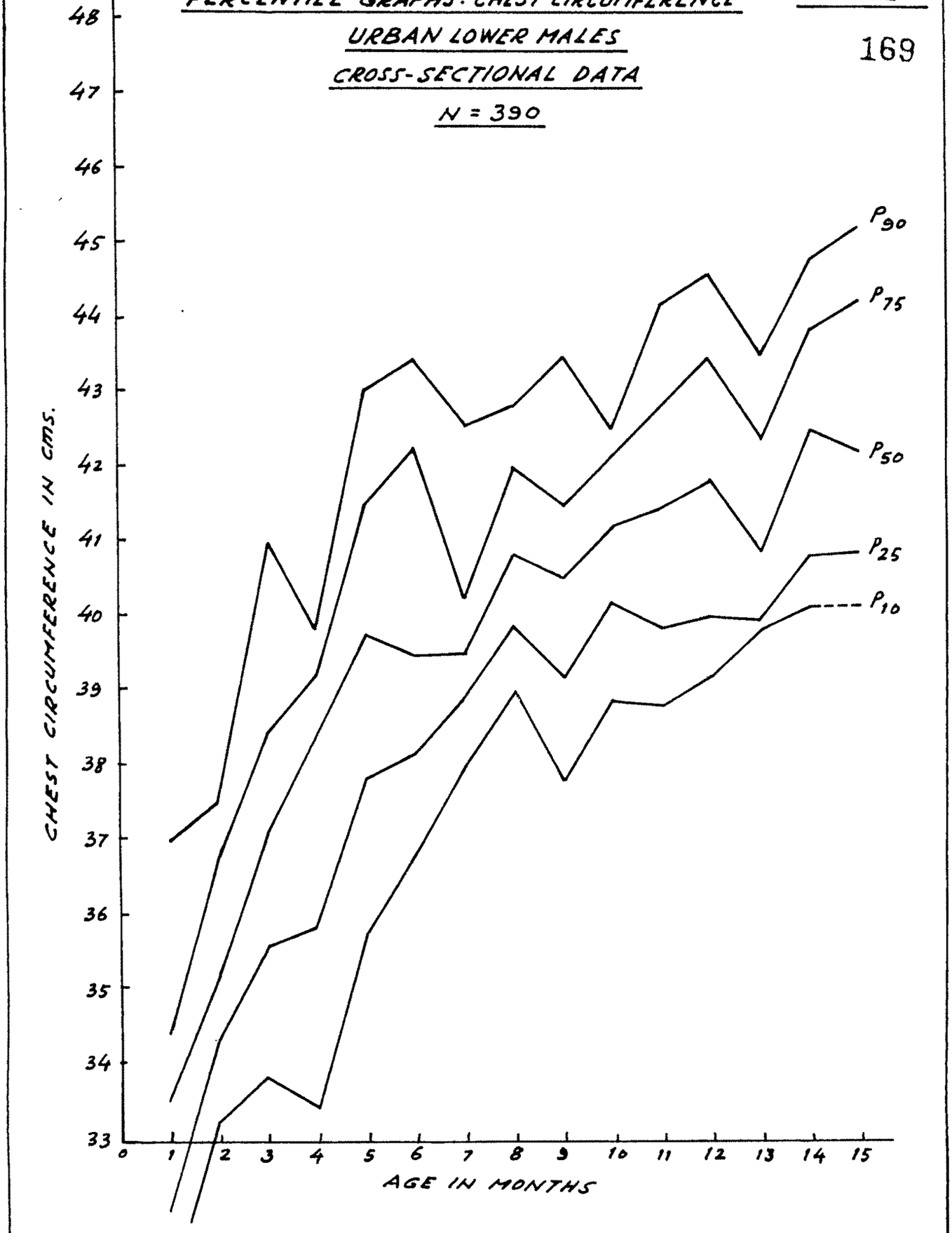


FIG. XIV 6

170

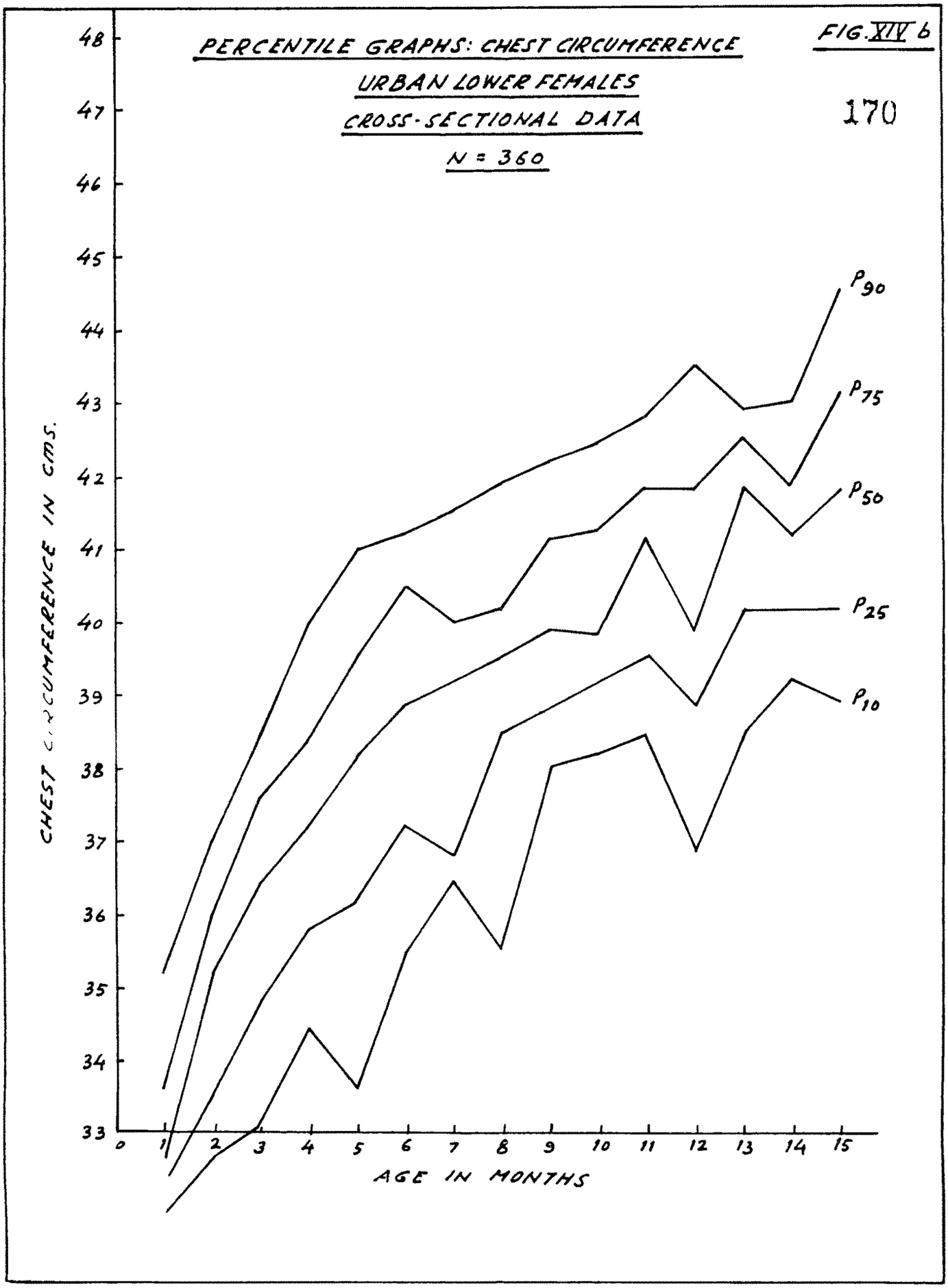

PERCENTILE GRAPHS: CHEST CIRCUMFERENCE
URBAN LOWER FEMALES
CROSS-SECTIONAL DATA
N = 360
CHEST CIRCUMFERENCE IN CMS.
AGE IN MONTHS
P90
P75
P50
P25
P10
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

FIG XIV C

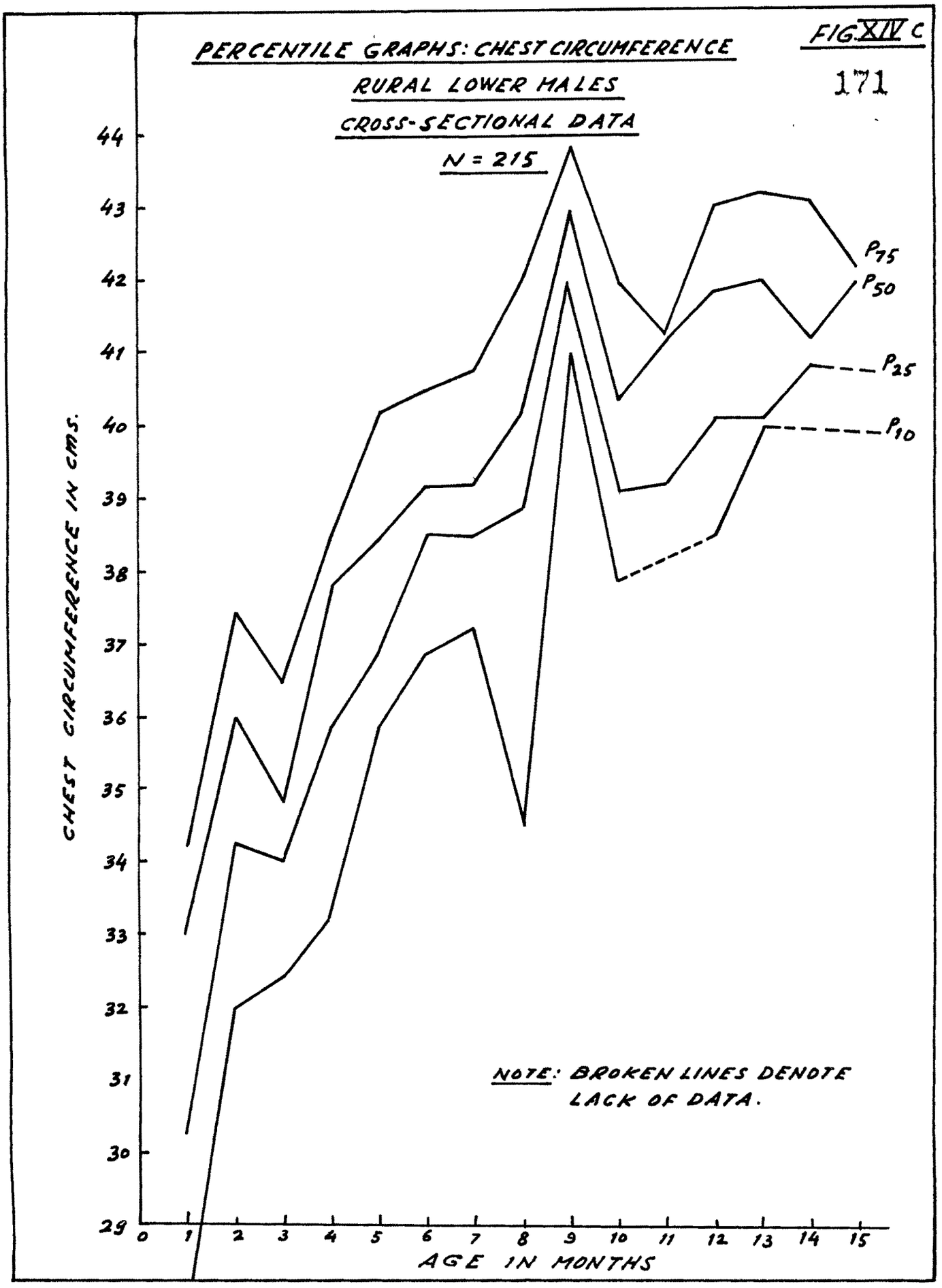

PERCENTILE GRAPHS: CHEST CIRCUMFERENCE
RURAL LOWER MALES
CROSS-SECTIONAL DATA
N = 215
CHEST CIRCUMFERENCE IN CMS.
44
43
42
41
40
39
38
37
36
35
34
33
32
31
30
29
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE IN MONTHS
P75
P50
P25
P10
NOTE: BROKEN LINES DENOTE LACK OF DATA.

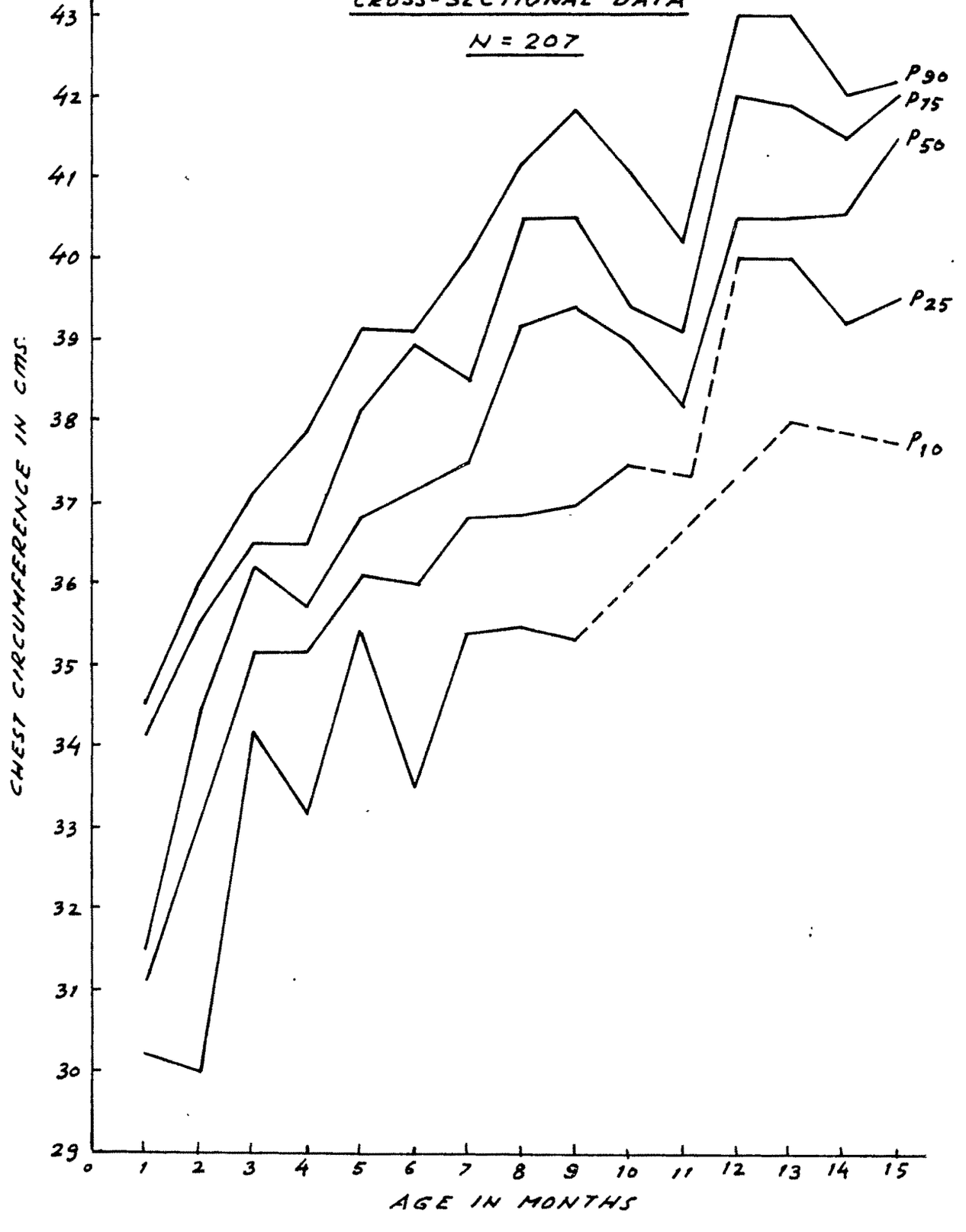
FIG. XIV d

PERCENTILE GRAPHS: CHEST CIRCUMFERENCE

RURAL LOWER FEMALES

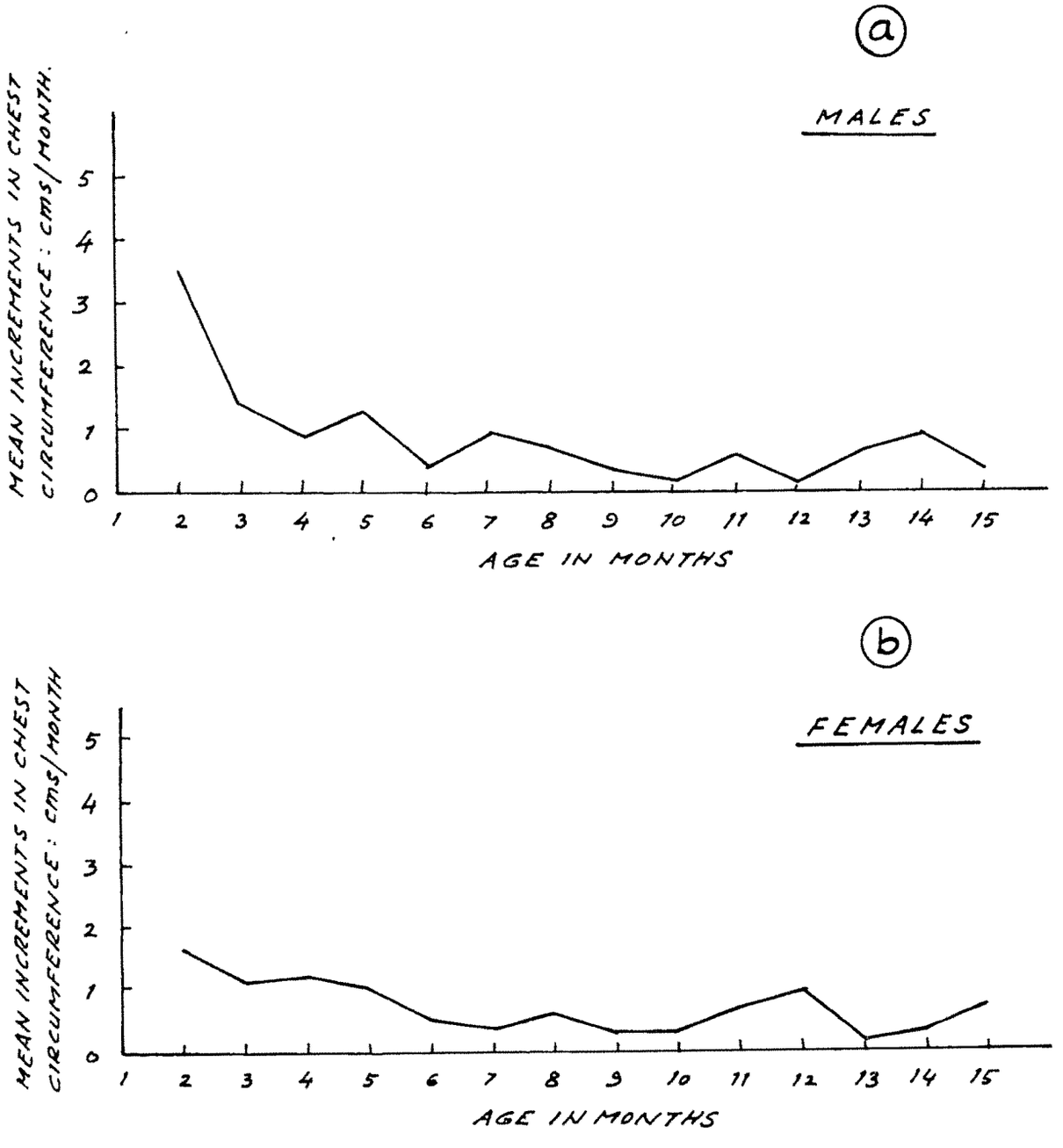
CROSS-SECTIONAL DATA

N = 207



GRAPHS OF MEAN MONTHLY INCREMENTS IN CHEST CIRCUMFERENCE OF MALE AND FEMALE INFANTS AGED 1-15 MONTHS FROM LOWER SOCIO-ECONOMIC CLASS OF URBAN AREA LONGITUDINAL DATA

FIG XV



place at the 4th month and then the velocity of growth levels off. The deceleration in the females is less sharp than the males.

In Figure XVI a,b,c, and d selected individual rates of growth of chest circumference are compared with the mean curves of the group.

Observations : Periods of spurts of growth and rest are noted in both the sexes.

In Figure XVII a and b, growth of head circumference is compared with the growth of chest circumference in both the sexes from the longitudinal sample.

Observations : The comparison of the curves of the head and chest circumference point out that the curves seem to run parallel in both the sexes.

Ratios and Proportions :

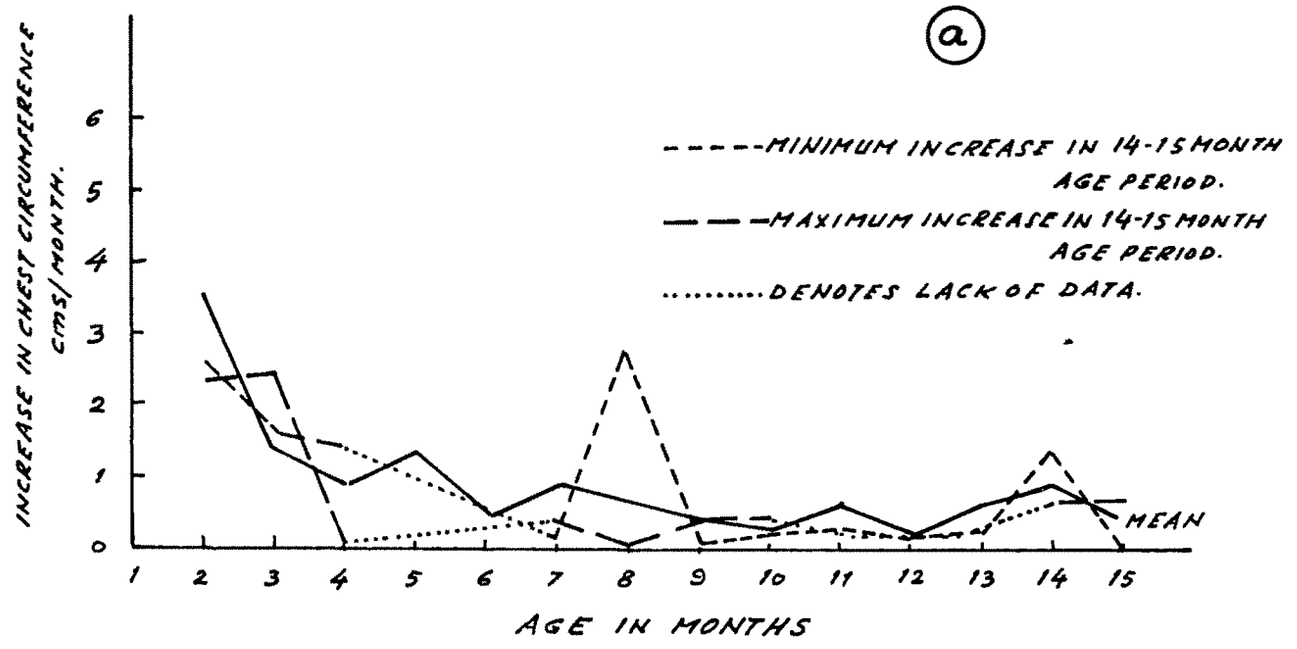
Mean ratios of head circumference to chest circumference and standard deviations thereof were calculated from the longitudinal sample. These values are given in Table IV.

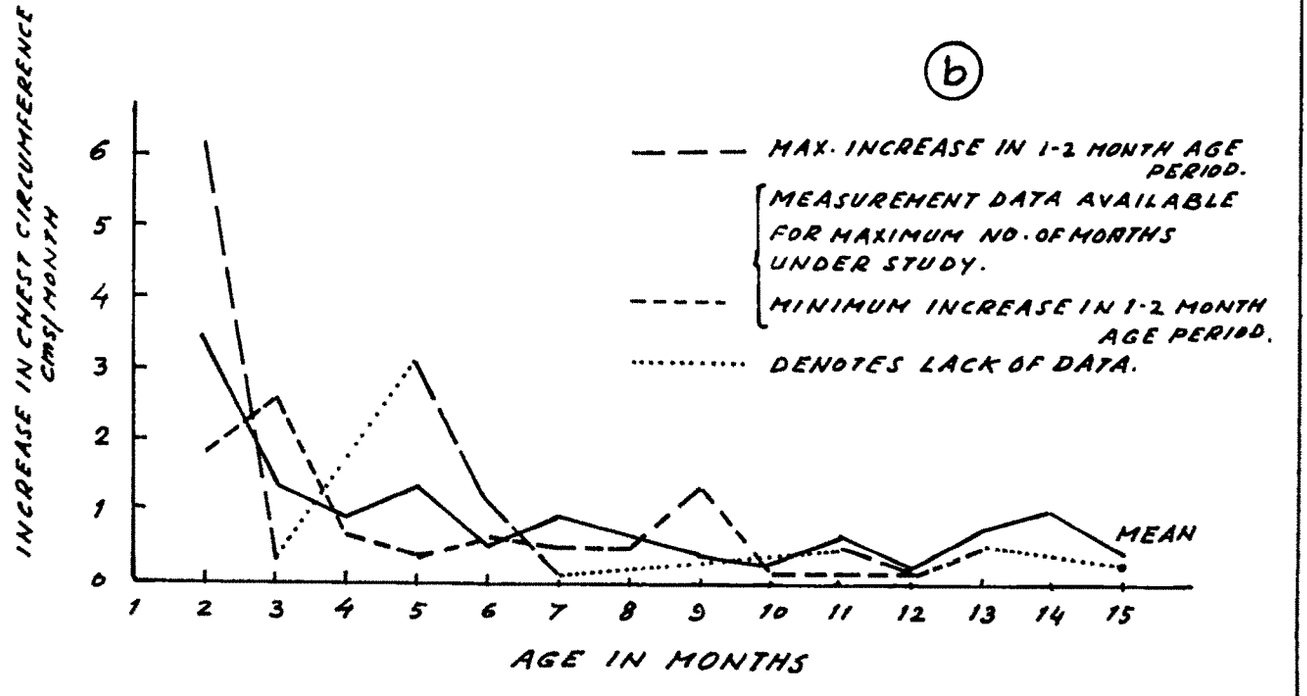
Observations : The mean ratios of head circumference to chest circumference in the urban male group of infants remains more than one in the first fifteen months of life.

FIG. XVI 1

GRAPHS OF MEAN MONTHLY INCREMENTS IN CHEST CIRCUMFERENCE SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN CHEST CIRCUMFERENCE

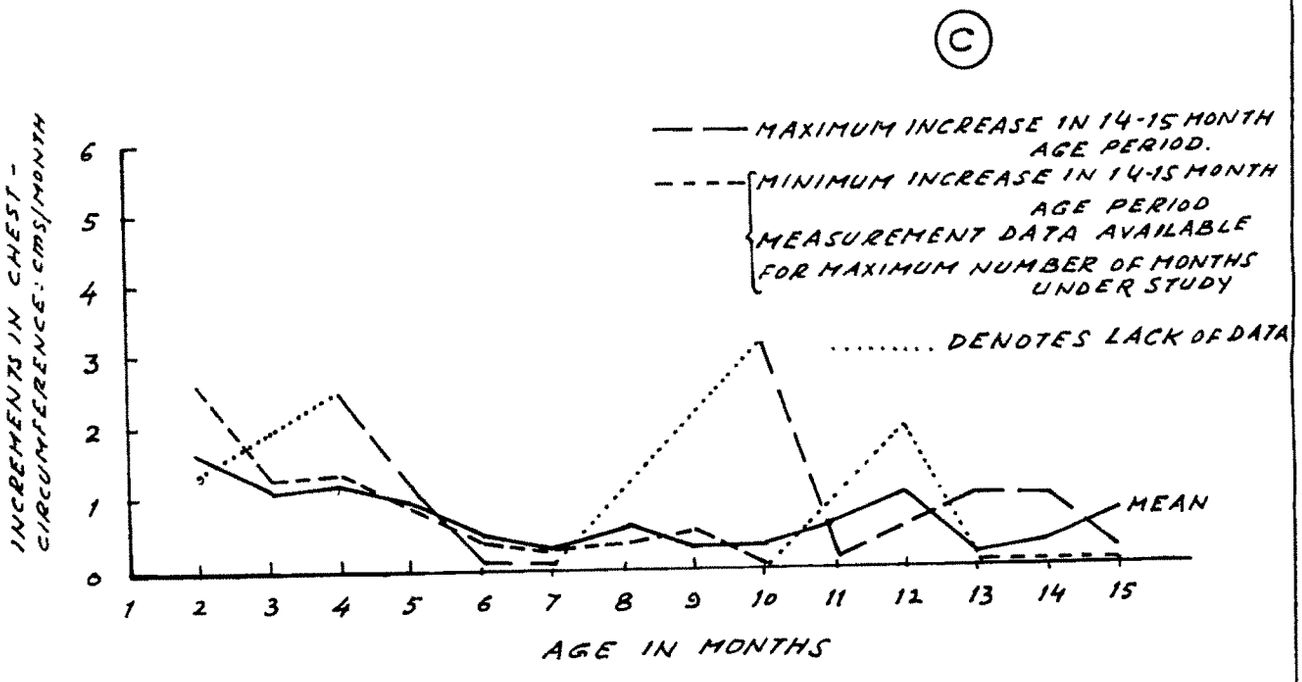
LOWER URBAN MALE LONGITUDINAL DATA





GRAPHS OF MEAN MONTHLY INCREMENTS IN CHEST CIRCUMFERENCE SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN CHEST CIRCUMFERENCE LOWER URBAN FEMALE LONGITUDINAL DATA

FIG. XVI 2



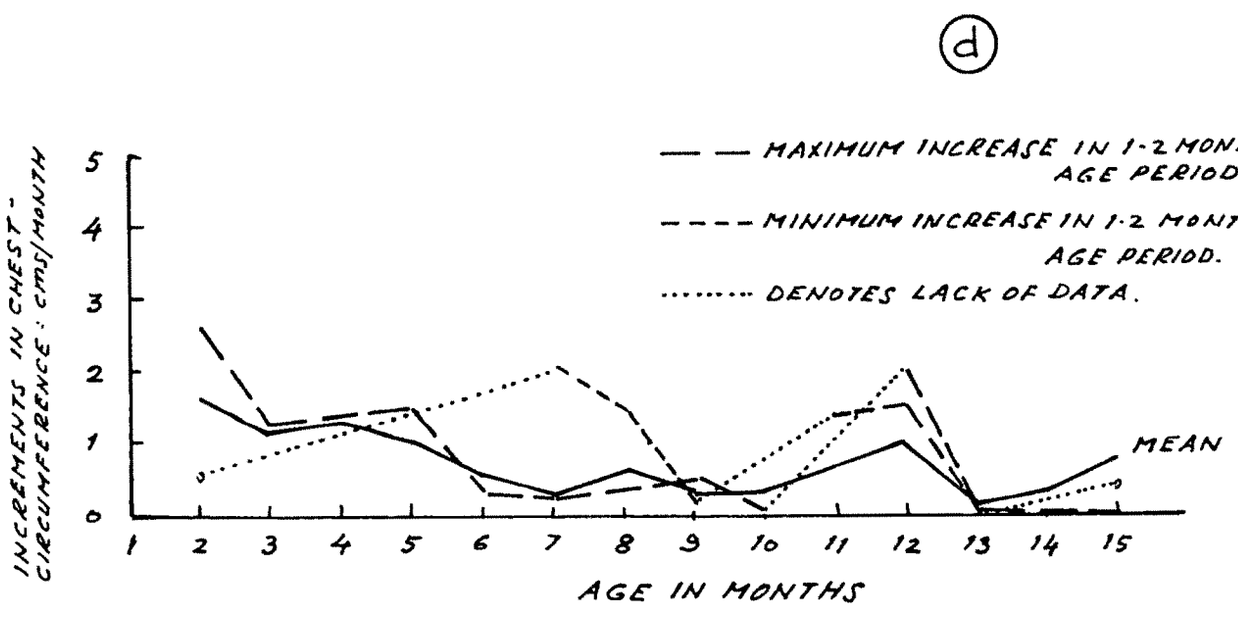


FIG. XVII 1

177

DISTANCE GRAPH OF MEAN HEAD CIRCUMFERENCE AND MEAN CHEST CIRCUMFERENCE OF URBAN MALE: INFANTS BELONGING TO LOWER SOCIOECONOMIC GROUP:

AS THEY GROW FROM 1 MONTH TO 15 MONTHS LONGITUDINAL DATA

(a)

MALES

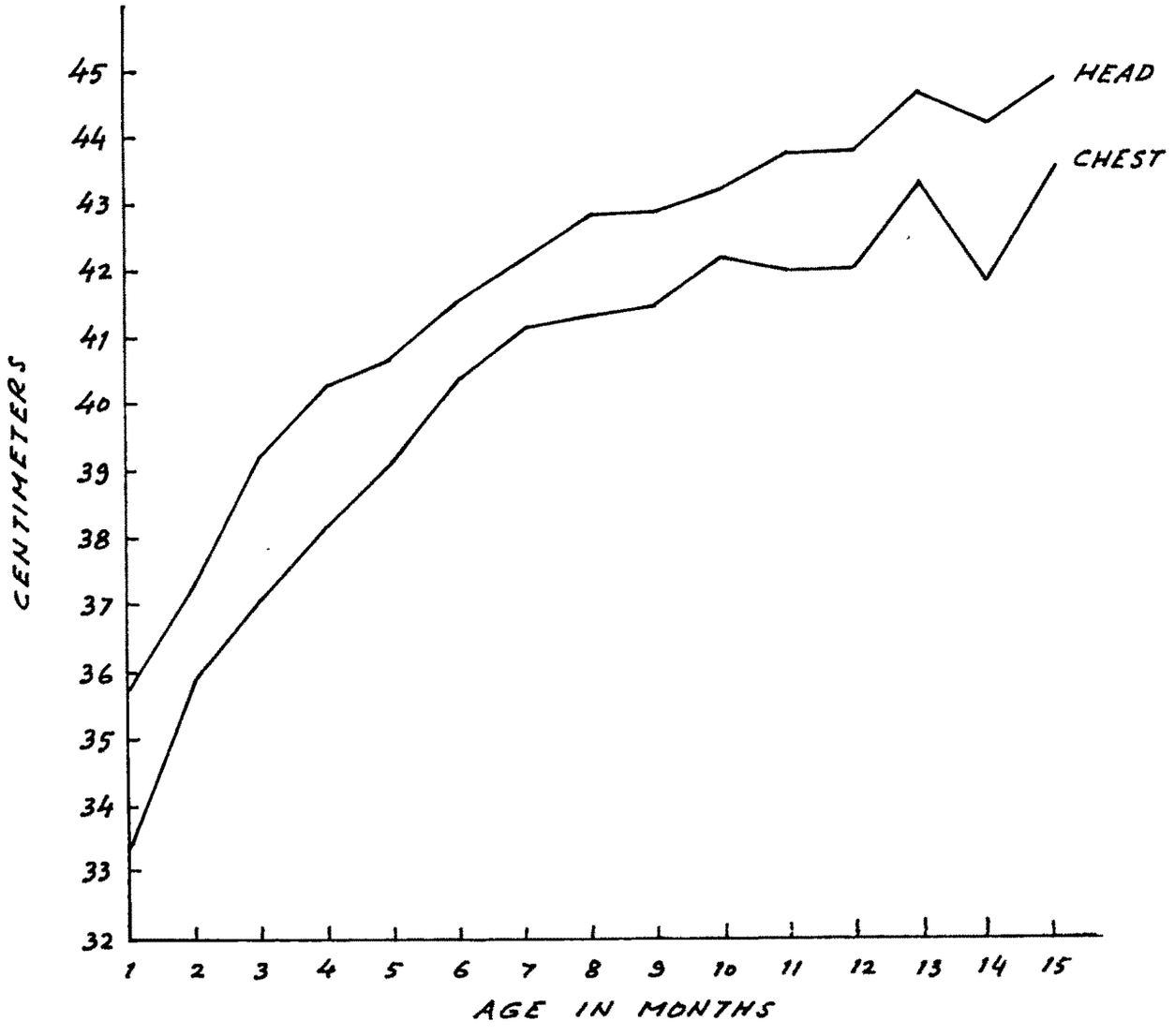


FIG. XVII 2

DISTANCE GRAPH OF MEAN HEAD CIRCUMFERENCE AND MEAN CHEST CIRCUMFERENCE OF URBAN FEMALE INFANTS BELONGING TO LOWER SOCIOECONOMIC GROUP; AS THEY GROW FROM 1 MONTH TO 15 MONTHS LONGITUDINAL DATA

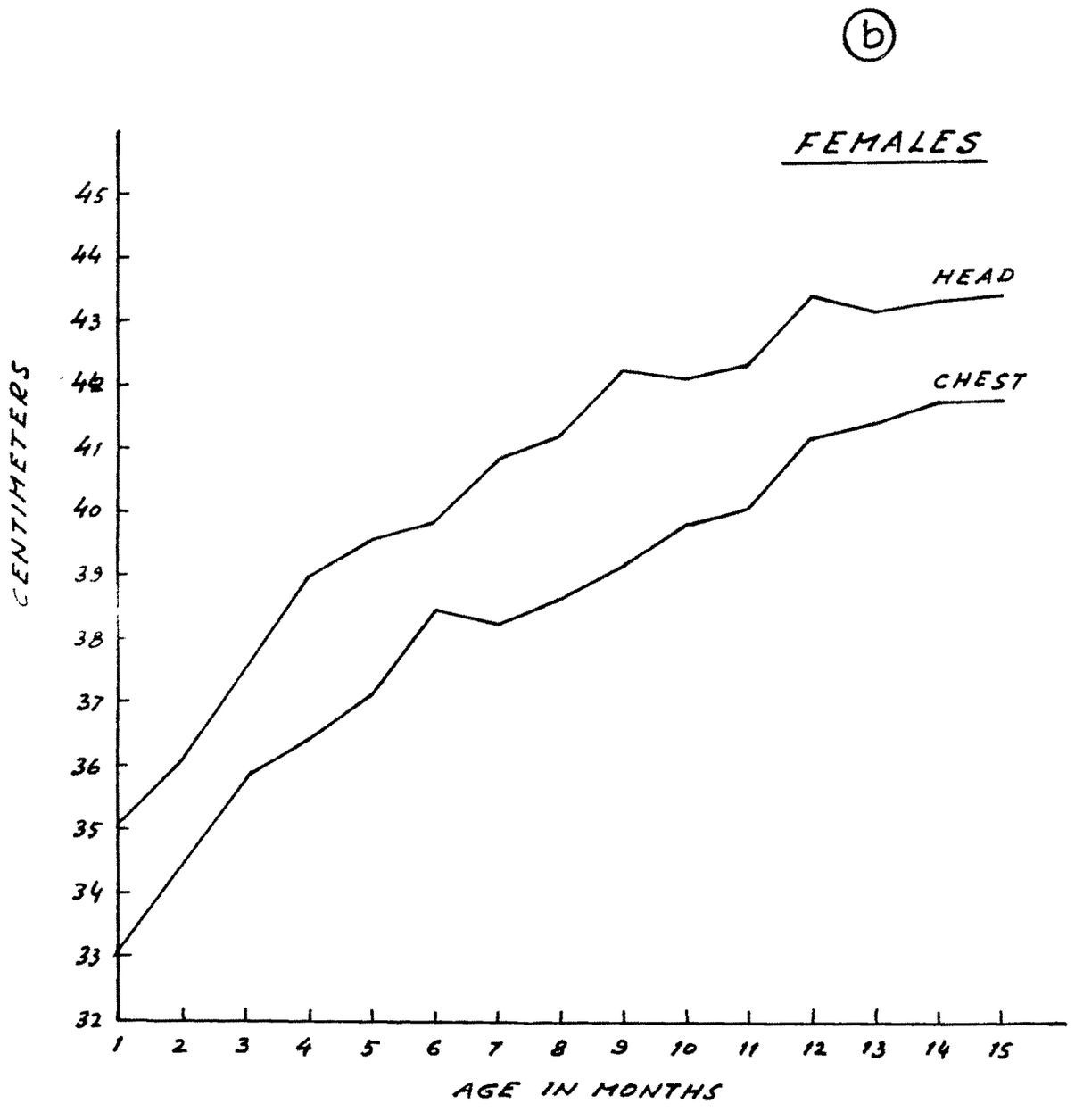


TABLE IV

Values of mean ratios of head circumference to chest circumference and standard deviation thereof for A(male) and B(female) infants aged 1 to 15 months of lower socio-economic class of urban area.

Longitudinal data.

A - MALES

Age in months	N	Mean Head circum/Chest circum-ference	S.D.
1	4	1.08	0102
2	6	1.05	0.02
3	7	1.06	0.02
4	6	1.05	0.03
5	5	1.04	0.02
6	5	1.04	0.02
7	7	1.04	0.03
8	6	1.05	0.02
9	6	1.01	0.06
10	6	1.04	0.01
11	5	1.04	0.01
12	7	1.05	0.02
13	5	1.03	0.01
14	4	1.03	0.03
15	6	1.03	0.02

Table IV - continued

B - FEMALES

Age in months	N	Mean Head circum/Chest circum -ference -ference	S.D.
1	6	1.06	0.03
2	8	1.05	0.05
3	5	1.05	0.05
4	6	1.06	0.04
5	8	1.06	0.05
6	4	1.04	0.02
7	7	1.06	0.04
8	4	0.84	0.44
9	5	1.08	0.02
10	4	1.05	0.04
11	5	1.06	0.03
12	4	1.05	0.03
13	6	1.03	0.03
14	5	1.02	0.03
15	6	1.04	0.02

The variation at each month is fairly constant, ranging from .01 standard deviation to .06, but in the majority of cases being .02 to .03. In the group of female counterparts, this ratio is 0.84 in the 8 month old group. The standard deviations vary between .02 and .05, except for the 8 month old group in which it is 0.44.

III - Birth Weight and Weight :

Birth Weight : Birth Weight

In the present study, in total, 266 birth weights as reported by the mothers of infants included in the sample, were available for analysis. Of this number, 109 were of female infants and 157 of male infants. Table V gives these values arranged according to the control variables, plus the arithmetic means and standard deviations. A normal distribution for the sample was assumed.

Observations : In the lower, urban group of 181 birth weights reported, the mean birth weight for the female infants was 95 gms. more than that of the male. Secondly, when examining the range of the weights, the minimum weight for the female newborn is also higher than the male newborn by 227 gms. However, the maximum weight is higher for the male infant by about 227 gms. than his female counterpart. Thus the range of the distribution of male birth weight is wider by 227 gms. at both the extremes,

giving rise to a wider standard deviation value than that for the female infant birth weight of the lower urban group.

TABLE V

Values of birth weight in kilogram, showing range, mean and standard deviation of male and female infants born in and around Baroda during 1965-1969.

Controls						
Residence	Socio-economic class	Sex	N	Range	Mean	S.D.
URBAN	Lower	Male	93	1.591 kg - 4.318 kg	2.729kg	1.215
		Female	88	1.818 kg - 4.091 kg	2.824kg.	0.565
	Higher	Male	21	2.045 kg - 3.778 kg	3.015kg.	.616
		Female	10	2.500 kg - 3.423 kg	2.9178kg	.206
RURAL	Lower	Male	16	1.200 kg - 3.636 kg	2.860kg.	.692
		Female	12	1.000 kg - 4.000 kg	2.723 kg	.99
	Higher	Male	17	1.818 kg - 3.636 kg	2.848 kg	.574
		Female	8	1.818 kg - 3.636 kg	2.755 kg	

In the higher urban group, the same characteristic is noted, but the absolute values are higher, as expected. The minimum weights in the ranges differ by 455 gms. amongst the sexes, and the maximum by 355 gms.

In the urban group as a whole, the mean values of the higher socio-economic group for both the sexes are higher by 286 gms. for the males and 94 gms. for females.

This difference between the socio-economic classes in the rural setting is not evident when the male mean birth weights of the two classes are compared. With comparable N (16,17) the difference in the means is only 12 gms., and that also in favor of the lower socio-economic rural male ! If the ranges of these male birth weights for these two groups are examined, the maximum weights are almost identical, and the minimum in the higher group is higher by 618 gms. Probably, this difference in the minimum birth weight of the rural male is the significant socio-economic class difference.

Amongst the females of the rural higher and lower socio-economic groups, the comparison is difficult as the N is quite small (12 and 9) and differs by 25%.

In the same socio-economic group, the difference between the mean birth weights of the sexes amounts to

137 gms. in the lower socio-economic group; and 56 gms. in the higher socio-economic group. The minimum and maximum birth weights differ by 200 gms. and about 364 gms. respectively in the lower socio-economic group, and 0 gm. and 450 gms. in higher socio-economic group of the rural setting. Thus the difference in the minimum birth weights of the sexes is identical in the urban and rural setting around Baroda.

In the higher socio-economic group, the sex difference in the minimum and maximum birth weight is nil. However, there is one extremely high birth weight reported (4.090 kg.) amongst the females which in a sample of 9, pulls up the mean to higher than its male counterpart. But, when this one observation is removed from the sample, and the mean recalculated it appears to be more representative. The comparisons are made with the unduly high value disregarded.

Weight

Means and Standard Deviations

Mean weights and their standard deviation for all the control variables of residence, sex, and 1 to 15 month age groups except socio-economic class are calculated and presented graphically in Figures XVIII a, b, c and d.

FIG. XVIII a

185

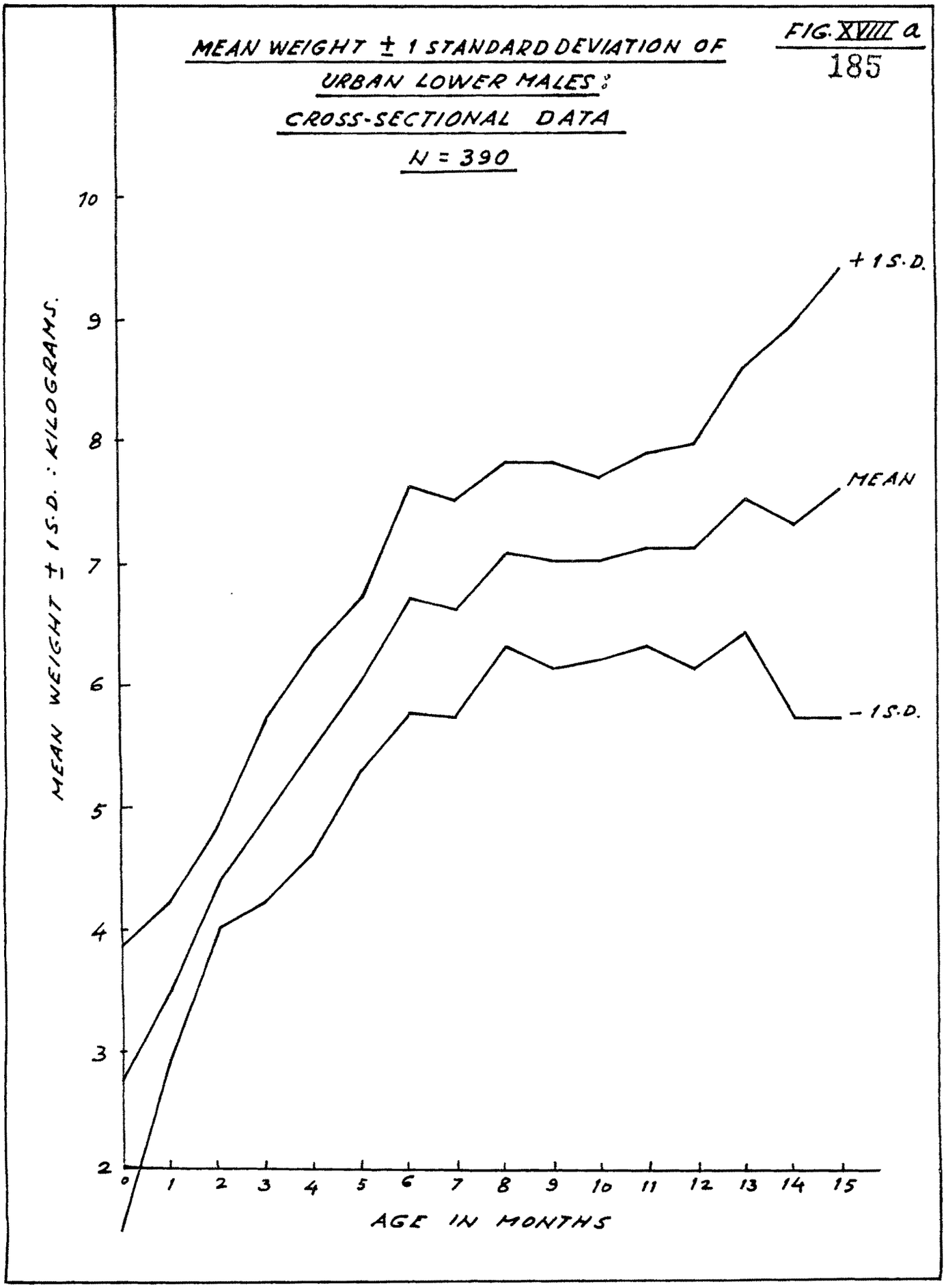


FIG. XVIII 6

MEAN WEIGHT ± 1 STANDARD DEVIATION OF URBAN LOWER FEMALES: CROSS-SECTIONAL DATA

N = 358

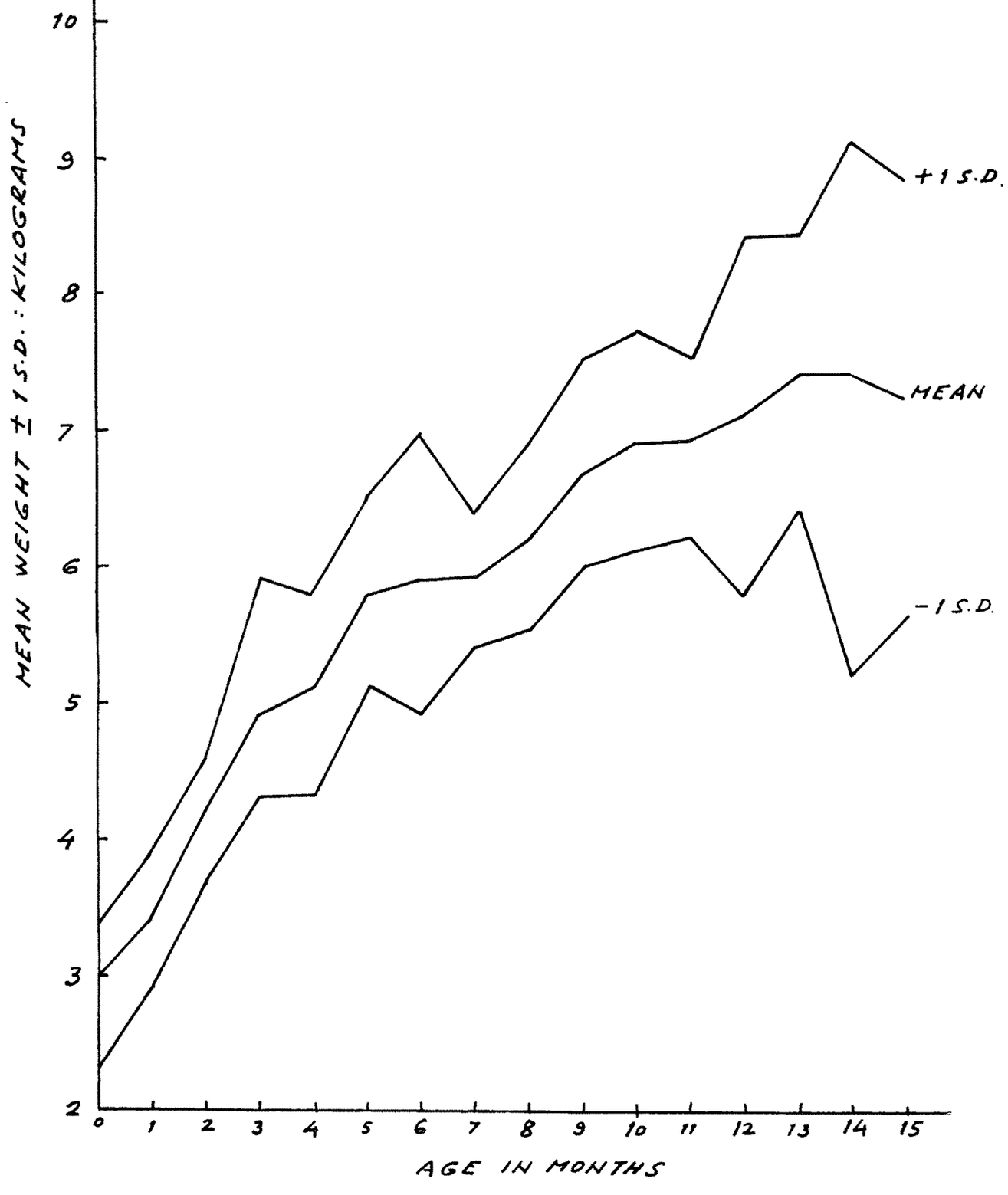


FIG. XVIII C

GRAPH OF MEAN WEIGHT ± 1 STANDARD DEVIATION OF MALE INFANTS AGED 1 TO 15 MONTHS OF LOWER SOCIO-ECONOMIC GROUP OF RURAL AREA

N = 210

CROSS-SECTIONAL DATA

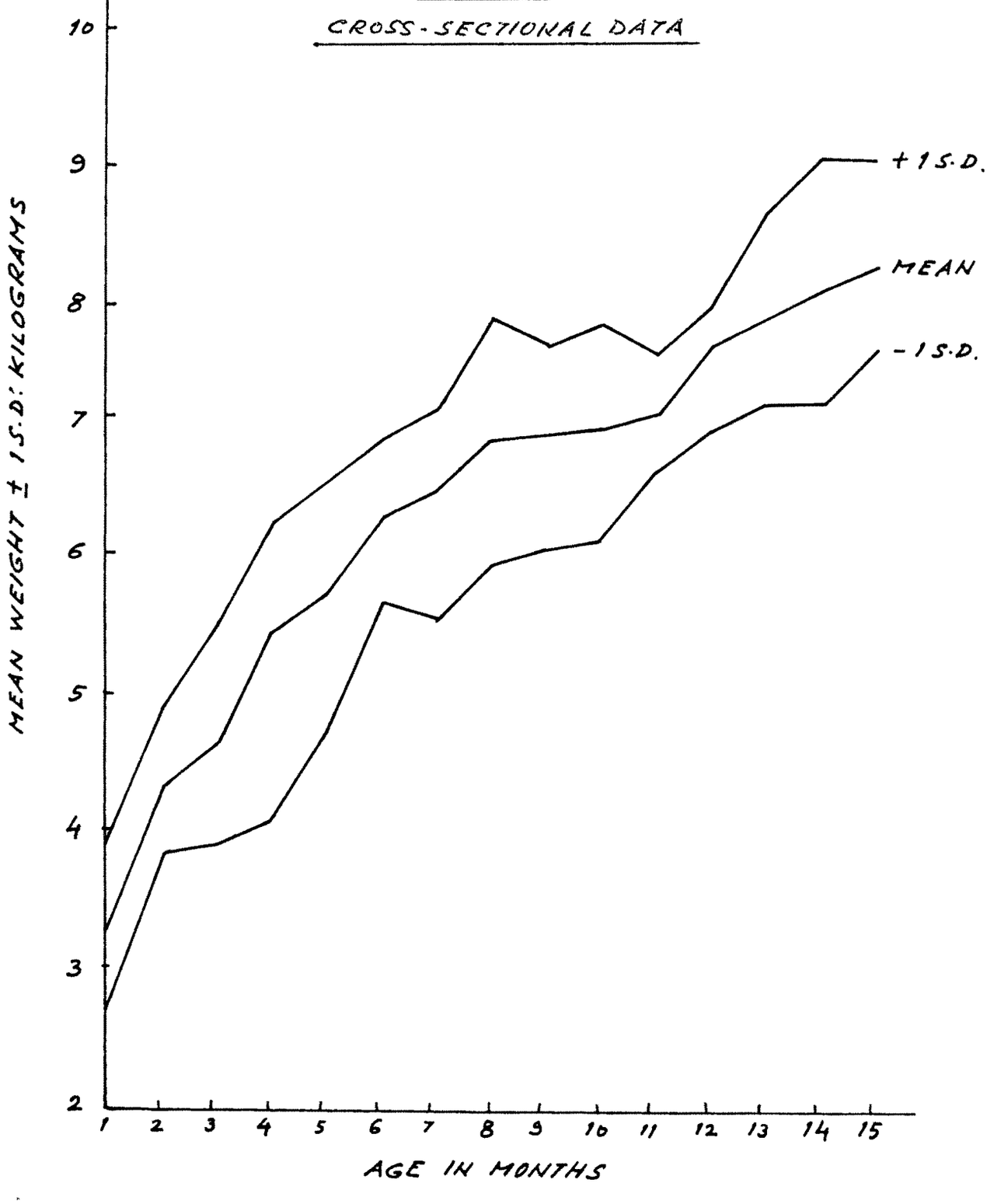
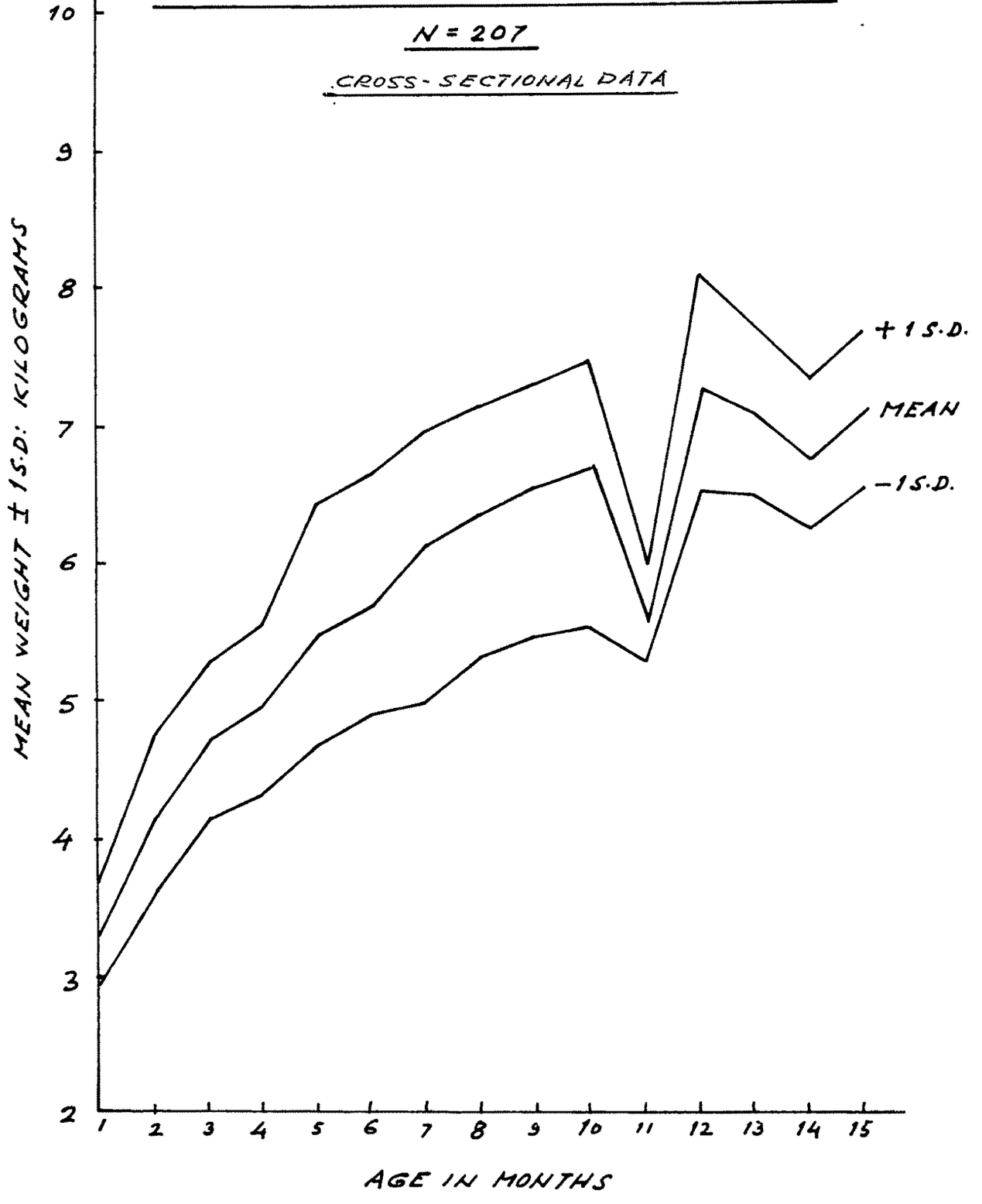


FIG. XVIII d

GRAPH OF MEAN WEIGHT ± 1 STANDARD DEVIATION OF FEMALE INFANTS AGED 1 TO 15 MONTHS OF LOWER SOCIO-ECONOMIC GROUP OF RURAL AREA

N = 207

CROSS-SECTIONAL DATA



Observations : The increase in mean values in advancing sub age groups from 1 to 15 months is noted. This is in accordance with the known trend of physical growth. Wide variations are noted in 14 and 15 month olds of the urban male group, and in 12, 14 and 15 month olds in their female counterparts. In the rural group the females of 11 month old weigh less on the average than the 10 month olds. This is probably due to the extremely small N of 6 in the group of 11 month olds.

Percentile Point Estimations :

Percentile point estimations of weight are graphically presented in Figures XIX a, b, c and d.

Observations : The erratic nature of the progress of these percentile point estimations is noted in all the four control groups.

Rates of Growth of Weight :

The mean monthly increments in weight are shown graphically in Figure XX a,b,c and d.

Observations : Close observation of the graphs reveal that those for the two socio-economic classes appear to differ in their peaks and dips, but not for ~~the~~ both sexes to the same extent. Upto the age of 7 months, the shape of the curve for the male and female values is practically

FIG. XIX a

PERCENTILE GRAPHS: WEIGHT
URBAN LOWER MALES
CROSS-SECTIONAL DATA
N = 390

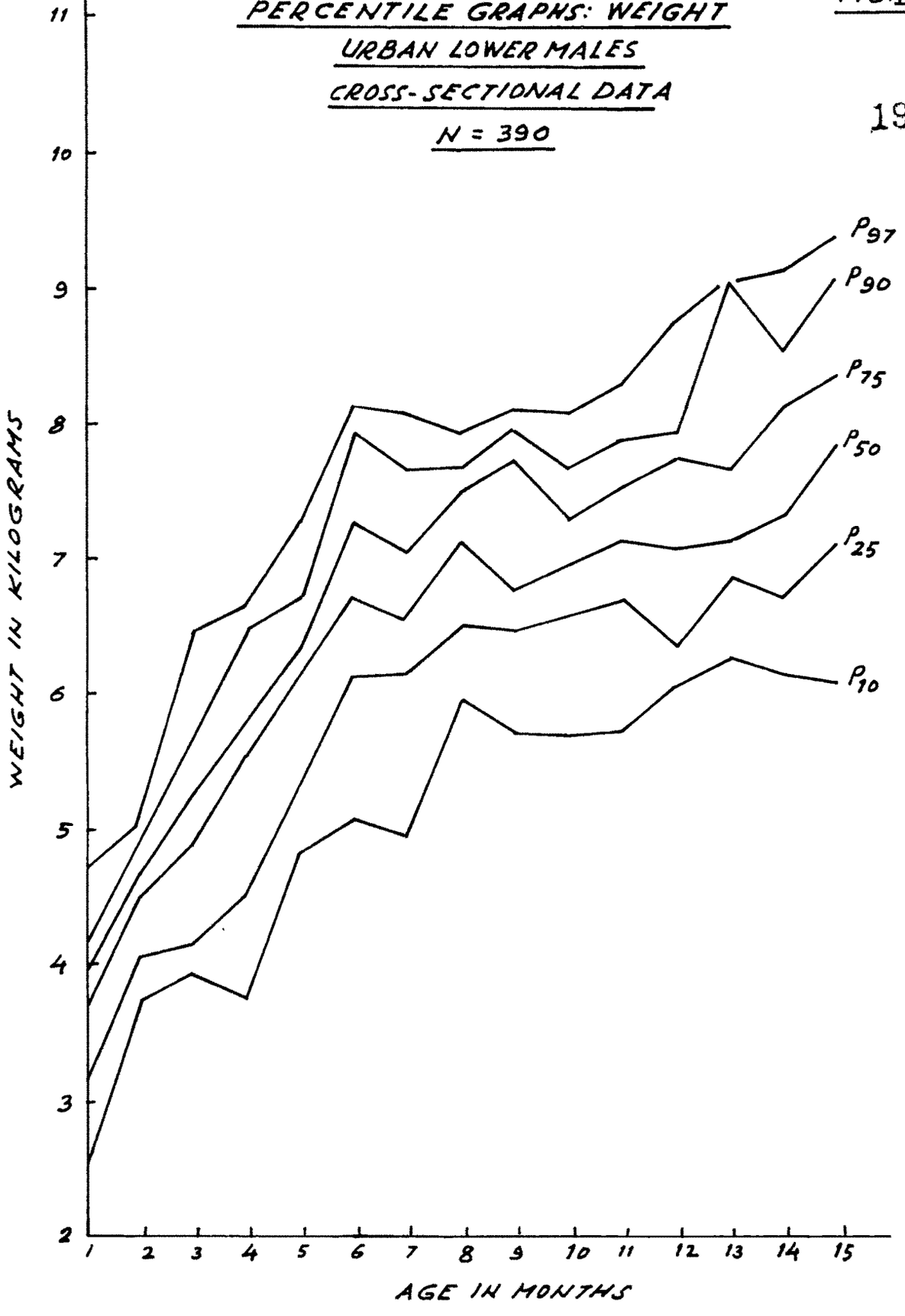


FIG. XIX b

PERCENTILE GRAPHS: WEIGHT

URBAN LOWER FEMALES

CROSS-SECTIONAL DATA

N = 358

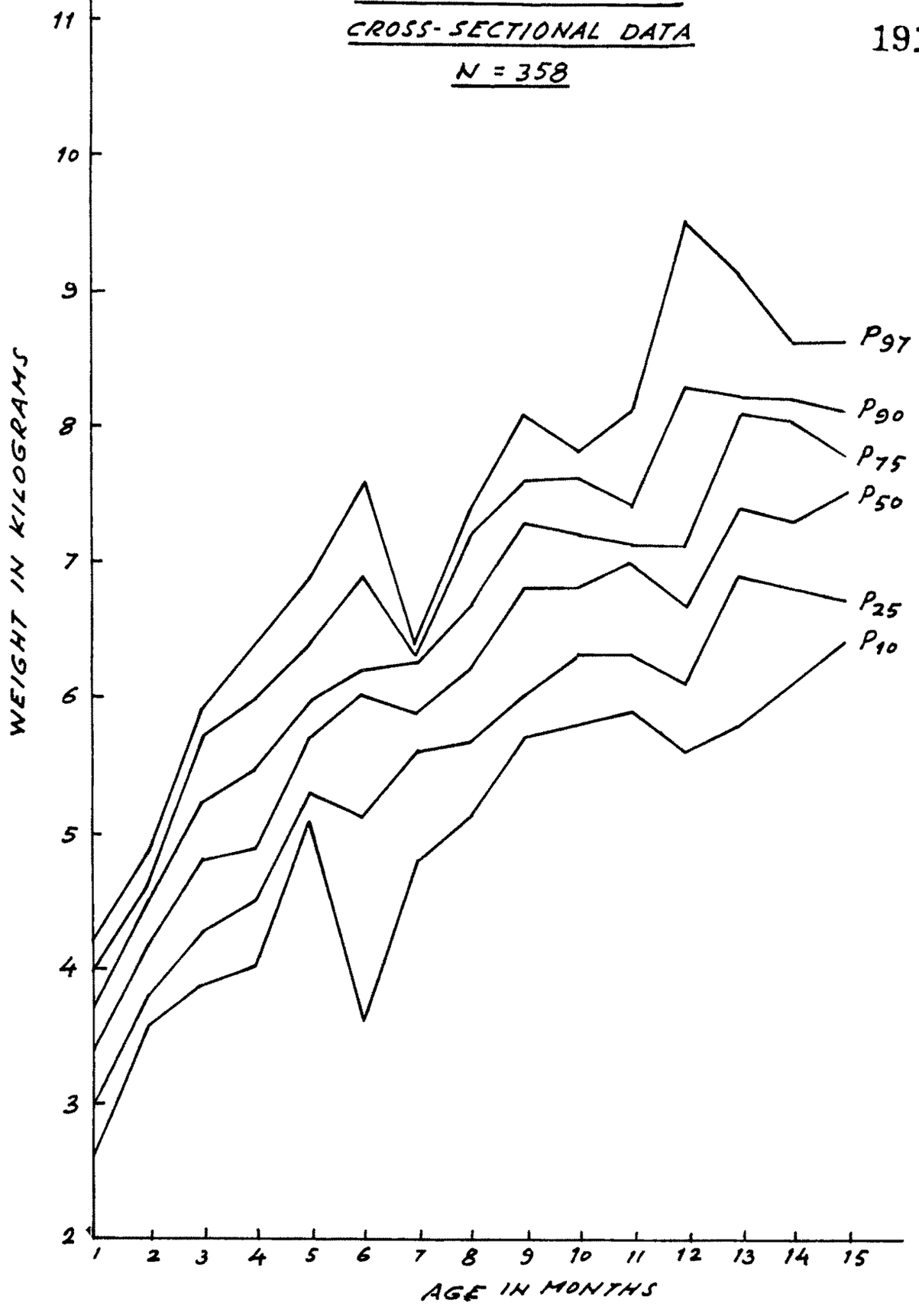


FIG. XIX C

192

PERCENTILE GRAPHS: WEIGHT
RURAL LOWER MALES
CROSS-SECTIONAL DATA
N = 210

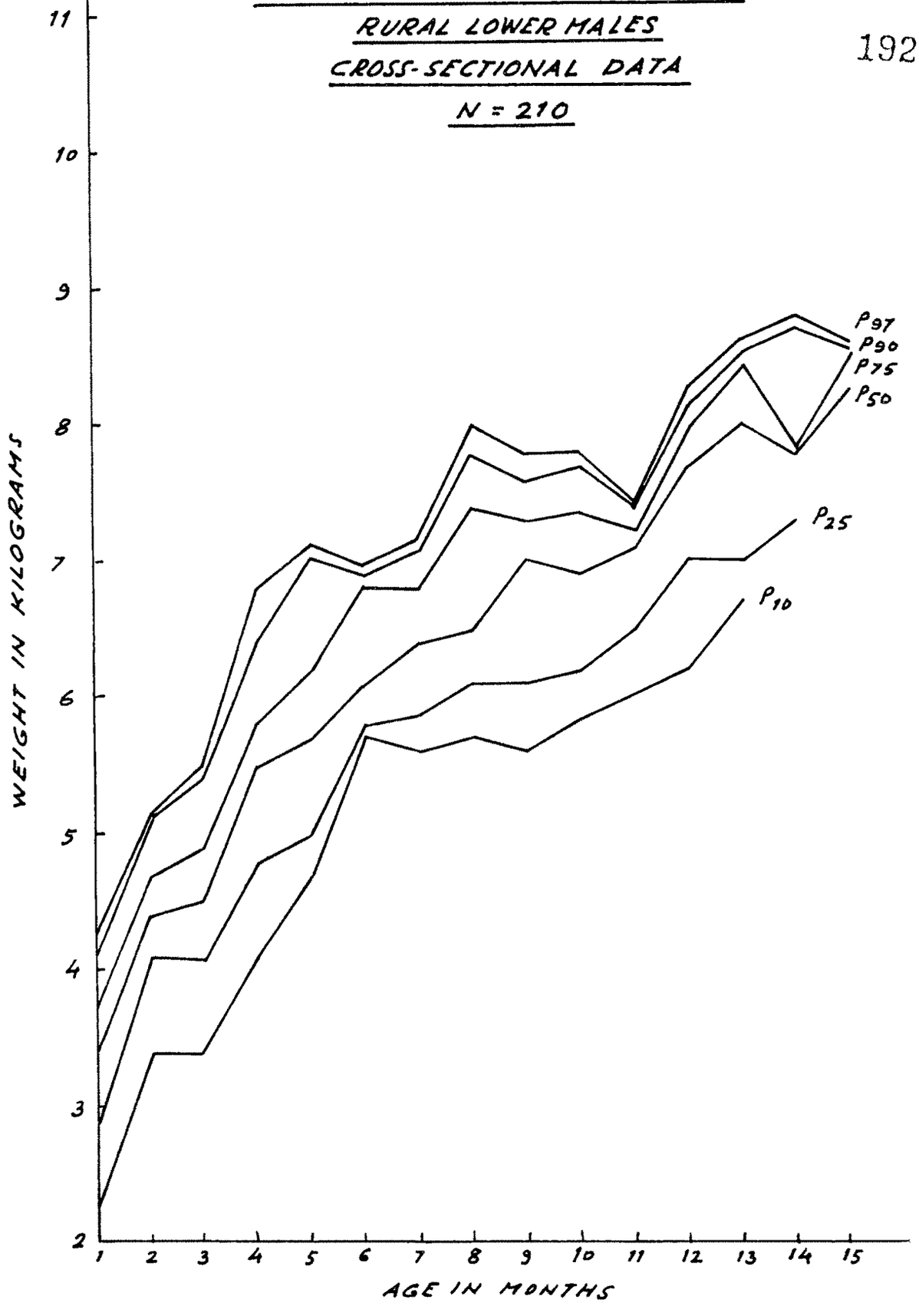


FIG. XIX d

PERCENTILE GRAPHS: WEIGHT
RURAL LOWER FEMALES
CROSS-SECTIONAL DATA
N = 207

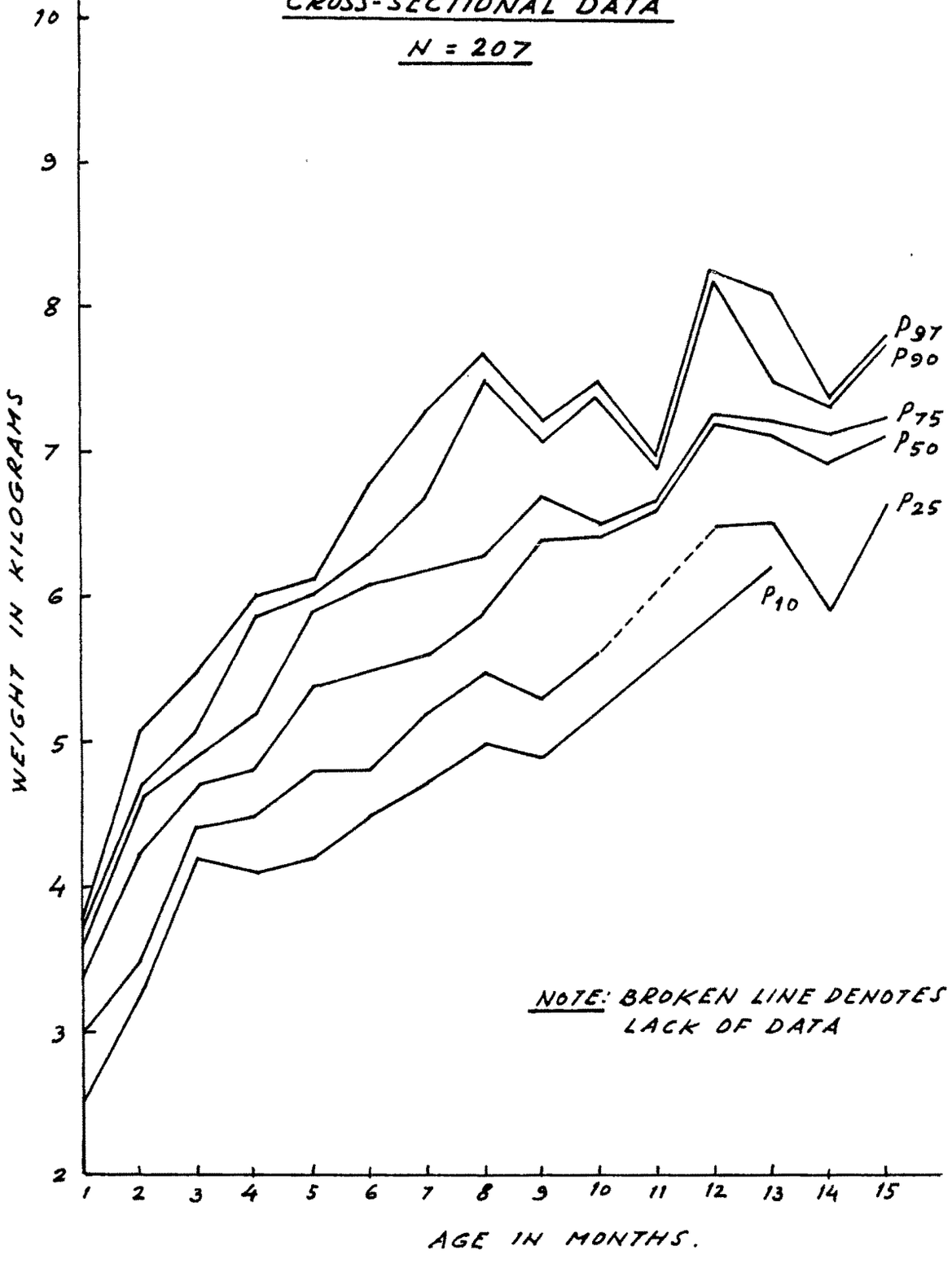
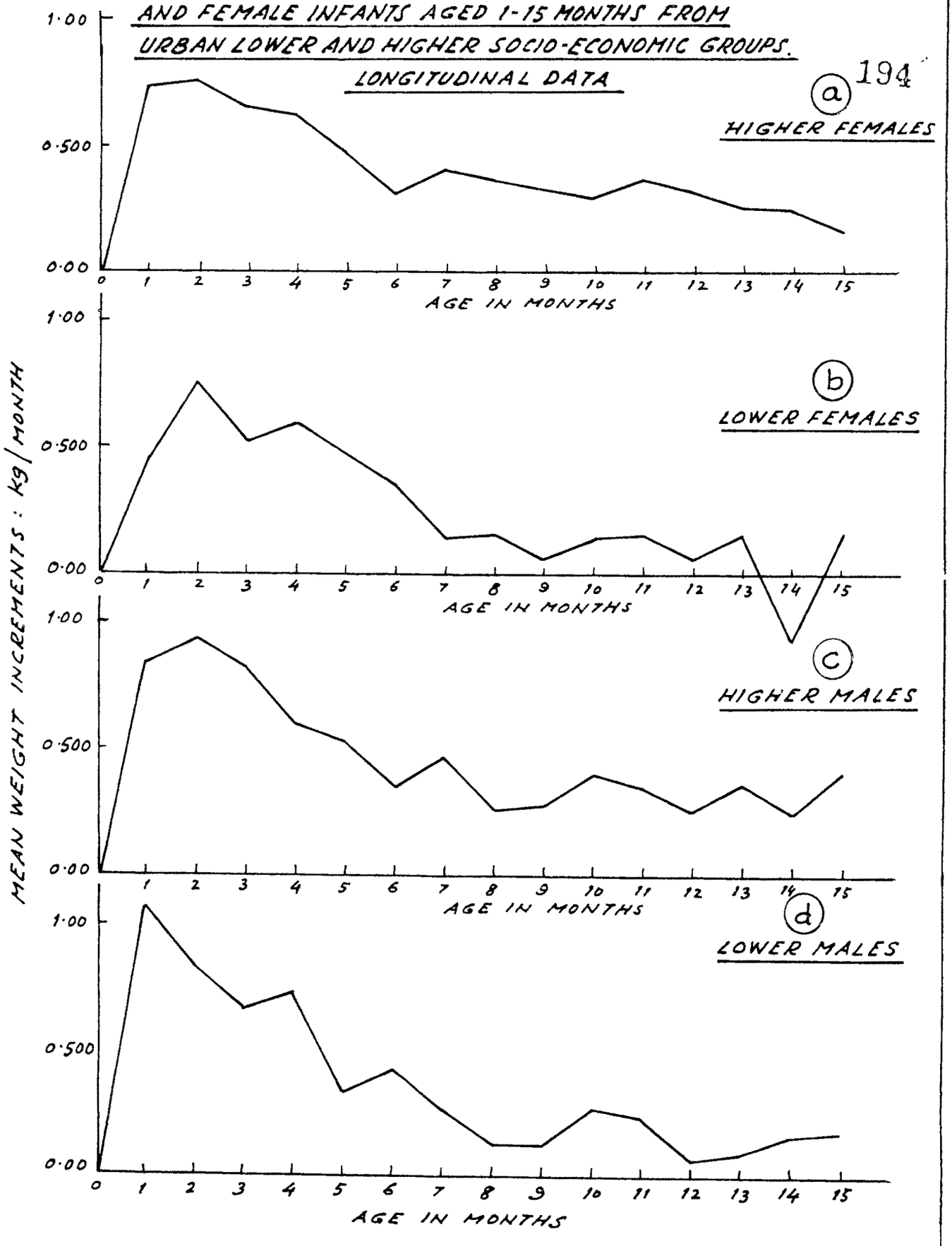


FIG. XX

MONTHLY MEAN INCREASE IN WEIGHT OF MALE AND FEMALE INFANTS AGED 1-15 MONTHS FROM URBAN LOWER AND HIGHER SOCIO-ECONOMIC GROUPS.

LONGITUDINAL DATA



identical. However, the sex differences are more pronounced in the lower socio-economic class.

The decrease in the rate at which weight is gained is generally evident.

Figure XXI a,b,c,d,e show selected individual patterns of weight gain superimposed on the mean pattern of weight gain of their group.

Observations : This comparison clearly visualises the flattening of individual gains and losses of weight in the mean curve during the first fifteen months of life in the mean curve.

Birth weight and rate of weight gain :

Calculations were carried out to test the commonly accepted belief that birth weight is approximately doubled at 5 months and tripled at 12 months. Weights of 46 infants from the longitudinal data, whose birth weight, weight at 5 months and/or weight at 12 months were recorded were selected for study. Birth weights of these male and female infants of higher and lower socio-economic classof urban community were doubled and tripled and then compared with their actual observed weights at 5 months and 12 months of age. The differences between the estimated and observed weights were noted and the percentage error of estimation on actual observation was calculated. Results of these calculations are presented in Table VI. (page 199).

FIG. XXI 1

GRAPHS OF MEAN MONTHLY INCREMENTS IN WEIGHT SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN WEIGHT

LOWER URBAN MALE LONGITUDINAL DATA

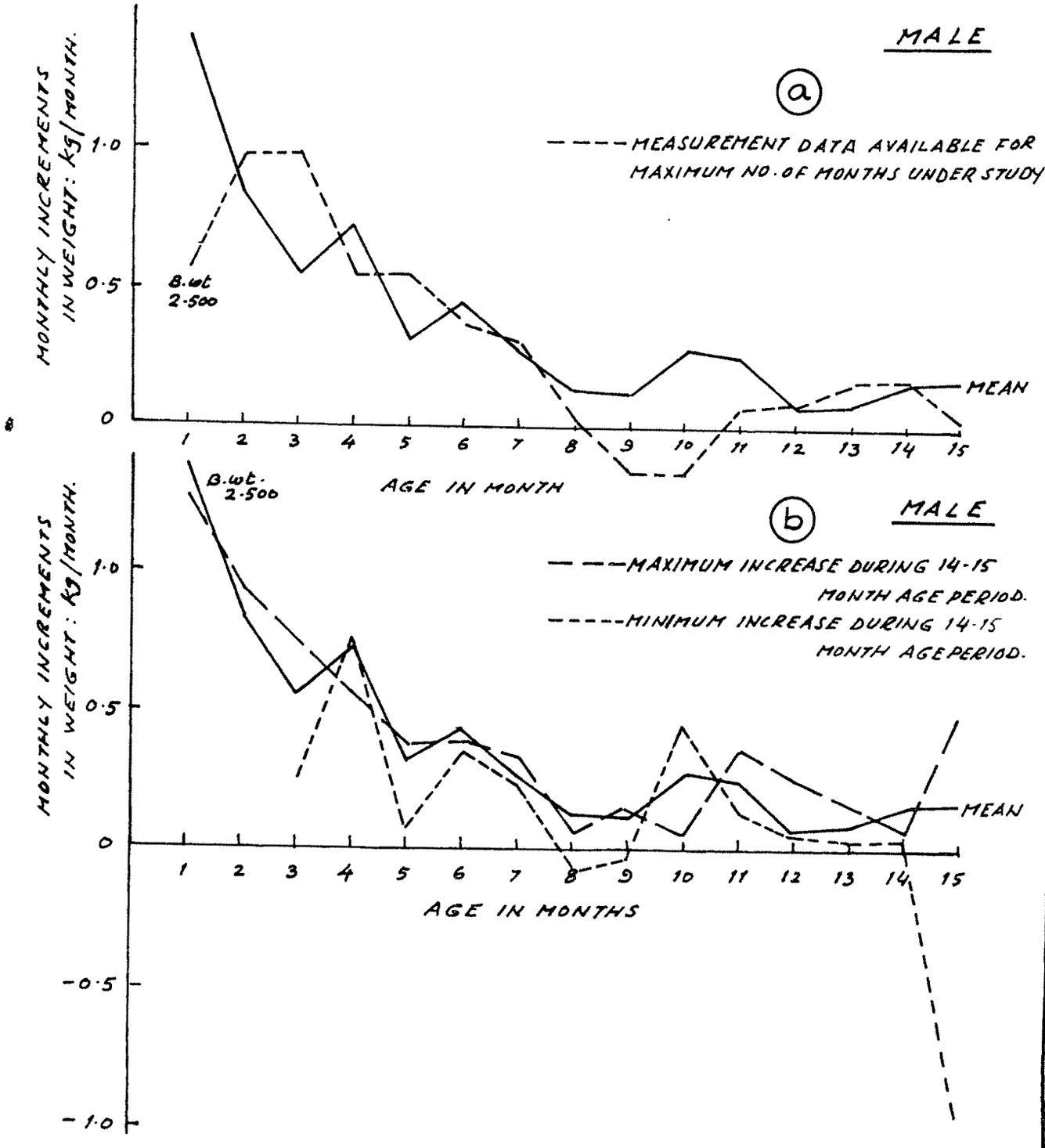
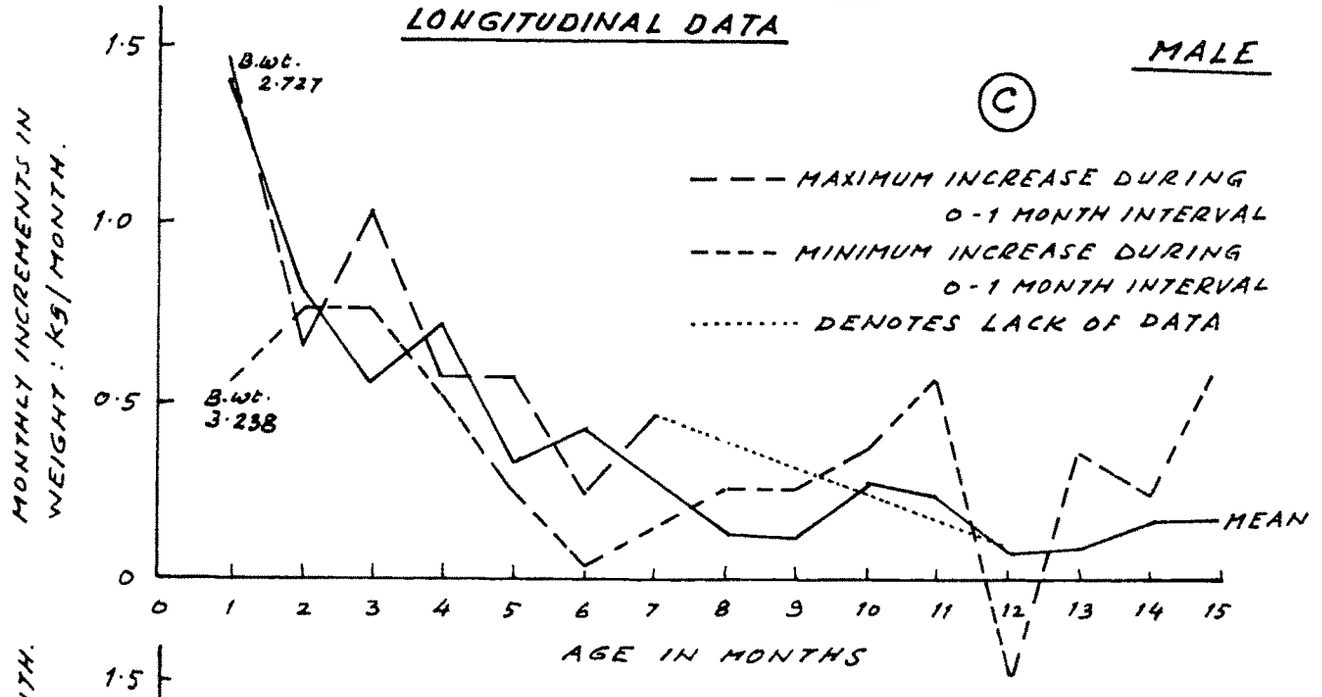


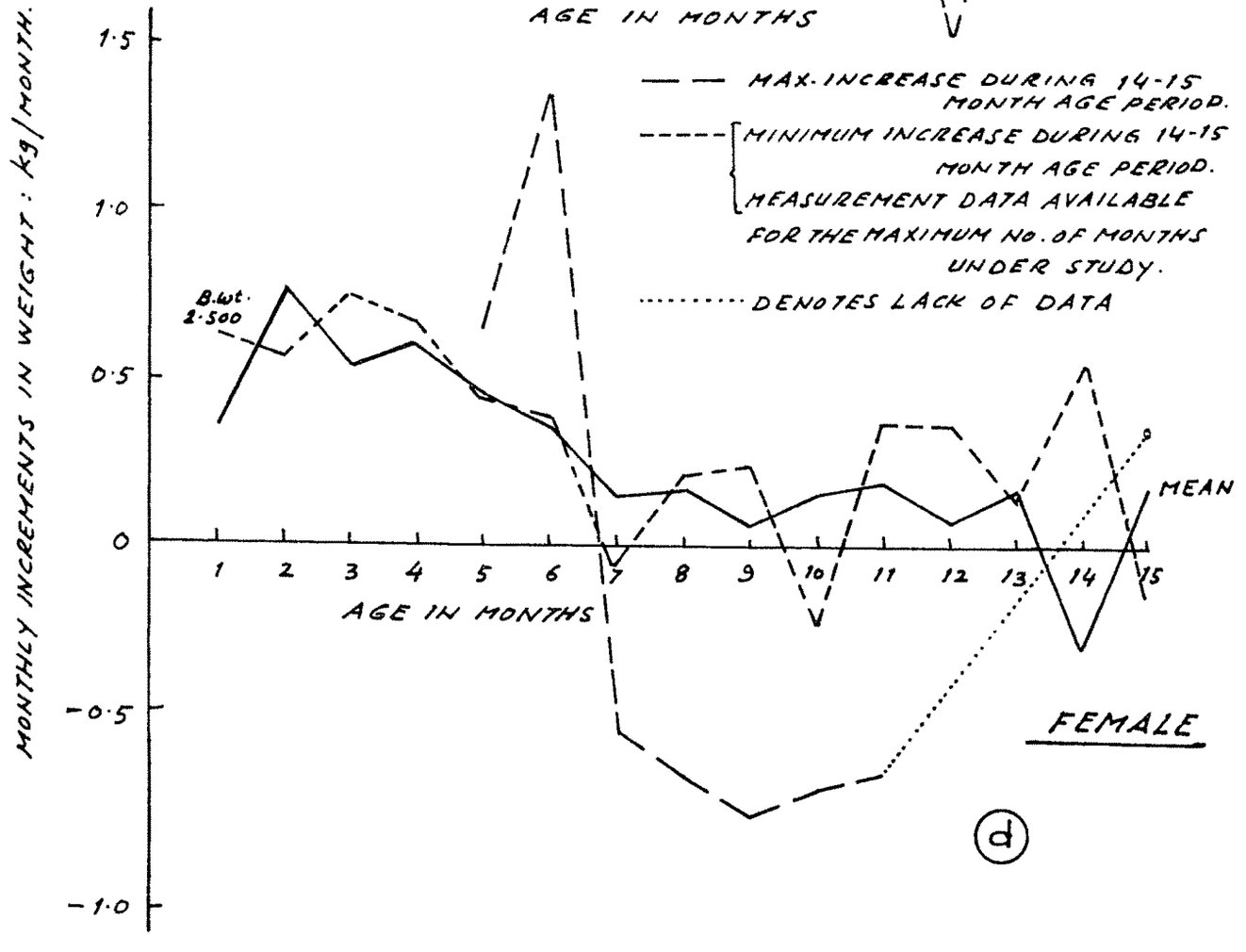
FIG. XXI 2

GRAPHS OF MEAN MONTHLY INCREMENTS IN WEIGHT SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN WEIGHT LOWER URBAN MALE & FEMALE LONGITUDINAL DATA

MALE



(c)



FEMALE

(d)

FIG. XXI 3

GRAPHS OF MEAN MONTHLY INCREMENTS IN WEIGHT SUPERIMPOSED WITH SELECTED INDIVIDUAL GRAPHS OF MONTHLY INCREMENT IN WEIGHT LOWER URBAN FEMALE LONGITUDINAL DATA

FEMALE

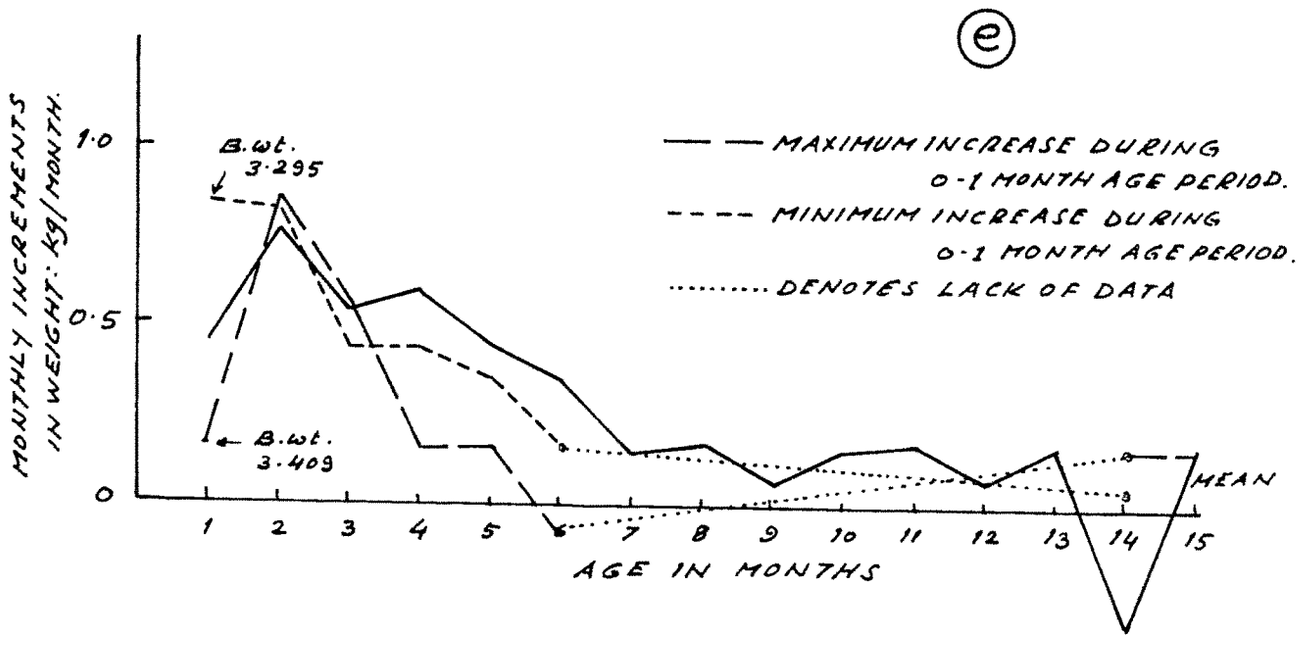


TABLE VI

Comparison of observed weight at 5 months and 12 months with twice and thrice the birth weight respectively.

Longitudinal Data

S,No.	B.wt.kg.	5 mo. Ob.wt.kg.	B.wt.x2	% error	12 mo. Ob.wt. kg.	B.wt.x3	% error
1	2	3	4	5	6	7	8
1			Lower Urban Male				
1	2.500	--	--	--	8.011	7.500	+6.1 %
2	2.727	6.373	5.454	+12.48%	7.357	7.171	+2.52 %
3	2.897	7.386	5.794	+11.5 %	8.564	8.691	-1.48 %
4	2.727	6.249	5.454	+14.82%	6.647	7.171	-7.89 %
5	1.818	--	--	--	7.244	5.454	+24.8 %
6	3.182	6.505	6.364	+24.04%	--	--	--
7	2.727	6.306	5.454	+ 2.24%	7.272	7.171	+1.39 %
8	3.238	6.164	6.476	- 5.07%	7.911	9.714	-22.8 %
9	2.344	6.363	4.688	+26.4 %	8.124	7.032	+13.4 %
	Mean : 3.02						
		6.62 (more than twice the mean birth weight)			7.64 (	2½ x mean B.wt.	
	N.B. : Range of percentage error - 22.95% to + 24.8%						
			Lower Urban Female				
10	3.409	5.227	6.818	-30.4 %	--	--	--
11	2.727	6.382	5.454	+14.5 %	--	--	--
12	2.500	5.539	5.000	+9.18 %	6.704	7.500	-1185 %
13	1.378	4.474	2.756	+38.4 %	--	--	--
14	3.295	6.221	6.59	-5.8 %	--	--	--
15	2.045	5.639	4.09	+27.5 %	--	--	--
	Mean 2.56	5.59 (more than twice the mean birth weight)			6.7		

Continued...

Table VI - continued

1	2	3	4	5	6	7	8
			Higher Urban Female				
16	2.954	6.391	5.908	+7.54 %	8.295	8.862	-6.85 %
17	3.182	7.215	6.364	+11.78%	9.289	9.546	-2.77 %
18	2.585	6.761	5.170	+23.58%	7.584	7.755	-2.26 %
19	2.954	7.144	5.908	+17.4 %	--	8.862	--
20	2.954	6.363	5.908	+ 7.15%	8.408	8.862	-5.4 %
21	2.500	6.136	5.000	+18.6 %	7.812	7.500	+4 %
22	2.841	5.255	5.682	- 8.1 %	6.931	8.523	-22.95%
23	3.011	5.255	6.022	-14.56%	6.846	9.033	-32.0 %
24	2.784	5.852	5.568	+ 4.86%	7.840	8.352	-6 .54%
25	3.423	7.158	6.846	+ 4.93%	8.976	10.269	-14.38%
Mean	2.92	6.35 (more than twice the mean birth weight)			8.0 more than 2.5xmean birth weight.		

N.B. : Range of % error - 22.95% to + 4%

			Higher Urban Male				
26	3.380	8.238	6.76	+17.95%	10.567	10.140	+ 4.04%
27	3.580	8.011	7.16	+10.6 %	9.317	10.740	-15.25%
28	2.954	6.136	5.908	+3.72 %	7.840	8.862	-13.0 %
29	3.182	6.363	6.364	nil	8.295	9.546	+15.08%
30	3.466	8.636	6.932	+19.70%	11.022	10.398	+ 5.66%
31	3.778	7.727	7.556	+2.22 %	9.033	11.334	-25.5 %
32	3.182	7.272	6.364	+12.48%	9.999	9.546	+ 4.53%
33	2.727	6.363	5.454	+14.3 %	9.317	8.181	+12.2 %
34	2.954	7.414	5.908	+20.3%	9,658	8.862	+ 8.24%
35	2.954	--	5.908	--	7.954	8.862	-11.4 %

Continued...

Table VI - continued

1	2	3	4	5	6	7	8
36	2.841	8.085	5.682	+29.6%	9.545	8.523	+10.7 %
37	3.125	--	6.25	--	8.238	9.375	-13.85%
38	2.954	6.136	5.908	+ 6.98%	8.295	8.862	- 6.72%
39	2.045	5.255	4.09	+22.2%	7.727	6.135	+20.6 %
40	2.954	6.207	5.908	+4.8 %	7.840	8.862	-13.0 %
41	2.585	6.051	5.17	+14.55%	8.465	7.755	+ 8.36%
42	2.954	6.391	5.904	+ 7.63%	7.869	8.862	-12.6 %
43	2.954	6.491	5.904	+ 9.05%	8.295	8.862	- 6.83%
44	2.727	7.556	5.454	+14.58%	9.954	8.181	+17.8 %
45	3.182	6.732	6.364	+ 5.48%	--	9.546	--
46	2.841	6.789	5.682	+16.38%	8.295	8.523	- 2.74%
Mean :	2.97	6.96 (more than twice the mean birth weight)			8.88	approx.3x b.wt.	

N.B. : Range of percentage rror - 25.5% to + 17.8%

Observations : An examination of this table reveals that the range of percentage error in all the groups is quite high. That even the mean observed weight at 5 months in all the groups is generally more than 2½ times the mean birth weight of that particular group. The mean observed weight at age 12 months is close to 3 times the mean birth weight of only one group.

Correlation Analysis :

Correlation gives the strength of relationship between variables. A correlation coefficient is actually a measure of how well a straight line fits the points in a scatter diagram. It varies between 0 (zero), meaning no correlation or complete scatter, to ± 1, meaning perfect corelation, i.e. all coordinates falling on the line. The relationship is designated by 'r' and is called the coefficient of corelation.

Correlation coefficients of weight and stature, and stature and chest circumference at each month are calculated for both the sexes living in urban and rural area. In using this statistical method, sample characteristics had to be taken into consideration. One of these was the fact that the limited sample for rural higher socio-economic group of infants was reduced considerably on fragmentation

due to controls and no cross-sectional data were available for the urban higher socio-economic group of infants. Therefore, the corelation coefficients were calculated only for the lower socio-economic classes of both urban and rural Baroda. These calculations were done only for the age sub-group in which the N was 9 or more than 9. These are presented in the table VII.

Observations : It is noted that height and weight are correlated statistically at the .01% level in all the ages except 9 months in the urban male infants. In the female counterparts of the same group, they are correlated at this level (.01%) at all months except 5 months. In this group the significance is only at .05% level. In the 7 month and 15 month old group of females these two anthropometric measurements are not statistically significantly related at even at the .05% level.

In the rural group of males, height and weight are significantly related at the .01 % level in all the age groups except, 2,7,8,11,12. The nature of this relationship is not known from the data for the 14 and 15 month olds. In the female counterparts this relationship is significant at the .01 % level in only 4 groups; viz., the 1,2,3 and 7 month olds.

TABLE VII

Correlation coefficients between stature and weight and stature and chest circumference.

A

	MALES			FEMALES	URBAN	
Age	N	Ht.-Wt. 'r'	Ht.-Chest 'r'	N	Ht.-Wt. 'r'	Ht.-chest 'r'
1	21	.706**	.411**	29	.719**	.605**
2	24	.659**	.670**	26	.578**	.446**
3	29	.772**	.715**	21	.852**	.714**
4	19	.825**	.571*	31	.691**	.531**
5	29	.811**	.605**	21	.486*	.335
6	35	.813**	.544**	15	.926**	.715**
7	27	.644**	.352	23	.255	.124
8	22	.559**	.339	28	.533**	.156
9	20	.514*	.497*	30	.778**	.368*
10	24	.586**	.517**	26	.758**	.384
11	28	.674**	.590**	22	.602**	.603**
12	32	.665**	.431*	18	.716**	.796**
13	26	.815**	.053	24	.812**	.341
14	31	.734**	.575**	19	.720**	.499*
15	23	.607**	.283	25	.160	.125

1-15 months { 390

continued...

Table VII - continued

B

	MALES				FEMALES	
Age	N	Ht.-Wt. 'r'	Ht.-Chest 'r'	N	Ht.-Wt. 'r'	Ht.-Chest 'r'
1	16	.717**	.640**	16	.688**	.311
2	20	.344	.126	17	.608**	.583*
3	12	.818**	.730**	25	.541**	.172
4	20	.775**	.756**	18	.481*	.350
5	20	.639**	.554*	13	.436	.031
6	15	.656**	.624*	15	.438	.501
7	19	.563*	.364	14	.698**	.341
8	12	.234	.103	17	.579*	.057
9	20	.793**	.659**	14	.618*	.628*
10	12	.838**	.791**	9	.549	.297
11	13	.572	.643	6	.984	.992
12	13	.173	.107	9	.583	.569
13	12	.663*	.695*	16	.536*	.065
14	5	--	--	9	.437	.330
15	3	--	--	9	.348	.318
1-15 months		210				

** Significant at .05% and .01% level

* Significant at .05% level only.

Stature and chest circumference seem to be related with each other in all the four control groups even less frequently. Interestingly enough this relationship is very infrequently significant in the rural group.

Correlation coefficients of all the anthropometric variables under study were calculated to test their relation with each other for the entire age group of 1 to 15 months. These calculations were by-products of multiple regression analysis, where the dependent variable 'y', by turns was taken as each of the anthropometric measurements viz., stature, stem height, head circumference, chest circumference and weight ~~by turns~~. These values are given in Table VIII.

Observations : Examinations of this table reveals that in all the control groups of sex and residence, all the anthropometric measurements are related to each other and their relationship is significant at .01% level.

---

* This regression analysis was carried out at the computer control of the Operation Research Group, Division of Sarabhai Technological Development Syndicate Pvt.Ltd., Baroda.

TABLE VIII

Correlation of anthropometric variables under study with each other for the entire age period under study, viz., 1 to 15 months.

LOWER URBAN

N	y =	Ht.& Wt. 'r'	Ht.head circumference 'r'	Ht.-chest circumference 'r'
		MALE		
389	Wt.	.702	.419	.432
388	Ht.	.863	.536	.544
391	Head 0	.688	.522	.525
388	Chest 0	.669	.694	.639
		FEMALE		
359	Ht.	.789	.824	.778
357	Wt.	.817	.793	.726
359	Head 0	.789	.824	.779
358	Chest 0	.789	.793	.726
		LOWER RURAL		
		MALE		
210	Wt.	.760	.718	.703
210	Ht.	.760	.718	.703
210	Head 0	.760	.897	.703
210	Chest 0	.760	.718	.703
		FEMALE		
206	Wt.	.682	.665	.625
207	Ht.	.708	.762	.738
207	Head 0	.708	.768	.738
206	Chest 0	.682	.665	.625

Note: All the above values are significant at .01% level.

Regression Analysis :

If we have two measurements X & Y we can relate them by means of a straight line which predicts the most likely value of Y for any given value of X. This straight line is given by the equation

$$Y = a + bX$$

where a and b are constants, and is called a regression line. Unless the measurements are perfectly correlated one with another the prediction of Y from a value of X is subject to a certain amount of error; most of the points do not actually lie quite on the line, but around about it. The amount of this error in prediction is measured by the statistic $\sigma_{est.}$, the standard error of estimate. Its interpretation is, that of all the values actually obtained for Y at a given value of X about 95% lie within the range $\pm 2\ \sigma_{est.}$ from the predicted value of Y. These regression lines are such that equal numbers of sample variants are on either side with minimal distance between the regression line and the sample variants.

The efficiency of any regression depends first on the correlation between the two measurements (since if there is no correlation the relating together of the two is simply an irrelevance), and secondly on any disease process, whatever be its nature, which alters one measurement and not the other.

In the present sample, the correlation matrix for head and chest circumference of the urban male infants was calculated to be 0.83904 by simple regression analysis. It means that if 'y' or chest circumference were to be estimated in terms of 'x' or head circumference, 70% of the prediction of the variability in 'y' would be accounted for by the variability in 'x'. The investigator was interested in finding out how this predictive value compared with the use of central tendency in setting up norms that were not based on chronological age. In Figure XXII, 3 graphs depicting the relationship between the head circumference (X-axis) and chest circumference with the age in month as a parameter on the graph are plotted. These three graphs represent:

(1) The observed values of one male infant of urban lower group.

(2) The estimated values, based on a large cross-sectional sample, and

(3) The calculated median values of the same sample.

Values of head circumference and chest circumference from which these graphs are drawn are given in Table IX. Calculations of predictive value based upon the regression equation are given in Table IX A.

TABLE IX

Values of head circumference and estimated chest circumference for the same age of male infants, by use of medians and simple regression analysis.

Cross sectional Data N = 390			Longitudinal data of one male infant			
Age	Median* Head circum -ference	Chest circum -ference	Age	Observed** Head circum ference	Chest circum ference	Estimated*** Chest circum -ference
1	36.0	33.5	1	34.8	32.4	33.0
2	37.4	35.4	2	35.8	34.2	34.0
3	39.2	37.5	3	38.2	36.8	36.3
4	39.8	38.6	4	38.9	37.5	37.0
5	41.2	40.2	5	39.2	37.9	37.3
6	42.0	39.6	6	41.0	38.5	39.0
7	42.0	39.9	7	41.5	39.0	39.5
8	43.0	41.0	8	42.0	39.0	40.0
9	42.8	40.9	9	42.0	40.8	40.0
10	43.3	41.3	10	42.5	41.0	40.5
11	44.0	41.5	11	42.8	41.1	40.8
12	44.1	41.8	12	42.8	41.2	40.8
13	44.6	41.2	13	42.9	41.7	40.9
14	44.5	42.5	14	43.8	41.9	41.8
15	44.5	42.2				

* Median values based on urban male cross-sectional sample aged 1-15 months N = 390 - Lower socio economic group.

** Observed values of code No.0731, urban male infant measured every month from 1 month to 14 months - lower socio-economic group.

*** Estimated values of chest circumference from observed values of head circumference of 0731 by linear regression analysis of chest circumference of 390 male infants aged 1-15 months - urban lower socio economic sample measured cross sectionally.

Table No.IX A

Estimated values of chest circumference calculated by regression analysis on observed values of head circumference of one male infant belonging to urban lower socio economic class.

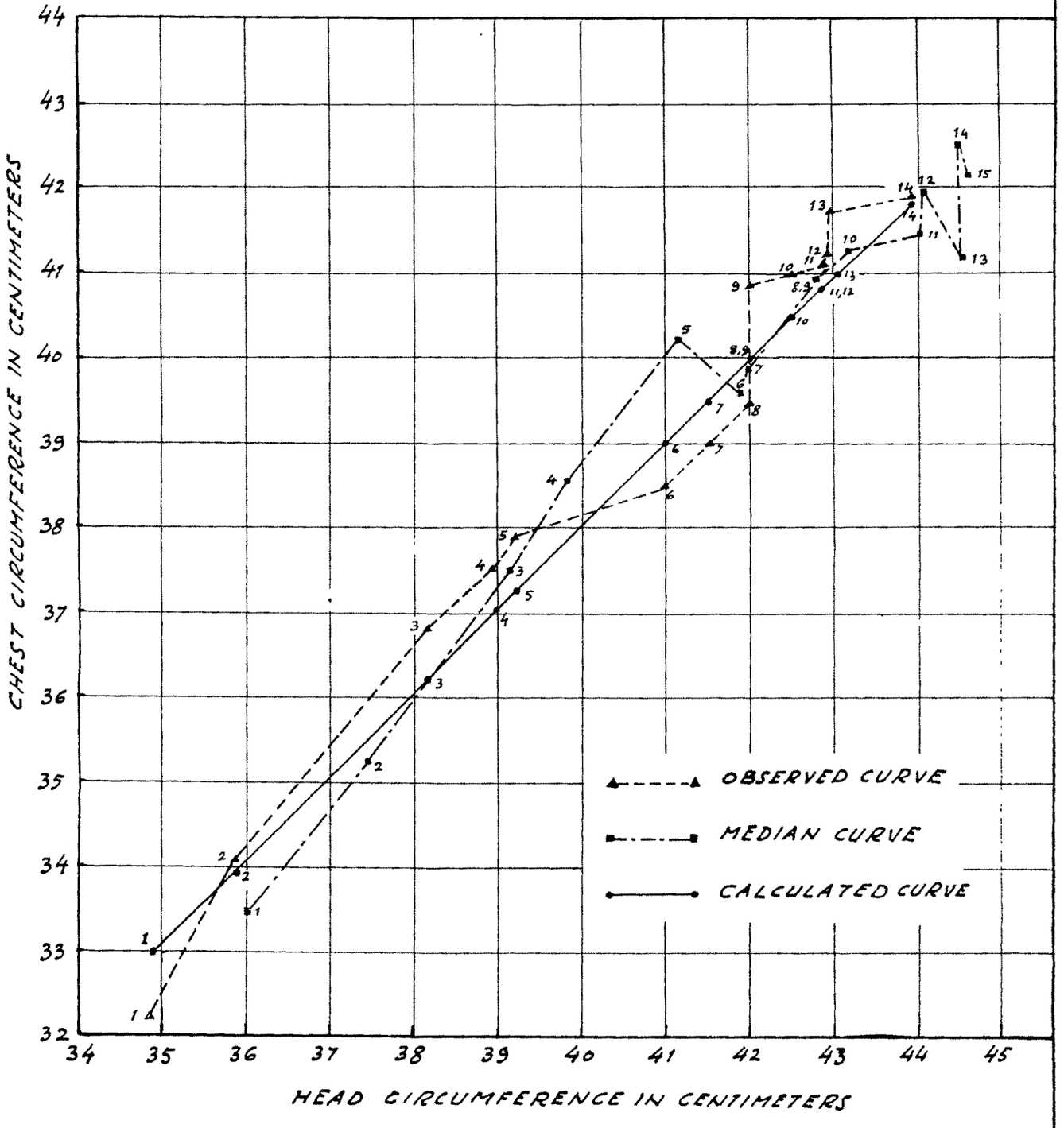
Chest circumference = y = a + bx

where x is the observed value of head circumference.

Age	Head circum-ference x	= x		+ = -.911136	
		x .97453 =	bx + (a= -.911136) =	Y =	estimated chest circumference
1	34.8 x	.97453 =	33.913644 - .911136	=	33.0 cms.
2	35.8 x	" =	34.888174 "	=	34.0 cms.
3	38.2 x	" =	37.227046 "	=	36.3 cms.
4	38.9 x	" =	37.909217 "	=	37.0 cms.
5	39.2 x	" =	38.201576 "	=	37.3 cms.
6	41.0 x	" =	39.955730 "	=	39.0 cms.
7	41.5 x	.97453 =	40.442995 - .911136	=	39.5 cms.
8	42.0 x	" =	40.930260 "	=	40.0 cms.
9	42.0 x	" =	40.930260 "	=	40.0 cms.
10	42.5 x	" =	41.417525 "	=	40.5 cms.
11	42.8 x	" =	41.709884 "	=	40.8 cms.
12	42.8 x	" =	41.709884 "	=	40.8 cms.
13	42.9 x	" =	41.807337 "	=	40.9 cms.
14	43.8 x	" =	42.684414 "	=	41.8 cms.
15					

FIG. XXII

THREE GRAPHS DEPICTING THE RELATIONSHIP BETWEEN THE HEAD CIRCUMFERENCE AND CHEST CIRCUMFERENCE WITH AGE IN MONTHS AS A PARAMETER ON THE GRAPHS



Summary of Observations :

The observations based upon the statistical analysis may be summed up as follows :

Central Tendency and Variation : The increase in the values with advancing age is noted in all the anthropometric measurements in accordance with the known trends of physical growth. In general extremely wide deviations are noted in all the five anthropometric measurement values in certain control groups in certain age groups.

When one considers the different age groups as entities, even though all the anthropometric measurements are of the same infants in each age group, these variations occure in different age groups for different measurements. There is one exception. In the urban group of 15 month olds of both the sexes these wide variations occure in all the five anthropometric measurements of stature, stem height, head circumference, chest circumference and weight.

This phenomenon in general is not observed in the rural groups. The few exceptions are as follows. Stature exhibits moderately wide variation in the 10 month old male in the rural community. Stem height shows this variation again in the rural male in the 3 and 8 month olds and chest circumference in the 11 month old group of rural lower class females.

Percentile point estimations :

In general the point estimations at the different levels of P_{10} to P_{90} run parallel. In certain age groups it has not been possible to compute these estimations because of the inadequate N for the purpose. In certain age groups in some control variables these point estimations of some measurements of the different levels do not run parallel. Either they are too close to the adjescent level or too far from the adjescent level.

Rates of Growth :

The rates of growth of all the anthropometric measurements show a sharp decline in the early months. The exact age at which this decline is sharpest differs for different measurements, and the two sexes. The only exceptions are the stem height, and head and chest circumference which exhibit the sharp deceleration at 4 month in both the sexes. This deceleration takes place earlier in the lower socio-economic class than in the higher socio-economic class for stature in the present study.

The rates of growth of all the measurements show spurts of growth characteristic of great velocity alternating with periods of rest characteristic of 0 (zero) velocity or decreased velocity.

There is great individual variability in rates of growth of all the anthropometric measurements. Mean growth rates of all the anthropometric measurements hide the peaks and dips of variability of individual rates.

Rate of weight gain : Comparison of twice and thrice the birth weight with actual observed weights of the same infants at age 5 months and 12 months shows the percentage error in estimation to be quite high in both the sexes and both the socio-economic classes.

Birth weight :

In general female infants weight less than the male infants at birth. In the lower urban socio-economic class the birth weight of female newborns was more than the male newborns by 95 gms.

Ratios and Proportions :

The stem stature index : This index in general decreases with age in all the four control groups. The standard deviation varies a great deal in all the four control groups.

The skelic index : The value of this index is minimum before 2 months of age in all groups except the rural male. The value of this index at 3 months is less than that at the 2 month level in the rural male infants.

In general it demonstrates an increasing trend with advance in age.

Head and Chest circumference : The mean curves of both these measurements seem to run parallel in both the sexes. The ratio of mean head circumference to mean chest circumference in general remains more than 1. The range of the standard deviation is narrow.

Correlation Analysis :

Correlation analysis was carried out to study the relationship of the different anthropometric measurements. Especially relationship of height and weight and height and chest circumference is studied at each of the first fifteen months of life. Of these two pairs of anthropometric measurements, height and weight are better correlated at each month than height and chest circumference. However, the correlation between stature and weight is not found to be consistent at each of the 15 months and is also not consistent in the control groups of sex and urban-rural communities.

Correlation analysis was also carried out to test the relationship of all the anthropometric measurements under study for the entire age group of first fifteen

months. It was noted that all the anthropometric measurements were statistically significantly related to one another at the .01% level.

Regression analysis :

Simple regression analysis was carried out for head and chest circumference of the urban male infants during the first fifteen months. It is noted that the estimated values of chest circumference by this method for the first fifteen months are closer to the actual observed values at each month than the median values of the group.